

Using Design Fiction to Develop a Critical Inquiry Method in Media Education

Géraldine Wuyckens

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Abstract

The thesis discusses the concept of design fiction and its application in media education. Design fiction is a creative practice that combines speculative design and science fiction to explore possible futures for new technologies. Design fiction is used in various fields, including traditional and critical design, to consider the social, cultural, ethical, political, and economic implications of technological inventions on society.

The doctoral research proposes using design fiction in media education to engage students in critical reflection and evaluation of digital media and technologies. This aligns with the purpose of media education, which encourages critical thinking about media. The author suggests using design fiction to develop a critical inquiry method in media education, based on Dewey's theory of inquiry and inquiry-based learning approaches. The aim is to enable students to ask critical questions about digital media and technology to enhance their critical thinking. As part of this research, an educational programme using design fiction and a rubric for assessing students' critical inquiry competence were developed.

The educational programme was built in collaboration with *Action Médias Jeunes*, a Belgian non-profit association. The programme demonstrates how exploring speculative futures can facilitate reflection on societal issues and own media practices. The rubric, developed as an evaluative tool, helps distinguish critical questioning from non-critical questioning based on criteria derived from scientific literature and students' questions. The collaboration with *Action Médias Jeunes* was part of a design-based research project that spanned several years. The project went through iterative phases, implementing design fiction activities in classrooms, testing the rubric, and collecting data to examine the effects of educational practices using design fiction on students' critical inquiry competence.

The thesis presents the results of this collaboration and addresses the research question of how design fiction can help build a critical inquiry method in media education and how this method can support the development of learners' critical inquiry competence. The results show that design fiction can help build this method in its way of encouraging students in formulating hypotheses about the future and investigating them through the production of diegetic prototypes and speculative scenarios. Furthermore, design fiction can contribute to the development of the critical inquiry competence through its ability to generate critical speculative questions about technologies and their future.

Jury Members

Pierre Fastrez – PhD supervisor

PhD Pierre Fastrez is a Senior Research Associate of the Belgian National Fund for Scientific Research and a Professor in Information and Communication at the Université catholique de Louvain (Belgium). For the last fifteen years, he has undertaken and directed research projects on media literacy that combine an experimental and evaluative approach involving the development of assessment tools based on performance tests, and a qualitative and interpretive approach dedicated to the inference of media competences based on the analysis of media practices. He directs the research journal “*Recherches en Communication*”. He is a member of the Higher Council for Media Education in French-speaking Belgium.

Sébastien Fevry – PhD Committee Member

PhD Sébastien Fevry is a Professor in Information and Communication at the Université catholique de Louvain (Belgium) and coordinator of the GIRCAM research group. With Emmanuelle Fantin and Katharina Niemeyer, he has recently co-edited the book “*Nostalgies contemporaines. Médias, culture et technologie*” (Septentrion, 2020). He is also the author of numerous articles in journals such as *Image & Narrative*, *Espace temps.net*, *Studies in French Cinema*, *Memory Studies* or *Intermédialités*. In 2020, he is one of the editors of a special issue of *Cahiers de narratologie: Défilement, projection, performance. La lanterne magique comme dispositif narratif*.

Martin Lalonde – PhD Committee Member

Martin Lalonde is an Associate Professor at the School of Visual and Media Arts at the University of Quebec in Montreal (Canada). He works as a specialist in innovative pedagogies and didactics of visual and media arts. His research focuses on the impact of mobile and ubiquitous digital technologies on teaching and learning in visual arts. His recent work specifically addresses the impact of the virtual augmentation of educational environments and immersive technologies on adolescent’s multimodal media literacies development. His fields of interest also include the theoretical and practical foundations of visual and media arts curricula, the impact of social media and conversational images on the teenager’s communications practices, design-based research and visual research methodologies, as well as the sociology of arts education.

Sirkku Kotilainen – External Jury Member

PhD Sirkku Kotilainen is acting as Professor of Media Education at the Faculty of Information Technology and Communication Sciences at Tampere University (Finland). Her research profile is youth civic participation in digital societies with digital skills as critical media literacies including critical awareness on algorithm-based communication, together with the research interest on participatory methodologies. She has conducted research for 25 years, recently been involved in European projects including Children and Youth Online: Research and Evidence (CORE) and Youth Digital Skills (ySkills) together with EUKIDS Online network and research. She is teaching in international master studies, currently in the MDP on Sustainable Digital Life and doctoral level supervising in the PhD programme titled as Convergence of Humans and Machines (2023 – 2027) at Tampere University.

Suzanne Kieffer – Jury President

PhD Suzanne Kieffer is a Professor in Information and Communication at the Université catholique de Louvain (Belgium). She holds a PhD in Computer Science with research interests in human-computer interaction, user experience (UX), user-centred design and information visualisation. Passionate about UX, she has been working for and with users for over ten years. She currently works on the integration of UX into software development models, for example by supporting project partners active in the automotive and cybersecurity sectors increase their “user-centredness”. In 2022, she co-authored a book entitled “*Les fondamentaux de la visualisation de données*”, a guide to designing data visualisations for both students and teachers in the humanities and social sciences.

List of Publications

Peer Reviewed Publications

- **Wuyckens, G.** (2023). Conceptualizing a Framework for Design-based Research in Media education: Case Study of a Project Using Design Fiction to Develop Critical Inquiry Attitude. In *Mapa y la brújula, El. Navegando por las metodologías de investigación en comunicación. (Pdf) – Libros Fragua* (Fragua). <https://fragua.es/producto/mapa-y-la-brujula-el-navegando-por-las-metodologias-de-investigacion-en-comunicacion-pdf/>
- Lalonde, M., Blanchette, K., **Wuyckens, G.**, Huebner, E. J., & Meilleur, B. (2023). La création de récits d'anticipation en réalité virtuelle pour le développement de la compétence numérique et de la compétence en littératie médiatique multimodale des élèves au secondaire. *Médiations et médiatisations*, 15, 15. <https://doi.org/10.52358/mm.vi15.346>
- **Wuyckens, G.** (2022). Using Design Fiction to Develop Pupils' Critical Inquiry Competence. *The Journal of Media Literacy*. <https://ic4ml.org/journal-article/using-design-fiction-to-develop-pupils-critical-inquiry-competence/>
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- **Wuyckens, G.** (2021). Design fiction as a critical inquiry method in media education: First findings of an exploratory research project. *Media Education Research Journal*, 9(2), 22. https://microsites.bournemouth.ac.uk/merj/files/2021/03/MERJ_9.2_Wuyckens.pdf
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- Lalonde, M., Blanchette, K. et **Wuyckens, G.** (2022). *Le transfert des connaissances comme pratique intégrée et itérative dans le processus méthodologique de la recherche design en éducation*. Colloque intitulé « Comment faire pour que les résultats de la recherche trouvent écho dans les lieux d'enseignement ? » au Congrès de l'ACFAS, Montréal.
- Lalonde, M. et **Wuyckens, G.** (2022). *Pensée-design : Intégrer l'innovation pédagogique dans les contenus de la formation en enseignement des arts et des technologies*. 9^{ème} Colloque International en Education. Palais des Congrès à Montréal.
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- **Wuyckens, G.** (2019), *Design fiction as a critical inquiry method in media education*. Nordmedia Preconference 2019. Malmö universitet, Malmö.
- **Wuyckens, G.** (2019), *Le design fiction comme méthode d’enquête critique en éducation aux Médias*. Journée des jeunes chercheurs Gis2IF. Campus Condorcet, Saint-Denis.
- **Wuyckens, G., T’Kint, A. et Kieffer, S.** (2019), *Designing Media*. Carleton University, Ottawa.
- **Wuyckens, G., Haineaux, E. et Lourtoux, J.** (2018), *L’écriture collaborative transmédia : récits, usages et identités*. Assises de la recherche en culture populaire et médiatique. Sorbonne Nouvelle Paris 3, Paris.

Note about Writing Style

Before delving into my research, I feel it necessary to address the writing style in which this thesis is presented. I would like to shed light on the deliberate choices made to ensure clarity, coherence, and overall effectiveness in communicating my ideas.

First, I am writing this research work in English, a language that holds a special place in the global academic landscape. Though not my native tongue (native French speaker), I have chosen English as the medium of communication for a compelling reason – its richness in scientific literature and its ability to connect researchers from diverse backgrounds. By writing in English, I hope to transcend geographical boundaries and contribute to a broader community of scholars who share a passion for knowledge.

Second, I want to highlight a significant choice in this thesis – the use of non-gendered language. As society evolves and embraces inclusivity, I believe it is essential to reflect these values in academic work and communication. I have adopted the following rules for non-gendered language usage throughout this thesis:

- **Avoiding Gendered Pronouns:** Whenever possible, I use gender-neutral pronouns such as “they/them” or “their” instead of gendered pronouns like “he/she” or “him/her”.
- **Using Gender-Inclusive Terms:** I opt for gender-inclusive terms and expressions that encompass all genders rather than using language that implies a specific gender. For example, “students” instead of “boys and girls”.
- **Acknowledging Personal Pronouns:** I respect individuals’ preferred gender pronouns and use them as appropriate. If a person’s pronouns are known, I use them in my writing to show respect for their identity.

Third, I would like to provide some clarity on how I am referring to the grade levels in primary and secondary education in Belgium, especially for international readers who may be unfamiliar with the terminology.

- **Primary Education:** In the context of primary education, I use the term “first grade”, “second grade”, “third grade”, and so on to indicate the different years of primary school. Belgium’s primary education spans six years, typically starting at age six and continuing through age twelve. For example, “a third-grade primary school student” refers to a student in their third year of primary school, typically around the age of eight.

- Secondary Education: Similarly, when discussing secondary education, I use “first year”, “second year”, “third year”, and so forth to denote the different years of secondary school. Belgium’s secondary education also comprises six years, typically starting at age twelve and continuing through age eighteen. For instance, “a first-year secondary school student” signifies a student in their first year of secondary education, usually around the age of twelve.

I hope these clarifications will help you navigate the content more easily. If you have any questions or need further clarification on any topic, please do not hesitate to reach out.

Thank you for your interest and engagement in this manuscript.

List of Acronyms

AI	Artificial Intelligence
DBR	Design-based Research
DF	Design Fiction
DP	Diegetic Prototype
HCI	Human Computer Interaction
HTTF	HACK To The Future
IBL	Inquiry-based Learning
ICT	Information and Communication Technology
ML	Media Literacy
MT	Media Text
SF	Science Fiction
Sci-fi	Science Fiction

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INTRODUCTION

In a world in which the future is becoming increasingly uncertain, imagination has a role to play in anticipating future crises and, above all, in opening spaces for discussion about the world we want to live in. Design fiction, which lies between speculative design and science fiction, is a creative practice that reopens the imagination and explores possible futures for new technologies. The term was first coined by Bleecker in 2009 to refer to the process of exploring possible near futures in science and cinema. At the intersection between science fiction and science fact, design fiction was defined as “the embodiment of materialized reflections on design today, as well as projections and anticipations of the designed futures” (Bleecker, 2009, p. 17). Nowadays, design fiction is used in many other fields, such as traditional and critical design, or public affairs. The common feature of its use in this variety of contexts is that it considers the technical aspects of an invention in relationship with its social, cultural, ethical, political, and economic implications on the imagined society (Tanenbaum, 2014). In this respect, design fiction can help people to question their everyday use of technology through the exploration of possible near futures (Mitrovic et al., 2015).

In the framework of my doctoral research, I propose using design fiction in media education to engage students in a critical reflection and evaluation of digital media and technologies. One major feature of design fiction is to question and critically think about our use of technologies. This feature is in line with the purpose of media education, which encourages critical views on digital media. Based on Dewey’s theory of inquiry (1938b) and inquiry-based learning approaches, I suggest using design fiction to develop a critical inquiry method in media education. A critical inquiry method is a method which enables students to ask critical questions about digital media and technology with the objective of developing their critical thinking. In this context, I developed both an educational programme using design fiction and a rubric assessing students’ critical inquiry competence.

The educational programme was developed in collaboration with a Belgian non-profit association, *Action Médias Jeunes*. I used models of inquiry-based learning and narrative theories to structure the activities to encourage students to adopt an attitude of critical questioning about the media and technological environment that surrounds them. The aim of such a programme is to demonstrate how exploring the future, and in particular speculating, can help students to reflect on both societal issues and their own practices as media users. In this context, I have developed a second instrument, the rubric, which is an exploratory tool

for evaluating media education activities based on students' questions on media text, here design fiction text ('text' in a semiotic sense). Based on the scientific literature and the corpus of students' questions collected during pre- and post-tests, the rubric includes a set of criteria for distinguishing critical from non-critical questioning.

The collaboration with *Action Médias Jeunes* is part of a design-based research (DBR) project that began in 2018 et that lasted about five years. DBR is a recent paradigm in media education research based on collaboration between researchers and practitioners in real learning contexts, which aims to generate theoretical and practical outputs. We conducted two iterative phases during which we built and implemented design fiction activities in the classroom. We also tested the rubric once and collected various data that enabled us to draw conclusions about the main research hypothesis, i.e., the effect of educational practices using design fiction on learners' ability to ask critical questions about media texts and the technologies they depict. The association is now on free wheels and is currently conducting a third phase based on the lessons learned in the last two phases.

This thesis presents the results of this collaboration and provides an answer to the following research question: *How can design fiction help build a critical inquiry method in media education and how can this method support the development of learners' critical inquiry competence?* The manuscript is structured into four main parts: the research context, the theoretical framework (itself divided into three parts), the method and outputs, and the findings. This plan is quite similar to the other thesis manuscripts, except that it includes an entire section dedicated to the method and outputs of the DBR project. The educational programme and the rubric both took years to build and were the subject of intense collaborative work. It therefore seems relevant to dedicate them a whole section to describe their content and process.

PART 1: RESEARCH CONTEXT

Conducting a Design-based Research Project in a Media Education Context

The first part of this thesis contextualises the research project. First, I give some definitions of the concept of media education, revisit its historical origins, and present the kind of media education activities carried out in Belgium. Second, I review the literature on design-based research (DBR) to introduce the particular form of research that was conducted during the project. This literature review is necessary at a relatively early stage to understand the specific articulation of the present thesis. I conclude the research context part by introducing the way I used DBR in the framework of my own research project.

Chapter 1: The Praxis of Media Education

It seems obvious to begin this manuscript by defining the research area, namely media education. This will not only allow the reader to understand the context in which the research project took place, but also to justify later my epistemological position in the field. First, I introduce the praxis of media education to better understand the scope of the concept. Second, I offer a brief history of the emergence of media education in the French community of Belgium. Third, I review the different kinds of activities that practitioners¹ can carry out in a context of media education.

1.1. The Concept of Media Education

Media education refers to “the set of teachings, pedagogical processes and activities that contribute to the development of critical thinking and media literacy” (Landry & Basque, 2015, p. 59; personal translation). Media literacy² generally refers to the knowledge and skills needed to analyse, evaluate, or produce media messages (Martens, 2010). Media education focuses on a wide range of issues in today’s society, such as consumer awareness of the power structures that shape media representations (Kellner & Share, 2007b) or the emergence of a participatory culture (Jenkins et al., 2009). Concerned with civic engagement, media education wants to develop critical thinking and democratise society.

According to Macdonald (2008), media education is seen as a “pedagogy of questioning” which aims at “developing habits, skills, and the knowledge required to understand media messages, as well as production and navigation in an over-saturated media environment” (Landry & Basque, 2015, p. 49; personal translation). One way to evaluate individuals’ knowledge and skills is to make learners ask themselves a set of key questions when analysing media, such as: Who is the author of the text? Why is (s)he communicating? What is the context of the publication and the reception? Who is the reader? And so on. These questions teach citizens to be more critical of the media messages surrounding them.

The term media education itself is a point of discussion. This notion is not only polysemic but also controversial, “[...] because it presents in its theoretical and practical reflections current debates on media, society and education” (Landry & Basque, 2015, p. 49; personal translation).

¹ I use the term “practitioners” to refer to teachers, educators or any other people that carry out educational activities.

² I focus on the concept of media education in this first chapter but a whole chapter is devoted to media literacy later in the manuscript.

In response to the issues raised by the conceptualisation of this term, Landry (2017) has proposed to define media education not from knowledge and skills but from practice, the *praxis*, that is, a transformative practice operating a constant dialogue between practice and theory, reflection and action. This definition is more in line with the social and political goals of media education.

A significant part of media education belongs to the tradition of critical theory. This approach emphasises “the importance of critique, reflexivity and the achievement of emancipatory consciousness, free from indoctrination and socialization” (Kellner, 2003, p. 166). The focus is on the interplay of representations and ideologies in mass media culture. The goal is to make people more resistant to persuasion and to develop a critical autonomy. As we discuss in Chapter 3, critical media literacy is an illustrative movement of this approach and extends the concept of media literacy to develop competences that enable citizens, among others, to critically analyse power structures in the media.

In today’s society, marked by the rapid advancement of new technologies, the term ‘digital literacy’ is becoming frequently mentioned to expand to the notion of media literacy. Buckingham (2007) is one among many researchers that uses the notion of digital literacy to exceed the limits of the medium of writing and include digital technologies. He frequently contends, especially in this discourse, that digital literacy is often narrowly and instrumentally conceptualised. He proposes that it would benefit from being envisioned as an application of the critical and conceptual approach he advocates for in the realm of new digital contexts (Buckingham, 2019). In this context, Buckingham emphasises the centrality of information in digital literacy, highlighting the critical abilities to locate, use, evaluate, and produce information (2007, p. 45). As definitions evolve, contemporary perspectives on digital literacy now encompass competencies related to fostering personal awareness of the risks and ethical dimensions inherent in digital environments (Landry & Basque, 2015, p. 57; personal translation). Digital literacy is highly relevant today with the increasing influence of artificial intelligence and algorithms, which are reshaping how information is accessed, interpreted, and utilised in digital environments.

1.2. The Historical Invention of Media Education in the French Community of Belgium

De Smedt (2012) explains that “[a]s in many European countries, media education in the French-speaking Belgium has its origins in a movement of pioneering practitioners, i.e., educators” (p. 3; personal translation). Through various initiatives in the field, including at

schools, educators laid the foundations for what later became media education. De Smedt (2012) identified four phases lasting around ten years that marked this process. The next few paragraphs summarise these four phases before moving on to the present day. This history provides a better understanding of the many facets of media education praxis.

1.2.1. Media: From the Support of Teaching to the Object of Interpretation

The first phase refers to that of the pioneers and covers the 1970s. It coincides with “[...] the period when audio-visual media flows and objects began to be mastered, from a technical point of view, by non-professionals” (De Smedt, 2012, p. 3; personal translation). In this regard, teachers began to use them to support their lessons. For example, they used films, television programmes and advertising materials to teach geography or English (Piette, 2007). Until then, the media had been heavily demonised by Christian communities, who saw it as a way of subverting values, and intellectual circles, for its oppressive and mass-oriented nature.

The second phase refers to the emergence of various think tanks and covers more or less the 1980s. These groups included educators and teachers, as well as inspectors, cultural managers and academics, and initiated a common reflection around the notion of media education. They were disappointed about this restricted use of the media because until then, young people did not learn spontaneously from the audio-visual media (Fastrez & De Smedt, 2012). As De Smedt (2012) describes, “[i]n French-speaking Belgium, the Médiathèque of the French Community of Belgium, a private but subsidised organisation, has played an important role in bringing together different players to work on projects to disseminate and reflect on the topic” (p. 4; personal translation). Among the initiatives it led were surveys on media use and training needs, training courses on the pedagogical use of audio-visual media, and guides to audio-visual media education. At that time, media education was largely focused on the image and sound, and rather assimilated to audio-visual education.

The third phase refers to the institutionalisation of media education and covers approximately the 1990s. Media education is recognised as a public educational project and in this context, French-speaking Belgium is endowed with a Council for Media Education (in French, *Conseil de l'Éducation aux Médias* - CEM), responsible for advising the French-speaking Belgian government in this area (De Smedt, 2012, p. 4). The objectives are transversal and there is no intention to include any specific audio-visual course at school. Media professionals are required to train teachers so that they can incorporate media education into their lessons. In this regard, the CEM allocated resources to three media education resource centres which will be involved in teacher training: *C.A.V Liège ASBL*, *Média Animation ASBL* and *Centre*

d'Autoformation et de Formation continue (CAF). They are (still) in charge of designing, promoting and supervising initiatives, actions, experiences, pedagogical tools, research or evaluations in the field of media education in the Walloon-Brussels Federation (CSEM, n.d.-a).

The fourth phase refers to the partial integration of media education into teaching and covers more or less the 2000s. The media environment was changing radically at this time, with the internet becoming a part of everyday life and social media proliferating. Media education was struggling to assert its place in contrast to approaches which tend towards protectionism, i.e., which claim to protect citizens from the dangers of the internet, and approaches to education which mobilise ICTs in the classroom without making these media themselves and their societal issues objects of interpretation. As De Smedt (2012) points out, however, the years 2000 in French-speaking Belgium saw “[...] a significant amount of research projects and initiatives devoted to the way in which young people appropriate the Internet (*Internet et les jeunes*, *Educaunet*, *Mediappro*, *Euromeduc*, etc.)” (p. 8; personal translation). Some of this research projects were part of an international European framework and led to draw conclusions about user practices and the competences necessary for media education. In the 2000s, the scope of media education therefore broadened to include content other than audio-visual and began to take online content into account such as social networks, online forums, and websites.

1.2.2. Media Education Today: A Distributed Praxis

Nowadays, in the French community of Belgium, media education is still taught as a transversal subject at school. It is often the initiative of the teachers, who build their lessons based on the resources available or ask the help of educators specialising in the praxis. There are also initiatives outside the school context, such as youth, media or lifelong learning organisations which carry out media education projects for varied audience (minorities, senior, etc.). The role of the CEM, which has now become the Higher Council for Media Education (in French, *Conseil Supérieur de l'Éducation aux Médias* - CSEM), is to support these various initiatives.

Figure 1.1.

Logo of the CSEM



The CSEM has expanded to include more members, including scientific experts in media education and new information technologies, professional journalists specialised in the written press, radio and television, cultural organisations, youth organisations, representatives of education, trade unions and policymakers. Its mission is defined as follows: “to promote media education and to encourage the sharing of information and cooperation between all the actors and organisations concerned by media education in the French Community, in particular the different media sectors, compulsory education and lifelong learning” (CSEM, n.d.-b; personal translation).

Furthermore, ministries value media education projects in formal and informal settings, and budgets are allocated to organisations each year. In Belgium, the government of the Wallonia-Brussels federation has adopted a media education plan in 2021. This plan includes 62 actions aiming to reinforce and make accessible tools to allow each citizen, whatever their age, to benefit from a critical media education. The plan is based on four strategic axes, namely:

1. Provide all students with a solid and critical education in media and information literacy.
2. Evaluate and adapt the CSEM’s missions.
3. Communicate, raise awareness, coordinate projects, actors, and actions in media education, and strengthen collaborations.
4. Develop new media literacy initiatives on digital media and social networks.

(Linard, 2021; personal translation)

This budget plan is a real step forward for French-speaking Belgium and meets a real demand from several sectors, including education, to obtain funding to educate young people about the media.

1.3. Three Categories of Media Education Activities

There are many and varied activities for practising media education. In its portfolio of educational activities, the CSEM lists a whole range of them. They include writing an article for a daily newspaper, choosing a photo for the school newspaper, making a television news report, building a class blog, analysing a cinema poster creatively, and putting a story into pictures in the style of a comic strip (CSEM, 2016). Other activities may include role-playing, producing a podcast, visiting professional media enterprises (such as a radio company), or inviting journalists into the classroom to share their experiences. For the purposes of this research project, I have grouped these activities into three main categories, which help me to structure the activities I have carried out with the participants.

In American elementary and secondary education, “[s]ome schools emphasize primarily the study of media issues or the critical analysis of media messages, whereas other schools primarily provide students with opportunities for media production” (Hobbs, 2004, p. 44). Of course, both are needed, and even more. In our paper with Jerry Jacques (2022), we highlighted a third approach to media education, which is discussion and confrontation of points of view between participants. To understand all aspects of the media ecosystem, the student must learn to construct and deconstruct media texts (“texts” in the semiotic sense³) as well as to debate one’s ideas. These kinds of activities are complementary and focus on the development of critical thinking. Through these activities, media education pursues numerous objectives: questioning participants’ own media practices, developing creative media uses, fostering participation, giving voice to the unheard and so on.

1.3.1. Analysing Media Texts

A first approach to media education is to confront participants with different media texts and analyse them. Reading media texts (newspapers, books, reviews, etc.) allows participants to address, for example, the issue of sources or points of view (subjectivity versus objectivity). As spectators, they can watch video clips (films, TV news, TV series, etc.) and identify the television format along with its intention. As information searchers, one task could be browsing the web to gather information about a topic in order to develop a critical position

³ I explain the concept of media texts in more detail when I discuss media literacy in Chapter 3.

on the information found on the Web. As a gamer, playing cooperative or competitive (video) games can help to approach various topics and concepts (cyber watching, algorithms, etc.).

1.3.2. Producing Media Texts

The second approach is to let the participants be their own media producers. Through workshops or training, they create a media text such as a video capsule, a journalistic report, a photo gallery, a newspaper article, a review, a game, a website and so on. This kind of activity aims at developing their technical skills as well as at exercising their critical thinking on the functioning of the media system “as a whole”. They are part of “a teaching approach in which learning is encouraged by actively engaging with the learning process” (Fletcher, 2005, p. 1): the active learning, or what Gibbs (1988) calls “learning through doing”.

1.3.3. Discussing Media Texts

The third approach consists in discussing and debating a particular topic. This category of activities is complementary to the others: whether they are reading or producing activities, the objective is to stimulate the debate to develop critical thinking of participants. “In that sense, a critical thinker able to foresee a greater complexity of a problem should also be able to have an increased capacity to speak about this problem” (Wuyckens & Jacques, 2022, p. 4). This last panel of activities includes, for example, the setting up of a brainstorming about a concept such as media or a “moving debate” (from French: *débat mouvant*) which consists in giving the floor to all the members of an assembly (and not just to those who want to talk) about a controversy.

1.4. Synthesis Chapter 1: Media Education as A Multifaceted Praxis

To conclude, media education is a set of learning practices and processes aimed at fostering critical understanding and competences necessary to analyse, create, and discuss media texts. The previous section is a good illustration of the many facets of media education praxis. Media education activities are versatile, finding applications in a range of contexts, encompassing both formal and informal settings. As demonstrated, these diverse activities empower participants to navigate the complex media environment, question their own media practices, encourage creative media use, foster participation, and amplify underrepresented voices. By weaving together these three categories, media education endeavours to not only deconstruct and construct media texts but also to engage in vibrant dialogues that help us understand the intricacies of our ever-changing media landscape.

Chapter 2: Design-based Research

Design-based research (DBR) is an emerging paradigm for educational research. It appeared as a result of criticism of experimental research, which, as the proponents of this new paradigm argue, does not consider the multiplicities of variables involved in real learning and teaching contexts. This is what educational researchers called the ‘credibility gap’ (Levin & O’Donnell, 1999), a detachment of research from practice where experiments are strictly controlled and conducted in a laboratory. In order to account for the influence of context, Ann Brown (1992) suggested studying learning in the complexity of a classroom to transform it. The same year, her student, Allan Collins (1992), proposed to develop a science of education in the form of design, ‘a design science of education’. The goal was to develop both a systematic method to conduct design experiments and a theory of design for future innovations.

Design-based research aims at theorising transformations in the educational environment while being pragmatic and grounded through the production of innovations to meet practical needs in the field. One of the particularities we can highlight is that this paradigm implies the collaboration between researchers and practitioners in each step of designing educational interventions (artefacts, techno-pedagogical devices, or educational programmes) (Jacobsen, 2014). Furthermore, DBR attempts to improve educational practices through iterative cycles of design, enactment, data collection, analysis, and redesign that help refine the educational intervention (McKenney and Reeves, 2012).

Although DBR is increasingly used in the field of education, it is not very popular in the field of communication sciences. However, an application in media education would seem quite appropriate. Action research, a similar paradigm developing practical solutions for educators, is already increasingly used in media education and differs from DBR in that it does not claim to test theory and validate various designs. DBR focuses on the evolution of design principles that enables us to advance “[...] a theoretical agenda, to uncover, explore, and confirm theoretical relationships” (Barab & Squire, 2004, p. 5). DBR can therefore build a bridge between theory and practice in the context of media education, in order to produce new knowledge that could be directly applied to educational practice.

2.1. Theoretical Foundations

In the literature, design-based research (DBR) has been variously referred to as design experiments (Brown, 1992; Collins, 1992), design research (Cobb, 2001) and development research (Richey & Klein, 2005; Van den Akker, 1999). To distinguish it from other related methods, Wang and Hannafin (2005) proposed to define design-based research as:

[...] a systematic but flexible methodology⁴ aimed to improve educational practices through iterative analysis, design, development, and implementation, based on collaboration among researchers and practitioners in real-world settings, and leading to contextually-sensitive design principles and theories. (p. 6)

Barab & Squire (2004) specified that “[d]esign-based research is not so much an approach as it is a series of approaches, with the intent of producing new theories, artifacts, and practices that account for and potentially impact learning and teaching in naturalistic settings” (p. 2).

McKenney and Reeves (2014) have recently suggested another term to characterise this new paradigm, namely educational design research. They define it as a “genre of research in which the iterative development of solutions to practical and complex educational problems provides the setting for scientific inquiry, and yields new knowledge that can inform the work of others” (p. 133). The solutions can be “educational products (e.g., a multiuser virtual world learning game), processes (e.g., a strategy for scaffolding student learning in online courses), programs (e.g., a series of workshops intended to help teachers develop more effective questioning strategies), or policies (e.g., year-round schooling)” (p. 131). McKenney and Reeves (2014) define educational design research as a genre of research that uses quantitative, qualitative, and mixed methods to answer research questions.

Based on the pre-existing literature, McKenney and Reeves (2014) have identified seven characteristics of educational design research (p. 134):

1. It is pragmatic because it is concerned with generating usable knowledge, and usable solutions to problems in practice.
2. It is grounded because it uses theory, empirical findings and craft wisdom to guide the work.
3. It is interventionist because it is undertaken to make a change in a particular educational context.

⁴ Many authors define design-based research as a methodology. Yet DBR does not refer to a study of methods or is not limited to one method. As a result, I define it as a research paradigm, as well as a genre or form of research.

4. It is iterative because it generally evolves through multiple cycles of design, development, testing, and revision.
5. It is collaborative because it requires the expertise of multidisciplinary partnerships, including researchers and practitioners, but also often others (e.g., subject matter specialists, software programmers or facilitators).
6. It is adaptive because the intervention design and sometimes also the research design are often modified in accordance with emerging insights.
7. Finally, it is theory-oriented not only because it uses theory to ground design, but also because the design and development work is undertaken to contribute to a broader scientific understanding.

To illustrate the variety of educational design research, McKenney and Reeves (2014) present three examples of research in the field of educational communications and technology (see table 2.1.). The first example, documented by Thomas et al. (2009), presents a series of journal papers that contribute to the refinement of a theory of transformational play and the development of interactive learning games. The two other examples, by Klopfer and Squire (2008) and Oh (2011), also present iterative research projects that seek to develop innovative theories, methodologies, and educational tools. They all adopt a design-based research approach, by integrating the design process into the research itself, iterating and continuously improving their products or theories based on results and feedback. In essence, these examples illustrate how educational design research engages in practical projects aimed at enhancing learning and education through a combination of theoretical reflection and practical development.

Table 2.1.

Three examples demonstrating educational design research variation (McKenney and Reeves, 2014, p. 136)

	Thomas et al. (2009)	Klopfer and Squire (2008)	Oh (2011)
Problem	Middle school students were relatively unengaged in meaningful scientific inquiry	High school and college students were frequent users of handheld devices such as smart phones, but were not using them to learn	Graduate student collaboration in online learning course was superficial and unproductive
Main focus	Investigating the implementation of a technology-rich educational innovation in a public elementary school in the USA	Developing innovative applications for mobile computing for environmental science education	To optimize collaborative group work and student learning in an online higher education learning environment
Intervention developed	Quest Atlantis: a 3D multiplayer virtual environment	A series of games that can be played on handheld devices such as PDA and smart phones	"E-learning Evaluation" course based on authentic tasks for online delivery
Knowledge created	Theory of transformational play	Theoretical framework called "augmented reality educational gaming"	Multiple design principles and associated strategies to enhance group work in online courses
Research methods used	Observations Interviews Surveys Document analyses Three qualitative case studies	Observations Interviews Focus groups Discourse analysis Case studies Design narratives	Participant observations Questionnaires Interviews Three sequential case studies
Research scope	This design research initiative has been underway for more than a decade with substantial funding from NSF and other sources	The design research study has been underway since 2001 with initial funding from Microsoft and other sources	This study lasted 2 years with no direct funding
Primary practical contribution	As of 2010, Quest Atlantis had been used by 50,000 students in more than a dozen countries. atlantis.crlt.indiana.edu	The work started with this project is now part of the Games, Learning, and Society group at the University of Wisconsin where numerous learning games can be found. www.gameslearningsociety.org	An online course design for a graduate level course based around authentic tasks was developed with substantial support for group work. http://authenticlearning.info/AuthenticLearning/Home.html

2.1.1. Distinguishing between DBR and Psychological Experimentation

Collins et al. (2004) identified seven contrasting aspects between traditional psychological methods and design experiments methodology (see table 2.2.). These aspects emphasise a number of characteristics specific to DBR.

Table 2.2.

Comparing psychological experimentation and design-based research methods (Barab and Squire, 2004; adapted from Collins, 1999)

<i>Category</i>	<i>Psychological Experimentation</i>	<i>Design-Based Research</i>
Location of research	Conducted in laboratory settings	Occurs in the buzzing, blooming confusion of real-life settings where most learning actually occurs
Complexity of variables	Frequently involves a single or a couple of dependent variables	Involves multiple dependent variables, including climate variables (e.g., collaboration among learners, available resources), outcome variables (e.g., learning of content, transfer), and system variables (e.g., dissemination, sustainability)
Focus of research	Focuses on identifying a few variables and holding them constant	Focuses on characterizing the situation in all its complexity, much of which is not now <i>a priori</i>
Unfolding of procedures	Uses fixed procedures	Involves flexible design revision in which there is a tentative initial set that are revised depending on their success in practice
Amount of social interaction	Isolates learners to control interaction	Frequently involves complex social interactions with participants sharing ideas, distracting each other, and so on
Characterizing the findings	Focuses on testing hypothesis	Involves looking at multiple aspects of the design and developing a profile that characterizes the design in practice
Role of participants	Treats participants as subjects	Involves different participants in the design so as to bring their differing expertise into producing and analyzing the design

The first two major differences identified by Collins et al. (2004) are that design-based research focuses on understanding the messy situations that characterise real life learning and on capturing social interaction in complex real-world settings such as a classroom. Such an approach to learning offers several benefits. First, research results “consider the role of social context and have better potential for influencing educational practices” (Barab & Squire, 2004, p. 2). Second, “[b]eing situated in a real educational context provides a sense of validity to the research and ensures that the results can be effectively used to assess, inform, and improve practice in at least this one (and likely other) contexts” (T. Anderson & Shattuck, 2012, p. 16).

Unlike psychological experiments that demonstrate how particular independent variables affect a few dependent variables in laboratory settings, design-based research aims to identify

all the variables that characterise the messy situation. DBR therefore does not only focus on a single variable, as the only significant measure, and takes into account all the variables relating to the specific content and skills that can be acquired by students, as well as those relating to their dispositions to learning, cooperation and motivation (Collins et al., 2004). In this respect, educational researchers and educators have a role to play in promoting learning environments in which these dispositions can manifest among students.

Design-based research is also distinguished from psychological methods by the flexibility of the revision of its design. DBR is driven by cycles of design, enactment, data collection, analysis, and redesign aimed at refining the educational intervention. “This approach of progressive refinement in design involves putting a first version of a design into the world to see how it works” (Collins et al., 2004, p. 18) and to construct more robust designs over time. The goal is to refine both theory and practice by the development of both “a more systematic methodology for conducting design experiments” and “a design theory that can guide implementation for future innovations” (Collins, 1992, p.1). Rather than simply testing hypotheses, the goal of design-based research is to develop a profile that characterises the design in practice.

Last, design-based research involves the collaboration between researchers and practitioners at each step in the development of an educational intervention. As Anderson & Shattuck (2012) explain, “[...] a partnership is developed that negotiates the study from initial problem identification, through literature review, to intervention design and construction, implementation, assessment, and to the creation and publication of theoretical and design principles” (p. 17). All the participants in design-based research are therefore not simply ‘subjects’ and contribute to both the design and the analysis.

2.1.2. Determining the Goals of DBR

According to Anderson & Shattuck (2012), “DBR is a methodology designed by and for educators that seeks to increase the impact, transfer, and translation of education research into improved practice” (p. 16). As previously explained, “[i]n design-based research, practitioners and researchers work together to produce meaningful change in contexts of practice (e.g., classrooms, after-school programs, teacher on-line communities)” (The Design-Based Research Collective, 2003, p. 6). By applying their expertise, design-based researchers create usable solutions to problems encountered in local learning environment. Hence, design-based research builds a bridge between theory and practice by generating new knowledge that can

be directly applied to educational practice. The development of reusable knowledge contributes to the field by informing practitioners and other designers.

“In addition to the knowledge generated, the value of educational design research is measured in terms of its ability to improve educational practice” (McKenney & Reeves, 2014, p. 11). As Mc Kenney and Reeves (2014) point out, the DBR community is characterised by a common commitment to the progressive improvement of practices. “[R]esearch and theory evolve in concert with advances in practice, ensuring that complementary expertise and different perspectives contribute to the design” (Wang & Hannafin, 2005, p. 9). According to Stokes (1996), placing inquiry in practice, where engineering is a major concern, makes it possible to develop an in-depth understanding of a phenomenon. Design-based research is, therefore, an example of use-inspired basic research, that is, a form of research that aims “to produce scientific insights and solve practice problems” (Swiss National Science Foundation, n.d.).

2.2. Method

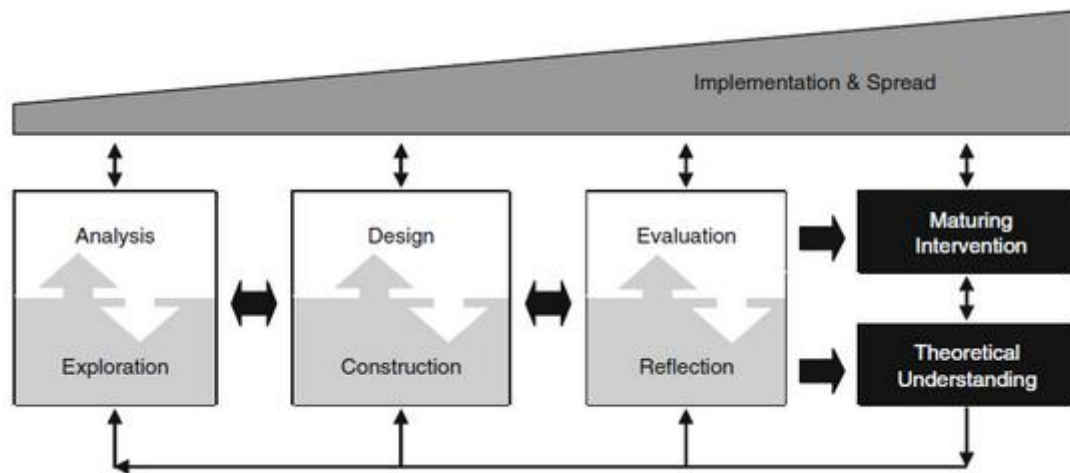
Design-based research is a participatory educational research paradigm that implies the collaboration between researchers and practitioners. According to Jacobsen (2014), “DBR is intentionally interventionist and researchers work closely with educators on understanding complex problems of practice, and on the collaborative design, development, implementation and evaluation of research-informed innovations in authentic learning contexts”. Its method is therefore characterised by different phases that aim to improve educational interventions. This section explores in detail the process of DBR, as well as the methods it deploys to analyse learning environments and the variables involved.

2.2.1. Design-based Research Process

McKenney and Reeves (2012) outline three phases to the design-based research process where the co-participation of researchers and practitioners is essential: analysis and exploration, design and construction, evaluation and reflection (see figure 2.3).

Figure 2.3.

Generic model for conducting educational design research (McKenney and Reeves, 2012)



In the first phase, the research team identifies the problem and compiles a scientific literature review to address the research problem (analysis). The practitioners help better understand the educational problem to be addressed and the classroom context (exploration). In the second phase, the research team considers “available knowledge about the problem and potential solutions in order to design the solution to be tested, as well as a coherent process for implementation and evaluation” (Jacobsen, 2014). The construction phase consists in designing and implementing the solution (artefact) through an iterative prototyping process that will continually refine and improve the solution. In the third phase, the research team gathers data about the impact of the innovation (observations, surveys, interviews, student designs, and so on) and work with the practitioners to develop methods for evaluation.

The evaluation phase has a twofold objective: the refinement of the design and the theoretical assumptions on which it is based. Importantly, design-based research goes beyond the simple testing of particular interventions: “Interventions embody specific theoretical claims about teaching and learning, and reflect a commitment to understanding the relationships among theory, designed artifacts, and practice” (The Design-Based Research Collective, 2003, p. 6). Design plays therefore a critical role in the development of theories, and not just in their evaluation (Edelson, 2002, p. 106). DBR distinguishes itself from other forms of research by generating new knowledge in addition to test theories by developing interventions.

2.2.2. Mixed Methods

Design-based research interventions generate a large amount of data, which involves both qualitative and quantitative methods. Rogoff (1995), as cited by Collins et al. (2004), pointed out three critical aspects in the analysis of learning environments, which include “the personal layer (the experience of the individual), the interpersonal layer (one-on-one interactions), and the community layer” (p. 35). Collins et al. (2004) added two essential aspects that refer to the elements of the environment and proposed five different levels relevant to educational designs. For each level, they specified the method of analysis to be applied (*ibid.*, p. 35):

- **Cognitive level:** What do learners understand before they enter a particular learning environment, and how does that understanding change over time? Some of the tools for analysis at this level include observations of thinking through learners’ representations and explanations. Through visual and verbal descriptions of ideas, researchers ask learners to expose their thinking. Are the explanations clear? Do representations capture important relationships?
- **Interpersonal level:** This viewpoint addresses how well teachers and students interact personally. Is there sharing of knowledge? Have the students bonded with each other so that they respect and help each other? Researchers use ethnographic techniques to observe these kinds of interactions.
- **Group or classroom level:** This viewpoint addresses issues of participant structure, group identity, and authority relationships. Is everyone participating? Is there a sense of the goals and identity of the group? Again, ethnography is an effective approach to analysis.
- **Resource level:** This level deals with what resources are available to learners and if they are easy to understand and use. How accessible are the resources? How well are they integrated into the activities?
- **Institutional or school level:** At this level issues arise as to communication with outside parties and support from the entire institution. Are parents happy with the design? Do administrators support it strongly? What are the micro-political issues that impact the design?

According to Collins et al. (2004), these levels are intricately interconnected. Designing and assessing these aspects requires diverse expertise, including “[...] teachers, administrators,

psychologists, anthropologists, media designers, etc. While one person can address these perspectives, explicit representation from each domain proves beneficial” (ibid., p. 35).

2.2.3. DBR Variables

Collins et al. (2004) distinguish between two types of variables: the dependent variables and the independent variables.

2.2.3.1. Dependent Variables

The objective of developing a design science of education has been first and foremost to “investigate how different learning-environment designs affect dependent variables in teaching and learning” (Collins et al., 2004, p. 17). As opposed to laboratory experiments, many variables cannot be controlled in design experiments because they are set in real learning environments. Collins et al. (2004) classified them into three categories, that is:

(a) **climate variables** such as engagement, cooperation, risk taking, and student control, (b) **learning variables**, such as content knowledge, skills, dispositions, meta-cognitive strategies, and learning strategies, and (c) **systemic variables**, such as sustainability, spread, scalability, ease of adoption, and costs. (ibid., p. 36)

The analysis of these variables requires different evaluation techniques including both quantitative and qualitative methods. As Collins et al. (2004) explained, climate variables are assessed by observational techniques (field notes, video records...), learning variables by pretest and post-test measures, and systemic variables by interviews and surveys (p. 36). As the design may not be fixed and evolved all along the different phases, the evaluation presents a significant challenge in DBR and techniques may change over time.

2.2.3.2. Independent Variables

Many independent variables may affect the success of the design in practice. Collins et al. (2004) listed a number of contextual variables that can determine the success of an innovation. The first variable is the setting of the learning environment that might vary over “homes, workplaces, museums, schools, or colleges; elementary, middle or high schools; public or private schools; urban, suburban, or rural schools; elite or community colleges: and so forth” (p. 37). The second one refers to the characteristics of the learners, for example, “age, socioeconomic status, turnover rate, attendance rate, and so forth” (p. 37). Other independent variables include the required resources and the support for implement, such as “materials, technical support, administrative support, and parent support” (p. 37). The different kinds of

professional development may also be considered to develop a successful design. “These can encompass workshops, design meetings, courses, videos of exemplary practice of the design, guided practice with expert practitioners, reflective meetings with colleagues, and so forth” (p. 37). Any costs need to be taken into account, such as “equipment costs, service costs, professional support and development costs, replacement costs, and so forth” (p. 38). Collins et al. (2004) cited a last variable, the implementation path, which covers “the variables involved in implementing a design, such as how the innovation is introduced, the time devoted to it, the duration of its usefulness, and so forth” (p. 38).

2.3. Theoretical and Practical Contributions

Anderson & Shattuck (2012) conducted a qualitative analysis of the most cited articles that focus on design-based research in education. The analysis of the empirical studies’ abstracts indicates that “the studies’ results focused on both what researchers learned to further their knowledge about a phenomenon and what effect the intervention had on student learning and motivation” (p. 24). Design-based research interventions are thus conceived not just to meet local needs, but “to generate and advance a particular set of theoretical constructs that transcends the environmental particulars of the contexts in which they were generated, selected, or refined” (Barab & Squire, 2004, p. 5). The table below shows several examples of studies, the local impact of the design work and the resultant theoretical contributions (see table 2.4.).

For example, in Barab’s Quest Atlantis project, documenting the learning gains was a necessary part of the research agenda because it provided warrants for the broader theoretical assertions about the relationship among the constructs of playing, helping, and learning, the importance of context in learning, and the value of socially responsive design (Barab et al., in press). (Barab & Squire, 2004, p. 6)

This objective of *producing* theories distinguishes design-based research from laboratory experiments and formative evaluation which seeks to *validate* existing theories (in a hypothetico-deductive approach). Barab & Squire (2004) listed three major differences (p. 5):

1. A constant impulse toward connecting design interventions with existing theory.
2. The fact that design-based research may generate new theories (not simply testing existing theories).

3. That for some research questions the context in which design-based research is being carried out is the minimal ontology for which the variables can be adequately investigated (implying that we cannot return to the laboratory to further test the theoretical claims).

In addition to the development of theoretical constructs, design-based research leads to the production of practical design principles patterns (T. Anderson & Shattuck, 2012, p. 17). Although design-based research interventions are contextualised in educational settings, they attempt to generalise from those settings to guide the design process (Collins et al., 2004, p. 21). The focus on the development and the evolution of design principles enables us to advance “a theoretical agenda, to uncover, explore, and confirm theoretical relationships” (Barab & Squire, 2004, p. 5). This objective distinguishes design-based research from much action research which does not claim to generate theory and validate various designs.

Table 2.4.

Characterising design-based research in terms of the designed artifact and resultant theory (Barab & Squire, 2004, p.7)

<i>Research Study</i>	<i>Local Impact</i>	<i>Theoretical Work</i>
Hartford Middle School project	Teacher professional development, produced curricular units, student learning and attitudinal gains	Interdisciplinary anchors as useful construct for teacher conceptualization and development of interdisciplinary units
Student apprenticeship camp	Pre-post learning gains, student attitudinal changes, positive attitude of scientists	Richer understanding of apprenticeship-type learning Characterization of differences between <i>constructivist</i> and <i>apprenticeship</i> learning environments
Virtual solar system project	Student learning gains, student collaboration	Claims about project-based learning and cognition as situated, particularly relations among learners' intentions, tools, and meaning making
Inquiry learning forum project	Participation rates, learning gains, control-experimental group attitudinal differences, interview testimonials	Richer understanding of the challenges of designing for Web-supported communities in the service of learning; Claims about the tenability of designing community
Quest Atlantis project	Pre-post learning gains, control-experimental group quality of work and attitudinal differences; interview testimonials; participation rates; chat and classroom observations	Demonstrating the interrelations of learning, playing, and helping; Richer understanding of the symbolic relations of power and play in multiuser virtual environments; Potential value of socially responsive design

2.4. Epistemological Positions

In a design-based research project, the researcher is invited to intervene whenever the opportunity arises to explore the learning issues. The notion of independence of the researcher in relationship to the learning environment is therefore not relevant in DBR, as it is not possible not to influence the intervention. As Barab and Squire (2004) pointed out, when the design-based researcher is involved in the process of designing, implementing, and assessing an educational intervention, maintaining the credibility and trustworthiness of the research findings becomes a significant challenge.

In this context, Rourke and Friesen (2006) highlighted two distinct orientations toward research: post-positivism and interpretivism. On the one hand, post-positivism is a school of thought that admits that there is an objective, observable reality, and that the personal experience of the researcher can influence what they observe. The researcher's judgement plays a role in the interpretation of the results of experiments, but any bias and subjectivity are controlled by methods (Rourke & Friesen, 2006, p. 274). On the other hand, interpretivists argue that objectivity is impossible and that:

[...] this same interpretation on the part of the researcher is not an incidental or undesirable process, but is one that is both unavoidable as well as central and foundational. Any study of human action, they argue, is the active interpretation of phenomena that are themselves intentional and consequently well beyond the realm of the unproblematically 'objective'. (Rourke & Friesen, 2006, p. 274).

Rourke and Friesen (2006) note that design-based researchers often oscillate between these two positions. They give the example of a special issue of the *Journal of Learning Sciences* where several authors, such as Barab and Squire (2004), provide a definition of DBR anchored in an interpretive posture but accompany it with footnotes that return them to post-positivistic touchstones.

Despite these two distinct orientations and oscillations, what we cannot contest is the pragmatic grounding of DBR, which generates theories whose value is demonstrated by their ability to change the world (Barab & Squire, 2004).

Such a system of inquiry might draw less from traditional positivist science or ethnographic traditions of inquiry, and more from pragmatic lines of inquiry where theories are judged not by their claims to truth, but by their ability to do work in the world (Dewey, 1938). (ibid., p. 6)

Moreover, in reviewing scientific literature, Rourke and Friesen (2006) find a gradual turn toward interpretive approaches to educational inquiry. This would be a way of understanding educational research "[...] not as a 'science' that would deny the reality of its own social construction, but that would be explicitly aware of the sociological and other conditions that inform it" (p. 280). In methodological terms, this implies studying human phenomena not as results that can be predicted or controlled but as subject to interpretation. The researcher's observations and manipulations can thus only be interpreted in the context of the educational intervention. To illustrate this type of research, Rourke and Friesen (2006) refer to examples

provided by hermeneutic and post-cognitive forms of psychology, phenomenology and ethnomethodology, as well as critical, historical, and genealogical methods (p. 280).

2.5. Limitations

Although the combination of theoretical and practical contributions of the DBR is one of its strengths, it is also one of its limitations. How can we generalise DBR interventions when they are so specific? Anderson & Shattuck (2012) question “the role and efficacy of DBR in bringing about large-scale and far-reaching systems reforms” and wonder “if the methodology is more suitable in small-scale systems or for sustaining improvements in educational systems when the research project is finished” (p. 24). In a similar reflection, Collins et al. (2004) question the replicability of design experiments and warn that “[t]he effectiveness of a design in one setting is no guarantee of its effectiveness in other settings” (p. 18).

To answer these questions, Bannan et al. (2016) assume an exploratory stance which is content with ‘fuzzy generalisations’ rather than a statistical calculation. Bassey (1998), cited by Bannan et al. (2016), postulates that fuzzy generalizations “replace the certainty of a scientific generalisation (“it is true that...”) by the uncertainty, or fuzziness, of statements that contain qualifiers (“it is sometimes true that...”) which stand in contrast to statistical generalization of quantitative empirical research” (p. 4). According to Barab & Squire (2004), design-based research does not claim to find the truth and it is the various designs in different contexts that attest for the viability of a theory. They explained:

Researchers looking to add methodological rigor and coherent epistemological systems to design-based methodologies might benefit from further grounding in the pragmatic philosophies of Dewey and Peirce, both of whom have provided systems of inquiry rooted not in claims of truth, but rather in the viability of theories to explain phenomena and produce change in the world. (Barab & Squire, 2004, p. 7)

Design-based research provides therefore “a way to ‘systematically’ seek out ‘never-seen before possibilities’ or produce analytic generalizations in the complex learning situations of today embracing the messiness and authenticity” of real learning contexts (Bannan et al., 2016, p. 9). The added value of design-based research for educational research is that this method provides keys to understanding both specific cases and generalisations. Simmons (1996), cited by Bannan et al. (2016), states this issue as:

The tension between the study of the unique and the need to generalise is necessary to reveal both the unique and the universal and the unity of that understanding. To live with ambiguity, to challenge certainty, to creatively encounter, is to arrive, eventually, at 'seeing' anew (pp. 237-238).

The scientific literature highlights other limitations of the DBR paradigm, such as the question of researcher engagement. Barab and Squire (2004) argued that "[...] if a researcher is intimately involved in the conceptualization, design, development, implementation, and re-searching of a pedagogical approach, then ensuring that researchers can make credible and trustworthy assertions is a challenge" (p. 10). It seems that in design-based research, it is not possible for the researcher not to influence the learning environment. Some will argue that this inside knowledge can detract from the research validity, but it is also the responsibility of the design-based researcher to support the intervention actively. "Rather than remain detached from the research context, researchers are implored to intervene where possible, using interventions as opportunities to examine core theoretical issues and explore learning" (Barab & Squire, 2004, p. 10). It is therefore the role of the researchers to attest the trustworthiness and credibility of their claims by drawing on methodological practices consistent with other qualitative methods.

Dede (2004) also indicates that design-based research generates an unmanageable (and almost unstorable) amount of data that can cause bias in the selection of which cases to highlight. He claims that these research studies are 'over-methodologized' because "only the first five percent or so of the data collected were needed to induce the findings" (Dede, 2004, p. 107). Each piece of data (repeated interviews, videotapes, surveys, and so on) is gathered and may lead to what he calls a 'massive overkill'. In this regard, Collins et al. (2004) propose to share analysed data: "[...] it makes sense for the design research community to establish an infrastructure that would allow researchers at other institutions to analyze the data collected in design studies, in order to address their own questions about learning and teaching" (p.40).

In addition to being over-methodologized, Dede (2004) states that DBR is under-conceptualised. Although design-based research aims to produce theoretical constructs, "the results reported are simple 'common sense' for anyone with experience in educational settings" (Dede, 2004, p. 107). diSessa and Cobb (2004), cited by Dede (2004), explain in much detail that "much DBR lacks a strong theoretical foundation and does not attempt to generate findings important for the refinement and evolution of theory". Rather than first looking for problems in the educational environment, design-based researchers develop predetermined solutions to which they can apply the problems.

Further in his commentary, Dede (2004) makes an interesting remark about the influence of the context on the research conducted. The political and ideological context generally defines the issues that the research must address but the interests of each participant also matter. Design-based research involves the collaboration between researchers and practitioners at each step of the design of an educational intervention. A DBR study usually begins with the identification of a problem, and we might ask ourselves who should determine this problem because each participant has its own interests. Dede (2004) reflects on this issue by asking the following question:

Do we as scholars start with what practitioners identify as problems (e.g., how can unqualified reading teachers be trained to use a didactic teacher-proof approach to compensate for their weaknesses) or with what we believe are theoretically promising interventions that would require transformation of the current system to effectively implement? (ibid., p. 113)

This question poses another dilemma, related to the evolution of design: “how do we choose when faced with the alternatives of modifying a design in ways that pose interesting issues for the refinement of theory, versus altering the intervention to increase its usability, scalability, and sustainability?” (Dede, 2004, p. 114). These objectives are not necessarily opposite, but several authors (Dede, 2004; Fishman et al., 2004) point out the difficulty of reconciling them. In relation to this problem, “the challenge of bounding the temporal scope of a DBR project is exacerbated by the requirement for multiple iterations” (T. Anderson & Shattuck, 2012, p. 18). While educators and teachers must respect the school year schedule, researchers must “develop multiyear DBR research agendas that have legitimate space and roles for graduate students to undertake and “own” significant pieces of this larger agenda” (T. Anderson & Shattuck, 2012, p. 18).

The final and probably the most challenging problem is the question of the epistemology of design-based research. In this respect, Dede (2004) asks the following question: “Should we have some similar set of collective arbitrary but rational standards for how specified a design intervention be to be considered ‘true’ DBR?”. Several authors (Bannan et al., 2016; Dede, 2004) acknowledge that no consensus on the research and design paradigms currently exists within the DBR community. They referred to the radical opposition between post-positivism and interpretivism. As a reminder, at the objective extreme of the epistemological spectrum, the positivist paradigm explains the complexity nature of the social world with “predictive theories similar to those in the physical and biological sciences” (Dede, 2004, p. 110). At the

subjective extreme of the epistemological continuum, the exploratory and constructivism paradigm recognises that no objective reality exists and is content with 'fuzzy generalisations' rather than a statistical calculation (Bannan et al., 2016). This lack of collective standards makes it difficult to define what can be considered an effective DBR and to assess the efficacy of interventions.

Conclusion PART 1

Using DBR in Media Education

Media education scholars are constantly looking for new methods that are more grounded in the reality of practices to test the viability of their theories. Despite its limitations, design-based research can provide opportunities in a media education context. First, by its iterative and collaborative nature, this paradigm is quite relevant for studying the reality of educational practices. More and more European media education projects involve scientists and practitioners working together to design and evaluate educational interventions. DBR is a participatory educational research paradigm where everyone does what they know best at the right stage of the project. Second, thanks to its flexible design, DBR can take the specificities of the context of media education into account. This form of research enables us to work in real and concrete conditions while considering the contemporary practices of the users and the current media issues. Third, more than validate existing theories, DBR can produce theories and practical design principles patterns. It thus responds to a need in media education to build new theories to expand the field.

In my doctoral research, I have adopted a design-based research approach to investigate how design fiction can help build a critical inquiry method in the context of media education and how this method can support the development of learners' critical inquiry competence. I set up a DBR project that began in September 2018 in collaboration with a Belgian non-profit association called *Action Médias Jeunes*. This project is a first attempt to consider the opportunities of this kind of research in media education by building a bridge between practice and research. The goal of this study is to contribute to filling the above-mentioned 'gap' (a detachment of research from practice), and to offer new perspectives in the field of communication sciences for the development of new methods anchored in the reality of practices.

The Three Stages of Our Project

As part of our DBR project, we applied McKenney and Reeves' model (2012) to the best of our ability (see figure 2.3.). However, it is important to specify from the beginning the particularity of our context: as a reminder, in Belgium (and in most European countries), media education is not a subject matter taught in a dedicated course in school curricula. The activities designed as part of the project were therefore given by external educators specialised in the praxis. In primary education, the activities were carried out in class at the teachers' convenience and the latter were actively involved in the creation of the programme content.

While in secondary education, the activities took place during social studies, physics or French classes, and teachers did not contribute significantly to the content of the programme. Their role was mostly to supervise the class.

The collaboration with the educators of *Action Médias Jeunes* took place in three important stages. After presenting my research topic to a general assembly of the association, some educators set up a project called 'HACK to the future' (HTTF) that used design fiction in primary and secondary education. This project started in October 2018 and lasted a whole school year. The educator-initiators invited me to attend the sessions as an observer in two primary school classes and in a sixth-year secondary class.

During this stage, I started reviewing the literature on the different uses of design fiction to find an application in a media education context. I also worked on the development of the critical inquiry method and reviewed literature on inquiry-based learning in education sciences and media literacy. As I was only beginning to compile scientific literature at this stage, I only took some field notes in a notebook without systematically recording the sessions in class. The goal was to collect exploratory data on the possible uses of design fiction in an educational context to prepare the second stage.

In 2020-2021, the association reiterated the project under the name 'Possible futures' (in French, *Futurs Possibles*) with one class of third-year secondary school students. The second stage refined HTTF and met my scientific goal more closely, which are designing a critical inquiry method using design fiction in media education as well as an assessment tool to evaluate the learners' critical inquiry competence. Unlike the first stage in which I did not contribute significantly into the design of the activities, I developed each step of the second stage in collaboration with *Action Médias Jeunes* media educators. We based our work on both the compiled theory and the lessons learned from the previous stage.

As part of the second stage, I made additional research on narrative and cognitive theories to investigate the contribution of narrative to critical thinking. I also took the time to develop my evaluation instrument, namely a rubric for assessing students' critical inquiry competence. This rubric was used for pre- and post-tests, which required participants to view science fiction video clips and formulate key questions about the vision they convey and the technologies they feature. Additionally, many other data were collected all along the programme. I took field notes of the activities in a notebook and recorded some of the conversations with the students. I also made copies of the teaching materials developed for the project as well as the students' productions.

In 2022, the association and I decided to develop a final version of the educational programme to share it with the community of media education practitioners. This constitutes the third stage of our DBR project. In June 2022, we already obtained a first funding by receiving the first place of the Marieli Rowe Innovation in Media Literacy Award⁵. Based on the preliminary results of the data analysis, we built the main stages of the programme. Shortly before submitting this thesis manuscript in late September 2023, *Action Médias Jeunes* secured funding from the Government of the Wallonia-Brussels Federation (FWB) in Belgium after applying to a media education project call by the Higher Council for Media Education (CSEM) in June 2023. The organisation developed the ‘The Future Is Now!’ project (in French, *Le Futur, c’est Maintenant!*), which extends beyond the traditional school setting. The project unfolds in three phases: a test phase with a youth centre in November 2023, the creation of a toolkit for youth supervisors, and training courses for those wishing to delve deeper into the topic and connect with future generations.

This third stage is the final step, which consists of the completion, from a theoretical point of view, of my thesis, and from a practical point of view, of the educational programme. This last step is characterised by the generalisation of the results to other contexts and the formulation of design principles.

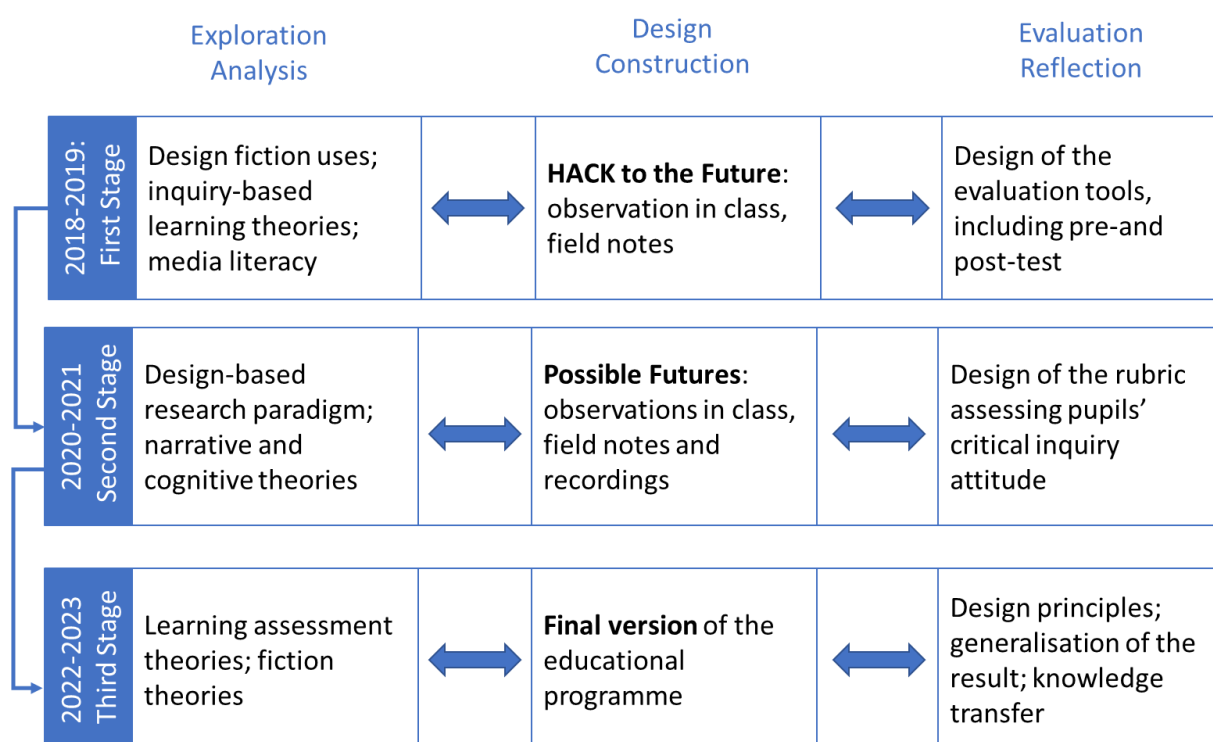
Illustrative Overview of the Project

Figure 2.5. synthesises the third stages of the present design-based research project. This overview highlights the iterative nature of the phases involved in refining the educational intervention (exploration/analysis, design/construction, and evaluation/reflection). The reader will also note that these phases were conducted in parallel in each stage, e.g., the scientific literature fed into the field and vice versa.

⁵ See the other award recipients and their projects here: <https://ic4ml.org/awards/marieli-rowe-innovation-in-media-literacy-education-award/marieli-rowe-innovation-in-media-literacy-education-award-recipients/> (retrieved October 11, 2023)

Figure 2.5.

Three stages of the DBR project



Epistemological position

As highlighted in the scientific literature reviewed earlier in Chapter 2, projects in Design-Based Research (DBR) generally align with two distinct paradigms: post-positivism and interpretivism (Rourke & Friesen, 2006). In the case of our DBR project, choosing between these paradigms proves challenging as the research incorporates mixed methods for data collection and analysis. The hybrid nature of our method draws inspiration from post-positivism to integrate quantitative elements into data collection and analysis, while simultaneously recognising the necessity of considering the social contexts inherent in field-grounded research. This balanced approach aims to enhance the understanding of the use of design fiction in a media education context, providing a more comprehensive and nuanced perspective.

Therefore, I suggest referring to recent literature on mixed methods research (MMR) to define my epistemological position. This literature first allows me distinguishing the two main uses of the 'paradigm' concept: as exemplars shared by communities of practices and as worldviews (see Figure 2.6.).

If we consider the MMR literature, scholars appear to use two main notions of paradigm: some identify the notion of paradigm with the Kuhnian concept of “exemplars shared by a communities”, understood as an intellectual framework and a set of concrete puzzle-solutions shared within a scientific community (Denscombe, 2008; Hemmings, Beckett, Kennerly, & Yap, 2013; Morgan, 2007); others adopt the idea of paradigms as “worldviews”, according to which a paradigm is a framework that reflects researchers’ assumptions about reality, methodology, and epistemology (Creswell & Plano Clark, 2011; Guba & Lincoln, 1994). (Ghiara, 2020, p. 12)

Figure 2.6.

The different conceptualisations of paradigms in mixed methods research (Ghiara, 2020, p. 15)

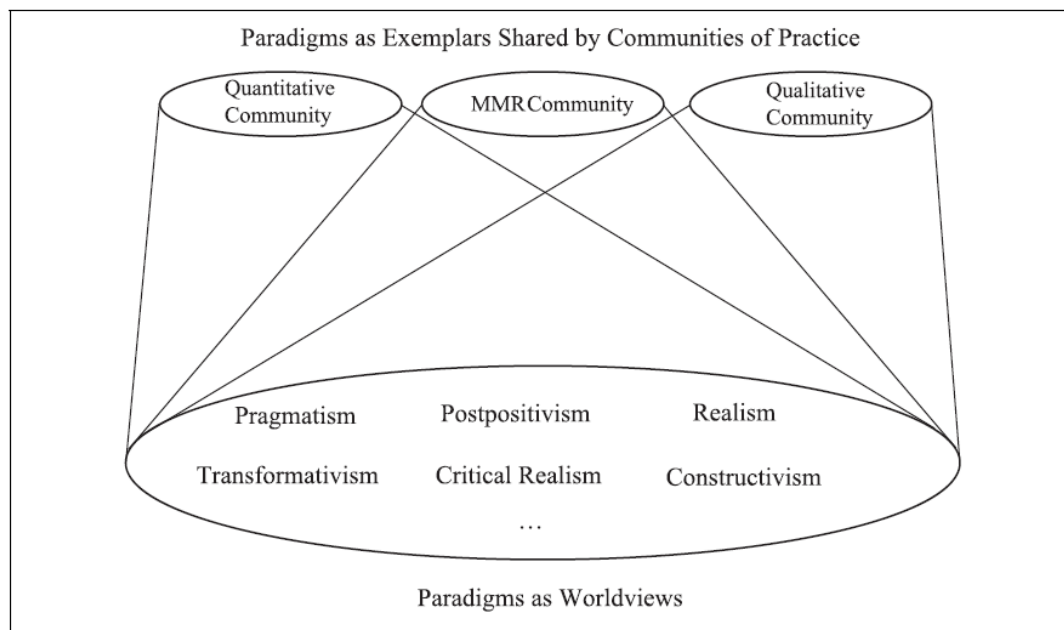


Figure 1. The pluralistic debate in MMR can be clarified by considering the use of the notion of paradigms in the literature. On the one hand, the term ‘paradigms’ has been used to denote the sets of exemplars shared by the MMR, the quantitative and the qualitative communities. On the other hand, the term ‘paradigms’ has been used to describe systems of ontological, epistemological and methodological assumptions that in the social sciences are known by the name of ‘worldviews’. The second meaning of the term ‘paradigms’ is used when researchers argue that MMR can mix different paradigms.

The first conception is probably the most widespread in the social sciences and emphasises three paradigms: quantitative, qualitative, and mixed methods. However, some authors, such as Mertens (2012), oppose this kind of conceptualisation that solely focuses on the methodological aspect and advocate for considering elements related to ethics, reality (ontology), and epistemology. As noted by Biesta (2010), “the terms *quantitative* and *qualitative*

denote kinds of data, not the epistemologies, methodologies, designs, and ontological assumptions that are associated with different research frameworks” (Mertens, 2012, p. 255). Agreeing with the authors’ previous statements, I acknowledge that the first approach alone may not sufficiently determine the orientation of research and I therefore propose to position my research within the second conceptualisation of the paradigm, namely, as worldviews.

Mertens (2012) identified three paradigmatic stances in mixed methods research: (1) dialectical pluralism, (2) the pragmatic paradigm and (3) the transformative paradigm.

- (1) The dialectic stance embraces multiple paradigmatic traditions and methodologies, allowing the researcher to integrate the beliefs of the postpositivist paradigm in quantitative-oriented data collection and the constructivist paradigm in qualitative-oriented data collection. The researcher can then facilitate a conversation between the two approaches throughout the study, fostering deeper understandings through the convergence and dissonance found in their respective approaches (ibid.).
- (2) The pragmatic paradigm asserts that there is no universally appropriate set of methods, and the selection criteria should be guided by what is relevant in the specific context of the study. This approach is grounded in Dewey’s pragmatic philosophy, emphasising the significance of concrete experience and practical problem-solving. In the pragmatic paradigm, the relevance of research methods depends on their suitability for the research question, rejecting a universal methodology. Truth is thus seen as emerging from diverse interactions with the social world (ibid.).
- (3) The transformative paradigm serves as a research framework that advocates for the use of mixed methods to support the advancement of human rights and social justice. “Based on this axiological assumption, the researcher is able to derive implications for the nature of reality, knowledge, and systematic inquiry that are commensurate with this ethical stance” (ibid., p. 256). This paradigm fosters a multifaceted view of reality reflective of diverse power dynamics in society and leads to an epistemological assumption involving community engagement in culturally respectful ways.

Our DBR project combines all three paradigms, marking a distinctive approach in mixed methods research. Within the dialectic paradigm, our approach aligns with the principles of post-positivism and incorporates quantitative methods, employing pre- and post-tests to assess students’ critical inquiry competence. These data are interpreted alongside qualitative data gathered during the implementation of the educational programme, reflecting a more constructivist perspective. This dynamic interplay between quantitative and qualitative data not only reflects our commitment to methodological diversity but also positions our study

within the dialectic paradigm, fostering a more profound and comprehensive understanding of the outcomes (Cronenberg, 2020).

Second, our commitment to the pragmatic paradigm can be seen in the way we have deliberately chosen our methods to suit our research question. In the data collection phase, we adapted to the nuances of the field and adopted a contextual responsiveness. While in the data analysis phase, we adhered to a focused approach, limiting our analysis to what was essential for addressing our research question directly. Furthermore, our overall approach is deeply rooted in a pragmatic perspective, drawing from the principles of DBR to extract knowledge directly from the field. This pragmatism is evident in our emphasis on practical outcomes and contextually relevant artifacts. Notably, in terms of outputs, the pragmatic paradigm aims to develop circumstances or create artifacts for specific purposes contextually. In our context, we have generated outputs that are highly specific to our learning setting, namely an educational programme and a rubric, serving as tangible products directly derived from our contextualised approach.

Third, our research also aligns with the transformative paradigm, especially considering our objective of using design fiction in media education. Firstly, through the use of design fiction, our approach facilitates an in-depth exploration of the societal and ethical implications linked to digital media and new technologies. This transformative nature is evident in our overarching goal to cultivate critical thinking and reflective practices among students. Secondly, our research further aligns with the transformative paradigm due to its positioning within media education. Specifically, our aim is to contribute significantly to media education by empowering young individuals with enhanced critical thinking competences, particularly focusing on the development of the critical inquiry competence, and fostering active citizenship. By integrating design fiction into media education, the thesis strives to empower students with the competences needed to actively engage in the inquiry process. This dual commitment to transformative paradigm, facilitated by design fiction and integrated into media education, underscores our dedication to positive change and the cultivation of responsible, critically engaged citizens.

To conclude, in our DBR project, we navigate a nuanced paradigmatic stance, weaving together elements of the dialectic stance, the pragmatic paradigm and the transformative paradigm. The pluralistic dialectic within our research framework acknowledges the coexistence of multiple paradigms, allowing for a nuanced exploration that draws on both qualitative and quantitative methodologies. Embracing pragmatism, our methods align purposefully with our research question, showcasing adaptability and a focused approach in

data collection and analysis. Rooted in DBR principles, our pragmatic perspective emphasises practical outcomes, exemplified by context-specific artifacts like an educational programme and a rubric. While our commitment to the transformative paradigm is evident in the integration of design fiction in media education, fostering critical thinking, and empowering students with the critical inquiry competence. Therefore, our DBR project serves as an embodiment of a dynamic paradigmatic stance that harnesses the strengths of all three paradigms to navigate the complexities of media education research.

PART 2: MEDIA LITERACY AS CRITICAL INQUIRY

In the first part of the thesis, I defined media education as a praxis contributing to the development of media literacy and critical thinking. In this second part, I share my conception of media literacy based on inquiry approaches to learning.

The concept of inquiry refers to a type of systematic questioning that underlies the educational process, where citizens adopt a scientific attitude towards everything as opposed to a non-critical attitude (Cospérec, 2018). The concept has its origins in Dewey's theory of inquiry (1938b), in which inquiry is conceptualised as logic, i.e., a series of operations and behaviours to follow that reduce the uncertainty of a situation. This theory has led to a pedagogical approach, known as inquiry-based learning (IBL), which advocates a student-centred approach to learning. Starting with the prior knowledge and experience of students, IBL proposes multistage models that students can follow to explore new phenomena.

To engage students in the inquiry process, media education scholars have built inquiry-based learning models with both fixed and flexible sets of questions (Schilder, 2014). "In inquiry-based practice, students learn to use relevant questions to evaluate and analyze media messages and to reflect on the media they create" (Rogow, 2011, p. 18). This approach helps students to develop a more holistic understanding of the media environment and contributes to the development of their critical thinking. In this context, IBL models refer to media literacy core concepts or key questions models that help structure and evaluate media education activities (Fastrez, to appear).

In the framework of the present research, the concept of inquiry operates in two different ways. On the one hand, inquiry refers to the pedagogical approach of inquiry-based learning. I use IBL models to build the structure of the educational programme around the practice of design fiction. On the other hand, inquiry refers to the assessment method based on key questions. I use media literacy key questions models to assess students' ability to ask critical questions about media texts. Far from being mutually exclusive, these two conceptions both approach inquiry as a process of questioning that allows one to ask critical questions about media texts. In this context, this second part of the manuscript explores the scientific literature to share this own conception of media literacy, as critical inquiry.

Chapter 3: Media Literacy

In 2022, Landry, Fastrez and I published a paper titled *Untangling media literacy, information literacy, and digital literacy: A systematic meta-review of core concepts in media education*. We conducted a cross analysis of the way in which literature reviews specifically address these three concepts and articulated a critical analysis of the main findings from the reviewed texts regarding the conceptual landscape that they cover. We introduced the paper as follows:

The concept of literacy occupies a central place in several fields of research studying media practices and uses of information and communication technologies (ICTs), and educational practices meant to support them. In this context, the term literacy refers to one or more abilities, which are manifested in the observable actions and practices of media and ICT users. (Wuyckens et al., 2022, p. 169)

The meta-review highlighted that the concepts of media literacy, digital literacy, and information literacy figure prominently in media education. As the present research project focuses on students' ability to ask critical questions about media texts, I am particularly interested in media literacy.

In its basic definition, the term 'literacy' refers to the ability to read and write text. As the media ecosystem has expanded greatly in the past few years, the concept of literacy has increasingly included new abilities and definitions have multiplied. The concept of media and what we may consider critical have evolved as well. This chapter explores these different changes and reviews the literature on media literacy.

First, I present three common epistemological perspectives for defining media literacy and position the present research within it. Second, I present the purposes of media literacy by exploring its different axiological positions over time. Third, I define my conception of "media" and the model I mobilise to understand the specific nature of the inquiry process. Fourth, I give an overview of the multiple methods for assessing media literacy and, in particular, for assessing inquiry and criticality, as the present research focused on students' ability to ask critical questions.

3.1. Definitions of Media Literacy

The Institute for Statistics of UNESCO (2020) defines literacy as “the ability to identify, understand, interpret, create, communicate and compute, using printed and written materials associated with varying contexts”. Associated with an adjective, the term specifies the subject or type of competence concerned. For example, computer literacy can be defined as the knowledge and ability to use computers and search online. As a result of the rise of new digital media and their related uses, there is a significant number of literacies and the boundaries between them are not always well established. Nevertheless, the significance of a concept is not primarily derived from its definition, but rather from its practical implementation and alignment with uses, needs, and educational objectives (Wuyckens et al., 2022, p. 178).

As introduced earlier, the present research is grounded in the specific field of media education. As the research project focuses on the development of students’ critical thinking about media texts, I adopt the adjective ‘media’ for specifying the nature of the ‘literacy’. As we stated in our meta-review, there are many definitions of media literacy in the scientific literature (Wuyckens et al., 2022). Martens (2010) reviewed 165 papers on media literacy and highlighted two main approaches in media literacy education⁶:

- 1) An information processing approach centred on the individual’s cognitive abilities (represented by Potter 2004)
- 2) A critical-cultural approach centred on the contextual nature of media practices (represented by Buckingham 2003)

In addition to these two approaches, we can include the competence-based approach, which lies halfway between these two. A competence-based approach to media literacy was developed by my research group, the Knowledge Mediation Research Group (UCLouvain, Belgium).

3.1.1. Media Literacy as Cognitive Abilities

The first approach defines media literacy in terms of knowledge and skills that individuals need to analyse, evaluate, or produce media texts. It has its roots in the definition of media literacy given by the National Leadership Conference on Media Literacy: “media literacy is

⁶ The term ‘media literacy education’ is the equivalent of the concept of media education and generally includes both the learning processes and the education initiatives that contribute to the development of media literacy and critical thinking.

the ability to access, analyze, evaluate, and communicate messages in a variety of forms” (Aufderheide & Firestone, 1993). As Buckingham (2007) explains,

Access thus includes the skills and competencies needed to locate media content, using the available technologies and associated software. At least in Ofcom’s⁷ usage, it also includes the ability to regulate (or self-regulate) access, for example, by being aware of potential risks, and using regulatory mechanisms and systems of guidance.

Understand includes the ability to decode or interpret media, for example, through an awareness of formal and generic conventions, design features and rhetorical devices. It also involves a knowledge of production processes, and of patterns of ownership and institutional control, and an ability to critique media, for example, in terms of the accuracy or reliability of their representations of the real world.

Finally, **create** involves the ability to use the media to produce and communicate one’s own messages, whether for purposes of self-expression or in order to influence or interact with others. (p. 44)

In his literature review, Martens (2010) explained that “these knowledge and skills mainly relate to four key facets of the mass media phenomenon, i.e., media industries, media messages, media audiences, and media effects” (p. 3). ‘Media industries’ refer to the commercial nature of mass media and the purpose of commercial. ‘Media messages’ include the constructed nature of messages with media grammar literacy complementing media content literacy. ‘Media audiences’ refer to the different possible interpretations of media content. ‘Media effects’ concern the effects on individuals and society.

W. James Potter is one of the most emblematic authors of the cognitive approach. Potter (2004) defines media literacy as “the set of perspectives from which we expose ourselves to the media and interpret the meaning of the messages we encounter” (pp. 58-59). He has identified five strong knowledge structures (media effects, media content, media industries, the real world, and the self) and seven skills that people need (skills of analysis, evaluation, grouping, induction, deduction, synthesis and abstracting) to be media literate. Knowledge structures are sets of organised information in one’s memory that help “[...] make better decisions about seeking out information, working with that information, and constructing meaning from it

⁷ As explained on their website, “Ofcom is the UK’s communications regulator, regulating the TV, radio and video on demand sectors, fixed line telecoms, mobiles, postal services, plus the airwaves over which wireless devices operate” (Ofcom, 2023).

that will be useful to serve their own goals” (Potter, 2004, p. 33). The skills are the tools that are used to perform a task, and which are developed through practice (see figure. 3.1.).

Figure 3.1.

The Seven Skills of Media Literacy (Potter, 2004, p. 36)

1. **Analysis**—breaking down a message into meaningful elements
2. **Evaluation**—judging the value of an element; the judgment is made by comparing the element to some criterion
3. **Grouping**—determining which elements are alike in some way; determining which elements are different in some way
4. **Induction**—inferring a pattern across a small set of elements, then generalizing the pattern to all elements in the set
5. **Deduction**—using general principles to explain particulars
6. **Synthesis**—assembling elements into a new structure
7. **Abstracting**—creating a brief, clear, and accurate description capturing the essence of a message in a smaller number of words than the message itself

Potter’s approach to media literacy is cognitivist, as media literacy is defined as “a set of cognitive skills that the individual, considered as an autonomous actor, must master independently of the context in which they are exercised” (Fastrez, to appear, p. 3). Although the cognitive approach is relevant to task performance, it has its limitations when it must take the experience and context of learners into consideration. It is in this context that the critical-cultural approach was developed, addressing the social contexts in which multiple cultural practices can emerge (ibid.).

3.1.2. Media Literacy as Media Practices

The second approach is from the perspective of cultural studies (Martens, 2010). Rather than focusing on knowledge or skills, it considers one’s dispositions, attitudes, practices, or cultures. Scholars working within a cultural/critical study framework often “[...] pair their interest for young people’s popular culture with a sociocultural conception of learning as a

collective, participatory process. Therefore, they emphasize interaction and social context” (Martens, 2010, p. 9). By contrast, the cognitive perspective proposes a conception of media literacy as a set of individual cognitions that are independent from one’s social and cultural practices (Fastrez et al., 2022).

Culture/critical approach is intended to be more grounded in the reality of practices to study authentic learning or teaching contexts. « Methodologically, cultural/critical scholars tend to describe and theorize media teaching and media learning within complex real-life contexts, while social science researchers typically test the effects of media literacy interventions within controlled research environments” (Martens, 2010). This implies that cultural/critical approaches are generally associated with ethnographic studies, providing thick descriptions of situated media practices, while cognitivist approaches involve quantitative assessments of cognitive abilities (Fastrez, to appear).

Barton and Hamilton (1998)’s social theory of literacy provides a framework to comprehend the approach of media literacy as social practices. Their works focus on the notion of literacy practices, defined as “cultural ways of using literacy” (ibid., p. 8) and emphasise the social structures in which they are situated. This theory recognises that it is necessary to look at one’s values, attitudes, feelings, and social relationships towards literacy to comprehend practices (Street, 1984). “This includes people’s awareness of literacy, constructions of literacy and discourses of literacy, how people talk about and make sense of literacy” (Barton et al., 2000, p. 7). These refer to processes that connect people together and include “shared cognitions represented in ideologies and social identities” (ibid.).

This theory is based on a number of principles, including the following ones. First, literacy practices refer to a range of activities that people do in their everyday life, but these practices cannot be detached from their context of use: literacy events are always located in time and space (Barton & Hamilton, 1998). Second, this theory assumes that there are several literacies. As practices can involve different media or symbolic systems, such as a film or a computer, they can be regarded as different literacies, such as film literacy and computer literacy (Barton et al., 2000). Furthermore, practices are part of different cultures and languages, so they can also lead to new configurations of literacies such as academic literacy or workplace literacy (ibid.). Third, “literacy practices are patterned by social institutions and power relationships, and some literacies are more dominant, visible and influential than others” (ibid., p. 11). Bélisle (2007) discusses the “legitimacy effect” to refer to the question of which practices are worth declaring and which are not. Legitimate practices are those “often associated with a heritage

that is transmitted and protected by institutions” such as schools, as opposed to ordinary practices, which are associated with “entertainment, domestic life and the organisation of work, among other things” (ibid., p. 23; personal translation).

Cultural/critical media education scholars drew on these various principles to review the pedagogical approach to media education in schools (Buckingham, 2004; Burn & Durran, 2007; Knobel & Lankshear, 2014). They acknowledged the use of popular culture media in the classroom (in opposition to the strict use of “legitimate” culture), such as television, which had previously been associated exclusively with the domestic context. As a result, they have recognised the diversity of practices and literacies within the school environment. Their work has led to the development of New Literacies Studies, which differ fundamentally from conventional print literacies on the basis that they include digital forms of media and technologies (Knobel & Lankshear, 2014) as well as new forms of participatory culture⁸ (Jenkins, 2006a).

New Literacies (or Multiliteracies) recognise the audience’s role in media content production. “Because social media tools and platforms have enabled group collaboration and community dialogue, audiences have become producers, and the gap between productive literacies and receptive literacies has narrowed” (Hobbs, 2016a, p. 9). This shift reorients literacy practices from individual behaviour towards a community focus, considering the contexts of sharing among knowledge communities (ibid.).

Buckingham, one of the precursors of cultural/critical approach, emphasises the importance for understanding media’s broader societal context. Buckingham’s focus is not just on how media is made and consumed, but also on its role in shaping, and being shaped by, cultural and social norms. In his work “The Media Education Manifesto”, Buckingham (2019) explains his conception of media literacy:

[...] media literacy is not simply a matter of knowing how to use particular devices, whether in order to access or to create media messages. It must also entail an in-depth critical understanding of how these media work, how they communicate, how they represent the world, and how they are produced and used. (p. 3)

This approach delves into the regulation and impact of media industries, offering a more investigative and critical perspective. Buckingham’s manifesto advocates for integrating

⁸ The concept of ‘participatory culture’ is discussed in the following section on the purposes of media literacy.

media education into school curricula, emphasising its importance in understanding issues like data use, fake news, and the broader media environment.

As Martens (2010) points out in his literature review, Buckingham “[...]” argues that we cannot teach a limited set of cognitive abilities which individuals somehow come to possess” (p. 2). Instead, he proposed four key media concepts – production, language, representation, and audiences – to interpret (mass) media messages (Buckingham, 2003b).

Figure 3.2.

The Core concepts of Media Literacy (Buckingham, 2003b)

1. **Language** — Every medium has its own combination of languages that it uses to communicate meaning.
2. **Representation** — Self-evidently, the media do not offer us a transparent ‘window on the world’, but a mediated version of it. They don’t just present reality: they re-present it.
3. **Production** — All media are consciously created and manufactured. Although some media texts are made by individuals working alone, just for themselves or their family and friends, many are produced and distributed by groups of people, often for commercial profit.
4. **Audiences** — As the media have proliferated, they increasingly have to compete for people’s attention and interest. Media producers might imagine they know what different groups of people will want, but it is often hard to explain why some things become popular, and others do not.

Buckingham’s core concepts help students to understand media messages in their multiple forms, while taking the digital media environment into account. As Buckingham (2007) states, media education does not only consist in “accessing” (digital) media or using them as tools for learning: “on the contrary, it means developing a much broader critical understanding, which addresses the textual characteristics of media alongside their social, economic and cultural implications” (pp. 48-49). This last quote underlines the particular nature of the media literacy

approach as media practices, where the context has an important role to play in the interpretation of media messages.

3.1.3. Media Literacy as the Expression of Competence

In my research group, the Knowledge Mediation Research Group (GReMS), we have developed a third approach which is situated at midway between the last two approaches and “consider media literacy as the expression of competence, manifest in one’s competent situated action” (Fastrez et al., 2022, p. 74). The concept of competence implies the mastery of elementary (behavioural, stereotyped and automated) knowledge and skills as well as the selection and the relevant combination of them to adapt to new situations (Fastrez, to appear). “From this perspective, knowledge and skills are among the internal resources that can be put to action by the competent (media literate) individual” (ibid., p. 3).

A competence is linked to intentional action and becomes manifest when an individual acts towards a goal. According to Scallon (2004), “the term ‘competences’ refers to the mobilisation, i.e., the appropriate use, of knowledge and practical skills in a variety of situations” (p. 11; personal translation). In learning contexts, Tardif et al. (2006) distinguishes competences from complex performances by emphasising that the competence mobilises a variety of internal and external resources within these situations (p. 15).

Developing a competence involves a learning process through which the individual becomes (more) competent. The context of learning can vary from a supervised setting to a self-directed learning. The development of a competence is also carried out in the situations in which it is mobilised. According to Gillet (1998), the competence is of the nature of the “virtual”, and is actualised in performances, which make competence visible and observable. The actualisation of a competence in a situation can be an opportunity for its development. A competence “[...] is also the ability to adapt in a new and non-stereotyped way to new situations. What counts is not only the mastery of procedures, but also the ability to mobilise them to deal with an original problem” (Rey et al., 2006, p. 13). The actualisation of an individual’s competence in a new situation can extend the family of situations in which they are competent.

In order to connect competences to media practices, Fastrez (2012) proposes a conceptual framework structured in a competence matrix that defines media literacy in terms of the competence required to read, write, navigate, and organise media from technical, semiotic, and

⁹ Original quote (in French) : « *On parle de compétences lorsqu’un individu mobilise, c’est-à-dire utilise à bon escient, ses savoirs et savoir-faire dans des situations variées* ».

social standpoints. Reading and writing focus respectively on the reception and production of media objects, while navigating and organising focus respectively on the reception and production of a collection of related media objects (ibid., p. 5).

Table 3.3.

The Competence Matrix (Fastrez, 2012)

Tasks	Dimensions	Technical	Semiotic	Social
Reading				
Writing				
Navigating				
Organising				

The approach of media literacy as the expression of competence provides an appropriate framework for defining my own approach to media literacy. As a reminder, my aim is to assess students' ability to ask critical questions about media texts, and in this context, I am developing a quantitative measurement tool. The formulation of questions by learners implies the mobilisation of both internal and external resources which can only be observed in real learning contexts. It is therefore difficult for me to limit my approach to a cognitivist perspective which would see inquiry as a strict set of cognitive abilities, or to a critical/cultural perspective which favours qualitative assessment methods (see section 3.4. for more details on media literacy assessment methods). The competency-based approach offers a middle ground between these approaches, and thus makes it possible to approach inquiry as a competence.

3.2. Purposes of Media Literacy

Educators and scholars who are interested in media literacy can embrace a wide variety of motives and goals. Initially, there was a vague consensus that media literacy aimed to develop critical thinking (Hobbs & Jensen, 2013). However, tensions emerged fairly quickly around what was meant by the word 'critical', and a first duality emerged in the community between

protectionist and empowerment traditions. While those in favours of protectionism see media literacy as a “means to address the harms, risks, and challenges of growing up in a media and technology-saturated cultural environment”, those in favours of empowerment see media literacy as a “tool for personal, social, cultural, and political empowerment” (Hobbs, 2016b).

This duality has long existed within the community (Hobbs, 1998) and reflects a tension that still divides a significant number of media education scholars today. The many articles published in the *Journal of Broadcasting & Electronic Media* in which Hobbs and Potter argue for one tradition or the other attest to this current tension (Hobbs, 2011a, 2011b; Potter, 2010, 2011). Nevertheless, various initiatives have since emerged to try and ease the tensions between the two approaches, such as the National Association of Media Literacy Education, through the creation of the Core Principles (National Association of Media Literacy Education, 2007). The relatively recent concept of ‘participatory culture’ (Jenkins, 2006a) has also made it possible to extend the conception of media literacy by including aspects other than critical thinking, such as the creation of social networks and the involvement in the community. The following paragraphs explore these different approaches, which illustrate the different axiological positions of media literacy.

3.2.1. Protection

The protectionist approach has its origins in the beginnings of media education in the second half of the 20th century (Hobbs & Jensen, 2013). In the United States (and in the European Union as well), media education mainly referred to audio-visual education, i.e., and consisted in the “[...] development of abilities that enable children to have an understanding of the techniques and ‘language’ of film” (p. 3). While some educators and film scholars saw this as a way to develop children’s affinity with the cinema, others saw media education as a way to protect them from the harmful influences of the Hollywood studios. “Media literacy education was understood as a ‘cognitive defence’ against the most overt and disturbing forms of sensationalism and propaganda pouring out of the rapidly growing culture industries” (ibid.).

In this perspective, media audiences are considered as passive victims and media education can help counter negative media influence on them. The protectionist approach demonises the media system and aims to protect citizens from the dangers and manipulations of the media (Kellner & Share, 2007a). In this context, media education has a “anti-media” bias that distorts our relationship with the media and does not empower us to act properly.

This approach is important when it addresses the naturalizing processes of ideology and the interrelationships with social injustice, but it is deeply flawed when it does so through dogmatic orthodoxy and undemocratic pedagogy where teachers merely denounce the media and students are encouraged or coerced to follow this anti-media line. (Kellner & Share, 2007a, p. 6).

By its lack of critical distance, this approach is therefore rather delicate to adopt for teaching about media. It is problematic to many educators and scholars in several respects.

According to this view, the teaching methods that result from educators who see themselves as protecting students are ineffective in the classroom. When media literacy skills are positioned in opposition to media culture, the quality of the instruction is compromised. Many teachers at both the K12¹⁰ and university levels have found that students are unresponsive to the idea that they are helpless victims of media influence who need to be rescued from the excesses and evils of their interest in popular culture. Buckingham (1993) suggested that by focusing on the problematic features of the mass media, we neglect young people's emotional engagement with the media, and we may ignore the genuine pleasures they receive, substituting cynicism and superiority instead of promoting real questioning and analysis. Too often, the protectionist stance leads to an instructor-focused classroom, where the teacher tells the student the "facts" about media's negative influence, about the manipulation of messages, and the student listens quietly and takes notes for the test. Such an approach to teaching and learning may cause students to parrot the correct interpretations—the ones the teacher has sanctioned—and, in doing so, media literacy education may lose its authenticity and its relevance to students' lives (Buckingham, 1990; Masterman, 1985; Williamson, 1981). (Hobbs, 1998, p. 19)

The protectionist movement is still present in the media literacy education community. In his systematic literature review of 165 papers on media literacy, "Martens (2010) notes that some communication scholars position media literacy education as a solution to the problem of negative media effects like media violence, gender and racial stereotyping, and bias in the news" (Hobbs, 2011b, p. 11). Furthermore, Potter (2010), one of the pioneers of the media literacy field, identifies four common themes that constitute, according to him, a general agreement across the writings about media literacy. His first two themes emphasise media

¹⁰ K12 refers to the 12 years of compulsory primary and secondary school in the USA.

literacy as a means of protecting individuals from potential media negative effects, although these themes are far from being a consensus in the media literacy community (Hobbs, 2011b).

3.2.2. Empowerment

The empowerment perspective is opposed to the view of media literacy as a protective factor and considers it instead as an active process involving the participation of citizens in the analysis and production of media texts (Weninger et al., 2017).

Emerging theoretically from constructivist learning theory and articulated in the work of visual literacy specialists, media arts educators, and youth development professionals, this approach to media literacy emphasizes young people as capable, resilient and active in their choices as both media consumers and as creative producers. (Hobbs, 2011b, p. 422)

This approach has prompted a series of educational initiatives promoting DIY as a means of self-expression and identity building, as well as a vehicle for the development of critical thinking skills about media and technology (Hobbs, 2011b). These initiatives focus on the development of “skills of access, critical multimodal analysis and creation as well as students’ reflective and evaluative capacities” and “provide youth with foundational competencies and knowledge to participate in a mediated civic and political life” (Weninger et al., 2017, p. 430).

From this perspective, media education contributes to the development of a critical autonomy in citizens which is necessary for the proper functioning of democracy (Hobbs, 1998, p. 22). The role of the teacher or educator is to promote this critical autonomy, which refers to “the process of internalizing the tools of self-reflection, critical analysis, and communication for one’s own purposes and motives (Mendez & Reyes, 1992)” (ibid.). This perspective represents a major break with the protectionist movement, by encouraging students to think for themselves, to reach autonomous decisions, rather than reproducing their teachers’ ideas about the media (ibid.).

Although the empowerment movement is the dominant movement within the media literacy community today (Hobbs, 2011b), divisions subsist within the movement itself. We can identify two sub-movements: the media literacy movement and critical media literacy. These two approaches are distinguished by the critical and militant nature of critical media literacy.

3.2.2.1. *Media Literacy Movement*

The media literacy movement brings together several organisations in the US approaching media literacy as “a series of communication competencies, including the ability to access, analyze, evaluate and communicate”. As Kellner and Share (2007a) explains, “this approach attempts to expand the notion of literacy to include multiple forms of media (music, film, video, Internet, and so on) while still working within a print literacy tradition” (p. 7). As a result, it legitimates news forms of expression and communication for teaching while questions technological domination in media and entertainment culture (Hobbs & Jensen, 2013).

According to Kellner and Share (2007a), the media literacy movement proposes an approach intended to be neutral in order to avoid altering the student’s judgment in their interpretation of the media.

While this ambiguous nonpartisan stance helps the dissemination of media education, thereby making some of the ideas and tools available to more students, it also waters down the transformative potential for media education to become a powerful instrument to challenge oppression and strengthen democracy. (p. 7)

Hobbs and Jensen (2013) highlight, however, important perspectives that still ignite controversy within the movement.

There are the political and governmental leaders who see MLE as an “alternative to censorship,” an opportunity to move government out of the business of media regulation. There are media literacy educators who push their political agendas onto students, offering their critique of capitalism as gospel and orchestrating student ‘voice’ in a mandated form of ‘service learning,’ coercively enrolling students into a political action project, telling them what to think instead of encouraging them to think for themselves. There are those whose opposition to ‘big media’ propels their participation in media literacy education, who believe that the media literacy movement has stepped away from its critical focus and lost its edge, teaching aesthetic and text-analysis skills but not “creating an engaged student who has the capacity to undertake social action” (Quin and McMahon 2007, 229). There are others who worry that MLE increases alienation and promotes cynicism, robbing students “of their sense of focus and ambition as it relentlessly drives home the dour political-economic magnitude of the media machine” (Zanker 2007, 53). And there are those who are troubled by their discovery that MLE can activate, among some students, an

outpouring of transgressive moments as in student-created videos that feature parodic, horrific, grotesque, and forbidden content, sometimes involving animal cruelty, violence, sexuality, gender and racial stereotypes, “which push us to question how comfortable we are when the curriculum becomes child-centered” (Grace and Tobin 1998, 45). (Hobbs & Jensen, 2013, p. 4)

Far from being prejudicial to the movement, these tensions are part of the “journey to empowerment” and are essential for making progress in research in this field (Hobbs & Jensen, 2013).

3.2.2.2. Critical Media Literacy

Kellner and Share (2007b) explain that critical media literacy expands the notion of literacy “to include different forms of media culture, information and communication technologies and new media, as well as deepen the potential of literacy education to critically analyze relationships between media and audiences, information and power” (p. 59). In this approach, media literacy plays a resistance role to an unfair social order and aims at developing skills that will enhance democratisation and participation. Critical media literacy wants to empower people by enabling them to create their own meanings and identities; this is a means of collective emancipation.

An important area of theoretical work for critical media literacy comes from other fields including cultural and feminist studies. These approaches address equity and social justice issues related to media misrepresentations and stereotyping, e.g., the inclusion of some groups and exclusion of others, the dominant and positively represented groups and disadvantage marginalised and subordinate ones, and so on (Kellner & Share, 2007a). They offer methodologies that help students deconstruct the representations of class, gender and race in media and reveal the structures of power and the functioning of ideology. They are both opposed to the notion that audiences are powerless and value an active role of the audience in deconstructing as well as creating media texts.

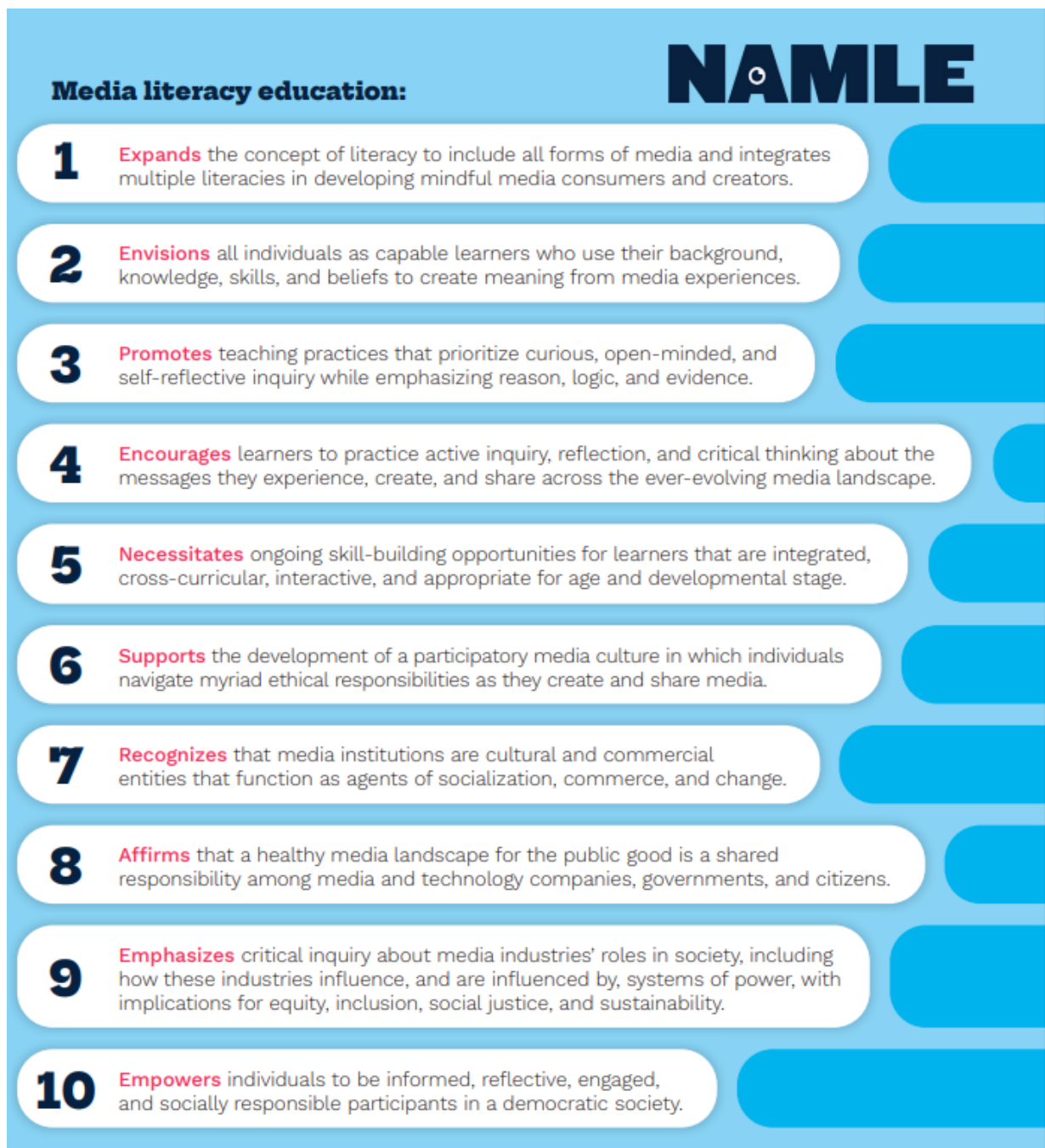
3.2.3. Core Principles

The Core Principles, initiated by the National Association of Media Literacy Education, are part of the initiatives that try to ease the tensions between the protection and empowerment traditions (see figure. 3.4.). They situate media education “[...] within both literacy education and constructivist learning theory and emphasizing its role in supporting active democratic

citizenship, as opposed to simply creating informed consumers of mass media and popular culture” (Hobbs & Jensen, 2013, p. 7). These principles constitute a consensus on a shared vision of media education as a means of “develop[ing] informed, reflective and engaged participants essential for a democratic society” (National Association of Media Literacy Education, 2007, p. 4).

Figure 3.4.

NAMLE Core Principles (2013 version)



3.2.4. Participatory Culture

Participatory culture refers to “a culture with relatively low barriers to artistic expression and civic engagement, strong support for creating and sharing one’s creations, and some type of informal mentorship whereby what is known by the most experienced is passed along to novices” (Jenkins et al., 2009, p. 3). According to Jenkins (2006a), today’s new forms of media reinforce this idea of participatory culture as opposed to public passivity and lead us to talk about participatory communities developing content that is just as creative as it is critical, such as web pages, forums, fanfics, videos, tweets, memes, and so on.

This participative culture is part of an age marked by media convergence. Convergence refers to “the flow of content across multiple media platforms, the cooperation between multiple media industries, and the migratory behavior of media audiences who would go almost anywhere in search of the kinds of entertainment experiences they wanted” (Jenkins, 2006b). In this context, culture becomes the creation of everyone and no longer of a privileged few (Wuyckens, 2016). In a culture of convergence, everyone participates regardless of their influence and status (ibid.).

In this context, Jenkins et al. (2009) focuses his approach to literacy on the community involvement rather than individual expression and has developed a series of social skills centred on collaboration and networking. His model includes the next eleven skills (see figure 3.5.).

Figure 3.5.

New Media Literacy Skills (Jenkins et al., 2009)

1. Play — the capacity to experiment with one’s surroundings as a form of problem-solving
2. Performance — the ability to adopt alternative identities for the purpose of improvisation and discovery
3. Simulation — the ability to interpret and construct dynamic models of real-world processes
4. Appropriation — the ability to meaningfully sample and remix media content
5. Multitasking — the ability to scan one’s environment and shift focus as needed to salient details.
6. Distributed Cognition — the ability to interact meaningfully with tools that expand mental capacities
7. Collective Intelligence — the ability to pool knowledge and compare notes with others toward a common goal
8. Judgment — the ability to evaluate the reliability and credibility of different information sources
9. Transmedia Navigation — the ability to follow the flow of stories and information across multiple modalities
10. Networking — the ability to search for, synthesize, and disseminate information
11. Negotiation — the ability to travel across diverse communities, discerning and respecting multiple perspectives, and grasping and following alternative norms.

Jenkins’s approach has led media education scholars to extend their conception of media literacy to include the new forms of participation suggested by his model of media convergence.

First, Hobbs’ “Create to Learn” (2017) aligns with his concept of participatory culture, emphasising effective learning through media creation. She expands media literacy to include digital literacy, integrating knowledge, skills, and competencies vital in a technology-rich world.

As information, entertainment, and persuasion are now shared digitally and persona, social and professional relationships are developed through interaction with social media as well as mass media and popular culture, people of all ages need the ability to access, analyze, create, reflect, and take action using a wide variety of digital tools, forms of expression and communication strategies. (ibid., p. 6)

The learning process is seen as both formal and informal, with media creation being a key method for learning and participation in contemporary culture.

Second, Mihailidis and Thevenin (2013) developed a media literacy framework for engaged citizenship that includes two competencies based on Jenkins's works.

The first is a participatory competency, which focuses on enabling skills "make it possible for average consumers to archive, annotate, appropriate, and recirculate media content in powerful new ways" (Jenkins et al., 2009, p. 8). [...] A collaborative competency for the engaged citizen builds on Jenkins's participatory culture to outline how "generative learning communities" (Lewis, Pea, & Rosen, 2010, p. 352) can lead to a cocreation of meaning that moves toward engagement. (Mihailidis & Thevenin, 2013, p. 8)

Third, the project "Mapping Impactful Media Literacy Practices"¹¹ studies the factors of impact and equity within the society to support more inclusive futures. Media literacy is seen as essential to giving a voice to marginalised and underserved communities.

Rather than breaking with previous traditions, these new conceptions of media literacy provide continuity with them by taking into account the realities of today's media environment. They promote new values such as media creation and equitable sharing and, in particular, make it possible to raise the visibility of minorities. By adopting an inquiry-based learning approach, the present research is in line with the studies that have been carried out in recent years, and places particular emphasis on the empowerment of students to appropriate and create media texts that make sense within their own experience and community of practices.

¹¹ See the website of the project: <https://mappingimpactfulml.org/> (retrieved July 7, 2023)

3.3. Objects of Media Literacy

Since the emergence of the conception of media literacy as the “ability to access, analyze, evaluate, and communicate messages in a variety of forms” (Aufderheide & Firestone, 1993), there has been a proliferation of approaches as well as models providing a framework to help learners interpret the media. “Whether one considers that (media) literacy corresponds to knowledge and skills, a form of competence or an array of social practices, none of these perspectives determines what such knowledge, skills, competence or practices are about” (Fastrez, to appear, p. 6). It therefore seems essential to define what is meant by the term ‘media’ in order to identify the focus of my approach to media literacy, and to define the model used in the present research in order to understand the specific nature of the inquiry process.

3.3.1. The Study of Media Texts

The concept of media is just as crucial to define as literacy is to understand what media literacy covers. Media has long been used to refer to digital technological tools, and was referred to as ‘educational technology’ or ‘information and communication technologies’ (ICTs) (Meunier & Peraya, 2015). These concepts focused on technical means, information transmission, and mass communication means and did not go beyond the level of empirical description of technical objects and their characteristics (ibid.). They were part of the structuralist paradigm of the time. However, many elements had to be considered, such as the institutions of production and dissemination, the systems of representation, the languages specific to each media, the cognitive postures of the recipients, and so on. Meunier & Peraya (2015) thus proposed a more inclusive definition of media composed of three major elements: production, product, and reception.

They based their approach on Anderson’s definition of medium as recognisable human activity that organises reality into readable texts for engagement (J. A. Anderson & Meyer, 1988, p. 316). Meunier & Peraya (2015) explained each part of the definition in their book. First, human activity assumes the primacy of humanity over technique. Second, the activity is oriented, finalised, which means that the intentionality presides over all action, over all human communication. Third, any media constitutes reality in discourse, and is one of the possible representations; it is a cognitive tool, an intellectual technology. Fourth, every message must be considered as a text, i.e., a semiotic framework on which, says Anderson, “the reader can operate”. Finally, the texts are readable, which implies the knowledge of codes and conventions allowing the appropriation of the text as well as the participation of the reader in the elaboration of the meaning of the text.

They specified that some objects only become media when there are recipients: “If these objects do possess a *media potential*, this potential is only realised during a socio-technical activity involving a receiving instance, a real public and reception practices” (Meunier & Peraya, 2015, p. 397; personal translation). For example, a CD-ROM stored in an old drawer is not media. It can only be considered as media when it is consumed, i.e., when it is put in the disc player and watched by an audience.

Based on Anderson’s definition, Meunier & Peraya (2015) proposed the concept of ‘media device’, or ‘mediated communication device’. Mediated communication is understood as “any form of communication using a technological device – a medium of any kind” (ibid., p. 411; personal translation). Mediatisation refers to “the process of creating such devices, a process in which screenwriting plays an important role” (ibid.).

They highlighted three dimensions of the media device:

1. Production and reception areas
2. Forms of representation of information and knowledge
3. Forms of dissemination and restitution of these.

Fastrez (2012) who worked on the concept of media literacy and media competence also agrees with Anderson’s definition and proposes three types of media ‘objects’. As the author explains, “the concept of ‘object’ is to be understood here in the sense that an individual’s competence can take these three dimensions of a media (or media practice) as its object”¹² (p. 4; personal translation).

1. Media are informational objects: “they are designed to represent objects (real or fictional) that are external to them, using their own languages” (ibid.). This dimension includes the form of the medium and its representations, its content.
2. Media are technical objects: they are the result of technical production processes or are themselves used to produce or disseminate other media objects (ibid.). This dimension includes their technical working, their function, the semiotics of their interfaces and the technological issues related to them (ibid.).
3. Media are social objects: “any media object refers to the actors (institutions and persons) producing and distributing it, to the intentions of these actors, to the effects

¹² Original Quote (in French): « *Le concept d’objet doit ici être entendu au sens où la compétence d’un individu peut prendre pour objet ces trois dimensions d’un média (ou d’une pratique médiatique)* ».

it produces, to the cultural models it conveys, to the social uses associated with its reception, to the principles linked to its responsible and ethical use, etc.” (ibid., p. 5)

As Fastrez et al. (2022) state, this definition provides the centrality of the concepts of text (in its semiotic sense) and meaning making, which have had a structuring role in media literacy research. Texts can be considered as any form of reified expression or communication mobilising one or more semiotic systems (e.g., verbal language, fixed or moving images, graphic design, sound, music, ...) (Hobbs et al., 2010, pp. 16–17) in single or multimodal arrangements. A text is a unit of meaning involving a process of interpretation or understanding. Anything that can underlie such a process can be considered as a text. From a media studies perspective, a text can therefore refer to a television programme, a film, a video game, a website, a book, a song, a podcast, a newspaper article, a tweet, or an app (Gray, 2017, p. 196).

In the present research, I mobilise the concept of ‘media text’ (rather than only ‘media’) to apprehend the different facets of media texts. I use core concepts models similar to Buckingham (2003b)’s four key media concepts to identify media text’s main characteristics. These types of models are based on an inquiry approach to learning and help individuals interpret media texts in their globality.

3.3.2. Core Concepts & Key Questions

Many researchers argue that the principle of inquiry is at the heart of media literacy (Thoman et al., 2008). To engage students in the inquiry process, they have built inquiry-based learning models with both fixed and flexible sets of questions (Schilder, 2014). For example, the National Association for Media Literacy Education (NAMLE, 2014) has constructed a list of key questions to analyse media messages, divided into three categories: authors and audiences, messages and meaning, representations and reality (see figure. 3.6.). The Center for Media Literacy (CML) has established five key questions to deconstruct the media messages (see figure. 3.7.) They associated them with five key words (authorship, format, audience, content and purpose), five core concepts and another set of five key questions to ask oneself in a construction process (Thoman et al., 2008).

Figure 3.6.

Key Questions (NAMLE, 2014)

KEY QUESTIONS TO ASK WHEN ANALYZING MEDIA MESSAGES		
USING THIS GRID – Media literate people routinely ASK QUESTIONS IN ALL THE CATEGORIES (the middle column) of this grid as they navigate the media world. The specific questions listed here are suggestions; you should adapt or change them to meet your children's developmental level and your learning goals. Not all questions will apply to every media message, and questions will often have more than one answer. To help children develop the habit of giving evidence-based answers, nearly every question should be followed with a probe for evidence: HOW DO YOU KNOW? or WHAT MAKES YOU THINK THAT? And remember that the ultimate goal is for children to learn to ask these questions for themselves.		
AUTHORS & AUDIENCES	AUTHORSHIP	Who made this?
	PURPOSES	Why was this made? What does this want me to do? Who is the target audience? Who are they talking to? or Who is this for?
	ECONOMICS	Who paid for this?
	IMPACT	Who might benefit from this message? Who might be harmed by it? Is this message good for me or people like me? What does the storyteller want me to remember?
	RESPONSE	What actions might I take in response to this message?
MESSAGES & MEANINGS	CONTENT	What does this want me to think (or think about)? What would someone learn from this? What does this tell me about [insert topic]? What ideas, values, information, and/or points of view are overt? Implied? What is left out that might be important to know?
	TECHNIQUES	What techniques are used and why? How do the techniques communicate the message?
	INTERPRETATIONS	How might different people understand this message differently? What is my interpretation and what do I learn about myself from my reaction or interpretation?
REPRESENTATIONS & REALITY	CONTEXT	When was this made? Where or how was it shared with the public?
	CREDIBILITY	Is this fact, opinion, or something else? How credible is this (and how do you know)? What are the sources of the information, ideas, or assertions? Can I trust this source to tell me the truth about this?
Adapted by Faith Rogow (faithrogow@earthlink.net) with contributions from Cindy Scheibe (scheibe@thasa.edu) from NAMLE's Core Principles for Media Literacy Education, April 2007 www.NAMLE.net/coreprinciples Educational use for direct instruction permitted.		

Figure 3.7.

Questions/TIPS (Thoman et al., 2008)

CML's Questions/TIPS (Q/TIPS) © 2002–2007 Center for Media Literacy www.medialit.org				
#	Key Words	Deconstruction: CML's 5 Key Questions (Consumer)	CML's 5 Core Concepts	Construction: CML's 5 Key Questions (Producer)
1	Authorship	Who created this message?	All media messages are constructed.	What am I authoring?
2	Format	What creative techniques are used to attract my attention?	Media messages are constructed using a creative language with its own rules.	Does my message reflect understanding in format, creativity and technology?
3	Audience	How might different people understand this message differently?	Different people experience the same media message differently.	Is my message engaging and compelling for my target audience?
4	Content	What values, lifestyles and points of view are represented in or omitted from this message?	Media have embedded values and points of view.	Have I clearly and consistently framed values, lifestyles and points of view in my content?
5	Purpose	Why is this message being sent?	Most media messages are organized to gain profit and/or power.	Have I communicated my purpose effectively?

Key questions are intended to guide students in their inquiry process when confronted with media texts. Besides helping them structure their questioning, the goal of this approach is to promote questioning habits beyond media education activities. In the present research, I approach media literacy from the perspective of core concepts and investigate students' ability to ask key questions about media texts. Regarding assessment, this involves measuring media literacy in terms of participants' ability to ask questions about the various perspectives offered by the core concepts.

3.4. Assessment of Media Literacy

As conceptions of media literacy are multiple, each has developed its own assessment tools. The cognitive approach favours quantitative measurements of individuals' knowledge and skills elements concerning media, while the critical/cultural approach favours qualitative descriptions of media literacy practices (Fastrez et al., 2022).

The cognitive tradition, which supports a unified vision of a singular literacy, favours quantitative assessments involving standardized measurement of knowledge and skills, such as the ones included in international surveys (e.g. PISA, PIRLS). The critical-cultural tradition tends to question the very relevance of assessing literacy at all, as it considers multiple literacies to be tied to the specific contexts and social groups in which they are practised. Rather than providing systematic assessments, this strand of research has yielded thick descriptions of culturally and socially situated literacy practices. (Fastrez, to appear, p. 3)

While cultural/critical approaches are generally associated with ethnographic studies, their assessment methods can, however, use quantitative measures. Based on five examples of media literacy models, Fastrez (to appear) explains that “[t]here is no one-to-one mapping between any of these models and specific assessment methods, where a given model would only translate to a specific type of assessment instrument” (p. 10). For example, Jenkins et al. (2006)'s list of twelve New Media Literacies favours qualitative ethnographic studies of situated media practices and is closed to the critical-cultural approach of media literacy but was operationalised by Literat (2014) through a quantitative survey in the form of a declarative scale (Fastrez, to appear).

Although the cognitivist and cultural/critical approaches to media literacy seem radically opposed, their assessment method seems to indicate that the division is more difficult to operate. Martens (2010) argues in his literature review that these approaches can be used “as complementary perspectives on one single multifaceted research phenomenon” (p. 9).

Concerning the approach of media literacy as the expression of competence, it supports “forms of assessment that rely on the performance of tasks by research participants, in which they can demonstrate their competence” (Fastrez, to appear, p. 3). These assessments typically combine multiple tasks that cover a series of situations. These situations are necessary to observe task performance, as competences can only be manifest in one's competent situated

action (ibid.). The tasks must relate to situations that are meaningful for the participant, so that they can be motivated and committed to these tasks (ibid.).

In the present research, I want to assess students' critical inquiry competence. Competence-based assessment provides a general framework for my experiment, which involves a complex situation where students ask questions about media texts. The problem that remains is how to distinguish between critical and non-critical questioning. The final sections of this chapter aim to identify several criteria for assessing students' ability to ask critical questions, such as the media literacy core concepts and the 'criticality' levels of their questions.

3.4.1. Assessing Inquiry

While critical inquiry seems to be an essential competence to improve students' critical thinking, few studies have examined students' abilities to ask their own questions. Inquiry-based learning models are generally used to assess students' responses to researcher-generated questions. To address this gap, Schilder and Redmond (2019) propose a method to assess media literacy development by examining students' ability to ask their own questions.

To measure students' media literacy inquiry, we evaluated the questions they posed in response to viewing an advertisement. We analysed questions by media literacy concept and by level of complexity before and after their participation in the media literacy courses. (Schilder & Redmond, 2019, p. 95)

The media literacy concepts are drawn from core principles key questions of NAMLE (2014) to which they added subcategories according to the students' questions. Their 2019 codebook features seven categories: Purpose, Text, Production, Audience, Representations, Realism and Not Critical (Schilder & Redmond, 2019). They define them as follows:

1. **Purpose:** Questions focus on the purpose of the message, including aspects related to authorship, context of dissemination, and economics. Questions might focus on why the message was created and disseminated, when and how, by whom, and other inquiries about general intentions of the media.
2. **Text:** Questions focus on the explicit content of the text as a narrative, encompassing what is happening and who is involved. Questions typically require the answerer to recall or respond to the story of the media in some way.

3. **Production:** Questions focus how the media was constructed, what production techniques were used, and why these techniques were used. For example, lighting, music, framing, camera language, and other audio-visual elements.
4. **Audience:** Questions focus on who the audience is in general terms, in addition to eliciting information about the experiences, interpretations, emotions, or opinions of the viewers/audiences of the ad, including their subsequent feelings, physical
5. **Representations:** Questions focus on the implicit content of the text and issues related to representations, ideologies, and values. Questions provide an entry for the answerer to consider how media impact social norms and cultures, including conceptions of gender, race, ethnicity, sexuality, etc.
6. **Realism:** Questions focus on eliciting information about the constructedness of the media, specifically prompting the answerer to critically consider the nature of the media in terms of reality.
7. **Not Critical:** These are unclear questions; These questions reflect misconceptions; These questions might not answer the research prompt; These questions might approach the media sample as content for teaching and learning with, rather than about media; These questions suggest that the questioner does not grasp the constructed nature of the media sample. In other words, these questions seem to be about the media as though it was real and suggest that the questioner embodies some level of media literacy.

Schilder and Redmond (2019) used this categorisation to determine which content area was most questioned by the students. They found a significant increase in media literacy questions related to production techniques (what production strategies or appeals were used and why these techniques were used) and representations (issues related to stereotyping, agenda, bias, ideologies, and sociocultural values). They found that some categories were less accessible than others and this result shows the relevance to take the content areas into account for measuring students' critical inquiry competence.

The second criterion that Schilder and Redmond (2019) took into consideration to assess students' media literacy inquiry was the levels of complexity of their questions. These levels are fairly close to what we might consider to be levels of criticality. However, before presenting their levels, it seems important to return to the literature on what can distinguish critical questioning from non-critical questioning in a media education context. The next

section attempts to provide answers on the issue of criticality and presents the levels of complexity of Schilder and Redmond (2019), on which the construction of my rubric is based.

3.4.2. Assessing Criticality

The definition of media education includes the development of both media literacy and critical thinking. From a cognitivist perspective, critical thinking is defined as “a generic set of skills or processes to be developed independent of content and context” (Case, 2010). The skills generally refer to several levels, from low critical to high critical, that the student must achieve to become a critical thinker. “Traditionally, complex and abstract thinking skills are referred to as higher order thinking skills and these skills—such as the ability to analyze, evaluate, and create media messages—are a focal point in media literacy education” (Schilder & Redmond, 2019, p. 99). In this context, critical thinking is sometimes associated with metacognitive competences. Indeed, Feuerstein (1999) states that media education “[...] aims to develop metacognitive reflective strategies by means of study and critical responses towards the content of the media and its messages” (p. 44). These strategies refer to the critical dimension of literacy and the acquisition of a metalanguage, that is, a form of language used to describe the forms and structures of a particular mode of communication.

In practice, making a list of skills, or measuring levels, is not a simple matter and is not something that is independent of each situation. Furthermore, in reviewing the scientific literature, I have observed that media education scholars directly make lists of competencies before making a distinction between what we can consider as critical or not. To help to clarify this aspect of media literacy and to find out how to assess students’ critical thinking in terms of critical inquiry, this section looks at the notion of criticality. The term “criticality” here refers to the attitude of being critical. I am deliberately distancing myself from a cognitivist perspective that restricts the definition of “critical thinking” to a set of skill levels to be achieved and that do not consider the context of each situation, in order to focus on the specific aspect of the notion of “criticality” as an attitude (of being critical) and to link it to the concept of “inquiry” (as critical inquiry). My approach is therefore more along the lines of the empowerment approach to media literacy, where the aim is to encourage students to develop habits of questioning beyond the context of learning.

3.4.2.1. To Be or Not to Be Critical

Bardzell and Bardzell (2013) explored 150 years of critical ideas and their practical uses in order to propose that these ideas and uses can be leveraged as practical resources for Human

Computer Interaction¹³ researchers interested in critical design¹⁴. They traced the origins of critical design back to the Frankfurt School of critical theory. As Kellner (2003) explains, “[t]he Frankfurt School’s concern with consciousness, ideology, culture, and socialization highlights the importance of transforming individuals and societies through change of consciousness, culture, and the institutions of everyday life such as education” (p. 65). To rethink the notion of ‘critical’, they also referred to metacriticism, a family of thought which is concerned with “skilled appreciation of the arts and can be found in the English-language tradition of literary criticism (e.g., Arnold, Frye, Eliot, Abrams, and Bloom) and analytic aesthetics (e.g., Beardsley, Cavell, and Carroll)” (Bardzell & Bardzell, 2013, p. 3300).

Bardzell and Bardzell (2013) understand Dunne and Raby’s critical design as a “research strategy dedicated to transgressing and undermining social conformity, passivity, and similar values of capitalist ideology, in hopes of bringing about social emancipation” (p. 3298). They see in critical design a strategy to cultivate in the public a critical sensibility, which is defined by Dunne and Raby (2009) as follows:

The critical sensibility, at its most basic, is simply about not taking things for granted, to question and look beneath the surface. This is not new and is common in other fields; what is new is trying to use design as a tool for doing this.

Bardzell and Bardzell (2013) question this definition and point out a series of features that explain what makes critical design ‘critical’ based on critical theory and metacriticism. They first highlight in these two families of thought a perspective-changing holistic account of a given phenomenon which means an understanding of critical activity as “a construction of an account that holistically explains all the features of a phenomenon in a way that shifts one’s perspective or improve one’s perceptual acuity” (p. 3303). Second, for both critical theory and metacriticism, theory does not pretend to hold the truth but rather challenges the reader to think critically about his object in a new way. Third, they both “seek meaning and discovery in the struggle, heterogeneity and polyphony of human expressions and experience” (p. 3303). Fourth, both models aim at improving the public’s cultural competence, which refers to the ability of ‘looking beyond the surface’ in critical design, that is, reading sceptically, being

¹³ Human Computer Interaction (HCI) is a field that studies how people interact with computers and information technologies through interfaces with the aim of providing them with a satisfying and helpful user experience (see Chapter 5 for more details on HCI).

¹⁴ Critical design questions the boundaries of the traditional disciplines in design and aims to critically reflect on the role of design in everyday practices. This form of design is separated from the marketplace and aims to make people think how the world could be by generating an alternative to how things are now (see Chapter 5 for more details on critical design).

suspicious as well as perceiving and reading with unparalleled sensitivity and insight. Finally, they both see critical thinking in the service of social change.

Critical media literacy shares a common conceptual grounding with critical design. They both have roots in the Frankfurt School of critical theory. Some features that explain what makes critical design ‘critical’ are therefore similar to those of critical media literacy. For example, critical media literacy also aims ‘to shift one’s perspective’ from a strictly functional understanding of the media to a broader understanding of issues today. Moreover, critical media literacy helps students question current media system, express their own voices and struggle to create a better society (Kellner & Share, 2005). These objectives are in line with the purposes of media education, which attempts to give students “the critical knowledge and the analytical tools that we believe will empower them, and thereby enable them to function as autonomous, rational social agents” (Buckingham, 2003a, p. 313).

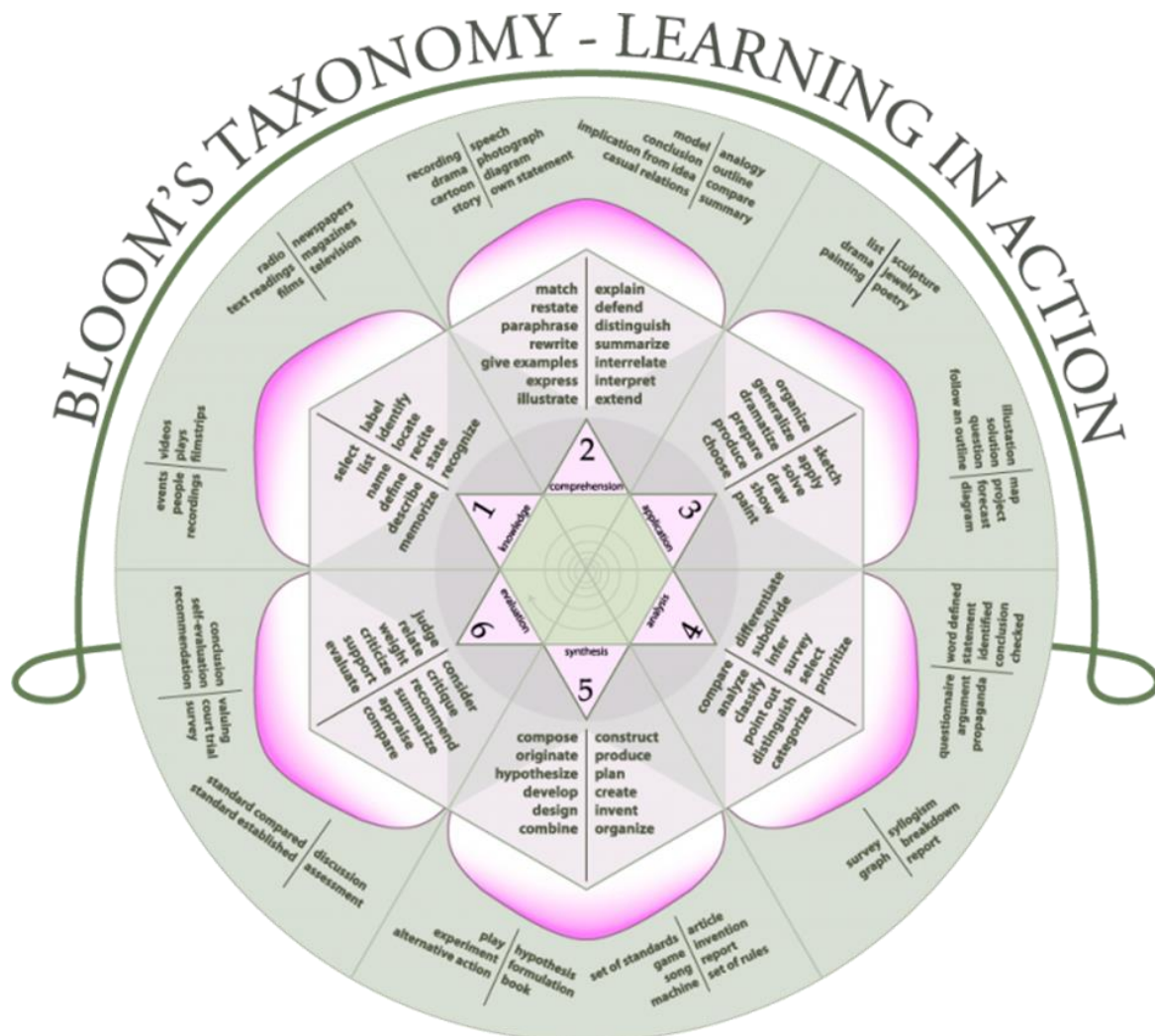
Although the present research is not part of the critical media literacy movement, this conception of ‘critical’ is relevant to consider in my approach to media literacy. By aligning with the features highlighted by Bardzell and Bardzell (2013), it allows me to conceptualise criticality as a comprehensive vision of social realities, questioning our presuppositions and crossing perspectives.

3.4.2.2. Lower And Higher Order Thinking Levels

As briefly mentioned above, Schilder and Redmond (2019) assessed students’ questions with a second criterion, the complexity of students’ questions. In their first experiment, they based their evaluation of the complexity of the questions on Bloom’s Taxonomy (1956). Bloom’s Taxonomy is a framework for categorising educational goals that helps teachers formulate questions to assess students’ level of understanding. There are six major dimensions: Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation (see figure 3.8.). Each dimension has typical operations formulated in the form of action verbs. In principle, the more operations a person is able to perform, the more he or she navigates through the dimensions.

Figure 3.8.

Bloom's taxonomy (1956)



Although Bloom's Taxonomy (1956) includes six areas of distinct mental operations, Redmond et al. (2016) did not identify as many levels of complexity in their data analysis. They differentiated students' questions by lower and higher order thinking levels in two content areas only: purpose and construction techniques. On page 64 of their paper, they give an example:

For instance, lower order questions about Purpose tended to be broad— such as “What is the purpose of this media?”— requiring the answerer to provide general information on the explicit nature of the ad. In contrast, higher order questions about Purpose— such as “What is the media trying to draw from the viewer?”— seemed to demand that the answerer provide details regarding the implicit motives of the media message, and

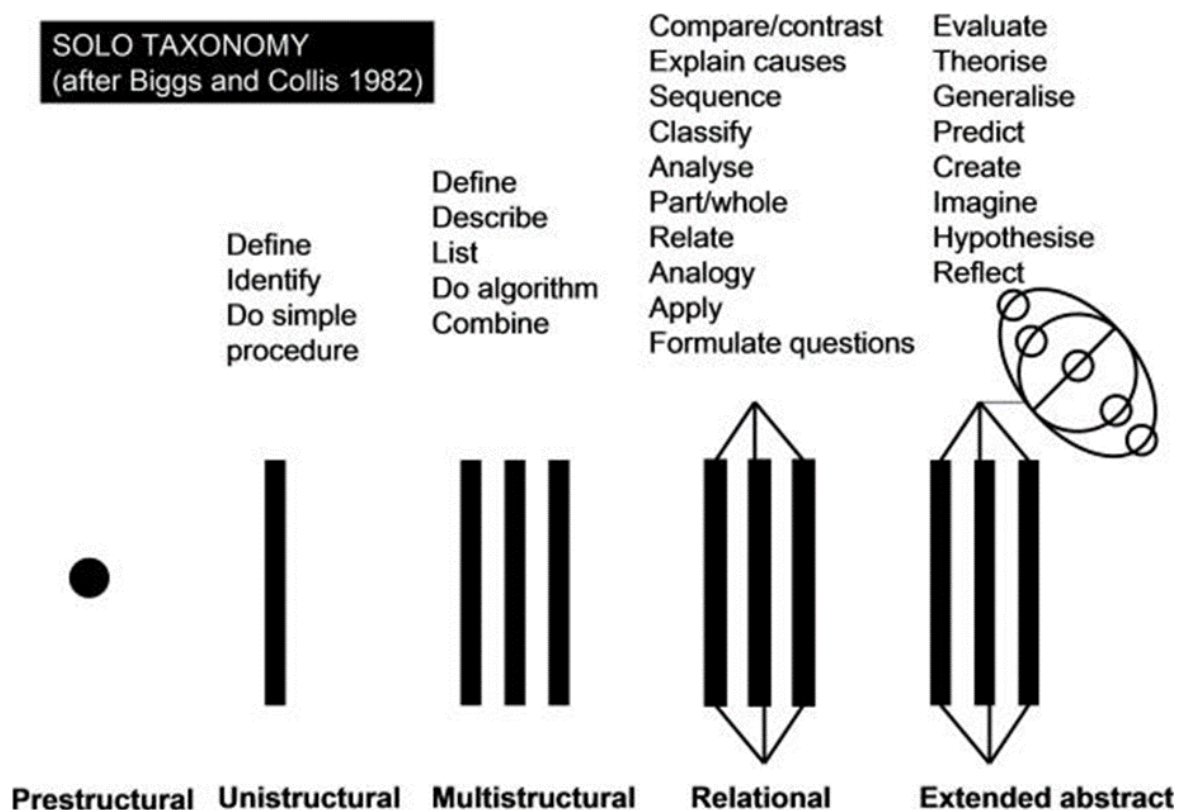
necessitated an awareness of the constructedness of the message (e.g., contexts of production, dissemination, or consumption).

Schilder and Redmond (2019) reiterated their experiment a few years later and redesigned their assessment instruments. They determined complexity levels by combining Bloom's Taxonomy (1956) and the SOLO Taxonomy (Biggs & Collis, 1982). As Schilder and Redmond (2019) described it, SOLO Taxonomy (an acronym for Structure of the Observed Learning Outcome) "provides an opportunity to investigate the nuances of thinking and disarticulate aspects that make thinking more or less complex" (p. 101). The taxonomy includes five hierarchical levels that indicate the complexity of students' understandings. The five levels are well described in the HookED wiki, which shares "readings, resources and effective strategies for teaching and learning based on SOLO Taxonomy" (Hook & Mills, n.d.):

1. At **the pre-structural level** of understanding, the student response shows they have missed the point of the new learning.
2. At **the uni-structural level**, the learning outcome shows understanding of one aspect of the task, but this understanding is limited. For example, the student can label, name, define, identify or follow a simple procedure.
3. At **the multi-structural level**, several aspects of the task are understood but their relationship to each other, and the whole is missed. For example the student can list, define, describe, combine, match, or do algorithms.
4. At **the relational level**, the ideas are linked, and provide a coherent understanding of the whole. Student learning outcomes show evidence of comparison, causal thinking, classification, sequencing, analysis, part whole thinking, analogy, application and the formulation of questions.
5. At **the extended abstract level**, understanding at the relational level is re-thought at a higher level of abstraction, it is transferred to another context. Student learning outcomes at the extended abstract level show prediction, generalisation, evaluation, theorising, hypothesising, creation, and or reflection.

Figure 3.9.

SOLO Taxonomy (1982)



Schilder and Redmond (2019) associated these five levels to five codes, ranging from lower order thinking with Code 0 at the prestructural level to higher order thinking with Codes 1, 2, 3, and 4 (pp. 119-121):

1. **Not Critical/Prestructural:** questions that were unclear, reflected misconceptions, did not answer the research prompt, or demonstrated that the questioner did not grasp the constructed nature of the media sample.
2. **Low/Unistructural:** questions that only focus on one piece of basic or fixed information that can easily be identified or recalled from the text.
3. **High/Multistructural:** questions that focus on breaking down main ideas and information, but do not examine relationships or require evidence-based thinking.
4. **High/Relational:** questions that analyse relationships of multiple concepts and typically reflect evidence-based thinking (e.g., asking “how” and “why” questions).

5. **High/Extended Abstract:** questions that focus on extending ideas and information into other domains or contexts in new ways—connecting, synthesizing, and transforming.

These codes provide interesting ways of assessing the critical level of students' questions. Coupled with the media literacy core concepts, they provide a measure for assessing their critical inquiry competence, i.e., their ability to ask critical questions about media texts. They could not be used as the sole criterion for evaluating students' questions, otherwise we would be restricted to a cognitivist perspective which considers critical thinking without taking into account the context of the learning situation. In this respect, the strength of Schilder and Redmond's approach lies in the fact that it takes these two criteria into account when assessing students' habits of inquiry, and that this makes these habits transferable to other contexts.

3.5. Synthesis Chapter 3: Conceptualising a Media Literacy Framework

The many definitions, approaches and models of media literacy highlight both the wealth of possibilities and the difficulty of operationalising the practices they underpin. In this chapter, I have given an overview of the main epistemological positions of media literacy, reviewed its history to identify its various objectives, specified its objects of study and studied its assessment methods. I propose to return briefly to these various points, by specifying the approach to media literacy adopted in this research.

First, there is no consensus definition of media literacy in the media education community. Martens (2010), who reviewed 165 papers on media literacy, highlighted two main approaches in media education: "an information processing approach centred on the individual's cognitive abilities" and "a critical-cultural approach centred on the contextual nature of media practices". I presented a third approach, specific to my research group, situated at midway between the last two approaches, which considers media literacy as the expression of competence (Fastrez, to appear). I aligned myself with this last approach by defining inquiry as a competence, involving internal resources (knowledge and skills) and external resources that enable students to adapt to new situations.

Secondly, media literacy can serve a variety of purposes. Over time, many tensions have arisen over what media literacy should be used for. I have reported on the conflict that existed, and continues to exist, between the proponents of protectionism and the proponents of empowerment. While the former see media literacy as a means of protecting people from the harmful effects of the (mass) media, the latter see media literacy as a means of empowering people to participate equitably in democratic society. Various initiatives, such as the core

principles created by the National Association of Media Literacy Education, have since aimed to ease tensions. In the age of convergence culture, theories around participatory culture have led to a broadening of the concept of media literacy and to consideration of the new forms of participation underpinned by the new media. Through its inquiry-based approach, this research addresses current media realities and is in line with recent studies that recognise students' capacity for empowerment.

Third, media literacy is undoubtedly about the media, but not everyone has the same definition of the term 'media'. I use the concept of media text ('text' in a semiotic sense) to apprehend the different facets of media texts. These different facets are studied from the perspective of core concepts, which constitute a media literacy approach to help participants interpret media texts in their globality. Core concepts, or key questions, are part of an inquiry-based learning approach that places the student at the centre of learning (see next chapter for more details about IBL). As the present research investigates students' ability to ask critical questions about media texts, key questions models offer an appropriate framework to define my perspective of media literacy as critical inquiry.

Fourth, media literacy can be assessed in a number of ways, based on its different approaches. The cognitive approach favours quantitative measurements of individuals' knowledge and skills elements concerning media, while the critical/cultural approach favours qualitative descriptions of media literacy practices (Fastrez et al., 2022). As competences can only be manifest in one's competent situated action, the competence approach supports performance-task-based assessment that is in line with the critical inquiry competence that I want to observe in the context of my experimentation. Several criteria can help distinguish between critical and non-critical questioning, and at this stage, I have mainly identified the media literacy core concepts and the criticality levels of questions.

In conclusion, the chapter on media literacy has provided some answers about the conceptualisation of the critical inquiry competence and its anchorage in the various approaches to media literacy, but it remains to be determined how it can be fostered through an appropriate pedagogy. Next chapter explores the notion of inquiry from its origins in Dewey's theory and presents different inquiry-based models in the world of education in order to clarify the approach to inquiry adopted in this research.

Chapter 4: Inquiry-based Learning

The following introduction is from my article *Using Design Fiction to Develop Students' Critical Inquiry Competence* (Wuyckens, 2022), published in the Research Symposium Issue of The Journal of Media Literacy.

A growing body of research suggests that traditional educational methods from the industrial era have become inadequate for the new realities of the 21st century (Scott & Friesen, 2013). As Barron and Darling-Hammond (2008) explain, “[t]oday’s employees must be able to communicate and collaborate, research ideas, and collect, synthesize and analyze information. They need to develop new products and to be able to apply different areas of knowledge to new problems and challenges” (p. 3). The nature of work has changed and continues to do so: we constantly change jobs and there are as many jobs that appear than disappear. We need to design new educational environments as well as new approaches to teaching and learning focused on the demands of life and work in the 21st century.

In that respect, new skills are required to prepare every child for the life that awaits them. We can no longer provide passive transmission-based learning that emphasises memorisation and information storage. “Education today must focus on helping students learn how to learn, so they can manage the demands of changing information, technologies, jobs, and social conditions” (Barron & Darling-Hammond, 2008, p. 3). To become critical thinkers, students need to take part in complex and meaningful projects that engage them in more ‘authentic learning’, that is, projects and activities that connect them with real-world problems. Student tasks must have “an authenticity, [and a sense] that the work being done in classrooms is ‘real work’ that reflects the living realities of the discipline being taught” (Western and Northern Canada Protocol, 2011).

One approach to authentic learning is inquiry-based learning (IBL), a constructivist approach based on the scientific method where the overall goal is to build knowledge and make meaning of the world around us. IBL can take various forms depending on the topic, discipline, or students’ age but they share a vision of learning that enables critical thinking and use of knowledge in new situations.

This chapter seeks to deepen our understanding of IBL to consider its development in a media education context. I start by reviewing the origins of the concept of inquiry, from Socrates to Dewey's theory of inquiry. I then discuss definitions of inquiry-based learning, and present different models of inquiry in the world of education. I conclude by presenting the models developed in media education and the approach to inquiry in this research.

4.1. Back to the Origins: From Socrates to Dewey

As Scott and Friesen (2013) explain in their literature review about inquiry-based learning, the spirit of inquiry dates back to Ancient Greece with the questioning method employed by Socrates to engage in discussion with his interlocutors.

Starting with the notion that the only thing he knew was he knew nothing, Socrates would engage in a systematic and disciplined questioning process to discover basic truths about the inner workings of the natural world and ethical questions related to such enduring concerns as the nature of justice. (Scott & Friesen, 2013, p. 6)

Ross (2003) writes that “in the Socratic method, the classroom is a shared dialogue between teacher and students in which both are responsible for pushing the dialogue forward questioning” (p. 1). Teachers and students participate both in the questioning process and discover new truths together. For Socrates, seeking knowledge was a way of living more ethically and consciously in the world.

Although the spirit of inquiry has emerged in the Ancient Greece, the term ‘inquiry’ appeared in the middle of the 13th century from the Latin word *inquirere*, which literally means ‘to seek for’. At this point, inquiry can be defined as the seeking for truth, information or knowledge. In the Renaissance period, “[t]he spirit of seeking answers to the mysteries of the universe based not on established tradition or superstition but on observation, experimentation, and empirical verification, gained momentum during the early 1500's in Northern Italy” with key figures such as Galileo Galilei and Leonardo Da Vinci (Scott & Friesen, 2013, p. 6). This spirit continued to grow in importance over the following centuries until the modern era when the concept was theorised in Dewey's work.

John Dewey (1859-1952) was an American philosopher mainly known for his work in the world of education. He proposed a new way of educating that addressed the problems of schooling in the industrial environment at the end of the 19th century (Deledalle, 1995). Based on the philosophical tradition of pragmatism, he developed various theories, including his

theory of inquiry, that have supported, and still support today, educational programmes and political decision-making.

4.1.1. The Foundation of Dewey's Thinking: American Pragmatism

As Christophe (2023) describes in her thesis chapter on inquiry, at the source of Dewey's thinking is the American pragmatism initiated by Charles S. Peirce. In his papers *The Fixation of Belief* (1877) and *How to make our ideas clear* (1878), Peirce challenges Descartes' idealism by encouraging us to radically doubt our certainties and proposes a new approach to the scientific method based on action, i.e., inquiry (Christophe, 2023, p. 143). His theory is based on the postulate that reality exists independently of what we can think. It is possible to create new beliefs from experience, which implies that the individual acts on the world and experiences the world acting on them (ibid., p. 144). These new beliefs, a phrase that refers both to new meanings and to new knowledge, allow the subject to get out of the state of doubt.

Pragmatism makes a radical rupture with the old methods of knowledge and reintroduces practice into the development of philosophy. "Meaning is no longer determined by previous or ancient values, but by the examination of what we do: meaning is linked to inquiry" (Rozier, 2010, p. 4; personal translation). In this context, the inquiry starts with a problematic experience and uses scientific processes to address our doubts. In the work of Dewey, the concept of experience is itself rethought and life experience is no longer distinguished from learning experience (Rozier, 2010). As Christophe points out (2023), "the theory of inquiry thus serves as a model for philosophical inquiry, scientific inquiry, but also for ordinary inquiries, those of common sense, which draw directly on the registers of a practical enjoyment of material and ideal goods" (p. 141; personal translation).

4.1.2. A Pedagogy of Experience

Experience is the starting point for the inquiry process. Experience can be the source of various problems: "[...] differences of opinion, inability to understand a situation, inability to act on a material, and so on" (Christophe, 2023, p. 150; personal translation). The inquiry process is rooted in specific experiences, situated in singular cultural environments, and aims to understand the nature of the problem to provide solutions (ibid.).

Christophe (2023) explains that:

For Dewey (2005/1934, p.80), “[e]xperience occurs continuously, because the interaction of live creature and enviroining conditions is involved in the very process of living”. Experience then consists of a relationship between the organism and the environment that is characterised by an alternation between acting and experiencing. In the terms of Dewey, the environment is “experienced” by the individual. (p. 155; personal translation)

Dewey distinguishes between the ongoing experience and the singular experience. When the individual experiences the environment, “[t]hings are experienced but not in such a way that they are composed into *an* experience” (Dewey, 1934). The singular experience has a beginning and an ending.

In Dewey’s theory, “the environment is made up of all the conditions that intervene in the development of the individual’s capacities as a means or resource” (Zask, 2008, p. 314; personal translation). In other words, the environment consists of a cultural milieu, a fruit of language, where natural, physical facts are intellectualised in order to attribute to them a culturally determined meaning (Christophe, 2023, p. 155). Experience is therefore essential to the construction of all knowledge, and it is the continuity and constant adaptation between the organism and the environment that will allow the accumulation and stabilisation of experience.

4.1.3. The Pattern of Inquiry

Inquiry is defined by Dewey (1938a) as “the controlled or directed transformation of an indeterminate situation into one that is so determinate in its constituent distinctions and relations as to convert the elements of the original situation into a unified whole” (p.108). To achieve this determined situation, Dewey proposes a plan of action, in several steps. In this context, he characterises the inquiry as a ‘pattern’.

Whatever the particular problem may be to which intelligence is addressed, in action intelligence or inquiry goes through certain procedures and articulates kinds of operations. Or, better, inquiry has pattern and form; it moves in certain stages, having functional phases which betray and characterize, as points on a map, its overall process, from start to conclusion. (Thayer, 1952, pp. 33–34)

Modelled on the scientific method, the inquiry process consists in clarifying the problem in the problematic situation, formulating hypotheses and testing them, and acting on the

solution. The process is not linear and there may be some back and forth between the different steps.

4.1.3.1. The Antecedent Conditions of Inquiry: The Indeterminate Situation

The indeterminate situation refers to the questioning stage. It is characterised by disturbed, troubled, ambiguous, confused, or conflicting situations.

We inquire when we question; and we inquire when we seek for whatever will provide an answer to a question asked. Thus it is of the very nature of the indeterminate situation which evokes inquiry to be questionable; or, in terms of actuality instead of potentiality, to be uncertain, unsettled, disturbed. (Dewey, 1938b, p. 105)

4.1.3.2. Institution of a Problem

The inquiry starts when the indeterminate situation turns into a problematic situation. “Problems arise outwith the scope of intellectual or cognitive experience, they arise from a natural imbalance in our engagement with the environment (akin to hunger)” (Luntley, 2016, para. 34). In other words, problems emerge from problematic situations that are the necessary condition for inquiry. “The first result of evocation of inquiry is that the situation is taken, adjudged, to be problematic. To see that a situation requires inquiry is the initial step in inquiry” (Dewey, 1938b, p. 107).

4.1.3.3. The Determination of a Problem-Solution

After identifying the problem, the inquiry process continues with the formulation of hypotheses that will help solve the problem. The starting situation, although indeterminate, presents determinate facts that suggest possible solutions in the form of ideas.

A possible relevant solution is then suggested by the determination of factual conditions which are secured by observation. The possible solution presents itself, therefore, as an idea, just as the terms of the problem (which are facts) are instituted by observation. (Dewey, 1938b, p. 109)

These ideas contribute to clarifying the problem and can be understood as hypotheses.

4.1.3.4. Reasoning

Once suggested and entertained, the hypothesis needs to be tested. This phase of the inquiry process is reasoning and similar to experimentation.

This examination consists in noting what the meaning in question implies in relation to other meanings in the system of which it is a member, the formulated relation constituting a proposition. [...] Through a series of intermediate meanings, a meaning is finally reached is more clearly relevant to the problem in hand than the originally suggested idea. It indicates operations which can be performed to test its applicability, whereas the original idea is usually too vague to determine crucial operations. In other words, the idea or meaning when developed in discourse directs the activities which, when executed, provide needed evidential material. (Dewey, 1938b, pp. 111-112)

4.1.3.5. Conclusion

The final phase consists of reconsidering one's hypotheses and drawing conclusions about the experimentation carried out. In Dewey's terms, it consists in operationalising the selected ideas to check that they correspond to the rationally or theoretically deduced results. This phase leads to the formation of "[...] an opinion on the problematic (Pépin, 2015), a judgement on the idea, "which constitutes a conclusion [and] closes the debate (Dewey, 1910/2004, p. 142)"" (Dion-Routhier & Hamel, 2021, p. 835; personal translation).

4.1.4. The Democratic Issue at the Centre of Learning

Even if it is based on the scientific method, the theory of inquiry is naturally present in all social activities (Zask, 2019). We are confronted with problems every day that we must solve, and inquiry offers a suitable framework for any situation, whether it is ordinary or specialised. Dewey therefore considers the method of inquiry to be an asset for democracy, in the sense that it could inspire democratic debate. He is convinced that science and democracy are egalitarian, and can support each other (Festenstein, 2023).

"The very heart of political democracy is adjudication of social differences by discussion and exchange of views", he writes in a late essay. "This method provides a rough approximation to the method of effecting change by means of experimental inquiry and test" ("Challenge to Liberal Thought", LW15, 273). Democracy is a method for identifying and solving the common problems confronted by communities. Robust inquiry requires that we must have access to all the available evidence and arguments. If we want our inquiry to be successful, we should not prejudge its outcomes, by excluding sources of experience that allow us to explore and correct our hypotheses. (Festenstein, 2023)

The school is seen as the central institution of a democratic society. As underlined by Scott and Friesen (2013), “Dewey encouraged students to formulate problems related to their own experiences and augment their emerging understandings with their personal knowledge” (p. 7). Dewey advocated for a student-centred approach where students are actively involved in the learning process and teachers’ role is to guide them in this process. Inquiry is therefore a form of active learning and is sometimes referred to as “active inquiry” to emphasise this aspect.

4.2. Research on Inquiry-based Learning

While inquiry refers to a process to follow in indeterminate situations, inquiry-based learning is the pedagogical approach using inquiry to investigate a subject matter. Rather than simply presenting established facts or giving a direct path to knowledge, inquiry-based learning proposes to start from students’ questions and ideas. For a few decades, inquiry-based learning has gained popularity in education due to its innovative way to teaching and learning. The following section proposes an overview of the diversity of definitions, models and approaches related to inquiry-based learning.

4.2.1. Definitions

Inquiry-based learning, also called inquiry learning, is an “educational strategy in which students follow methods and practices similar to those of professional scientists in order to construct knowledge” (Keselman, 2003). Kuhn et al. (2000) define it as “an educational activity in which students individually or collectively investigate a set of phenomena - virtual or real - and draw conclusions about it” (pp. 496-497). This practice consists in discovering new causal relations by “formulating hypotheses and testing them by conducting experiments and/or making observations” (Pedaste et al., 2015, p. 48). Often viewed as an approach to solving problems, inquiry learning “can motivate students to learn and advance their problem solving and critical thinking skills” (Nesbit & Qing, 2014). These skills include “planning, setting priorities, organizing individual and group efforts, exerting discipline, determining how to communicate effectively with an audience, and understanding ideas well enough to answer the questions of others” (Barron & Darling-Hammond, 2008, p. 4).

IBL is a student-centred approach to learning: students take control of their learning and construct the meaning of their work. They are invited to be their own investigator and to formulate their own questions. “Instead of the teacher telling students everything they need to know, inquiry-based learning asks students to construct their own knowledge through

experiences and explorations” (Nesbit & Qing, 2014). This method therefore teaches students how to learn and involves a set of complementary skills such as teamwork, problem solving, communication, creativity, and innovation. In that respect, IBL is a form of active learning where the teacher has a role of a guide.

“Research has found that inquiry-based activities can boost students’ learning in a wide range of school subjects” (Nesbit & Qing, 2014). For example, social studies and science school programmes use IBL to help students develop intellectual skills that enable them to construct new knowledge. IBL enables them to develop content knowledge but also, and probably mostly, learn how to learn in a variety of contexts. More than thinking skills, IBL develops therefore what Costa and Kallick (2000) call ‘Habits of Mind’. These latter include a “set of 16 problem solving, life related skills, necessary to effectively operate in society, and promote strategic reasoning, insightfulness, perseverance, creativity and craftsmanship”. Upon completion of a task, students think about their thinking (metacognition), and through reflective questioning, they might be able to transfer their learning to any situation (Costa & Kallick, n.d.).

Two strategies to assist inquiry and develop Habits of Mind are asking questions and discussing (Queensland School Curriculum Council, 1994, p. 9). On the one hand, students must learn how to ask good questions and answer them. This implies to make them aware of the types of questions they can ask. Teachers can use a number of different models of question types, such as the four-step questions (Gilbert, 1996) or the strategic questioning process (Peavey & Hutchinson, 1993). The four-step questions model is based on the assumption that students often only ask descriptive questions and need to be encouraged to ask deeper questions. Each step builds on the previous one and is associated with a stage of an inquiry (see figure. 4.1.). The strategic questioning process is quite similar to the previous one and helps students scaffold questions from a simple to a more complex level (see figure 4.2.).

Figure 4.1.

Four-step questions (Gilbert, 1996)

Description

What is it?
Who does it involve?
Where is it?
Why does it occur here?
How does it occur?

Evaluation

What is the significance of this issue or problem to my life, the local community, the nation, the world?
How have factors in the past influenced it?
How might it be seen by different people?
What conflicts of interest are there?
Who gains? Who loses? Who decides?
How are the relationships between people affected?
What are the relationships between people and other phenomena?

Reflection

Are these relationships desirable?
What will happen if these relationships are altered?
What are the alternatives?

Action

What change, if a change is thought to be desirable, should be introduced?
How can we bring about change if we or others think this is desirable?
Who could we contact to discuss action projects?
What action should we take?

Figure 4.2.

Strategic Questioning (Peavey & Hutchinson, 1993)

1. **Focus questions** identify the situation and the key facts to an understanding of the situation, e.g. “What is this about?”
2. **Observation questions** are concerned with what a person sees and the information he or she hears about the situation, e.g. “What do you see? What do you know?”
3. **Feeling questions** are concerned with body sensations, emotions and health, e.g. “How do you feel?”
4. **Visioning questions** are concerned with identifying a person’s ideals, dreams and values, e.g. “How could it be? How should it be?”
5. **Change questions** are concerned with how to get from the present situation towards a more ideal situation, e.g. “What needs to be changed?”
6. **Personal inventory and support questions** are concerned with identifying a person’s interests and potential contribution and the support necessary to act, e.g. “What should we do? What can you do?”
7. **Personal action questions** are those which get down to the specifics of what to do, and how and when to do it. The actual plan begins to emerge, e.g. “What support do you need?”

On the other hand, discussing a question, issue or topic within the classroom contributes to the development of thinking skills, and more broadly, Habits of Mind, that also need to be taught to learners. As Daniel (2007) has pointed out, discussion, and particularly philosophical dialog, can develop complex cognitive abilities (clarifying, examining, revising, distinguishing, evaluating, criticising, etc.) and complex attitudes (being curious, being open-ended, being rigorous, accepting critics, etc.). In an experiment with children aged 10 to 12 years, she identified four thinking modes that take part in the development of critical thinking. The logical mode is the seeking for coherence, informal logic, order, convergence and uniformity in the discourse. The creative mode is the seeking for meaning, contextualisation of points of view, and transformation of meanings. The responsible mode establishes a link between behaviour and moral rules or ethical principles in order to improve personal and social experience. The metacognitive mode refers to the ability to think about the tasks performed, the points of view and the perspectives expressed (by oneself or by peers).

Finally, applying inquiry-based learning in class demands particular skills from the part of teachers. They must, among other things, “use effective questions and question types”, and develop “strategies for scaffolding and guiding student thinking, planning and working giving responsibility and decision-making increasingly over to students” (Lutheran Education Queensland, n.d.). Training teachers is a prerequisite for applying IBL at school.

4.2.2. Inquiry Models

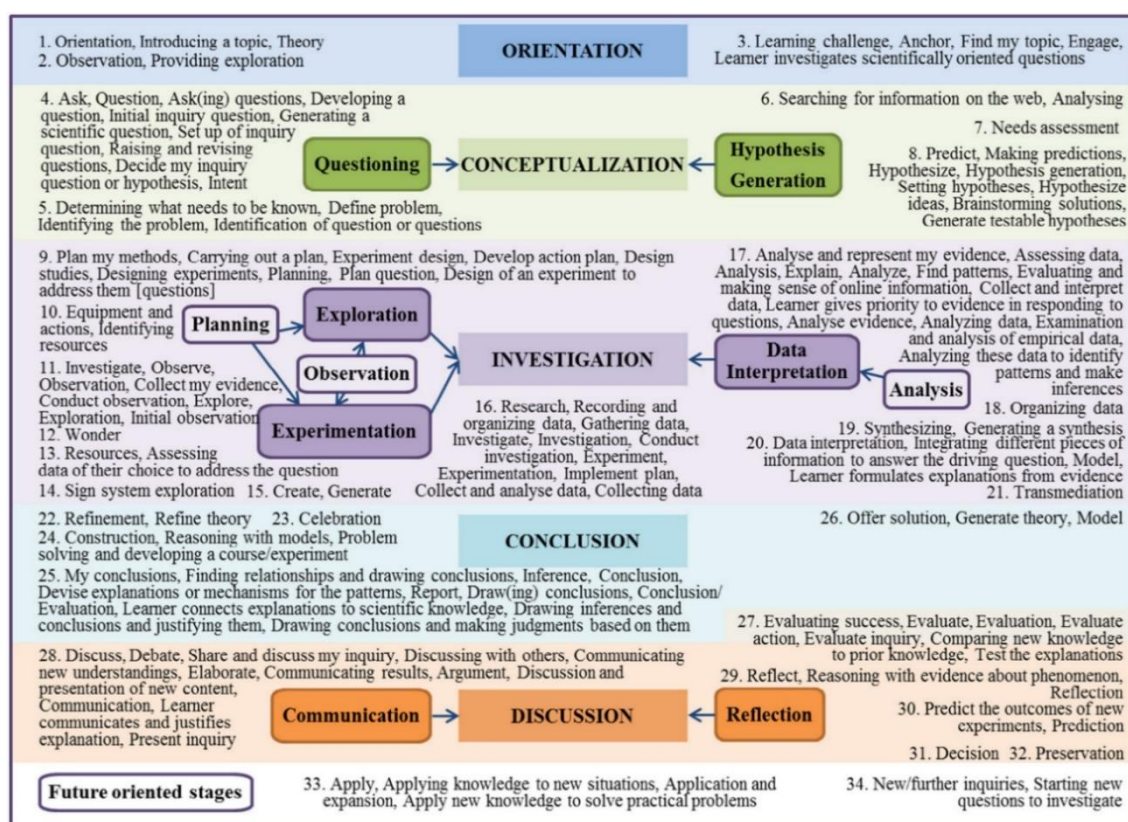
Starting with the prior knowledge and experience of students, inquiry-based learning is a process which follows a general sequence of phases that form together an inquiry cycle. The educational literature outlines a number of inquiry models that describe the broad phases of inquiry. The Queensland School Curriculum Council (1994) identifies three popular models of inquiry. First, the ‘Integrating Socially’ Model of Inquiry lists seven inquiry phases: tuning in, preparing to find out, finding out, sorting out, going further, making connection, and taking action. Second, the ‘TELMAR’ Model of Inquiry proposes similar phases: tune in, explore, look, sort, test, act, and reflect. Third, the action-research process consists in nine phases: identify a problem, investigate the problem, evaluate data, list possible actions, predict outcomes, select best action implement action, evaluate action, and identify a new problem and procedure. The following subsection focuses on one inquiry cycle, which synthesises the existing inquiry models and which serves as a foundation for the construction of the educational programme for the present thesis.

4.2.2.1. Pedaste et al. (2015)’s Inquiry Cycle

Pedaste et al. (2015) have summarised the core features of inquiry-based learning and have developed a synthesised inquiry cycle that combines the existing inquiry models. They outlined five general inquiry phases: orientation, conceptualisation, investigation, conclusion, and discussion (see figure 4.3.). In the orientation phase, learners explore a new phenomenon and find a particular topic to investigate. The conceptualisation phase consists in formulating specific scientific questions and generating hypotheses regarding the stated problem. The inquiry cycle continues with an exploration or an experimentation process, where learners collect and analyse data based on the experimental design or exploration. In the fourth phase, learners find relationships and draw conclusions from the data. The last phase is to discuss the inquiry process and to present some findings with others by engaging in reflective activities.

Figure 4.3.

Synthesised inquiry cycle (Pedaste et al., 2015)



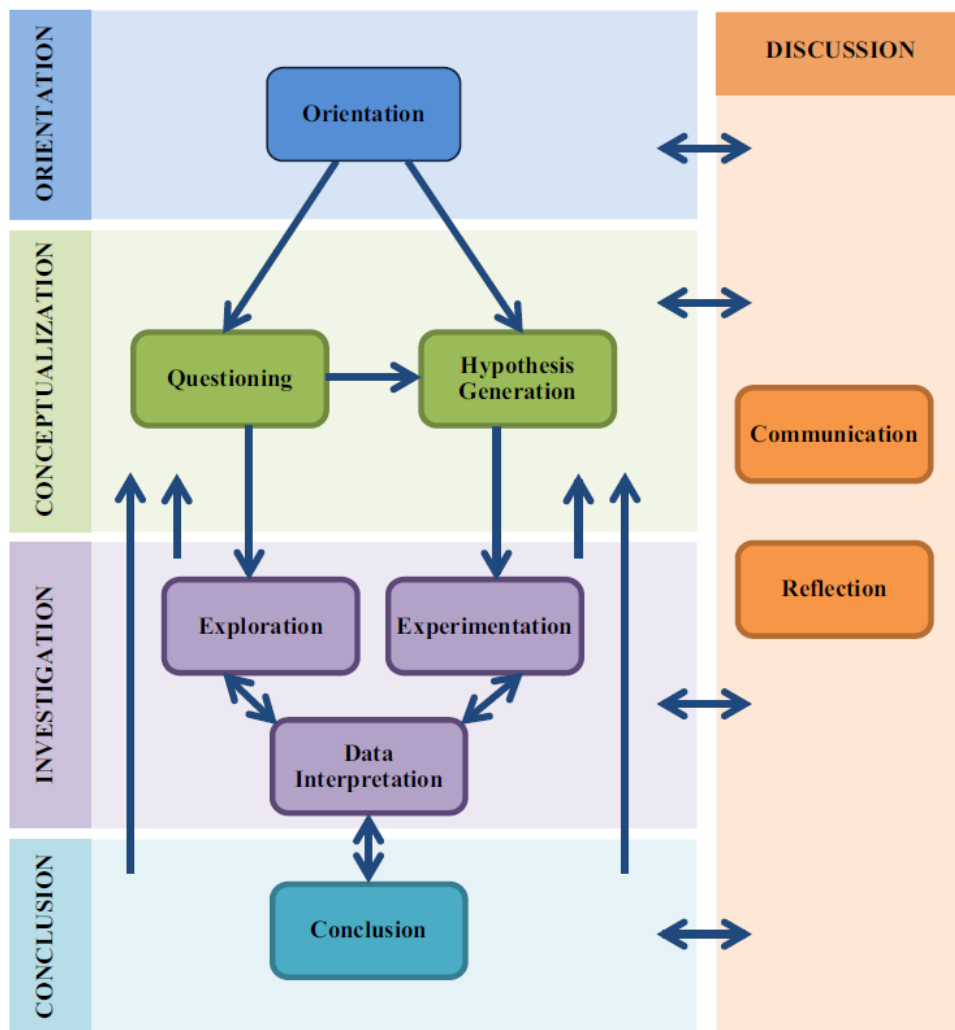
Pedaste et al. (2015) explain that some phases are divided into subphases and they can be adapted in the order we wish, depending on the emphasis we want to put on certain phases and the context of the educational intervention. Based on their literature review, they created their own model and highlighted the relationships between the phases and subphases (see figure 4.4.). By following the arrows, their framework includes three inquiry cycles (ibid., p. 55):

- Orientation–Questioning–Exploration–Data Interpretation (possibility in the cycle to go back to Questioning)–Conclusion;
- Orientation–Hypothesis Generation–Experimentation–Data Interpretation (possibility in the cycle to go back to Hypothesis Generation)–Conclusion;
- Orientation–Questioning–Hypothesis Generation–Experimentation–Data Interpretation (possibility in the cycle to go back to Questioning or Hypothesis Generation)–Conclusion.

Their model offers some flexibility and several cycles at different levels can be considered depending on the context.

Figure 4.4.

Inquiry-based learning framework (Pedaste et al., 2015)



4.3. Approaches to IBL

Barron and Darling-Hammond (2008) reviewed three approaches to inquiry-based learning: project-based learning, problem-based learning, and design-based instruction. In project-based learning, “students explore real-world problems and challenges, developing cross-curriculum skills while working in small collaborative groups” (ibid., p. 11). In problem-based learning, “students learn through the process of solving a problem. The approach is also inquiry-based when students are active in creating the problem” (ibid.). In design-based

learning, “students create, assess, and redesign products through stages of revisions. The work often requires collaboration and specific roles for individual students, enabling them to become experts in a particular area” (ibid.).

4.3.1. Project-based Learning

Scott and Friesen (2013) explain that “project-based learning organizes learning around the creation of a presentation or a product that is usually shown to an audience” (p. 16). Based on challenging questions or problems, “projects are complex tasks that involve students in design, problem-solving, decision-making, and investigative activities” (Mergendoller & Thomas, 2000, p. 3). Students work relatively autonomously in small groups over extended periods. Teachers participate in projects as peers rather than leading instructional activities.

Answering the question, “what must a project have in order to be considered an instance of PBL?”, Thomas (2000) identifies five key criteria for effective project-based learning: centrality, driving question, constructive investigations, autonomy, and realism (pp. 3-4):

1. Projects are central, not peripheral to the curriculum;
2. Projects are focused on questions or problems that “drive” students to encounter (and struggle with) the central concepts and principles of a discipline;
3. Projects involve students in a constructive investigation;
4. Projects are student-driven to some significant degree;
5. Projects are realistic, not school-like.

This is, as Barron and Darling-Hammond (2008) state, “an approach which aims to take learning one step further by enabling students to transfer their learning to new kinds of situations and problems and to use knowledge more proficiently in performance situations” (p. 5). Many studies reported in their review of research have shown that the students who had participated in a project-based curriculum worked more efficiently than the control group. They listed, among other things, the increase of students’ ability to define problems, to support their reasoning with clear arguments and to plan a project as well as the development of students’ skills such as critical thinking and problem-solving abilities.

4.3.2. Problem-based Learning

According to Barron and Darling-Hammond (2008), problem-based learning involves students working in small groups to “explore meaningful problems, identifying what they

need to know in order to solve the problem, and coming up with strategies for solutions” (p. 5). This approach includes implementing these strategies, evaluating their results, and generating new strategies until the problem is solved. As with project-based learning, the problems are realistic and can have multiple solutions and methodologies for reaching them.

Students are in the centre of problem-based learning. “In all problem-based approaches, students take an active role in building their knowledge, while the teacher’s role is to make thinking visible, guide the group process and participation, and to ask questions to solicit reflections” (ibid.). Working in small groups under the guidance of a tutor, “students engage with authentic problems before they have received any preparation or study, and may have to find information on their own to solve the problem” (Scott & Friesen, 2013, p. 18). Rather than giving them a list of tasks to follow, students need to find how they could find the answers by themselves and to develop their own inquiry process.

4.3.3. Design-based Learning

Design-based learning is a subcategory of project-based learning that focuses on product design. As Barron and Darling-Hammond (2008) explain, this approach asks students to design and create an artefact that requires them to understand and apply knowledge from a particular discipline (e.g., science, technology, art, engineering, or architecture). Through iterative activities, students are asked to create, test, assess and redesign their prototype. “[D]esign projects require students to set constraints, generate ideas, create prototypes, and develop plans through storyboarding or other representational practices. These are all critical twenty-first century skills” (ibid., p. 20).

The design-based learning approach is based on the premise that students gain a deeper understanding of a discipline by participating in the creation of its knowledge. *Learning through design* enables students to take control on their learning and to become experts in a particular field. Examples include competitions, such as the FIRST robotics competitions or the ThinkQuest competition, where students work collaboratively on a design project with the help of professional engineers and/or in the mentoring of a teacher. Barron and Darling Hammond (2008) reviewed a few studies that have used control-group designs to evaluate the impact of the approach. A growing body of research has shown that students learn more deeply when they are engaged in design-based learning.

4.4. Inquiry-based Learning in Media Education

As a result of recent technological changes, media education is looking for new methods for understanding the information and media environment. Inquiry offers a student-centred approach to learning that contributes to the construction of new knowledge. Depending on the defined objective, inquiry-based learning can help developing information literacy or media literacy.

4.4.1. Information Literacy: Inquiry as ‘Seeking Information’

In its basic definition, information literacy includes three components: access, evaluation, and use of information. Gasque (2016) defines information literacy as “the teaching-learning process needed to develop competences in order to seek for and use information effectively and efficiently” (p. 253). UNESCO established a list of these competences, such as understanding the role of media and information in democracy or critically evaluating information sources (Wilson et al., 2012). The word “information” is central to information literacy definition and includes “info-data” (binary information) as well as “info-news” from journalism and mass media, and “info-knowledge” from libraries and other information centres (Serres, 2017).

After reviewing the literature, I can highlight three approaches to inquiry-based learning in the context of information literacy: IBL as a problem-solving practice, inquiry process as project-based work, and guided inquiry as information search process.

First, the American Association of School Librarians (AASL, 2018) identifies six competencies including inquiring, defined as the ability to “build new knowledge by inquiring, thinking critically, identifying problems, and developing strategies for solving problems”. In collaboration with each other, learners investigate questions by continually seeking information in order to construct new knowledge.

Second, Gasque (2016) reported a review of literature on topics related to the nature of learning content and curriculum, especially the development of curriculum based on the research process – inquiry-based learning – in terms of information literacy. She related to Dewey’s work on projects and advocates for a conception of the inquiry process as project-based work that enables students to develop reflective thinking. She concluded that IBL enables “better integration of information literacy contents into the curriculum, providing

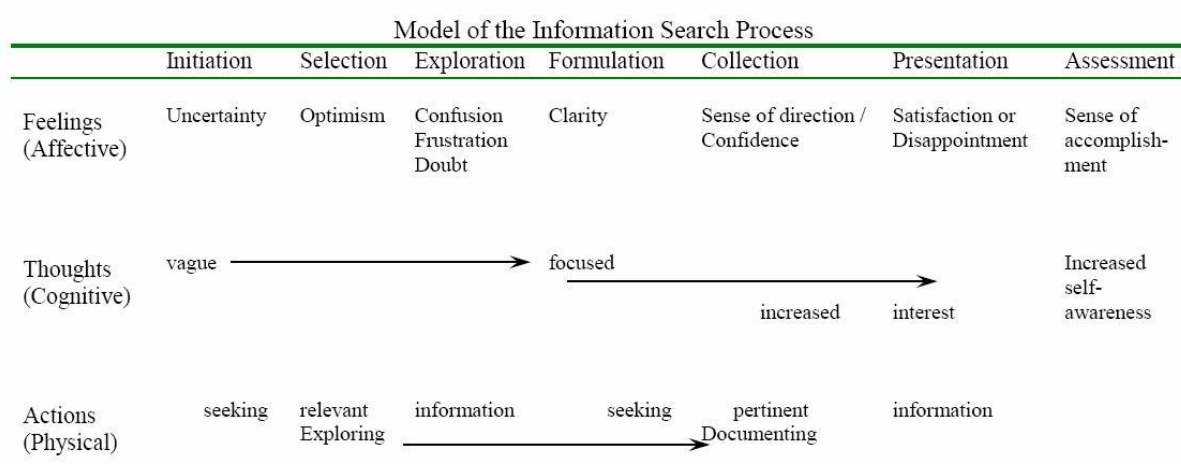
students with more meaningful learning by encouraging reflection, student protagonism, and learning how to learn among others” (Gasque, 2016, p. 261).

Third, in a conference paper, C. Kuhlthau (n.d.) argues the importance of guided inquiry in the development of new competencies for understanding and creating in the changing information environment of the 21st century. Guided inquiry introduces students to five criteria to apply for selecting useful sources and evaluating information: expertise, accuracy, currency, perspective, and quality. Through inquiry approach, students are able to comprehend and produce informational texts as well as understand stories in fiction. C. Kuhlthau (n.d.) emphasises the role of the school libraries as an essential source of information relevant to learning.

The inquiry process underlying the guided inquiry refers to the Information Search Process (ISP). C. Kuhlthau (2013) describes six stages of inquiry in the model of the ISP: task initiation, selection, exploration, focus formulation, collection and presentation (see figure. 4.5.). As she explains, “the six stages model of the ISP incorporates three realms of experience: the affective (feelings), the cognitive (thoughts) and the physical (actions) common to each stage”. The ISP reveals inquiry learning as a process of seeking meaning while seeking information.

Figure 4.5.

Model of the Information Search Process (C. Kuhlthau, 2013)



4.4.2. Media Literacy: Inquiry as ‘Asking Critical Questions About Media Texts’

As a reminder, there are many definitions of media literacy in the scientific literature. In Chapter 3, I have identified three main approaches, the first focusing on the knowledge and skills that individuals need to access, understand and create communications or media messages (Ofcom, 2004), the second considering one’s dispositions, attitudes, practices, or cultures (Buckingham, 2003a) and the third defining media literacy as the expression of competence (Fastrez, 2012). I pointed out that key questions models were used by the media literacy scholars to engage students in the inquiry process (Schilder, 2014). I presented two main models, “the key questions to ask when analysing media messages” from the National Association for Media Literacy Association, and “the Questions/Tips” of the Center for Media Literacy (see section 3.3.2. of the Chapter 3: Core Concepts & Key Questions).

Key questions models are part of a pedagogical approach to inquiry, as they are student-oriented, guiding learners to deconstruct media texts. “In inquiry-based practice, students learn to use relevant questions to evaluate and analyze media messages and to reflect on the media they create” (Rogow, 2011, p. 18). This approach helps students to develop a more global understanding of the media environment and contributes to the development of their critical thinking. In a media education context, inquiry allows to focus on the process rather than the outcome, i.e., on the reasoning or questioning rather than the solutions. By contrast with the problem-based learning approach to IBL, project and design-based learning approaches are therefore particularly relevant in a media education context as they allow participants to raise questions throughout the construction of the project or the design process. These types of approaches are the ones favoured in this research, where the students are involved in a design fiction project in which they are encouraged to ask themselves questions during the design process. This will be explored further in the remainder of the manuscript.

Conclusion PART 2

Thinking Media Literacy Along with Inquiry

To conclude, inquiry should be understood as a process of questioning that we adopt when confronted with a problematic situation and that allows us to clarify the most appropriate way to act at that moment. As Festenstein (2023) explains, “[t]he goal of an inquiry is not to arrive at a certain picture of the nature of things, but to come up with what is an inevitably provisional solution to the practical and intellectual problem that sparked it”. In a media education context, inquiry is particularly relevant because it is focused on learners’ media uses (i.e., their experience) and takes the immanent media environment into consideration. Although it often appears as a problem-solving method in the general scientific literature, its quality lies in its process of questioning and identifying problems. This is why, in the context of this research, I have decided to define inquiry as a process that allows one to ask critical questions about digital media and technology.

In this context, using design fiction to build a critical inquiry method can help students develop a broader critical understanding of media texts, which addresses their textual characteristics alongside their social and ethical issues, and which raises a personal awareness of students’ own media practices. The ultimate goal is still to provide students with media literacy abilities but with another conception of media literacy:

Consider, for example, how teachers might respond if, rather than describing media literacy with a definition about accessing, analyzing, understanding and producing media, we said “media literacy education is about teaching students to ask – and find answers – to important questions”. This phrasing puts teaching and students, rather than media, at the center of the discourse. (Rogow, 2011, p. 17)

Thinking media literacy along with inquiry allows us to get back to the roots of media education, that is, observing the world around us and questioning the way it operates while taking our own position into it into account. As Buckingham (2007) explains, “[i]n the context of media education, the aim is not primarily to develop technical skills, or to promote ‘self-expressions’, but to encourage a more systematic understanding of how the media operate, and hence to promote more reflective ways of using them”(p. 49). Rather than pointing out knowledge or skills needed to understand and produce media texts, I therefore propose to think about the kind of questioning that media literacy can raise in a media education context and develop for this purpose a framework for critical inquiry in a media education context.

PART 3: DEFINING DESIGN FICTION

The second part of the state of the art aims at defining design fiction. The scientific literature on design fiction is abundant as well as also highly contradictory. The authors reviewed give a wide variety of definitions of design fiction, which makes it difficult to identify exactly what it is. In this context, I introduce the Part 3 by providing some initial clues for understanding design fiction, in particular, its design process and its productions. I also define it from the beginning as a design practice¹⁵ to highlight its processual aspect and distinguish it from the method of speculative design and the literary genre of science fiction from which it draws its influence.

The two chapters included in Part 3 aim to circumscribe design fiction uses and the productions resulting from the practice. I have carried out a quasi-systematic literature review in which I have covered a large number of uses of design fiction; within this framework, I have distinguished a set of areas, fields and methods that make varied use of the practice of design fiction. This enabled me to gain a better understanding of the type of productions generated by design fiction and to discuss, in the conclusion, how design fiction productions could be mobilised in a learning context.

Between prototyping and storytelling

The commonly accepted definition of design fiction comes from science-fiction author Bruce Sterling, who defined design fiction as “the deliberate use of diegetic prototypes to suspend disbelief about change” (Bosch & Fritcke, 2012). Diegetic prototypes are objects and services that only exist in a storyworld, the world of the diegesis. Diegesis is a term borrowed from film scholars and narratologists, which refers to everything that is part of the storyworld. For instance, a piece of music in a film is diegetic if characters can hear it. Similarly, diegetic prototypes only belong to the fictional world: they are part of the narration and do not exist in the real world. A common example of diegetic prototype is the gesture-based computer interface in the film *Minority Report* (2001).

Diegetic prototypes are at the intersection of two activities: prototyping and storytelling. On the one hand, prototyping is “an incredibly powerful tool, allowing designers and design teams to understand how the product of their divergent, creative, or ‘designerly’ ways of knowing

¹⁵ I define design fiction as a design practice that uses narrative structures to consider and explain possible futures for technologies.

(Cross, 2008) might manifest themselves in a finished product” (Lindley et al., 2014, p. 241). In other words, prototyping allows designers to ‘play’ with ideas before concretising them. This phase is part of a larger process, called design thinking. Design thinking refers to a set of user-centred practices and methods within social and business innovation contexts. Plattner et al. (2011) describe five phases in design innovation process:

1. Empathy: understanding users’ wants and needs
2. Inspiration: defining the problem and benchmarking
3. Ideation: generating ideas (brainstorming)
4. Prototyping: turning ideas into something concrete
5. Testing: refining ideas by gathering feedback

While design thinking is a method mainly used in traditional design, design fiction is not necessarily intended to be used for business purposes. The purpose of design fiction is not so much to solve a problem by creating an object or service, but rather to materialise possible scenarios by creating fictional artefacts and then debate them. Moreover, the design thinking ‘testing phase’ is not part of the design fiction process, as diegetic prototypes remain fictional.

On the other hand, design fiction is a form of storytelling: it tells a story about a prototyped object in an imagined world. As defined by Mitrovic et al. (2015), design fiction uses narrative structures to explore possible futures for technologies and questions people on the role and impact of new technologies on everyday life. Design fiction generates what Bleecker (2009) called ‘conversation pieces’ which mean “stories that speculate about new, different, distinctive social practices that assemble around and through these objects” (p. 8). Diegetic prototypes tell a story about people and their mundane social practices in a possible near future. Stories offer a richer way of materialising ideas and sharing them to a large audience.

Characteristics of diegetic prototypes

Design fiction produces so-called ‘diegetic’ prototypes, i.e., prototypes that are situated in a fictional world (Kirby, 2010). A first literature review highlights four main characteristics.

First, diegetic prototypes are contextualised in a storyworld, the world of the diegesis. Tanenbaum (2014) explains that design fiction “[...] uses these fictional depictions of future technology to tell a story about the world in which that technology is *situated*. It uses narrative structures to explore and communicate the possible futures for the technology” (p. 22). Context helps people to comprehend the future by presenting a technology in the context of its use; the diegetic prototype “[...] uses a fictional frame to make an argument about a

potential future by demonstrating that future in a context that a large public audience can understand” (Tanenbaum et al., 2013, p. 31).

Second, they appear as natural and intuitive. In the film *Minority Report* (2001), Tom Cruise’s character Inspector John Anderson manipulates a gestural interface to conduct research in a database. “The audience wants to know what this thing is in the context of a story in which people — people in the year 2054 — routinely (lets assume so) operate machines to do their work using gestures such as this” (Bleecker, 2009, p. 37). Design fiction does not deal with absurd and inconceivable technologies. These latter are mundane and quite ordinary because they are, or would be. They are part of what Kirby names the ‘narrative environment’ of the film: these technologies constitute “[...] a natural part of the visual landscape in the film”, which reinforces their plausibility (Kirby, 2010, p. 48).

Third, diegetic prototypes are self-consistent technologies “[...] that adhered not only to the rules of the diegetic world but also to its own internal logic and the constraints of real-world computer technologies” (Kirby, 2010, p. 51). In narratology, consistency is a criterion of fiction: the fictional world must be consistent and believable to allow the immersion in the story. What is particularly interesting in design fiction is that diegetic prototypes must be consistent with the real world too. As mentioned previously, the design fiction prototypes are indeed not far from the actual technological developments.

Fourth, diegetic prototypes are not extraordinary but everyday technologies: as real-life prototypes, they are not perfect and still have flaws. They are very close to the human being and his weaknesses. In contradiction with Kirby, Bleecker (2009) argues that:

They aren’t primarily useful as design ideas for future technologies — although they are often received as such, and every advantage. Instead, and in their most useful mode as design fiction objects, they serve to incite conversations that are more cautionary than aspirational. (p. 27)

Diegetic prototypes open a discursive space about technologies’ social and cultural implications. The focus is here on the people and their relationship with technologies. “You don’t fetishize the instrument; rather you emphasize the rituals and the drama — the social elements that stories are always about” (Bleecker, 2009, p. 37). Design fiction prototypes are social objects and provide reflection about society.

Chapter 5: Design Fiction Uses

I reported a literature review to answer the following research question: What are the different uses of design fiction? The goal was to identify how design fiction is used, by whom, in which form and to what end. The research criteria to find references were as follows: the paper had to include the term “design fiction” in the main title, the abstract or the key words, and had to propose to use design fiction as a design practice. I did not keep papers that propose design fiction definitions or do not offer a particular way to use it.

I proceeded in four steps to find references. I first searched on Google Scholar with the key words ‘design fiction’. Given the high number of results (approximately 1600), I only looked at the first fifteen web pages. This research helped me to get an overview of the type of papers I could find about design fiction. I already selected a dozen papers, but I quickly realised that the further I progressed in the research, the less I had valuable results. As a second step, I collected papers from the database Scopus. I chose Scopus because it was the only one who proposed a significant amount of research results. With the key words “(TITLE-ABS-KEY (‘Design fiction’))”, I obtained 106 documents listed by the date of publication. I scanned the first 56 papers and withheld a major part of them according to the criteria. I stopped the research at this number of results because they were becoming repetitive. Third, I did additional research on Google and Twitter to cover the full range of uses of design fiction: I discovered new areas such as business innovation or public affairs. I reframed the research to find academic papers about these news uses and searched on Google Scholar in French and English with the key words “name of the area + design fiction”. Fourth, I searched on Google, Google Scholar, and the ACM Digital Library for some definitions of the fields of use to better understand the context of design fiction use.

This review is presented in two major parts: the areas and the methods. The areas are distinguished from the methods because some areas use common methods in the application of design fiction. There is no prescribed order for the reading of the sections related to areas and methods: if the reader feels the need to learn more about the methods during the reading of the areas, they can move on to reading the sections related to them.

5.1. Four Main Areas

Areas are first defined by their goals: cinema provides entertainment, design aims at designing products and services, design-oriented research advances knowledge, and public affairs is in the service of the society.

In the second area about design, traditional design is distinguished from critical design: the former is a problem-solving practice while the latter is a problem-finding practice. The steampunk movement is considered as a form of critical design for its similar purpose of criticising the role of the technologies. In traditional design, three major areas are identified: business innovation, design research and green practices. In design research, two fields are defined by their objects: interaction design is the design of the interaction between users and digital products, while sustainable design is the design of sustainable products.

In the third area about design-oriented research, two major areas are defined by their goals: research through design applies design practices to new problems in order to create knowledge and Human Computer Interaction (HCI) improves computer and information technology interfaces to provide a better user experience. Ubiquitous Computing is a HCI field concerned with the tangible computing technologies and social computing.

5.1.1. Cinema: Providing Entertainment

Design fiction has been used by filmmakers and scientists in the production of science fiction films. Film scholar David Kirby (2010) demonstrates in his paper that filmmakers hire scientific consultants to help them in the creation of diegetic prototypes. For instance, computer engineer John Underkoffler worked on the gesture-based computer-interface technology featured in *Minority Report* (2002) (see figure 5.1.). He contributed to the film to make it look natural, plausible, and consistent with the future imagined world. Older films, such as *Woman in the moon* by Fritz Lang (1929) or *Destination moon* by George Pal (1950), required cooperation with rocket scientists to improve the film's realism and believability.

Figure 5.1.

Gesture interface in Minority Report (2000) – Picture retrieved from the film



The cooperation between filmmakers and experts in these films offered them a win-win situation. For filmmakers, hiring renowned scientists added significant publicity value. For scientists, it is an opportunity to promote the potential of new technologies: as Kirby (2010) states, the objective is to convince people about the future technology's necessity, viability and benevolence in order to obtain research funds to develop them. Consequently, some SF films contributed to the development of real-life prototypes. The impact of such films must therefore not be neglected in developing new technologies as well as in shaping a collective imaginary.

Design fiction narratives have effects on collective imaginary in shaping technological futures. As Bleecker (2009) mentions about the film *2001: A space odyssey* in his essay, "The overall approach of the production points to a way of designing not only a visual story, but also creating a shared, collective imaginary about a near future world that explores of a myriad of possibilities" (p. 23). Re-thinking about the relationship between people and their everyday lives is a form of collective imaginary. In this context, SF TV shows and films (as well as other forms of SF popular culture) belong to collective imaginary, shape popular imagining of the future and constitute a starting point for debate and discussion.

As analysed by Kirby (2010), design fiction has been used as a form of pre-product placement. It has nevertheless also animated discussions about interactive technologies between

researchers, designers, and users. It affords sharing knowledge about visions of the future and contributes to the scientific research and development field. Furthermore, new TV series such as *Black Mirror* go beyond the goal of design fiction as defined by Kirby, by questioning and criticising technological progress, instead of reaffirming it. They tell a story about how technologies influence the society and everyday life by speculating on the future. In this way, this type of series is closer to the objectives of critical design, by bringing more questions than answers to the problems depicted (see below the section on critical design).

5.1.2. Design: Designing a Product

Design is the creative process of designing a product, a way of materialising ideas and speculations (Bleecker, 2009). Design fiction can be used both in traditional design and critical design.

5.1.2.1. Traditional Design as Problem-Solving Approach

Traditional design is a problem-solving practice, usually dealing with problems detected by other professions.

In this sense, the mission of design is closely related to the needs of the industry or, in a broader sense, the creation of a better living standard. Through a modernist perspective, design is viewed as a service industry that primarily addresses clients' needs. (Mitrovic, Golub, and Šuran 2015, p. 9)

Also called affirmative design (Dunne & Raby, 2013), its goal is to change the world for the better by coming up with new ideas for products and services, and making them come true.

A) Business Innovation and Design Thinking

Business innovation is an organisation's process for introducing new ideas, services or products in order to improve them, to solve a problem or to reach new consumers (Pratt & McLaughlin, 2017). Its goal is to create value for the organisation and for the customers. Design thinking is an approach of business innovation and management that offers creative strategies based on analytic and intuitive thinking, to consider and resolve technical and social issues. Design fiction, as a practice to imagine the near future world, seems like the perfect tool for innovation and can be used for several purposes, as described below.

Design fiction can be used to help companies build breakthrough scenarios for their businesses: questioning the supply, the customers, the resources, the value network, and the

logic of income generation allows anticipating the market targets and the uses of the technology. These scenarios do not intent to reduce uncertainty but rather cultivate it in order to take advantage of it. Imagining dystopian scenarios is likely to increase creativity and helps managers to account for the complexity of their environment (Caron-Fasan & Chanal, 2013).

“Through its ability to make original projections of the future credible, it can help to share a strategic vision and support the transformation process” (Minvielle & Wathelet, 2017; personal translation). For example, an international team collaborated with IKEA to envision alternative futures of the industry “[...] that highlighted the sorts of tensions that [they] though were interesting to investigate, as well as productive in terms of design” (Brown et al. 2016, p. 2). They created a catalogue, as an example of a design fiction production, to think and talk about future technologies, such as drones or virtual reality glasses (see figures 5.2. and 5.3.).

Figure 5.2.

Ikea catalog from the near future (1) – Pictucre retrieved October 15, 2023 from:

<https://medium.com/design-fictions/an-ikea-catalog-from-the-near-future-e293938148bc>



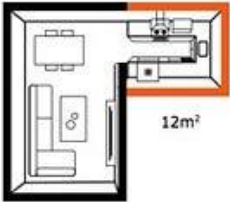
Figure 5.3.

Ikea catalog from the near future (2) – Picture retrieved October 15, 2023 from:

<https://medium.com/design-fictions/an-ikea-catalog-from-the-near-future-e293938148bc>



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kitchen service contract 36:-/month
Powerful privacy controls and personal diet recommendations based on your IKEA Tillsammans profile analytics. 647.123.45

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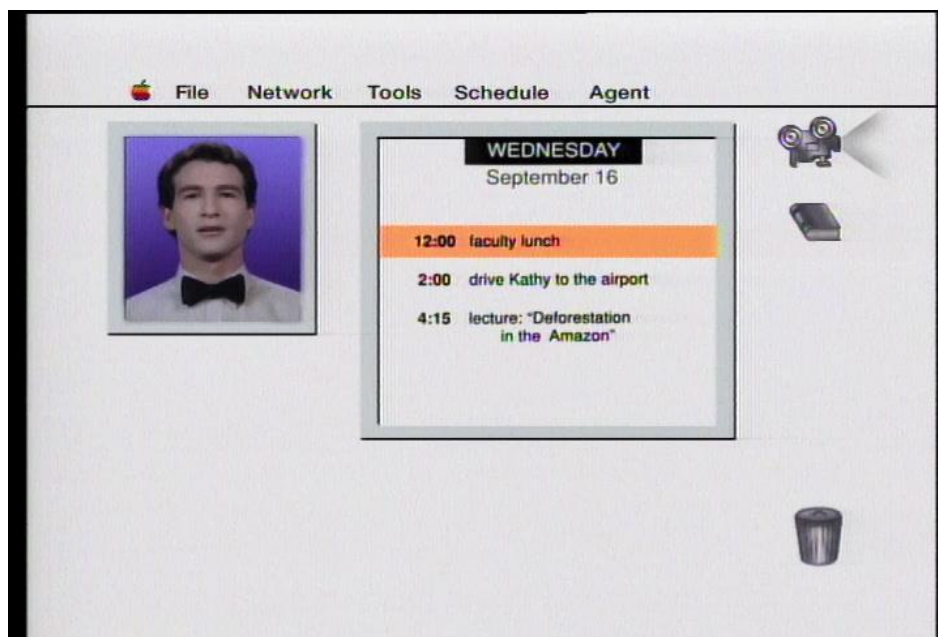
Large corporations, such as Apple or Google, use design fiction to persuade people of the important role that their technologies will play in the future. For example, the Apple-CEO John Sculley created a concept video for the Knowledge Navigator tablet in 1987, a multimedia device which offered hypertext information and used software agents to assist searching for information (see figure 5.4.). This prototype predicted the success of the computer tablets of Apple decades later (Rothstein, 2015). Starfire, a project launched in 1992 at Sun

Microsystems, is another example that predicted the future of computing. It required the collaboration of over a hundred engineers, designers, futurists and filmmakers to create a movie, a book and a paper that envision future office technologies such as a large screen for multimedia presentations or a laptop computer with chorded input (Tognazzini, n.d.).

Figure 5.4.

Apple Knowledge Navigator – Picture retrieved October 15, 2023 from:

<https://medium.com/design-fictions/an-ikea-catalog-from-the-near-future-e293938148bc>



Companies in household appliances (e.g., the Microbial Home by Philips) or in automobile manufacturing (e.g., the BMW Vision Next 100) also use design fiction to speculate on the future of their products. They aim at persuading the investors and partners about the company's prosperity and progress. Design fiction also allows to present their ideas to the consumers, such as concept cars during Auto Shows.

Figure 5.5.

Microbial Home by Philips - Picture retrieved October 15, 2023 from:

<https://www.dezeen.com/2011/10/29/microbial-home-by-philips-design/>



B) Design Research

Design research, also named research-oriented design or research for design (to be distinguished from design-oriented research), is the research area about the process of design. This field aims to understand and improve design processes and practices to provide better design guidelines and solutions. According to the designer Panthea Lee (2012), “[d]esign research is foundational to creating products, services, and systems that respond to human needs. In the public and international development sectors, understanding and meeting human needs are critical for improved livelihoods and better governance”. Design research develops user-centred strategies and methods such as design fiction to meet identified needs.

Design research addresses design problems and provides design solutions rather than develops knowledge within any professional field of design. Much like design, design research

does not “[...] primarily focus on explaining the world as it is; they share with engineering a fundamental interest in focusing on the world as it could be”. This field uses design fiction to construct scenarios to explore design ideas. In particular, design research uses science fiction narratives to form a collective imagining that shape technological futures.

Grand and Wiedmer (2010) argue that:

[...] ‘design fiction’ can be interpreted as a new strategy for design research, trying to benefit from the qualities of a ‘designerly way of knowing’ (Cross, 2007) and the current discussion of design research frameworks, by systematically questioning and deconstructing the self-evident, transcending it towards new, possible futures; concretely materializing, visualizing and embodying relevant controversies and perspectives in the form of artifacts, interfaces, installations and performances; asking ‘how the world could be’ instead of discussing how the world is; thus taking the inherent contingency of the world seriously and thereby exploring insights from different disciplines. (pp. 5-6)

As a practice and research field, design research seems to play an important role in our society: it aims to change things in order to create preferable, future situations. By creating a link between design research and science fiction, design fiction can help us to envision how the world could be: by questioning the present, our current practices with technologies, we can think of possible futures and try to explain them. Diegetic prototypes are seen as a method to communicate and materialise possible futures.

Interaction Design

Interaction design is the design of the interaction between users and digital products. The goal is to create products and services that respond as best as possible to user needs. The work of the designers is thus to build interfaces that facilitate user interaction with logical and thought-out behaviours and actions. Interaction design is about people: it aims to support people in their communication and interactions in their everyday life. This approach is intended to be user-centred and is often associated with user experience (UX) design, whose objective is to shape the experience of using a product.

Interaction design is actually pretty close to science fiction: “Sci-fi uses characters in stories to describe a possible future. Similarly, the design process uses personas¹⁶ in scenarios to

¹⁶ “Personas are fictitious, specific, and concrete representations of target users. Personas put a face on the user: a memorable, engaging, and actionable image to serve as a design target” (Adlin et al., 2006, p. 13).

describe a possible interface” (Shedroff & Noessel, 2012, p. 6). Envisioning is a method which is used by the practitioners of the field to reflect on the future impact of interactive systems on individuals and society. Science fiction has also inspired interaction designers in the interface building, and as mentioned above about design fiction uses in cinema area, the literary genre contributed to the developments of real-life prototypes in science research.

Since some designers are inspired by science fiction, it is not surprising that design fiction can be used to explore the future of interactive technologies. For example, Fuchsberger et al. (2017) used fictional job postings as ‘design fictions’¹⁷ to animate discussions and debates with stakeholders from a production site and with the public. They were indeed concerned with new ways to explore interactive futures of workplaces and saw design fiction as a method to facilitate the exploration of prospective interactive practices at work.

Game design, a subfield of interaction design, which is the process of creating the content and the rules of a game, is also interested in the potential of design fiction to foresee the future of gaming. In one of their research projects, Coulton and Lindley (2016) examined games software never written and games hardware never built, which they called ‘Vaporware’. They considered these games “[...] as examples of ‘Design Fiction’ as they once represented speculative visions of the future based on emerging technology” (p. 341). These diegetic prototypes illustrate future gaming and represent an opportunity to open discussions about the possible futures of video games.

Sustainable Design

Sustainable design is a form of design that questions our impact on the environment. This approach is defined by the Business dictionary (Business Dictionary, n.d.) as the “[p]hilosophy of interior, physical, or product design which complies with principles of ecological sustainability”. Sustainable design has many goals, among which reducing energy and water consumption, minimising the impact on climate change, or eliminating waste. The fields concerned by these issues are architecture, landscape, agriculture, the energy sector, the water sector, and fashion. Design fiction is a practice that can be used in sustainable design to question people about their consumption practices.

¹⁷ The author uses the term ‘design fictions’ to refer to productions created as part of the practice of design fiction. In my literature review, I have observed that other authors do the same, but I will personally avoid using this term hereafter to designate the productions and will directly specify the nature of those productions (prototype, narrative, etc.).

Prost et al. (2015) proposed a novel application of participatory design fiction for sustainable domestic energy consumption. Through two workshops, they “[...] investigated how energy consumption feedback is leaving users in a state of ‘helplessness’ despite raising awareness of their environmental impact” (ibid., p. 1649). One of their two workshops consisted in forming subgroups and writing fictions about their vision of future domestic energy.

After finishing writing up their fictions, each subgroup presented their story to the whole group. The workshop concluded with discussions regarding plausibility of each vision and, depending how ‘positive’ or ‘negative’ the story was, how to enable or prevent such a future. (ibid., p. 1652)

Soto et al. (2017) also used design fiction in sustainable design “to contextualize prospectively and inspire the students in the solution of global problems regarding water resource” (p. 141). The results indicated a significant increase in students’ awareness of sustainability (97%) and recycling (81%), with an equally high level of satisfaction (81%) in using science fiction to design water resource solutions (ibid.).

Unlike many other fields of design, sustainable design is not only about improving design or giving new ideas to designers, but also making people aware of their energy/water consumption and their waste. Here the benefit is shared between designers and participants. Besides, sustainable design is an example of participatory design where people are directly involved in the design process.

C) Green Practices

Designers and researchers are not the only ones who use design fiction for environmental sustainability. Wakkary et al. (2013) studied two types of green practices, everyday repair and green-DIY. Using the framework of Shove et al. (2012), Wakkary et al. (2013) described these practices in terms of materials, competences and meanings, and the interrelations among those elements, in order to redefine the roles of sustainable interaction design (SID). In addition to this, they reveal “[...] how design fictions are readily incorporated into green practices in ways that transform those practices and hold implications for transformations of design as well” (Wakkary et al., 2013, p. 23). Three examples of DIY and design exemplars or fictions are presented and explained: vegetal walls, aquaponics farming and collapse informatics. I will focus on the first two.

First, vegetal walls offer “an example of how green enthusiasts reinterpret professional projects and make them” (Wakkary et al., 2013, p. 26). ‘Vertical gardens’ imagined by

designers serve as visions of possible futures for gardening. These examples of design fictions of vertical gardening have inspired many green-DIY practitioners to take action and create their own versions of these concepts (see figure 5.6.). Second, aquaponics farming, a combination of aquaculture and hydroponics where one part feeds the other, provides “[...] an example of how designers can play a role in bringing design fictions towards the practice of green-DIY” (Wakkary et al., 2013, p. 28). *Biosphere Farm* is a diegetic prototype of an aquaponics system for the home created by Philips. Green enthusiasts interpreted and adapted this design fiction prototype into DIY projects (see figure 5.6.).

Figure 5.6.

DIY projects of green practitioners (Wakkary et al., 2013, p. 21)



Fig. 5. Examples of DIY gardening¹⁸. From left to right: vertical shoe organizer garden by pippa5, self watering thermal insulated mini greenhouse by mapmg, used tired raised garden by auntwrenny, and mini-greenhouse by kcrox1017 (all images from instructables.com¹⁹).

Even if they are not the creators of the design fiction prototypes, green enthusiasts draw their inspiration from these to develop their own projects. Design fiction can thus play a role in the development of green practices by enabling green practitioners to transform future visions of designers into concrete sustainable DIY projects. Considering that green practitioners repair objects and conduct DIY projects that support environmental sustainability, green practices can be considered as problem-solving practices that are used by everyday people.

5.1.2.2. Critical Design as Problem-Finding Approach

For several years, new approaches to design have emerged and questioned the boundaries of the traditional disciplines in design such as radical design, interrogative design, discursive design, future design, or transitional design. Critical design includes these new approaches and aims to critically reflect “[...] on the development and the role of the technology in everyday life, without dealing with the applications of technology, but rather considering its

implications” (Mitrovic et al., 2015, p. 11). Design is used here as a medium to question the practice of design itself and to discuss broader political, social, and cultural issues.

As designers Dunne and Raby mentioned in their book *Speculative Everything. Design, fiction, and social dreaming*, “[t]his form of design thrives on imagination and aims to open up new perspectives on what sometimes called *wicked problems*, to create spaces for discussion and debate about alternative ways of being, and to inspire and encourage people’s imaginations to flow freely” (Dunne & Raby, 2013, p. 2). Unlike traditional design, the goal is not to resolve problems and provide answers but rather to find problems and ask questions. This form of design is separated from the marketplace and aims to make people think how the world could be by generating an alternative to how things are now.

Critical design uses design fiction to create fictional products, services and systems from alternative futures to critically engage people with them as consumer-citizens (Dunne & Raby, 2013, p. 49). Therefore, critical design does not focus on designers or contractors’ interests, but rather widens participation in the debate on future technologies to the users themselves. For example, the Atelier Van Leshout (AVL) explores with their project *SlaveCity-Cradle to Cradle* (2005-) “what size city could be supported if we used humans as slaves to produce energy and even as a source of energy of themselves or as raw material” (pp. 86-87). This example is inspired by science fiction to conceive a prototype machinery, among other things, that questions how the city would work economically and its optimal scale. The project is part of what Dunne and Raby call ‘functional fictions’, namely fictions that are used for a specific purpose: asking questions.

Steampunk

Steampunk is a subgenre of science fiction literature which imagines a future world based on Victorian age and organised around an advanced technology. Also qualified as retro-futurism, it is an aesthetical technological movement opposed to contemporary capitalist society. Steampunk is characterised by a community that has similar particularities to punk by its DIY aesthetic, its nostalgic look towards the past and its rejection of social norms, capitalism, conformity, and contemporary lifestyle. Much like green enthusiasts, Steampunks develop DIY projects: the difference is that artifacts, although real, are functional only in the fiction.

Tanenbaum et al. (2012b) have studied “how, as a design fiction, Steampunk provides an explicit model for how to physically realize an ideological and imagined world through design practice” (p. 1583). Steampunk may be understood as a design movement by its creation of

designed artefacts and its sharing of methods and techniques through online personal sites. “Steampunk is an especially compelling form of design fiction because it uses appropriation and reimagination to create diegetic prototypes as a critique of contemporary relationships to technology” (Tanenbaum et al., 2013, p. 31). It follows a discursive purpose: Steampunks want to question design and technology by giving meaning to their creations. This genre is particularly suited to think about the future of interaction design and to understand the evolution of our relationship with technology.

Figure 5.7.

The Steampunk Xbox 360 (Tanenbaum et al., 2013, p. 30)



According to Dunne and Raby, speculative design has a potential “[...] for largescale social and political issues, such as democracy or sustainability or for alternatives to the existing capitalist model” (Mitrovic et al., 2015, p. 15). In Steampunk, this opposition is stronger and is not only limited to ‘questioning’: as Tanenbaum et al. (2013) have pointed out, designed objects are not neutral and communicate “value systems, cultural assumptions and ethical commitments” (p. 31). Steampunk practitioners appropriate designed artefacts and change their primary purpose to criticise the role of technologies; this movement can be therefore considered as a form of critical design that is devoted to fight capitalist ideology.

5.1.3. Design-oriented Research: Producing Knowledge

Research is the “experimentation aimed at the discovery and interpretation of facts, revision of accepted theories or laws in the light of new facts, or practical application of such new or revised theories or laws” (Merriam-Webster dictionary, n.d.). The goal of research is to discover new information and to reach new understandings in order to produce knowledge.

In contrast to design research, in design-oriented research, the design is the area and research the means: “[...] the production of new knowledge and the questioning of problem descriptions and other kinds of limitations to the freedom of design are seen as characterizing elements” (Fallman, 2004, p. 1). As Dourish and Bell (2014) state, design-oriented research is “[...] inherently directed toward the future and is predicated upon envisionments of alternative futures enabled by technological progress” (p. 769). Both a practice and a science, it is based on the imagination and realisation of possible futures.

5.1.3.1. *Research through Design*

Research through design (RtD) is a method used in design-oriented research. The goal of this field is not “[...] to produce commercial products but rather to apply design practices to new problems in order to create knowledge” which potentially qualifies as scientific (Blythe, 2014, p. 1). According to Stappers and Giacca (2017),

When we talk about RtD, we indicate design activities that play a formative role in the generation of knowledge, typically actions that we’d recognize as design activities from one of the design professions, that depend on the professional skills of designers such as gaining actionable understanding of a complex situation, framing and reframing it, and iteratively developing prototypes that address it.

Research through design is interested in the potential of writing practice in design development and thus, in design fiction. The latter is used as a technique to explore possible near futures of an imagined technology with consideration of its cultural, political, and social context. Coulton et al. (2017) argue that design fiction is a ‘world building’ activity “with no inherent link to narrative or storytelling” (p. 164). They emphasise the importance of the cohesion of the world and the interactions between people and things within that world rather than focusing on characters, narrative, or the plot. Here fiction serves design: the writing form help to consider all aspects of the future technology and to develop new perspectives.

Designers in research through design are commonly the creators of the scenarios; they create design fiction narratives themselves to explain their visions of future technologies. For example, Edwards et al. (2016) wrote together a design fiction scenario about honey bees to stimulate reflection on the importance of beekeeping for the future. Design fiction is also used in this field as an excuse to discuss the future in a scientific way. In the Solutionist Studio, Encinas and Blythe (2016) created a diegetic prototype that unexpectedly began to work in reality. They presented their paper as design fiction “[...] because nobody would accept these findings in any other form though they are as true as anything else published at CHI” (p. 387).

5.1.3.2. Human Computer Interaction

Design fiction has received recent interest from the Human Computer Interaction (HCI) research community. This field studies how people interact with computers and information technologies through interfaces with the aim of providing them with a satisfying and helpful user experience. “HCI research and science fiction have a common history and share common ground, as both are grounded in the present but envisioning desirable or undesirable futures enabled by technological developments” (Prost et al., 2015, p. 1650). The link with design fiction is even more significant than with science fiction, given that design fiction stories happen in a near future world which is not too far away from the concerns of today’s society. With design fiction, it is easier to transform visions of possible futures into design implications.

As Tanenbaum describes in an article published in *ACM Interactions* magazine (2014), design fiction, as a research method, can serve three important roles in HCI. First, it can be a “method for envisioning new futures and technologies”: it explores not only technical aspects of the researched technology but also its broader social, political, and cultural implications in the imagined society. This goal is comparable to critical design’s use of design fiction: critical designers create objects that question the role of the technology in the society, by considering its implications rather than its applications. Second, it can be a “tool for communicating innovations”, as Kirby (2010) and Bleecker (2009) respectively suggest in their paper: presented to a large audience, design fiction objects share knowledge and allow people to understand the future. As was shown, cinema uses design fiction in a similar way to promote the potential of new technologies. Third, it can provide “inspiration and motivation for design” and research by creating diegetic prototypes before attempting physical prototyping. Both in the cinema and in traditional design, design fiction is used to speculate on the future of the products, and this led to the development of real-life prototypes.

There are a lot of examples of design fiction use in HCI. I have identified three main categories.

Firstly, I can mention the creation and the use of design fiction by designers and researchers for the HCI community. They create design fiction scenarios and diegetic prototypes to explore the future of human-computer interaction and to share their ideas/opinions with the community to discuss future issues. To conceive them, they can draw on pop culture; for example, Wong et al. (2017) were inspired by the sci-fi novel *The Circle* (2013) to engage issues of privacy and surveillance. “By creating design proposals that explore connections between the novel’s imagined world and our present and future realities, we show that we are able to explore, expand, and articulate a range of social, technical, and legal configurations of the future” (Wong et al., 2017, p. 567). Design fiction was used here to interrogate the future of sensing technologies and to animate discussions between researchers.

Figure 5.8.

Design fiction proposals drawing from the novel The Circle (2013) (Wong et al., 2017)



Figure 8. Airport Security, inspired by NeighborWatch.
Images adapted from [35,51] under CC BY-SA 2.0

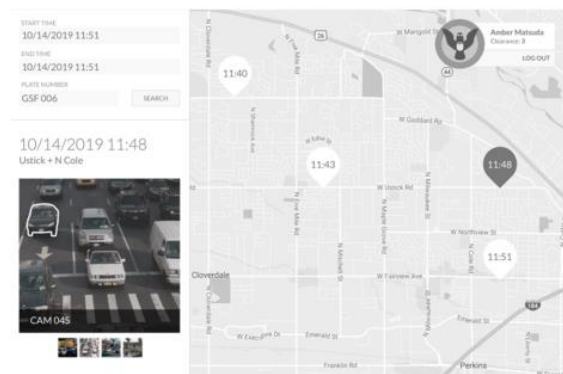


Figure 9. License Plate Tracker, inspired by SeeChange

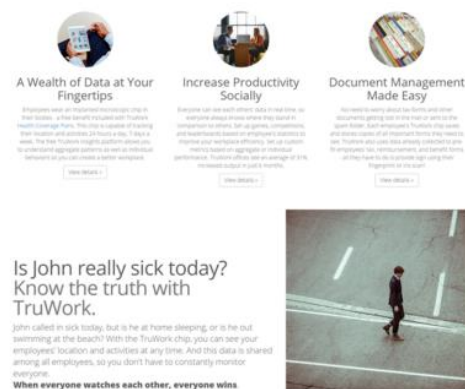


Figure 10. TruWork website, inspired by ChildTrack

Most of the researchers rely on their imagination, as it is the case for Kim et al. (2017) who wrote design narratives to explore the future of Human-Fabrication Machine Interaction, “a novel viewpoint from which to reflect on the importance of (i) interleaved design thinking and refinement during fabrication, (ii) enriched methods of interaction with fabrication machines regardless of skill level, and (iii) concurrent human and machine interaction” (p. 790). Rostami et al. (2017) also used design fiction to generate ideas about the future of technology: they explored mixed-reality performances through various archetypes including scripts, programs, and posters. As for Sturdee (2017), in shaping-changing interfaces, he employed mixed methodologies, “such as sketching user scenarios and creating design fictions to inform the field [...]” about application design and usage for shape-change (p. 399).

Other researchers are more specific in the creation of design fiction and develop concrete examples of diegetic prototypes. Based on home studies of food practices, Oogjes et al. (2016) created a diegetic prototype named Lyssa, “a hearing aid for your refrigerator that aims at reintegrating lost aspects of food” (p. 109) (see figure 5.9.). Through a video narrative, they proposed a reconfiguration of domestic food practices. Pinder (2017) answered pervasive advertising by providing a design fiction solution, the Anti-Influence Engine, “a distributed system that returns to users the power over their own associative memories” (p. 770). As a diegetic prototype, the Engine questions the manipulation of people by advertisers and opens discussion about design and ethical issues.

Figure 5.9.

Diegetic prototype Lyssa (Oogjes et al., 2016)



In the health care sector, Stead and Coulton (2017) created a design fiction object, the HealthBand, to “explore how open source and crowd-funded wearables might impact future health product legislation” (p. 101), while Schulte (2016) used design fiction in a similar way as a method to explore issues of new technologies in the health care system, by proposing “the idea of replacing Smart Home technology with wearable solutions” (p. 1110). Diegetic prototypes can help in creating physical prototypes, as Tanenbaum et al. (2012a) proposed in their studio where participants were invited to physical prototype their design fiction ideas.

To sum up this first series of examples, all these projects have in common the use of narratives to imagine the future of design. The researchers create design narratives (papers, novels, videos) or user scenarios for specific diegetic prototypes to share knowledge and to discuss new technology issues with the HCI community.

Secondly, design fiction is used as a means to engage researchers in critical reflection and evaluation of the potential consequences of their work. Linehan et al. (2014) used fictional narratives “to envision long-term consequences of contemporary HCI projects, as a means for engaging the CHI¹⁸ community in a consideration of the values and implications of interactive technology” (p. 45). Buttrick et al. (2014) criticised the relationship between people and technologies through three sexually explicit scenarios “[...] in which technology is portrayed in a dominant and controlling role, highlighting the often subservient and apologetic nature of human interaction with technology” (p. 825). Kirman et al. (2013) also wrote a paper about the future of human-computer interactions. They presented it as written by “robots from the future”: it describes how the HCI community contributed to the enslavement of humankind by evil robots during the 21st century. A few case studies, such as cognitive surplus, crowd sourcing or human computation, are introduced to explain how the HCI community supported the robot agenda.

In software engineering research, Barik et al. (2016) demonstrated through three pop culture dystopias “how reflecting on dystopian scenarios provides research opportunities as well as implications, such as making research accessible to non-experts, that are relevant to our present” (p. 924). They observed that software engineers were often optimistic about the future and advocated for dystopian thinking because it forces us, among other things, to confront difficult potential futures. This paper aims to support software engineers in their

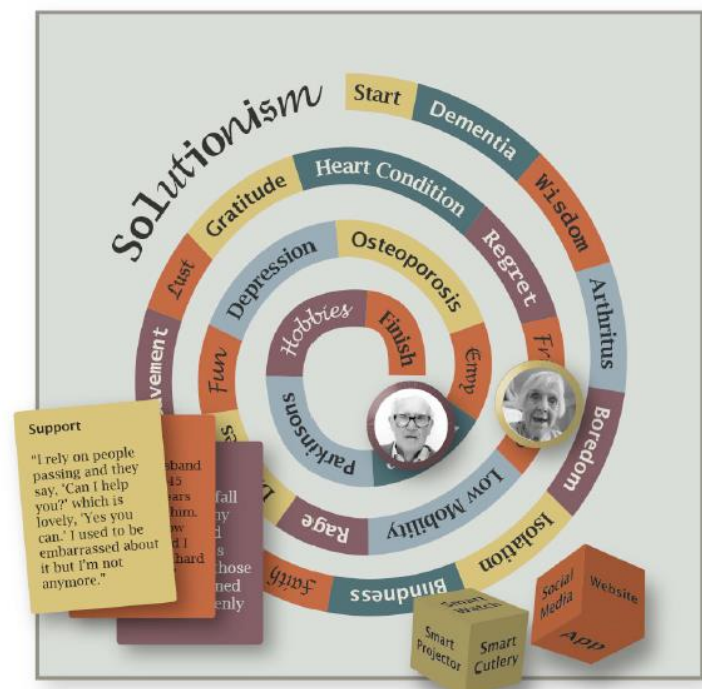
¹⁸ CHI means ‘Computer Human Interaction’. All HCI interest groups and conferences at the ACM Library are labelled CHI. For this manuscript, I use HCI, i.e., ‘Human Computer Interaction’.

research by providing a design fiction method, but it is also intended for individuals to help them understand the implications of software engineering research.

Blythe et al. (2016) proposed to use design fiction as an anti-solutionism strategy. They noted that “[m]uch of the academic and commercial work that seeks to innovate around technology has been dismissed as ‘solutionist’ because it solves problems that don’t exist or ignores the complexity of personal, political and environmental issues” (p. 4968). Design fiction can be used as an anti-solutionism strategy in engaging researchers to create superfluous, questionable or flawed objects that can animate discussions about alternative futures. In another paper, Blythe et al. (2015) presented a ‘solutionist’ board game to generate design concepts (see figure 5.10.). This approach is intended to involve participants in the production of design concepts to create a space for design beyond solutionism.

Figure 5.10.

Solutionism, the board game (Blythe et al., 2015, p. 3855)



The HCI community is rather active in the conception of design fiction productions, and a lot of papers provide methodologies and advice to other researchers. For example, Gilardi et al. (2016) wrote a paper that gives advice to HCI designers about creating design fiction films and getting experiences and emotions across. Markussen and Knutz (2013) offer a method of practising design fiction within HCI and interaction design. “The use of this method is

demonstrated by 4 design projects from a workshop set up in collaboration with a Danish author” (p. 231). Other researchers create design fiction that can be used for research or design process, as in the case of Schulte et al. (2016) who propose a design fiction about smart houses: they introduce design fiction as a method “to explore potential consequences of the use of technologies before they actually exist” (p. 1).

This second category of examples emphasised the use of design fiction as a tool for discussing the achievements of scientific and technological research itself. The researchers write fictional scenarios (papers, narratives, games) to distance themselves from their work and to avoid technological solutionism. Some of them provide methods that use design fiction practice and give advice to develop their critical thinking.

Thirdly, I can highlight the design fiction objects and scenarios created by researchers and addressed to users. In this case, they use design fiction to share and discuss their visions of futures with actual users, but also to evaluate their own creations. In Dalton et al.’s paper (2016), for example, design fiction productions were used as a tool for discussion with large public audiences. Researchers created a science-fiction novel and shared it on an online social website to engage people with their scenario with emotional and reflective aspects. The goal was to demonstrate the potential of the social-writing platforms as a design fiction tool.

Tanenbaum et al. (2016b) addressed “[...] how design fictional methods allow researchers to construct arguments about feared or dystopian futures within the context of collapse informatics” (p. 1). They proposed to draw inspiration from popular culture scenarios of collapse, such as *Mad Max: Fury Road* (2015) or *Interstellar* (2014), in the communication of HCI challenges and potential solutions to a broad public audience. These films “[...] didn’t directly persuade viewers to adopt specific positions advocated by the science consultants, but rather provided audiences with resources for formulating opinions about topics that had been previously obscure, alien, or unknown” (Tanenbaum et al., 2016b, p. 7). They are not only used to persuade people to accept scientific agendas (Kirby, 2010) but they also provide a critical distance.

Although people are involved in the reflection about the future technologies depicted in the cinematic stories, they do not take part in the design process, in contrast to participatory design (see section 5.2.: Two Design Methods). Design fiction is, however, very helpful for the HCI community because, as another paper of Tanenbaum et al. (2016a) mentions, “[a] better understanding of how design fiction embedded in popular media influences and engages mass audiences is critical to understanding how our own work will be received” (p. 67).

These last examples demonstrate that design fiction can also be used to discuss future issues with the actual users. Researchers create narratives (films, novels) to communicate technological advances in a way that the audience will understand. Even though users do not participate in the development of the scenarios, design fiction is very helpful for researchers to evaluate their work.

Ubiquitous Computing

Ubiquitous computing (UbiComp) is a field in HCI that is particularly interested in the potential of design fiction to envision possible future scenarios. Situated at the intersection of science fact, design and science fiction, UbiComp focuses on tangible computing technologies and on social computing. It creates materialised idea-objects that are part of a near future world with the objective of re-thinking interaction with technologies. As Bleecker (2009) describes in his essay, “UbiComp is driven, then, not so much by the problems of the past but by the possibilities of the future. UbiComp set a specific goal which may have been reasonable as a set of parameters for a speculative design of the near future of computation” (p. 74). SF stories are used in a way to contextualise UbiComp future and to consider possible consequences, implications, and the inevitable failures of technologies.

As an example, Dourish and Bell (2014) propose to read science fiction alongside ubiquitous computing. They analysed popular American and British science fiction television shows to raise questions about people, technology, and progress. Their goals were “to open up a dialog concerning the technological imagination as it manifests itself within pervasive computing research” and “to point out the implications for cultural embedding that are already inherent in design” (ibid., p. 774 and p. 777). A similar way to design fiction to explore ubiComp possible futures in HCI is envisioning: according to Reeves (2012), it refers to “a broadly future-oriented aspect of technology design which mixes fictions, forecasts, extrapolations or projections into societal visions for technological progress” (p. 1573).

5.1.4. Public Affairs: Serving Society

Public affairs refers to “matters of general interest or concern, especially those dealing with current social or political issues” (Dictionary.com, n.d.). This area gathers public officials, local communities, customers, trade institutions, union representatives and the media. They work together to develop a better policy and legislation. “Public affairs work combines government relations, media communications, issue management, corporate and social responsibility,

information dissemination and strategic communications advice” (Public Affairs Networking, n.d.). Design fiction can be used in public affairs.

As the experimentation ProtoPolicy suggests, “speculative design fiction” was used to help public institutions and interest communities to consider and debate the different implications of future socio-political changes. “By confronting political decision makers, public officials and citizens with these scenarios, ProtoPolicy seeks to generate reactions that, if taken into account, make it possible to adjust the trajectories of public policies” (Design Friction, 2017; personal translation). The *Commission Nationale de l’Informatique et des Libertés* (CNIL) in France similarly used design fiction in workshops regrouping personalities, ecosystem stakeholders, experts and community leaders “[...] to imagine and design various fictitious but realistic services by 2027 and to project themselves into the political and legal issues raised by each of them” (CNIL, n.d.; personal translation).

Figure 5.11.

Picture retrieved October 15, 2023 from: <https://medium.com/design-friction/proto-policy-using-design-fictions-to-negotiate-social-and-political-changes-740007813945>



5.2. Two Design Methods

The first part of the review has identified a number of areas. Four main areas and their use of design fiction were described: cinema, design, design-oriented research, and public affairs. They were characterised by their goals and included several fields. Some of them use participatory design or speculative design in their application of design fiction. As a consequence, I decided to present the methods separately from the areas: methods are not defined by goals or objects but rather by the processes and procedures they include. For example, participatory design can be a method used in business innovation to engage consumers in the design process.

5.2.1. Participatory Design

“Participatory design is a set of theories, practices, and studies related to end users as full participants in activities leading to software and hardware computer products and computer-based activities” (Muller, 2003, p. 1125). This approach actively involves all stakeholders throughout the design process, that is, not only the users but also politics, companies, or hospitals (depending on the context). Participants are invited to cooperate with designers and researchers to provide design solutions. Participatory design is, however, not restricted to technology design and development: “[t]he field is extraordinarily diverse, drawing on fields such as user-centered design, graphic design, software engineering, architecture, public policy, psychology, anthropology, sociology, labor studies, communication studies, and political science and from localized experiences in diverse national and cultural contexts” (ibid.).

Baumann et al. (2017) studied in their research, for example, how participatory design can help “to retain cultural values and embody the values of local stakeholders, especially with technology” (p. 5). During the workshop, groups created prototypes and design fiction videos that consider technical aspects of the technology as well as the social rituals, civic interactions, and cultural practices.

Fiction can be a resource for participation in designing speculative futures, as another paper of Baumann et al. (2017) suggests: “The project utilized design fiction scenario videos and collages to present provocative design concepts to local stakeholder meetings and the general public” (p. 266). Local communities were invited to co-design emerging technologies with academic and professional designers to establish ‘infrastructures of the imagination’ for long-term strategies and alternative cultural models of innovation. In recent work, Buie (2016) described the design and application of the game *Transcendance* to facilitate techno-spiritual

design. Through several workshops, participants were involved in the game design process with the objective to generate new design ideas. Buie used design fiction to facilitate further exploration of the workshops ideas by converting them into design fiction productions.

Although participatory design involves citizens, this method primarily serves researchers' interests. As Heidingsfelder et al. (2016) state, "[...] methods of participatory design can be invaluable for co-determining research trajectories and co-setting research agendas" (p. 25). Design fiction is used in a commercial context to help designers imagine what the future could be. Participatory design allows a human-centred approach but there is no intent to develop critical thinking about technologies. There are, however, a few exceptions.

In critical education futures research, Duggan et al. (2017) have recently conducted a research within the framework of their project the Near Future School. The latter:

[...] aims to translate and explore the potential of participatory design fiction practices for use with young people and those that work with them to explore near future scenarios of education that open up alternative and plural futures in the context of processes of foreclosure in a neoliberalising society. (p. 1)

In several workshops, students engaged in discussions with their peers and the research team after envisioning the potential future of their school in 2018 through the creation of stories and comic strips. The goal was to give free rein to the imagination of students and teachers in order to explore new ways of organising the school.

Rozendaal et al. (2016) offered another example of participatory design that provided a plus-value for participants, and not only for the designers. As the abstract summarises, "In this one-day learning workshop, we explore how embodied speculation in participatory design and innovation can help stakeholders imagine, critically reflect and engage in dialogue about the social opportunities and ethical implications of emerging technologies" (Rozendaal et al., 2016, p. 100). Even if the purpose is to explore new research opportunities with participatory design, this kind of workshop supports knowledge exchange and learning between designers and stakeholders. This research and the previous one are thus at the intersection between research-oriented design and critical design.

5.2.2. Speculative Design

Speculative design is employed by any field of design that speculates on the future to conceive new products and services. As the literature reviewed above shows, this method is therefore used in many fields of design.

In critical design approaches, speculative design is defined as “[...] a discursive practice, based on critical thinking and dialogue, which questions the practice of design (and its modernist definition)” (Mitrovic et al., 2015, p. 13). In this context, speculative designers re-think the role of technology in the today’s society by taking into consideration its implications. “This approach is most often based on the question ‘what if?’ questioning the interrelation between potential changes in the technological development and social relations” (ibid., p. 15). The goal is to imagine how the world could be by questioning the present. The designer and teacher James Auger asserts that:

[...] this design (i) moves away from the constraints of commercial practice (directed by the market); (ii) uses fiction and speculates on future products, services, systems and worlds, thus reflectively examining the role and impact of new technologies on everyday life; (iii) and initiates a dialogue between experts (scientists, engineers and designers) and users of new technologies (the audience). (Mitrovic et al., 2015, p. 13)

In this approach, design fiction is seen as a potential genre of speculative design practice (ibid.). As opposed to Kirby’s conception, it is not used here in a commercial context to promote a piece of technology but in a cultural and social context to question the technological development in the society. Inspired by science fiction, speculative design fiction imagines possible – not only plausible or probable – realms.

[Scenarios] can tell us something about ourselves here and now, about the technology we use and the way the technology influences the society and our everyday lives, and about the role that design can play in that context and not necessarily in this order. (Mitrovic et al., 2015, p. 31)

For example, design studio and research lab Superflux uses speculative design to explore the uncertainties of everyday life and emerging technology in a new way. They created a series of speculative design films where they introduce prototypes based on existing or near-future technologies.

A good example of their work is *Uninvited Guests*, which explores frictions between an elderly man and ‘smart objects’ [devices] in his home. This project, commissioned by ThingTank, gives a glimpse of a not-so-distant future where smart devices - rather than being helpers - are actually controlling (elderly) people’s lives. (Kolehmainen, 2016)

Figure 5.12.

Project Uninvited Guests by ThingTank – Picture retrieved from the video clip¹⁹



A second example, as proposed by Tseklevs et al. (2017), involves the utilisation of design fiction as a tool for debating societal, legal and ethical aspects of personal and pervasive health systems. They co-created two design fictions during a series of design workshops with community groups and analysed debates among older people about societal and ethical issues related to personal health system design. They advocate for a speculative design approach, coupled with participatory design.

The previous examples show that speculative design is generally associated with a critical perspective, although by definition it is a design method that can be mobilised in various fields of design. In the context of design fiction, we will remember that speculative design is inherent to the practice of design fiction in that it is an integral part of the design process for speculating on possible futures.

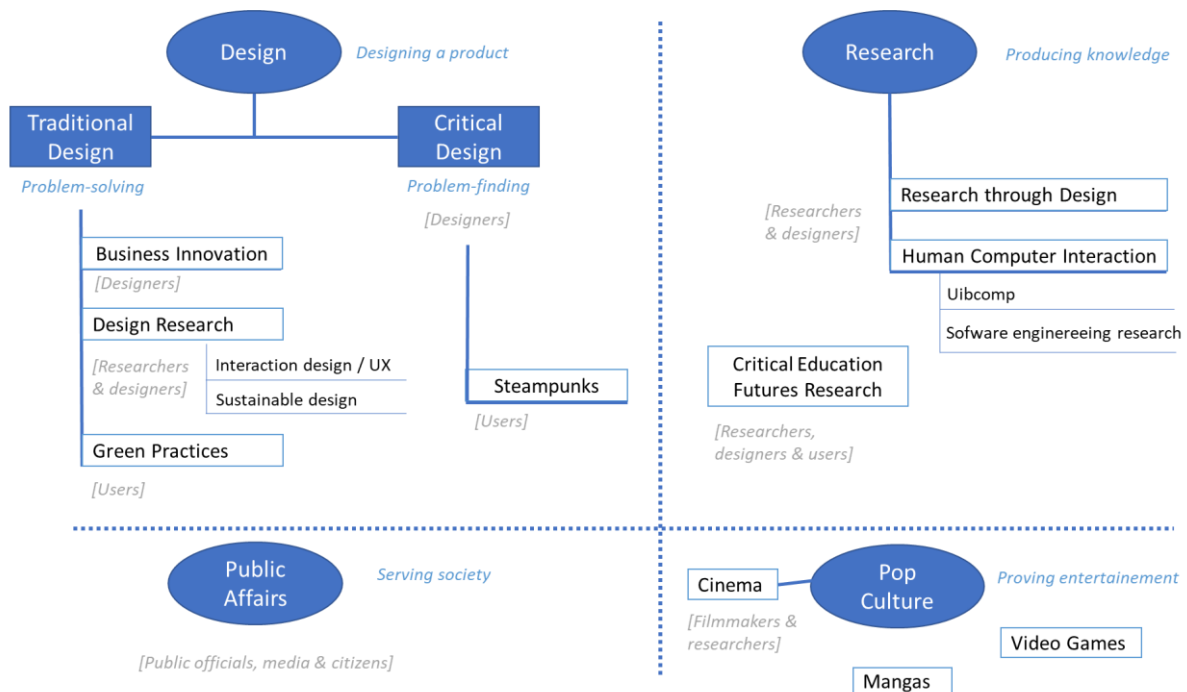
¹⁹ See the website of the project here: <https://superflux.in/index.php/work/uninvited-guests/#> (Retrieved October 15, 2023)

5.3. Synthesis Chapter 5: Mapping the Uses of Design Fiction

The literature review highlights a wide variety of uses for design fiction. The following diagram summarises the different fields in which it is used. The blue circles indicate the four main areas of use, with their objectives in italics. The rectangles indicate the fields included in these areas. I also added, in grey and in brackets, the audiences targeted by the fields, for example filmmakers and researchers for cinema.

Figure 5.13.

Different fields using design fiction



The reader will notice that the four areas are separated by dotted lines as it is possible for the areas to blend depending on the objectives of the field; this is the case, for example, with critical education futures research, which tends towards critical design approach to encourage students to think critically about the future. Some studies in HCI also encourage researchers to adopt a reflective attitude to their work. In addition, I decided to transform the area of cinema into a broader field, that of popular culture. Although the literature reviewed does not mention any use of design fiction other than in the field of cinema, we can mention video games or manga centred on technology that are comparable to design fiction productions (e.g., *Detroit Become Human* video game or *Ghost in the Shell* manga).

While there is an extensive literature on design fiction, this abundance constitutes an obstacle when attempting to define it. On the one hand, many authors define design fiction as a design field or a design method forgetting the science fiction part of it. Design fiction is therefore often confused with speculative design and is limited to a design method for imagining the future of products and services. All the storyworld and science fiction scenarios are bypassed in this context. On the other hand, and this is related to the previous issue, it is difficult to understand what exactly design fiction creates as outputs. Bruce Sterling gives a definition of design fiction with the production of 'diegetic prototypes', some authors speak of the creation of 'design fictions', others of 'speculative design fictions' ... None of these concepts helps us to really understand the process of design fiction, which is why the next chapter explores in detail the productions of design fiction.

Chapter 6: Design Fiction Productions

The literature review on design fiction uses highlighted that many fields and areas use design fiction for distinct reasons. Such diverse applications make the notion of design fiction rather vague, referring sometimes to prototypes developed by scientists or green practitioners and sometimes to speculative scenarios created by science fiction filmmakers or critical designers. Moreover, the objectives differ from one field to another, which use design fiction either for commercial purposes or for critical purposes. This chapter explores the different types of productions generated by the practice of design fiction as well as their purposes in relationship to the field in which they are developed.

6.1. Design Fiction as the Production of a Prototype

In its original definition, the practice of design fiction consists of materialising possible scenarios and then debating them. Design fiction would thus be primarily a design practice that creates artefacts expressing potential futures. The prototypes, however, differ from what is usually created in a traditional design practice, as they are fictional. The next paragraphs introduce the notion of ‘design’ and specifies the characteristics of the prototypes produced by design fiction practice.

6.1.1. Design in Traditional Design Practice

Design is defined in the Longman Dictionary as “the art or process of making a drawing of something to show how you will make it or what it will look like” (Longman Dictionary, n.d.). In other words, design consists in describing and materialising ideas into a made, crafted, instantiated object (Bleecker, 2009). Design is an imaginative practice which helps us to create new worlds and experiences. From the modernist²⁰ perspective, design has been primarily used as a problem-solving practice, usually dealing with problems detected by other professions in order to improve the quality of life of human beings (Mitrovic et al., 2015, p. 9). In this perspective, design is at the service of the industry and aims to address clients’ needs by anticipating them. Traditional design is related to mass production and technical innovation and try to make consumers buy.

²⁰ “Modernism, in the fine arts, a break with the past and the concurrent search for new forms of expression. Modernism fostered a period of experimentation in the arts from the late 19th to the mid-20th century, particularly in the years following World War I” (Kuiper, n.d.).

6.1.1.1. *User Scenarios and User Stories*

The design process involves a series of steps which generally includes the development of users' scenarios. The Interaction Design Foundation defines a user scenario as "a fictitious story of a user's accomplishing an action or goal via a product" (Interaction Design Foundation, n.d.). User scenarios help designers understand the way users might use a product or a service and provide guidance on usability testing. Once the product or the service has received a sufficient number of tests, the company puts it on the market, and the user will have to correctly interpret its design to use it. At this point, we need to clearly distinguish two meanings of the term 'design': design as an uncountable noun refers to the process of creating things, while design as a countable noun refers to the appearance of an object, its configuration or its aesthetic, resulting from the process of design. Stories can emerge during the design process in the form of user scenarios as well as during the use from the properties of the designed object, as we see in the next section.

6.1.1.2. *Design Communicates Uses*

Donald Norman (2004) argued that design is communicating: "[d]esign is a conversation between designer and user, one that can go both ways, even though the designer is no longer present once the user enters the scene" (p. 2). The design of an object has not only a utility function, it also serves to communicate to the user how to use that object. de Souza (2005) explains that design affordances specify designer's intention to users. The term 'affordance' is originally defined as the actions possible by an agent (usually a person) and the environment (Gibson, 1983). Norman (2004) distinguishes this concept with 'perceived affordance'. He explains that a good design makes these affordances visible and comprehensible to users, not in the world of possible affordances but rather in the world of perceived affordances. The role of the designer is to succeed in making the user reproduce user scenarios he imagined during the design process. In other words, the objective is to coincide the designers' conceptual model with the users' mental model through the 'system image', that is, the information conveyed by the physical product itself (Norman, 2004).

According to Norman (2004), a story is communicated through the designed object: "[t]he story provides the context that makes the roles of the various accoutrements clear and distinct" (p. 3). He takes the example of the dish for soap: there is no ambiguity that wire the dish is for soap only within the context of the bathroom because it is part of the story of how we take a shower. Designed objects tell stories in the context of social practices and could never exist outside of an imagined use context (Bleecker, 2009). Moreover, Norman (2004)

claims that stories are superior to logic because a story provides the context needed to understand the use of an object. “Without this story, without this conceptualization, the operation of something becomes a set of memorized actions, but without reason or purpose except “this is how it is done”” (Norman, 2004, p. 5).

6.1.2. Design as Fictional

Unlike previous design examples, design fiction is a design practice that produces fictional artefacts. As a reminder, diegetic prototypes only exist in the storyworld: they are part of the narration and do not exist in the real world. Although they may take on a material form, they are only functional in the fiction. Their function, however, goes beyond simple use and their design can communicate values.

6.1.2.1. Diegetic Prototypes as ‘Conversation Pieces’

As Bleecker (2009) explains, design fiction is a “kind of authoring practice that recombines the traditions of writing and storytelling with the material crafting of objects” (p. 7). Through this combination, design fiction generates what Bleecker (2009) called ‘conversation pieces’, that is, socialised objects that tell stories which “speculate about new, different, distinctive social practices that assemble around and through these objects” (p. 8). Like everyday designed objects, stories are embedded in the objects created by the practice of design fiction. These objects tell a story by themselves and do not necessarily need a context of use to be understood. In this context, critical design uses design fiction to create provocative and fictional products intended to open up new spaces of debate and discussion (Dunne & Raby, 2013).

6.1.2.2. Critical Design Objects Communicate Values

Critical design uses “design as a means of speculating how things could be” (Dunne & Raby, 2013, p. 3). As used in critical design, the practice of design fiction enables us to create objects that reflect today’s concern about politics, social relation, or ideology issues. Critical design allows going beyond storytelling and can provide what Dunne and Raby (2013) called a story-making, i.e. “[...] this dream-materializing ability, from purely commercial applications and redirecting it toward more social ends that address the citizen rather than the consumer or perhaps both at the same time” (p. 88). Critical designers develop socially engaged projects for raising awareness of the consequences of our actions as citizens-consumers. They use design as a medium rather than a solution to confront us to new ideals and values. Dunne &

Raby (2013) emphasise that critical design is not intended to mass-production and to assert its values, but can help people to construct maps for navigating new sets of values.

Moreover, the literature on design fiction uses demonstrates that citizens use themselves design fiction to confront the dominant consumerist ideology. As a reminder, Steampunks question the role products play in everyday life and create fictional artefacts as a critique of contemporary relationships to technology. Designed objects therefore embody designers' ideals and values: they are not just telling a story about social practices with technology but also communicating values, using design as ethos (Dunne & Raby, 2013). Steampunk is a subgenre of science fiction literature and objects are often grounded in a fictional universe that contextualises their use. Hence, a single object can evoke a whole storyworld (as we have explored in this section), just as the storyworld can contextualise a diegetic prototype (as we discuss in the next section).

6.2. Design Fiction as the Production of a Narrative

The creation of prototypes in design fiction practice generally goes hand in hand with the development of a narrative world. This world aims to embed the object in a broader context to illustrate its uses as well as to explain the consequences of its implementation. Stories created in the practice of design fiction usually take place in a near future, so that many authors situate design fiction at the intersection of science fiction and speculative design. The next paragraphs explore the link of design fiction with science fiction and specify the kind of stories produced.

6.2.1. Science Fiction and Design Fiction

“Science fiction can be understood as a kind of writing that, in its stories, creates prototypes of other worlds, other experiences, other contexts for life based on the creative insights of the author” (Bleecker, 2009, p. 7). Design fiction is inspired by science fiction in the telling of a story about something being prototyped in an imagined world: it is a form of storytelling. It uses narrative structures to consider and question possible futures of design. Diegetic prototypes are objects with stories about people and their mundane social practices.

In design, “[...] the capability to tell stories — even visual stories — about what you’re imagining offers a richer way of materializing these ideas, and circulating them” (Bleecker, 2009, p. 37). Kirby (2010) demonstrates that diegetic prototypes in popular films contribute to the technological development of the real world and help illustrate the potential applications of technology in the real world for the audience (p. 51). Mitrovic et al. (2015) also

state that re-thinking future asks to think about current technology and social relationships. Diegetic prototypes offer therefore plausible technology in a near future world.

6.2.1.1. Pre-Product Placement in Science Fiction Films' Production

As analysed by Kirby (2010), design fiction can be used as a form of pre-product placement in science fiction films' production. Filmmakers collaborate with scientists to help them in the creation of diegetic prototypes. The objective is to convince people about the future technology's necessity, viability, and benevolence in order to obtain research funds to develop them. For instance, computer engineer John Underkoffler worked on the gesture-based computer-interface technology featured in *Minority Report* (2002). He contributed to making it look natural, plausible, and consistent with the future imagined world. In this context, diegetic prototypes are developed in a laboratory and the filmmakers create a story around this object to contextualise its use. Science fiction objects thus have meaning only in the story in which they are embedded and do not exist independently of them. Films bring them to life and the objective is strictly commercial, that is, promoting a future product or entertaining the audience. However more and more critical films and TV series about society are being produced nowadays and would refer to a new trend in science fiction, namely 'critical science fiction'.

6.2.1.2. From Science-Fiction to Critical Science Fiction

Whether in book or film form, science fiction is mainly used for entertainment. Science fiction scenarios make viewers/readers suspend their disbelief to free their imagination and momentarily forget how things are now (Dunne & Raby, 2013). However, there are other reasons that explain why filmmakers and writers create fictional worlds: reflection, critique, and provocation. Critical science fiction refers to a particular strand of science fiction critique "in which dystopias are understood in relation to critical theory and the philosophy of science" (p. 73). These writings emphasise first and foremost political and social possibilities, a feature that Darko Survin (1972) names as 'cognitive estrangement' to describe how alternate realities can help criticise our own world. This feature will be examined in more depth in the next chapter dedicated to the nature of design fiction as fiction.

6.2.2. Speculative Scenarios

The most common form of narratives produced in design fiction practice is speculative scenarios. The uses of these scenarios are multiple, either to specify the characteristics of a diegetic prototype, or to stimulate reflection on the potential implications of future

technology. Based on the literature review on design fiction uses, the next paragraphs synthesise the different kinds of scenarios used in design-oriented research and in critical design.

6.2.2.1. Speculative Scenarios in Design-Oriented Research

The use of design fiction in design-oriented research generates a wide variety of scenarios. To begin with, designers create scenarios before prototyping to consider all aspects of the future technology. Scenarios help them explain their visions of the future and stimulate discussion about crucial research issues. In Human Computer Interaction, researchers create thus design narratives (papers, novels, videos) for specific diegetic prototypes to share knowledge and to discuss new technology issues with the HCI community. Some narratives are created for and shared with actual users to communicate technological advances in a way that the audience will understand. Other HCI researchers make a more critical use of design fiction and write fictional scenarios (papers, narratives, games) to distance themselves from their work. Design fiction is used in this context as a means to engage researchers in critical reflection and evaluation of the potential consequences of their work.

6.2.2.2. Speculative Scenarios in Critical Design

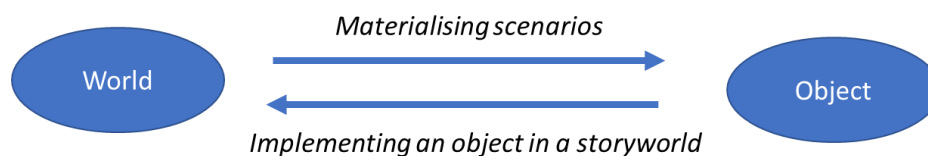
As used as a speculative design practice in critical design, design fiction critically questions the technological paradigm instead of reaffirming it. In this context, the purpose of design fiction is not to share “utopian or dystopian science fiction visions of the future, but to engender dialogue on what the future can be” (Mitrovic et al., 2015, p. 15). Dunne and Raby (2013) explain that speculative scenarios often start with a what-if question and open up spaces of discussion and debate. Fiction is used to speculate on future products, services, systems and worlds, in order to reflect on the role and impact of new technologies on everyday life. Moreover, speculative scenarios are open-ended, so that everyone is encouraged to construct their own interpretation. While (non-critical) science fiction aims to shape collective imaginary in confronting citizens to a single vision, critical designer’s role consists in facilitating alternative visions rather than defining them, using design as a catalyst rather than a source of visions (Dunne & Raby, 2013, p. 9).

Conclusion PART 3

The last chapter has demonstrated that many stories circulate around and through the prototypes generated by the practice of design fiction. Stories can emerge in the process of designing objects to contextualise their use, or they can be created to communicate a certain vision of the future. The practice of design fiction can therefore operate in two directions (see figure 6.1.): it consists of materialising scenarios (world to object) and implementing an object in a storyworld (object to world).

Figure 6.1.

Design Fiction two-way process



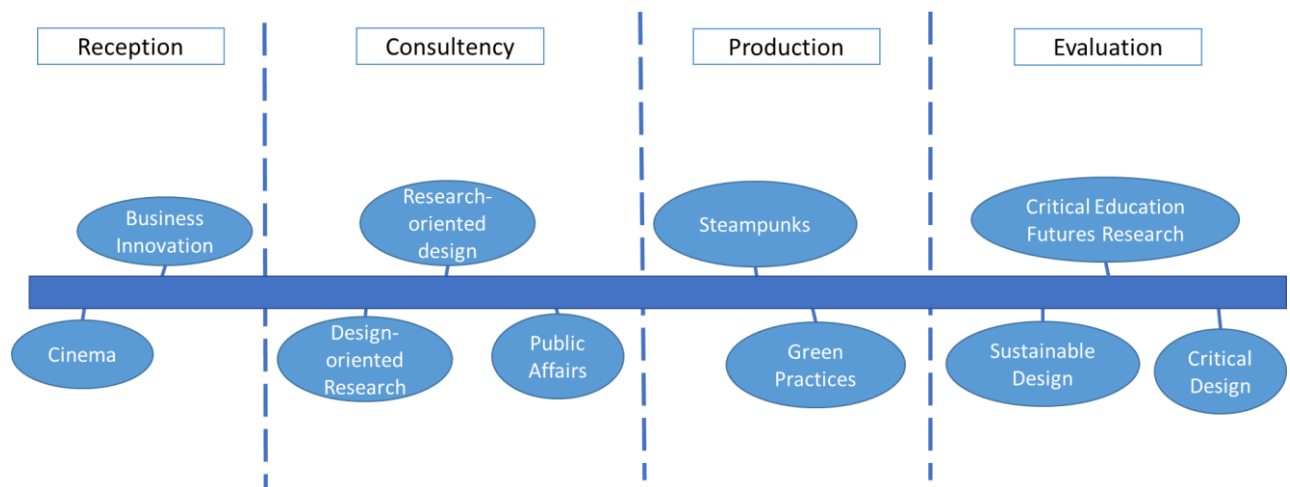
Moreover, the more design fiction is used critically, the more open the narrative seems to be and the spectator free in their interpretation. These findings suggest a variety of ways of using design fiction in classroom settings to develop critical thinking skills.

Practicing design fiction in classroom

Based on the literature review on design fiction uses, I propose first to illustrate the different role played by the user to identify the possibilities of activities in a media education context (see figure 6.2.). First, participants can be the recipient of a design fiction production, as this is the case in cinema when they watch a film, or in business innovation when they assist to the presentation of a new product. Second, participants may be consulted for their opinions and invited to share their visions of the future, as this is the case in public affairs or in the world of research. Third, participants can be their own designers and create design fiction productions, as Steampunks and green practitioners produce their own prototypes. Fourth, design fiction can be used to make aware and bring a reflection about possible futures among participants, as critical approaches to design and research suggest it.

Figure 6.2.

Role of the user in the different fields of use of design fiction



Second, I suggest crossing the roles played by the participant, here the student, with the type of production carried out, whether it is a prototype or a narrative. These different possibilities generate a set of activities that can be conducted in the classroom (see table 6.3.). I focus on the role of producer and receiver because some activities such as evaluation and discussion are included in the examples provided below.

Table 6.3.

Examples of design fiction activities in the classroom

	Reception	Production
Narrative	(1) Students as reader/viewer: they read/watch a DF book/film.	(3) Students as writers/filmmakers: they imagine a storyworld or/and write a speculative scenario
Prototype	(2) Students as fictive users: they are facing a prototype created by someone else (e.g., exhibition)	(4) Students as fictional designers: they create a prototype

- (1) A first possibility of activity is the reading/viewing of a science fiction book/film. As we have previously explored, we can find many examples of design fiction scenarios in pop culture as well as in design-oriented research and traditional design. Students

would be invited first to watch/read a pre-existing speculative scenario and second to question the way media technology is represented through it. The rubric created for the educational programme could help them question media representations as well as media technology itself.

- (2) A second possibility is to confront students with a prototype created by someone else. This activity can be carried out during a visit in a museum exhibiting critical objects or consist in discussing other students' prototypes. In both cases, students would have to question both the uses and values the objects communicate. What uses does the objects communicate to the user? What new forms of social practices do they narrate? What values and ideals are conveyed through the design of the object? Students could again use the rubric to question the objects.
- (3) A third possibility is to imagine a storyworld that will implement the media technology in the future or/and to write a speculative scenario that will problematise it. In the second case, students would be invited to envision the possible problems the media technology could engender in the imagined society. Scenarios could be aligned with traditional science fiction or critical science fiction, and they could be closed or open-ended²¹.
- (4) The fourth possibility proposes to let students design their own object, i.e., a media technology prototype. As we have previously explored, the activity of designing objects or services may request the elaboration of user scenarios. In this context, students would be invited to follow a design thinking process that would begin by speculating on the possible development of future media technology. They could then materialise their ideas in the form of objects or/and create user scenarios to illustrate their uses. Depending on the resources of the school, the materials used to make the object and the media used to create the user scenarios may vary.

²¹ The question of narrative closure is addressed in the chapter on design fiction as narrative.

PART 4: FICTIONAL AND NARRATIVE PROPERTIES OF DESIGN FICTION

My research question asks how design fiction can help build a critical inquiry method in media education and how this method can support the development of learners' critical inquiry competence. By identifying its uses, productions and possible activities in a school environment, the previous chapters have enabled us to gain a better understanding of the practice of design fiction, but it is still difficult to specify the characteristics that enable students to develop their critical thinking.

Part 4 focuses on the fictional and narrative part of design fiction to determine its contribution in a learning context. In the first chapter of this part, I conduct a literature review on the main theories of fiction and apply them to design fiction to identify the specific contributions of the practice in a learning context. In the second chapter, I present a literature review on narrative theories in narratology and cognitive science, and identify a set of narrative properties mobilised in design fiction practice that can help students define a problem.

Chapter 7: Design Fiction as Fiction

Fiction is an essential feature of design fiction. Fiction both makes it possible to distinguish it from other design practices and specifies how it works. Design fiction uses speculative design to question how things could be in a near future world. Unlike other design practices, design fiction creates objects that are fictional prototypes and only exist in the world of the diegesis. This allows designers not to limit their imagination and to consider all possibilities when designing a new piece of technology. The fictional nature of design fiction leads designers to suspend their disbelief and to immerse themselves fully in an imaginary world. In other words, they accept to play the game of fiction and to act as if the prototypes really existed to imagine and understand all their characteristics. This attitude is generally associated with fiction and characterises the practice of design fiction.

This chapter explores the fictional part of design fiction. Based on Jenny's course (2003), I first present the five major theories of fiction: fiction as untruth, fiction as conceptual construction, fiction as semantic world, fiction as literary genre, and fiction as mental state. Second, I apply these theories to design fiction in order to characterise the approaches of fiction it uses. Third, I investigate the role of (science) fiction in learning and development of critical thinking to determine how design fiction could make a similar contribution.

7.1. Theories of Fiction

The notion of fiction has multiple meanings. In his course, Laurent Jenny (2003) points out five theories of fiction. First, fiction can be equated with untruth and lies, particularly in the context of media reporting when, for example, a politician accuses a journalist of telling fictions about him or her. We now commonly use the term 'fake news' to refer to falsified information. The second approach refers to the etymological meaning of the term 'fiction' (from the Latin ' *fingere* ' which means 'to shape') and assumes that fiction is a conceptual construction to interpret reality. According to this conception, all narrative would be a fiction. The third approach relates to a theory and semantics of *possible worlds*, and attempts to characterise the structures and dimensions of fictional worlds. Fourth, fiction is used as a literary genre to distinguish it from non-fiction, which includes all *serious* genres. Finally, the fifth approach associates fiction with the particular mental state in which one receives a work of fiction and agrees to act as if it were real.

7.1.1. Fiction as Untruth

Fiction vs. truth is probably the oldest opposition known to the concept. It is based on a common sense understanding of fiction, not a scientific definition based on a specific theory. As Boillet (2020) explains, this opposition refers above all to that between the real and the unreal (pp. 32-33), that is, the factual and the fictional. In this context, fiction relates to misleading inventions, untruths, contrary to the facts. Jenny (2003) insists that this approach is not suitable for addressing a novel because the statements contained in it cannot be lying or true in the logical sense in which these terms are taken.

7.1.2. Fiction as Conceptual Construction

The notion of fiction has been used since antiquity to interpret reality. In this approach, reality would not be directly accessible to us and we would construct it from what we perceive of it. In the literary context, this approach asserts that all narratives, including those of historians, journalists and autobiographers, are fictions because they are a construction of meaning.

The argument in favour of this thesis is based on the idea that all narrative is based on a plot, that is, a chronological and causal order to a succession of events. The narrative would artificially structure these events, after having carefully selected them, in order to make them appear as a unified story with a beginning, a middle and an end (Jenny, 2003; personal translation).

However, we see the deconstructive nature of this approach, which always questions the veridical status of the texts. In his book, Boillet (2020) warns about this approach qualified as 'panfictionnalism' according to which everything is fiction (p. 168). This approach would not be the most effective because it is difficult to distinguish between fictional and non-fictional works.

7.1.3. Fiction as Semantic World

The semantic approach is based on the theory of possible worlds²² and attempts to characterise the fictional worlds. The theory of possible worlds defines the fictive universes as secondary

²² The theory of possible worlds and its link with semantics can be explained by its origins in the philosophy of language. "The theory of possible worlds was originally developed in the philosophy of language to demonstrate the formal properties of modal logic systems, which analyse the logical relations between statements formed with operators such as "It is necessary that" and "It is possible that". In a semantics of possible worlds as expressed by Saul Kripke, a linguistic expression is interpreted in relation to a possible world; for example, we will not say that (in a certain interpretation) a statement in language is simply true or false, but that it is true or false in relation to or in a possible world. For example: "the cat is green" will be true or false in relation to a

universes. According to this theory, there are an infinite number of possible worlds in fiction, all based on a primary world which is none other than the real world. As Jenny (2003) explains, Pavel (1988) called ‘salient structures’ the dual structures in which the secondary universe is ‘existentially innovative’, that is, includes beings that are not part of the first world (e.g., dragons). A fictional world can therefore be more or less distant from reality, according to its innovations as well as its impossibilities in the real world. This theory assumes that all fictional worlds are salient structures, i.e., that they articulate the primary world with a secondary world.

The semantics of fiction is concerned with the dimensions of fictional worlds. A first feature underlined by the semantic approach is that fictional worlds are incomplete. “We will never know how many children Lady Macbeth has, or whether Vautrin likes chocolate” (Jenny, 2003; personal translation). The author of a fiction invents a world only to the extent that the fiction requires it (Boillet, 2020, p. 40). Through their ‘cooperative goodwill’, the reader will give consistency to this incomplete world (in the terms of Umberto Eco, 1992) and carry out a work of ‘completion’ (in the terms of Richard Saint-Gelais, 2000) (ibid.; pp. 40-41). This makes each fictional world an actualisation of a particular fiction.

Other dimensions include consistency, verisimilitude, and believability. These three notions work together and emphasise the ‘constructive’ aspect of fiction, that is, the capability of fictional worlds to build their own rules. Verisimilitude refers to “the consistency of the rules underlying a fictional universe and the events taking place in it, according to the appreciation of a certain public” (ibid., p. 44; personal translation). This parameter does not consider the question of reference, i.e., the distance of the fictional world from the real world. What matters is the internal coherence of the fictional world. Regarding the dimension of believability, a story must be coherent in the eyes of the reader to be credible. The receiver is therefore just as important as the sender in the consistency of a story.

7.1.4. Fiction as Literary Genre

Fiction is commonly used to refer to a literary genre that is generally opposed to non-fiction. This approach considers fiction as a specific form of enunciation, with its own textual signs that distinguish it from others. Käte Hamburger (1973) is probably the most important theorist of this movement with her book *The Logic of Literature*. According to the author, “[o]f all the creative materials in the arts, however, it is language alone which is capable of

possible world, such as that of the fantasy tale or the realistic novel” (Guillemette & Cossette, 2006; personal translation).

producing the semblance of life, i.e., living, feeling, thinking, speaking, or also silent persons” (ibid., p. 59). “Fiction is thereby closely related to the representation of words, thoughts and feelings that are not imputable to the primary locutor (the author)” (Jenny, 2003; personal translation). Based on her thesis, Jenny (2003) cites three essential indicators of fiction: the use of third-person verbs describing inner processes, the free indirect style and the loss of the temporal meaning of the past. Dorrit Cohn (2000) later took up Hamburger’s theory in her book *The Distinction of Fiction* and proposed a generic definition of fiction as ‘non-referential literary narrative’.

The approach of fiction as a literacy genre places particular emphasis on the study of the temporality of the narrative. While the past is an indicator of fictionality for Hamburger (1973), Vuillaume (1990) distinguishes between two simultaneous fictions within a novel: that of the story represented and that of a narrative in which the reader lives. In this context, “the present mode markers associated with a past mode do not reflect an entry into the fictional consciousness of a character but a shift from the plan of the fiction of the story to the fiction of the actualisation of the reading of the text” (Jenny, 2003; personal translation). This thesis is comparable to Paul Ricœur’s first two mimesis, which consists of the time of the plot and the (real) time of the reader (see more detail on this theory in the Chapter 8, section 8.2.1.: Time in Narrative).

In his book *The Logical Status of Fictional Discourse*, John Searle (1982) proposes a pragmatic approach to fiction.

For Searle, as discourse, fiction has no textual nature of its own; its specificity is not linguistic, but pragmatic; fiction does not inherently refer to the status of the discursive instance at stake, but resides in the ‘illocutionary intentions of the author’ (p. 109) which are, according to Searle, openly assumed, i.e., feinting. (Chalonge, 2016, p. 4; personal translation)

Feinting refers to the situation where the author pretends to perform illocutionary acts by actually formulating sentences, as opposed to the situation where the author does mean to perform the illocutionary acts that they utter. The first situation is what Searle refers to as the art of feigning.

7.1.5. Fiction as Mental State

The final approach focuses on the recipient of literary fiction. Schaeffer (1999) uses the term ‘fictional immersion’ to describe the mental state of the recipient (and to some extent the

producer) of literary fictions. The subject is in two simultaneous worlds, that of the real environment and that of the imagined universe. This refers to the phenomenon of duplicity of Mannoni (1979) in which the subject, to enter into fiction, has to duplicate themselves. Readers are aware that they are dealing with a work of fiction but choose to believe it for the time they are consulting it. Coleridge (1817) long ago theorised this attitude to fiction with the concept of ‘the willing suspension of disbelief’ according to which the subject must agree to put aside their scepticism and to play the game as long as the fictional work requires. As opposed to the first approach to fiction as untruth, fiction is about accepting to believe a discourse as if it were true. Just like Searle’s (1982) author is feigning, the reader accepts to stop suspecting the author of the discourse is lying, because the question of whether what they say is true or not is irrelevant. In a fictional state of immersion, imagination prevails over perception and the subject becomes emotionally invested in the characters (Jenny, 2003).

Since Coleridge’s theory, many concepts have emerged to characterise the specific attitude to enter the fiction. These include Odin (2000b)’s ‘fictionalising mode’, Langlade (2008)’s ‘fictionalising activity’ and Boillet (2020)’s ‘fictional competence’. Some of these concepts are defined in opposition to others, such as Odin (2000b)’s ‘documentary mode’ or the concept of ‘distance’ which involves a process of *neutralising* fictional immersion and distancing oneself from media representations in order to be able to analyse them critically (Boillet, 2020). In the field of Games Studies, this notion of distance is generally contrasted with the phenomenon of immersion in video games (Delbouille et al., 2019) and would even be a necessary condition for the emergence of the game (Bateson, 1977); it would enable players to develop reflexivity and become aware that it is a game (Bonenfant, 2013).

The following subsections define these concepts in order to better identify the approach to fiction as a mental state. Before going through them, I want to underline that the fictional immersion applies to the receiver as well as the producer. “Both the producer and the receiver of a fiction pretend to believe that something that does not exist really exists [...]” (Boillet, 2020, p. 30; personal translation). This refers to the ‘fictional pact’ where both parties implicitly agree to play/feign without any prior consultation. This approach, which focuses on the relationship between the producer and the receiver, is described as ‘pragmatic’, as opposed to an ‘ontological’ approach which focuses on the status of the world or the people mentioned (real or fictional) (Boillet, 2020, p. 30), and which we called ‘semantic’ earlier.

7.1.5.1. *Fictionalising Mode vs. Documentary Mode*

In the study of reception, Odin (2000b) provided several guidelines for characterising the reader's fiction attitude. One of his works was to define the 'fictionalisation', or the 'fictionalising mode', which he characterised as the mode that leads the reader "to vibrate to the rhythm of the fictional events narrated"²³ (ibid., p. 59; personal translation). This mode differs from the documentary mode, which brings the viewer "to see a film in order to learn about the reality of things in the world"²⁴ (ibid.). These modes are distinguished by the reader's ability to distance themselves from the media text they are consulting.

7.1.5.2. *Fictionalising Activity of the Reader*

Langlade (2008) characterised the relationship of the reader with the fictional content of a work as the fictionalising activity (in French, '*l'activité fictionnalisante*'). Fictionalising activity refers to the "[...] movements of fictionality to which they [the reader] proceed by investing, transforming and singularising the fictional content of a work [...]"²⁵ (ibid., p. 46; personal translation). This activity helps the reader to insert their imaginary in the work as well as to assimilate the imaginary of the work. The fictionalising activity is based on mimetic consistency which "[...] refers to a representation of reality - and thus to an imaginary - that the reader elaborates through their experience of the world and the knowledge of varied cultural schemes (literary stereotypes, cultural commonplaces, recurrent motifs, etc.)"²⁶ (ibid., pp. 53-54; personal translation). In other words, mimetic consistency is built from known elements and the reader reacts with their own values. In this context, fictionalising activity is associated with one's fantasies and fears. Using the Freudian concept, Langlade (2008) showed that a reading apparatus (in French, '*un dispositif de lecture*') actually acts as a delusion. "The reader makes a phantasmatic investment in the work while affirming the 'objective' consistency of their reading"²⁷ (ibid., p. 58; personal translation). As Bayard (2008) explained, this delusion is certainly different from paranoia delusion but nevertheless implies a major distortion of reality and a total absence of doubt in the veracity of one's productions (ibid.). Fictionalising activity is thus comparable to fictional immersion where the reader is so

²³ Original quote: « *vibrer au rythme des événements fictifs racontés* ».

²⁴ Original quote: « *voir un film pour s'informer sur la réalité des choses du monde* ».

²⁵ Original quote: « [...] *les déplacements de fictionnalité auxquels il procède en investissant, transformant et singularisant le contenu fictionnel d'une œuvre* [...] ».

²⁶ Original quote: « *Cette cohérence mimétique renvoie à une représentation du réel — et donc à un imaginaire — que le lecteur élabore à travers son expérience du monde et la connaissance de schèmes culturels variés (stéréotypes littéraires, lieux communs culturels, motifs récurrents, etc.).* »

²⁷ Original quote: « *Le lecteur réalise un investissement fantasmatic dans l'œuvre tout en affirmant la cohérence «objective» de sa lecture.* »

absorbed in the fiction that it is no longer possible for them to doubt or question the work they are consulting at the time. To use Langlade's terms, I would describe the state of the reader as being delusion, or phantasm.

7.1.5.3. *Immersion vs. Distance*

In his book, Boillet (2020) discusses the process of distancing from media representations, which implies neutralising immersion or projection: the subject distances themselves from the representation that happens in front of them, but without them. He explains that « [t]he theatrical and cinematographic apparatus of the scene watched by a spectator in a darkened auditorium tends to place them both outside (of the stage) and inside (of a world where only what is played out on the stage exists)” (ibid., p. 183; personal translation). In order to distance themselves from the representation, spectators need to come out of their immersion or projection by being aware that it is a representation. According to Boillet (2020), “it is usually necessary to take some distance, take a step back and put aside personal impressions to analyse something critically and objectively” (p. 182; personal translation). In this context, the reader of fiction mobilises a series of competences that help them distinguish between the real and the fiction:

1. **Encyclopaedic competences:** “knowledge derived from direct sensory contact with the real world” (ibid., p. 201; personal translation).
2. **Semiotic competence,** “which consists of knowing signs and manipulating them” (ibid., p. 201; personal translation).
3. **Fictional competence:** “[it] involves acting as ‘if it were true’²⁸, but it can lead to suspending the question of disentangling what is true and false in the real world: we are then only interested in the fiction, and we put the real world completely into brackets” (ibid., p. 205; personal translation).
4. **Referential competence:** “being able to refer to signs belonging to distinct worlds: either to the real world or to an imaginary world. This referential competence is based on all our knowledge, but also more precisely on our knowledge of the functioning of various media: referential competence and media education are thus closely linked²⁹” (ibid., p. 204; personal translation).

²⁸ The expression ‘acting as if it were true’ is commonly used in the scientific literature of fiction and refers to the mental state of the producer or the receiver of a work of fiction who accepts to believe the events narrated, even though they are not real, at the time of creation or consultation of the work.

²⁹ The referential competence is based on the distinction between fiction and non-fiction. According to Boillet (2020), it encourages the development of media literacy competences that enable people to understand the media environment and to distinguish between different forms of media in order to analyse them critically.

In the field of Game Studies, the question of distance is also much debated and opposed to the concept of immersion. The player is so absorbed in the game (immersion by ‘absorption’) that they are losing their self-awareness (Delbouille et al., 2019). Like any other fictional attitude, the player pretends that what they are doing is ‘something else’ (Genvo, 2011). This ludic attitude is characterised as a ‘metaphoric process’ of the ‘imaginary in act’ (Henriot, 1989). The philosopher Henriot argues that as soon as one becomes aware that there is a game, the player enters into a posture of surrealism (Bonenfant, 2013). According to Henriot, cultivating this distance between the player and the game is necessary but constitutes an ethical ideal. Playing to the point of forgetting that we are playing would lead us into a position of alienation. Distance would thus allow us to be reflective; this reflexivity would even be a necessary condition for the emergence of the game (Bateson, 1977).

7.2. Approaches of Fiction in Design Fiction Practice

Based on Jenny’s course (2003), I can highlight three approaches of fiction in design fiction practice. First, fiction refers to the fictional worlds within which designers imagine diegetic prototypes and develop speculative scenarios. Second, fiction (and science fiction) is a literary genre that makes it possible to situate design fiction narratives in literature. Third, fiction immerses participants in a fictional world, as design fiction asks them to suspend their disbelief about change.

7.2.1. Design Fiction as the Exploration of a Near Future World

By definition, design fiction is a design practice that speculates how things could be in a near future world. Grounded in the understandings of the present, this practice produces possible scenarios that provide insights into our contemporary technology, its impact on society and the role of design in this context (Mitrovic et al., 2015). The question of the reference constitutes a key parameter of design fiction, as this practice imagine worlds that are not far away from reality. “So then design fiction, borrowing from science fiction, is the embodiment of materialized reflections on design today, as well as projections and anticipations of the designed futures” (Bleecker, 2009, p. 25). This practice establishes a link between the present and the future by creating speculative scenarios that reflect society’s current concerns.

Design fiction is characterised by other dimensions similar to those of fictional worlds, such as consistency, believability and verisimilitude. As a reminder, diegetic prototypes are fictional artefacts that does not belong to the *real* world. They are part of a diegetic world, which, as any other fictional worlds, must follow rules of consistency. What is quite particular in the

context of design fiction, however, is that diegetic prototypes are self-consistent technologies that must adhere to the rules of the diegetic world as well as to their own internal logic and the constraints of real-world technologies (Kirby, 2010). Diegetic prototypes are indeed not far from the current technological developments and must be consistent within both worlds to allow the immersion of the receiver into the (design) fiction. It is this consistency (or rather ‘these consistencies’) that will ensure the believability of the media representation to the audience and that will make it not only plausible but also close to a certain authenticity in relation to current technological developments.

In addition to these dimensions, “the logics of the story are what give a design fiction its power, and I would argue that in the absence of those logics, a design fiction ceases to operate” (Tanenbaum, 2014, p. 22). While Norman (2004) opposes stories and logic in his discussion of *Design as communication*, diegetic prototypes must be both narrative and logical to allow the immersion into the fiction.

7.2.2. Design Fiction as a Mix of Design, Science Fact and Science Fiction

Design fiction is first and foremost a (speculative) design practice. Its link with literary genres is due to the fact that it uses narrative structures to imagine the future development of technologies and their societal implications. Bleecker (2009) defines design fiction as a conflation of design, science fact, and science fiction. “It is an amalgamation of practices that together bends the expectations as to what each does on its own and ties them together into something new” (ibid., p. 6). It is difficult to oppose design fiction to non-fiction because, as we discussed in the previous section, it is a practice fundamentally anchored in the present, which must meet the requirements of both the primary and secondary worlds. However, we can highlight its links with the closest literary genre, that is, science fiction.

Science fiction is a modern literary and cinematographic genre describing situations and events happening in a more or less near future. Unlike other contemporary speculative genres such as fantasy and horror which do not attempt at scientific and technological plausibility, science fiction uses contemporary data on possible developments in science and technology to imagine the impact of actual or imagined science upon society or individuals. Science fiction is therefore based on assumptions about time, on what could have been the present, or even the past (uchrony), or what could have been the future (anticipation), for example after a major disaster. Scenarios take place on earth (utopia, dystopia) and in space (spacecraft, planets).

In a similar way, design fiction draws on the present time to imagine the possible development in science and technology. Design fiction is even more specifically close to hard science fiction³⁰ because the imagined technology is not far from current scientific development: there is often a continuity between the two worlds, between the current world and the diegetic world. Kirby (2010) demonstrated that diegetic prototypes in popular films contribute to the technological development of the real world and help illustrate the potential applications of a piece of technology in the real world for the audience (p. 51). Mitrovic et al. (2015) also stated that re-thinking the future asks to think about current technology and social relationships. Diegetic prototypes offer therefore plausible technologies in a near future world.

7.2.3. Design Fiction as the Suspension of Disbelief about Change

Design fiction is defined for the first time by science-fiction author Bruce Sterling in 2009, as “the deliberate use of diegetic prototypes to suspend disbelief about change” (Bosch & Fritcke, 2012). This definition is close to Coleridge’s concept of willing suspension of disbelief (1817) that characterises the attitude proper to enter into the fiction. ‘Suspending disbelief’ here means that design fiction has an ethic. In an interview, Sterling explained this part of the definition:

Design fictions are fakes of a theatrical sort, but they’re not wicked frauds or hoaxes intended to rob or fool people. A design fiction is a creative act that puts the viewer into a different conceptual space — for a while. Then it lets him go. Design fiction has an audience, not victims (Nast, 2013).

Design fiction does not pretend to mislead its audience but wants to make it aware of possible changes. As with fiction, it is possible to imagine the creation of a fictional pact between the producer and the receiver of a design fiction work. In this way, each one agrees to ‘play the game’ at the time of its consultation.

³⁰ Hard science fiction, or ‘hard SF’, is a sub-genre of science fiction that emphasises scientific accuracy and the internal coherence of the fictional universe, based on well-established and speculative scientific principles. The adjective ‘hard’ refers to the ‘hard’ sciences, in contrast to soft sciences, which include humanities and social sciences. (sensagent, n.d.)

7.2.3.1. *The Cognitive Estrangement*

Design fiction, due to its proximity to science fiction, can be first characterised by an attitude of cognitive estrangement. Theorised by Suvin (1972), this attitude distinguishes science fiction from other forms of fiction such as fantasy.

For Suvin, the key to cognitive estrangement is the presence in a story or novel of what he calls a ‘novum’, that is a device or machine that is absolutely new and whose presence compels us to imagine a different way of conceiving our world. (Oxford Reference, n.d.)

This ‘novum’ may refer to advanced technologies, alternative societies or alien creatures that expose the subject to strange ideas or situations. The particularity of science fiction is that it makes familiar these new elements presented in the work of fiction by encouraging an attitude of cognitive estrangement in the subject. By confronting ourselves with ideas and situations that challenge our usual expectations, we are forced to reassess our own beliefs, norms, and perceptions. This can help us to question what we take for granted and develop a deeper understanding of the diversity of possibilities that exist.

Drawing on the scientific literature explored on the approach to fiction as a mental state (see section 7.1.5.3.: Immersion vs. Distance), we can describe the attitude of cognitive estrangement as both immersion and distance in relation to the works of science fiction. By making familiar strange elements, they bring readers into the fiction while at the same time distancing them from it. This is what makes science fiction, and indeed design fiction, very interesting in a media education context, since one of its main aims is to distance ourselves from the media texts we are examining.

7.2.3.2. *The Speculation Attitude*

In addition to the attitude of cognitive estrangement, design fiction encourages an attitude that can be described as the ‘speculation attitude’, which consists in speculating on possible future worlds. The speculation attitude goes a step further than the attitude of cognitive estrangement when contemplating future scenarios: it does not limit itself to making strange elements familiar in fiction but poses hypotheses about the future.

This feature comes from the close proximity of design fiction to speculative design, which produces possible – and not just plausible or probable – scenarios grounded in our understanding of the present (Mitrovic et al., 2015). Traditional design generally operates in

the domain of the probable and imagines scenarios such as financial crashes, ecological crises, etc., whereas design fiction, through its connection with speculative design, allows us to go further into the imaginary of the future and open up discussion on various possible futures.

The speculation attitude encourages the suspension of disbelief, prompting participants to consider alternative realities, while questioning current norms and societal values. Through speculative storytelling, fictitious artifacts, and immersive exploration, the speculation attitude seeks to shed light on ethical dilemmas, technological implications, and cultural dynamics that could shape our future.

The speculation attitude is present from the creation of the diegetic world, where it is even a condition for the designer to give free rein to their imagination. The fictional nature of design fiction leads designers to suspend their disbelief and to immerse themselves fully in an imaginary world. The speculation attitude therefore concerns both the producer and the receiver of a design fiction production.

7.3. Role of (Science) Fiction in Learning

As we have seen in the previous sections, fiction has many facets. In a learning context, this can be beneficial to the development of equally diverse knowledge and skills. In the case of science fiction texts, and alongside with design fiction productions, their proximity with the real world should lead students to adopt an attitude of estrangement that would help them develop their questioning stance. Critical thinking constitutes an essential competence in media literacy and helps participants to interpret any media text. This section presents the role of fiction in learning contexts and the added value of science fiction in this respect.

7.3.1. Contributions of Fiction to Learning

Cavaillé (2016) has worked on the contributions of fiction in literature in general and in children's literature in particular. She highlighted the contribution of fiction as objects of knowledge (cognitive contribution) as well as modes of intelligibility and learning dispositions (cognitive and educational contributions). The following paragraphs describe the two types of contributions, which I accompanied by a few more examples from the scientific literature.

7.3.1.1. Fiction Works as Objects of Knowledge

As fiction is based on the real world, "[...] any fictional story is in one way or another 'referential', i.e., that any reader will extract knowledge from it, in all cases objects and motives

of knowledge, reflection, comparison, etc.” (Cavaillé, 2016, p. 256; personal translation). Works of fiction can therefore be used both as teaching materials for certain subjects as well as a means of motivating students in a specific area.

In some learning contexts, fiction can be very useful for accessing certain areas of knowledge. In her paper, Cavaillé (2016) used fiction works to teach geography. Fiction, as a literary genre, offers a subjective dimension to reality by offering several points of view, such as “that of the author, those of the various characters, and those of the hero, who evolves, questions themselves, makes decisions, and so on” (ibid., p. 259; personal translation). As she explained, these particular points of view on reality allow learners to avoid the potential effect of the positivist attitude. “This positivist attitude consists essentially in an absence of reflection, of reflectivity, or even of simple awareness of the excrescences and risks that inductivism, objectivism or factualism, etc. can represent” (ibid., p. 249; personal translation). In this context, fiction helped the students to construct a curiosity, a perspective and a questioning concerning spatiality and geography.

In a history class, fictional films were similarly mobilised to help students distance themselves from what they were watching on television. History teachers usually propose to their class documentaries that present “[...] history as a revealed truth, not as a discourse constructed by historians or moralists” (Matscanides & Schussler, 2011, p. 4; personal translation). The study of Matscanides & Schussler (2011) focused on the development of students’ critical thinking competence, centred in this framework on the ability to refer to historical sources and to the context of the films’ production, particularly in terms of the filmmakers’ intentions. The activity provided students with a grid for reading the ‘facts’, enabling them to better understand any historical film, whether fiction or documentary.

7.3.1.2. *Fiction as a Mode of Knowledge*

As Cavaillé (2016) explained, “[...] fiction and narrative allow us to represent and think about existence, everyday experiences, to think about ourselves, by providing an organising cognitive function” (p. 9; personal translation). They provide coherence to our experience, and in this respect, literary fiction offers an integrative and comprehensive vision of events and situations, as well as of characters and their experiences. This argument is tightly connected to cognitive narratology theories and, in particular, Herman’s (2002) conception of narrative as a resource for structuring and comprehending humans’ experience to create meaning (see more detail on cognitive narratology theories in the Chapter 8, section 8.3.2.: Narrative in Cognitive Science).

Literary fiction constitutes a particular mode of knowledge in that it strongly involves the reader by mobilising their emotions, affects and feelings, and deep values (Cavaillé, 2016). It is a tool of mediation between the individual and their sensitivity, their inclinations, their tastes, their judgments. Mediation operates all the better when reading experiences are shared and discussed. (Cavaillé, 2016, p. 258; personal translation)

In a context of fictionalising activity, Langlade (2008) proposed to construct a map of the affects generated by the work of fiction in order to reveal divergences and overlaps between the students' reading apparatus. He asked the students to situate themselves according to different affects: pleasure/displeasure, seduction/repulsion, adhesion/rejection, etc. and then to discuss them according to different affiliations (such as genres, origin, etc.). This example shows that:

[...] the consideration of affects makes it possible to incorporate them into collective imaginaries, whether these are shared by a more or less large cultural community or whether they refer to fundamental data of the human psyche, such as they appear in particular in mythological stereotypes and cultural commonplaces. (Langlade, 2008, p. 63; personal translation).

In other words, fictionalising activity generated both an enhanced sense of one's own identity and a liberating sense of community. In this way, fiction, and narrative, constitute places of mediation for the constitution of one's identity and the formation of one's experience.

7.3.2. Contributions of Science Fiction to Learning

Science fiction is distinguished from other works of fiction by its consistency with reality. As Laz (1996) explained, "[Science fiction] is not 'real' in the sense of being actual, concrete, and verifiable, but it is 'true' because it corresponds or conforms to that which is real, actual, and verifiable" (pp. 54-55). In a learning context, science fiction will therefore make it easier to get students to be interested in 'real' science but also to confront them with broader issues facing society. The following paragraphs present examples of the use of science fiction in various learning contexts and discuss its added value as the literature of estrangement.

7.3.2.1. Science Fiction in Learning and Teaching Science

As fictions, science fiction works can be used as objects of knowledge as well as places for constructing and sharing knowledge and experiences. For example, Dubeck et al. (2006)

propose in their book to use scenes from popular science fiction films to introduce students to basic physics and biology. The abstract of the book describes that “[T]hey include material about the greenhouse effect, nuclear power and nuclear terrorism, and the effects of an impact from a comet or asteroid” (Dubeck et al., 2006).

Cavanaugh and Cavanaugh (1996) pointed out the role of science fiction for motivating students to learn science. They explained that hands-on direct experience is not always possible or practical. Using science fiction at school “[...] allows students to experience a wide variety of science topics [...]” as well as “[...] to remember information they have been involved with in an entertaining or enjoyable way” (p. 2). In other words, science fiction can make learning more interesting, while increase students’ memory and understanding about science (Vrasidas et al., 2015).

Cavanaugh and Cavanaugh (1996) also highlighted some benefits of science fiction in interdisciplinary teaching and learning. They give the following example:

Students could read a book on which a film is based, or develop their own scripts, contrast societies and customs from the movie to present day, create scale models or story board representations of scenes to learn about film production and special effects, and analyze any mathematical concepts. (ibid., p. 2)

This last example highlights that the use of science fiction in the classroom would make even more sense in a project-based pedagogy where media texts would be subject to interpretation in parallel to what they could teach us in terms of content.

7.3.2.2. *Science Fiction to Teach Sociology*

Laz (1996) used science fiction to teach sociology. Due to its proximity with reality, science fiction can help students see social facts from another perspective. She argues that:

Used effectively, SF encourages and enables students to think about real and imagined social life, their own values and experiences, the ways in which we collectively shape social arrangements, the influences of society on individuals, and the possibilities for and constraints on altering social arrangements. SF does not merely entertain or provide variety; it develops analytic skills. (ibid., p. 55)

She highlighted three properties of science fiction that can be used to teach sociology.

First, science fiction, as the literature of cognitive estrangement, creates fictional worlds that are both familiar and strange to readers. The SF writer built a whole strange world and must

make it convincing to the eyes of the reader to let them enter the story. In the context of learning, this task of ‘estranging’ students is shared with sociology: “[i]t does so by presenting worlds, actions, and people which are simultaneously familiar and unfamiliar and in which, at least superficially, students themselves are not invested” (ibid., p. 56). Through the SF’s property of cognitive estrangement, SF works thus help students develop their sceptical, questioning stance.

Second, sociology is future-oriented, and appears more as a form of prediction, while science fiction is descriptive and speculative (Laz, 1996).

Le Guin describes science fiction as "a thought experiment. Let’s say (says Mary Shelley) that a young doctor creates a human being in his laboratory; let’s say (says Philip K. Dick) that the Allies lost the second world war; let’s say this or that is such and so, and see what happens..." (Le Guin 1976). (ibid., p. 56)

Science fiction authors create unusual thought experiments that lead students to question the ‘reality’ represented in the world invented. Through the features of science fiction to describe and speculate, SF works thus help students to develop critical and creative thinking.

Third, science fiction can be used to make students question their methods, concepts, and theories in sociology. For example,

[...] SF translates abstractions—concepts or theories—into particular people and actions, and it is the comprehensible, plausible actions and reactions of these particular people, the characters in the story, that engage and hold our interest. When students step back from the story and ‘see’ examples in fiction, in effect they are translating particulars back to abstractions. They are developing and using concepts, models, and hypotheses. (Laz, 1996, p. 57)

This last way of using science fiction makes it possible to bring to life important sociological concepts and can help develop analytical thinking.

7.4. Synthesis Chapter 7: Contributions of Design Fiction to Learning

The previous sections highlighted a number of contributions of fiction and science fiction in a learning context. I propose first to summarise these contributions and then to see how design fiction, through its fictional properties, could make a similar contribution in a learning environment, and in particular, in a media education context.

7.4.1. Summary of Contributions of Fiction and SF to Learning

Fiction, in its enunciative form (see section: Fiction as Literary Genre), refers to a type of discourse which, like any representation of reality, can be deconstructed. In this sense, fiction constitutes an object of knowledge that can be used as a means of deconstructing facts. Cavaillé (2016) explained that it allows one to counter a positivist attitude and not take information for granted. Fiction helps to stimulate doubt and curiosity, and challenges media representations. In this way, it contributes to the development of critical thinking.

The semantic approach to fiction has shown that the worlds of fiction are based on a primary world, which is none other than the real world (see section: Fiction as Semantic World). In science fiction, the proximity with the real world is particularly apparent because the scenarios are based on assumptions about current developments in science and technology (see section: Design Fiction as a Mix of Design, Science Fact and Science Fiction). Due to its proximity to the real world, science fiction is a great way to learn about 'real' sciences and related issues. It is also a motivating factor for students who cannot always carry out experiments in class.

Finally, fiction encourages the reader's fictional immersion by suspending disbelief about change (see section: Fiction as Mental State). In the context of science fiction, the reader is encouraged to adopt an attitude of estrangement that makes the fictional world both familiar and strange (see section: Design Fiction as the Suspension of Disbelief about Change). This attitude, coupled with that of speculation, helps them to adopt an alternative perspective on the events that develop their sceptical and questioning stance. Furthermore, in its narrative form, fiction enables us to organise our experiences and situate them in relation to those of others. Works of fiction can therefore act both as mediators in the construction of identity and as vehicles for collective imaginaries.

7.4.2. Contributions of Design Fiction to Media Education

To conclude, I can highlight similar contributions of design fiction in a learning context and, in particular, in a media education context. First, thanks to the attitude of cognitive estrangement, design fiction could encourage the reader to immerse themselves in the fiction while at the same time distancing themselves from it. This particular attitude would lead them to reflect on the issues raised by the media text content while situating it in its more global context. Furthermore, design fiction, borrowing from science fiction, could enable us to address current societal issues. It would be both a means of learning about the development of contemporary technologies and a mirror of our current concerns and experiences. In a

learning context, design fiction could therefore contribute to the development of students' knowledge of new technologies, as well as their critical questioning of digital and media issues through the adoption of an alternative point of view on the contemporary media ecology. The adoption of this alternative point of view could be encouraged by the speculation attitude of design fiction that leads participants to suspend their disbelief about change and to speculate about possible futures.

Chapter 8: Design Fiction as Narrative

This chapter explores narratology and cognitive science to identify the narrative properties of design fiction. It traces back the study of narrative in both domains, from early narrative schemas to recent definitions, and reflects on the role of the narrative as a support for cognitive operations such as problem solving. The objective is to determine the role of narrative in defining a problem to explore the contribution of design fiction (in its narrative form) for developing a critical inquiry method.

8.1. Classical Approaches to Narratology

Narratology, in its narrowest and most accurate definition, is the study of narrative in all its forms. The first approaches to narratology are grounded in literary theory, which explains narratology's primary interest in narratives in the form of written texts and organised by an author. Classical approaches to narratology are concerned with the sequential analysis of the narrative. They focus on the essence of narrative, namely the articulation of action and its consequent logic. They are based on *Morphology of the Folktale* by Vladimir Propp (1928) and the work of his successors such as Greimas' actantial model or Bremond's binary logic. These works are at the origin of all the studies of narrative semiotics developed by the structural linguistic school (Lits & Desterbecq, 2017, p. 62).

8.1.1. Classical Definitions of Narrative

Propp, the initiator of the movement, focused on the notion of 'function', described as "the action of a character defined from the point of view of its meaning in the course of the plot" (Fayol, 1985, p. 12; personal translation). He identified 31 recurrent functions from a corpus of more than a hundred Russian traditional tales. They can be grouped into three main sequences, as follows: a pre-sequence preparing the hero for their quest, a first sequence with a series of tests to be overcome and a second sequence in which the hero resolves the initial problem. These sequences reflect the main structure common to all narrative and led to a consensus among narratologist scholars about the definition of narrative as consisting of a beginning, a succession of events and an ending.

Among the most common definitions of narrative in classical approaches to narratology, we find those of the following authors. Gerald Prince (1984) defined narrative as "the representation of one or more real or fictive events communicated by one, two or several

narrators to one, two or several narratees”. Porter Abbott (2008) established the ‘bare minimum’ for any narrative structure and defined narrative similarly to Prince as the representation of an event or a series of events. Jean-Michel Adam (1992) presented the most elaborate sequence for any narrative (see figure 8.1.) by including the dimension of time. According to him, any story includes a beginning (initial situation) and an end (final situation); an element disrupts the initial situation (node) and then follows a series of actions (evaluation); denouement enables us to go back to the initial situation.

Figure 8.1.

Adam’s elaborate sequence for any narrative (1992)



Moreover, Adam (1992) distinguished the story from the narrative discourse: while the story is defined as an event or a series of events, the narrative discourse refers to the way the story is conveyed. Finally, some authors outlined a certain type of logical relation between sequences of events and introduced the notion of ‘causality’ as “the transition from one state to another state, caused or experienced by actors” (Bal, 2017).

8.1.2. First Structuralist Models

Structuralism is an intellectual movement that dominated social sciences in the 1950-60’s, especially in France. Structuralist scholars were interested in the ‘deep’ structures underlying any cultural phenomenon and analysed the way fundamental elements fit together to create an overarching structure. Regarding narrative, they were concerned about finding a common structure to all narratives, that is, the minimal constitutive elements for defining narrative organisation. They drew inspiration from grammar in linguistics and developed a series of models describing narrative structures. Propp’s works on the functions of fairy tales were at the origin of this movement and inspired Greimas and Bremond’s narrative models.

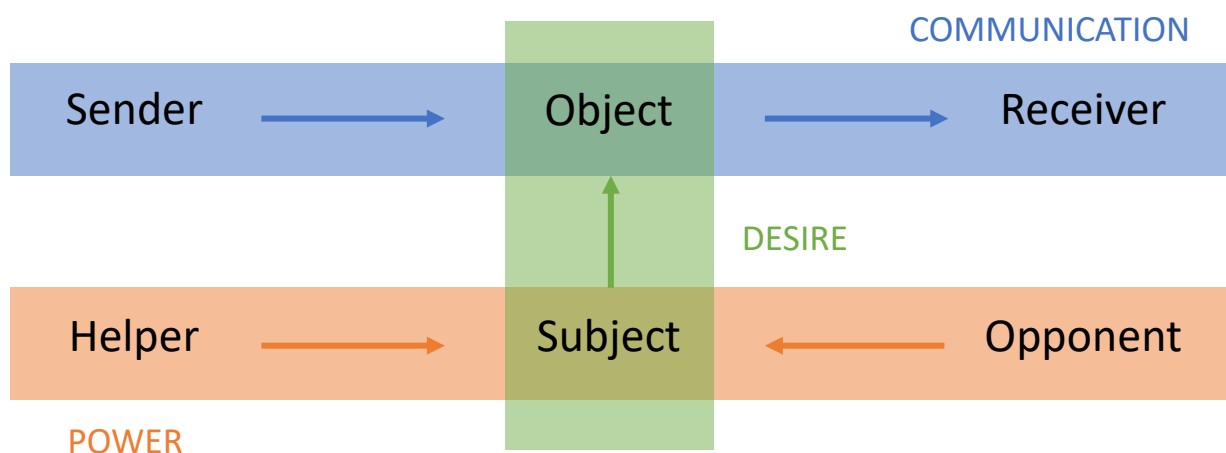
8.1.2.1. Greimas: *The Actantial Model and The Narrative Schema*

Greimas developed in 1966 the actantial model, a tool used to analyse the action that takes place in a narrative (see figure 8.2.). The model divides any action into six facets, called actants: sender, object, receiver, helper, subject and opponent. Actants are not simply characters, but refer to structural elements upon which the narrative revolves. The hero, or the subject, has a quest, the object. Helpers refer to positive characters, events or objects that help the hero in their quest, while opponents refer to negative characters, events or objects that try to stop their quest. The quest is given by a sender for the benefit of a receiver. Three axes connect the actants to each other. First, the desire axis includes the subject and the object. Second, the sender and the receiver are part of the axis of communication. Third, helpers and opponents are on the power axis, positive power for the former and negative power for the latter.

Moreover, the model includes three sequences and three tests common to all narratives. These sequences are situated on a fourth axis, the temporal axis. In the initial sequence, the order is disrupted by an element. This disruption creates the need for the quest. The topical sequence includes the qualifying test, the main test and the glorifying test. In the qualifying test, the subject proves their competence to complete the quest. The main test results in the conjunction of subject and object. The glorifying test refers to the subject's accomplishment (quest completion). The final sequence consists in restoring the order.

Figure 8.2.

The actantial model with its six actants based on Greimas (1966)



8.1.2.2. Bremond: *The Logic of Narrative Possibilities*

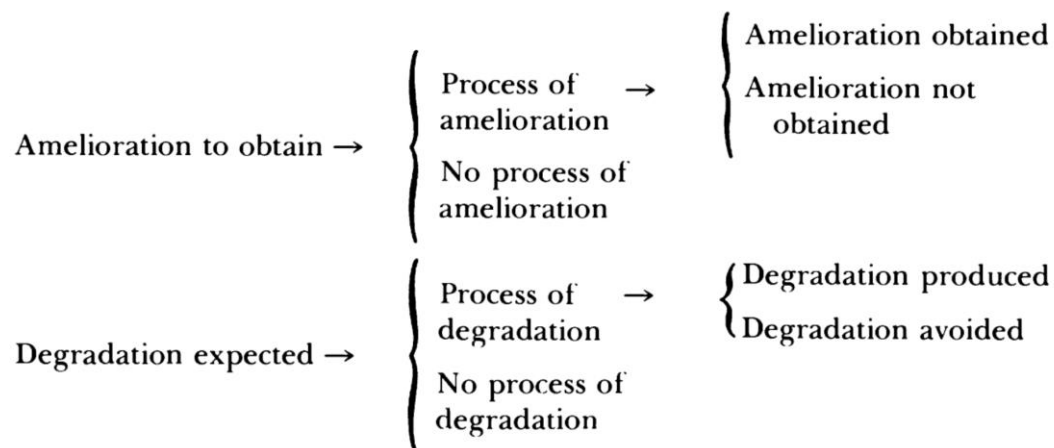
Bremond kept 'function' as the basic unit of the story. Function is applied, as with Propp, to actions and events which, when grouped in sequences, generate the narrative (Bremond, 1966). The grouping of three functions generates the elementary sequence. These functions are obligatory phases of any process:

[...] a function which opens the process in the form of an act to be carried out or of an event which is foreseen; a function which achieves this virtuality in the form of an actual act or event; and a function which closes the process in the form of an attained result. (Bremond & Cancalon, 1980, p. 387)

Elementary sequences can take two directions: amelioration versus degradation (see figure 8.3.). A narrative is a combination of several elementary sequences (put end to end, enclaved, coupled...).

Figure 8.3.

The logic of narrative possibilities (Bremond & Cancalon, 1980)



8.2. Pragmatic Approach to Narratology

As seen above, structuralist scholars were mostly concerned about finding a common structure to all narratives and developed models and definitions attempting to account for this structure. It will be necessary to wait until the late 1980s to observe a global shift in social sciences which considers the reader. This shift is marked by the transition from structuralism

to post-structuralism. Post-structuralism rejects structure as a self-sufficient concept to explain cultural phenomena and reintroduces ideas of complexity and uncertainty. In text analysis, instead of the author, the reader becomes the main object of interest. This consideration of the recipient is part of a pragmatic approach to narrative which allows taking the relational aspects of the narrative such as time, context, narrator, and characters into account.

8.2.1. Time in Narrative: Paul Ricœur's Triple Mimesis

Marie-Laure Ryan has worked on the definition of narrative by tracing the genealogy of the concept. In one chapter of a book, she explains that Ricœur looks deeper than 'events' and takes "temporality to be that structure of existence that reaches language in narrativity, and narrativity to be the language structure that has temporality as its ultimate reference" (Ryan, 2007, p. 23). Ricœur (1990) criticised structuralist scholars for having neglected time in narrative. Through three volumes, he stated that narrative is an imitation of time, a 'mimesis', and proposed the model of the threefold mimesis. The first mimesis, or prefiguration, is the pre-understanding of the field of action: it is the time of the present, the time of the experience. The second mimesis is the configuration, or 'the emplotment', which refers to the act of mediation: it is the time of the narrative. The third mimesis is the refiguration, the reception of the narrative, which intersects the world of the text and the world of the reader.

8.2.2. Narrative in Context: Gérard Genette's Typology

Genette (1972) is the first scholar taking the narrative context into account. He introduced the concept of 'narration', defined as the situation in which the narrative act takes place, as well as notions of narrative time, narrative instance and narrative mood.

First, narrative time relates to order, duration and frequency. Order refers to the relation between the order of events in the story and the order in the narrative, duration to the relation between the duration of events in the story and the duration in the narrative, and frequency to the relation between the number of times an event occurs in the story and the number of times it is told in the narrative.

Second, narrative instance includes voice, time of narration and functions of the narrator. Voice refers to the narrator of the story and questions the presence of the narrator in the story being told. Time of narration refers to the time of the telling occurs (events occurred in the

past, in the future, in the present, etc.). The functions of the narrator draw inspiration from Jakobson's model of communication and include: narrative function (telling the story), directing function (commenting on the organisation of the narrative), communication function (addressing the narratee), the testimonial function (establishing the narrator's relationship to the story) and ideological function (commenting on the story).

Finally, narrative mood refers to the focalisation and the ocularisation, respectively the point of view through which the story is perceived and the point of view through which it is shot (for movies). The latter are more developed in the next section.

8.2.3. The Point of View of The Characters: Focalisation, Ocularisation, Centration and Decentration

Focalisation and ocularisation concepts specify the relationship of the characters with the reader. First, focalisation refers to the reader's knowledge regarding the character's knowledge. There are three types of focalisation: a "zero" focalisation, an external focalisation, and an internal focalisation (divided into two subtypes). A zero focalisation implies that the reader knows more than the character and is aware of other events happening in the story. In contrast, an external focalisation implies that the reader knows less than the character. An internal focalisation implies that the reader knows as much as the character and does not have any additional information. An internal focalisation is considered as 'fixed' when the reader has the same knowledge as the character and as 'multiple' when the reader knows multiple perspectives.

Second, ocularisation refers to the camera's shooting angle. There are two types of ocularisation: an internal ocularisation (divided into two subtypes) and a zero or external ocularisation. An internal ocularisation implies that the spectator sees events as the character experiences them. An internal ocularisation is considered as 'primary' when the spectator sees through the eyes of the character (i.e., through the camera) and as 'secondary' when the camera is positioned behind the character's back. A zero or external ocularisation implies that events happen on their own, in a non-subjective way.

Based on the work of Jean Piaget on the foundations of the individual's social and cognitive development, Meunier and Peraya (2015) borrowed these last concepts and applied them in the field of communication. As researchers specialised in pragmatic semiotics and media analysis, they highlighted two effects characterising the link between the receiver and the

characters: centration and decentration. Centration refers to the notion of ‘egocentrism’ which characterises the point of view of the reader when they see events as they are experienced by the main character. Decentration refers to the reader’s ability to go beyond their own point of view and recognise that of others; these effects manifest themselves in narratives that tell multiple quests and stories as they are experienced by several characters. The video game “The Last of Us – Part II” is a good illustration of the decentration effect: the game does not give much freedom to the player but gives them several perspectives by making them play the role of the presumed adjuvant and opponent. This leads them to question the hero’s intentions, which are as worthy as those of the enemy.

8.2.4. Reading as Textual Cooperation: Eco’s Model Reader

Eco (1984) was interested in the role of the reader in the interpretation of the text. He developed the theory of the ‘model reader’ which recognises the reader as an active participant in the construction of meaning in a text. According to him, the model reader is the one who succeeds in understanding and making the interpretations desired by the writer. The model reader is an abstract figure which participates as much as the author in the narration. Eco conducted a project called “*Lector in fabula*” demonstrating the importance of the reader’s cooperation in the understanding of a text. Eco emphasised that the text itself provides cues, gaps, and ambiguities that require the reader’s intervention to make a coherent sense of it. The model reader fills these gaps by constructing interpretive hypotheses that are then verified or refuted as the reading progresses. Thus, the act of reading becomes a dialogue between the text and the reader, where the reader fills in the blanks and develops meanings based on their own intellectual and emotional background.

8.2.5. Relationship Between the Reader and The Character: Jouve’s Reading Engagement

Jouve (1992) conceived reading as a form of game-playing, in a psychoanalytic approach (inspired by the work of Michel Picard³¹). He explored the relation between the reader and the character in fiction and highlighted three forms of ‘reading engagement’. The first one refers to an intellectually aware reader, not caught up in the narrative, trying to figure out the character’s role in the narrative strategy (*‘lectantjouant’*) or in the global meaning of the narrative (*‘lectantinterprétant’*). The second refers to a reader wilfully suspending disbelief in

³¹ The reader can refer in particular to Picard’s 1986 book “*La Lecture comme jeu*” (Reading as a game), which examines the characteristics of games to describe reading.

order to enter the fictional illusion and identifying with characters as if they were real people. The third refers to an instinctive, voyeuristic reader using the character as a pretext to experience.

8.3. Contribution of Cognitive Science to Narratology

Cognitive science has its origins in cybernetics whose primary intention was to create a science of mind, based on logic. The cyberneticians Warren Mc Culloch and Walter Pitts published in 1943 *A logical calculus of the ideas immanent in nervous activity*. In this paper, they demonstrated how the connection between basic brain cells (called neurons) can produce complex patterns, i.e., how neurons networks can produce logical computation. As explained by Bruner (1990), their ideas inspired the 1950s cognitive revolution which aimed to replace behaviourism³² to bring ‘mind’ back into the human sciences. Based mainly on the metaphor of the mind working as a computer, this movement highlighted the role of cognitive activity in the construction of thought and the explanation of behaviour. The next paragraphs present the different cognitive science paradigms, from classical cognitivist approaches to emergent paradigms.

8.3.1. Paradigms in Cognitive Science

8.3.1.1. *Cognitivist Paradigm*

Classical cognitivist approaches try to understand the cognitive activity in terms of symbols. They refer to the cognitivist paradigm or the ‘symbolic’ paradigm of cognitive science. This paradigm uses the metaphor of the mind as a computer to explain how human intelligence works. “For cognitivist systems, cognition is representational in a particular sense: it entails — requires — the manipulation of explicit symbols: localized abstract encapsulations of information that denote the state of the world external to the cognitive agent” (Vernon, 2014, p. 22). Cognitivist scientists focus on information perception, its storage and retrieval, as well as its internal and external representation (Margolin, 2003, p. 271). The cognitive paradigm adopts an objectivist perspective considering the outside world as independent of the mind.

³² “In behaviourism, the organism is seen as ‘responding’ to conditions (stimuli) set by the outer environment and by inner biological processes. [...] Classical behaviourism was dedicated to proving that phenomena formerly believed to require introspective study (such as thinking, imagery, emotions, or feeling) might be understood in terms of stimulus and response. Classical behaviourism was further characterized by a strict determinism based on the belief that every response is elicited by a specific stimulus”. (The Editors of Encyclopædia Britannica, 2023)

Representation is therefore seen in its formal properties and detached from our subjective experience of the world.

8.3.1.2. Connectionism

In the 80s, Mc Culloch and Pitts' idea on neurons networks resurfaced in cognitive science and the metaphor of the mind as a network of interconnected neurons substituted that of the computer (Meunier, 2003, para. 11). As explained by Vernon (2014), "[c]onnectionist systems rely on parallel processing of non-symbolic distributed activation patterns in networks of relatively simple processing elements. They use statistical properties rather than logical rules to analyze information and produce effective behaviour" (p. 35). As defended by the early cyberneticians, logic is thus inherent to the neuronal activity, represented by the neurons' networks whose interconnection enables the transfer of energy (Meunier, 2003, para. 72). Moreover, connectionism presupposes the emergence of dynamic systems from the interaction of simple elements and therefore considers the mind as a highly cooperative system.

8.3.1.3. Emergent Paradigms

Classical cognitivist approaches showed some limitations to comprehend human knowledge and new paradigms emerged in the following years in favour of a position that takes subjective experience into account in their scientific approach to cognition. In opposition to the information processing view advocated by classical cognitivist approaches, emergent paradigms try to clarify the role of bodily experience and culture in the construction of human knowledge. These emergent approaches include dynamic systems theory and enaction theory as well as embodied cognition, situated action, and distributed cognition theories.

A) Dynamic Systems Theory

Dynamic systems theory (DST) is not so far from connectionism because they both agree that cognition is a behaviour that is a consequence of self-organisation. As explained by Vernon (2014), "[...] cognitive behavior arises as a natural consequence of the interaction of appropriately configured network of elementary components" (p. 42). While connectionist systems focus on microscopic behaviour, dynamical systems deal with macroscopic aspects and consider the behaviour of the system as a whole. Another fundamental aspect of dynamic systems is about time: "[DST] models the behavior of systems by using differential equations to capture how certain important variables that characterize the state of the system change with time" (Vernon, 2014, p. 39). DST views cognition as non-symbolic and non-linear,

occurring over real-time. In addition to being autonomous and emergent, dynamic systems are necessarily embodied into the physical platform in which they are implemented.

B) Enaction Theory

Enaction theory places experience at the heart of cognition. “The principal idea of enaction is that a cognitive system develops its own understanding of the world around it through its interactions with the environment” (Vernon, 2014, p. 47). The enactive cognitive system constructs its own reality, by making sense of its perceptions and actions from its own experiences. Initiated by Varela, Rosch and Thompson (1992), this paradigm is based on the phenomenological approach of experience that considers the role of bodily experience in the construction of the reality. This approach refers to constructivism and is opposed to objectivism according to which “[...] the facts are independent of our perceptions, beliefs, modes of knowledge, i.e. human cognition” (Meunier, 2003, para. 106; personal translation).

8.3.2. Narrative in Cognitive Science

The ‘narrative’ took some time to be studied in cognitive science, but some ideas emerged as early as 1932 with Barlett’s work on the notion of ‘schema’. The schema theory highlights the role of narrative structure as a support for memorisation and recalling (Campion, 2015; D. Rumelhart & Norman, 1995). This theory triggered the interest of cognitivists decades later, and within this framework, new concepts were introduced, such as scenarios and story grammars. The next paragraphs trace back the study of narrative in cognitive science, to the emergence of cognitive narratology and its various theories.

8.3.2.1. Schemas, Scenarios and Story Grammars

Barlett published in 1932 *Remembering*, a book in which he criticised the methods used by his previous peers in cognitive psychology to study memory (Fayol, 1985). Although Bartlett disliked the term schema and criticised its sketchy and definite nature, he agreed to use it by defining it as “active organisation of past reactions, or of past experiences, which must always be supposed to be operating in any well-adapted organic response” (Bartlett, 1932, p. 201). In other words, schemas are data structures constituted by past experiences of a subject which enables them to remember narratives. This theory means that the information available in a story should be selected and filtered from the outset, based on the prior knowledge of the subject and the search for coherence (Fayol, 1985).

The notion of schema was rejected for a long time by experimental psychologists for its vagueness (D. Rumelhart & Norman, 1995). The theory gained renewed interest among

researchers in the 80s, with the works of Mandler and his successors. They introduced the notion of story schema to account for the implicit organisation of narratives at the level of mental structures (Fayol, 1985). Story schemas highlight some regularities encountered in recalling stories and take the form of “a limited set of abstract categories linked together by precise relationships and in limited numbers” (ibid., p. 45). Mandler (1984) called these abstract categories ‘episodes’ and stated that they are articulated into a single canonical order. All episode contains a beginning, a development, and an end. They begin with a reaction of the protagonist to the beginning events, which takes the form of a cause for continued action, and include an outcome of an attempt to reach the goal (Mancuso, 1986, p. 92).

As Fayol (1985) sums it up, Mandler’s work was pursued by many researchers who tried to clarify his categories (pp. 47-58). Stein and Gleen (1979) proposed, for example, that an episode consisted of six categories: an initiating event, an internal response, an internal plan, an attempted action, a direct consequence and an affective and/or cognitive reaction. Warren, Nicholas and Trabasso (1979) specified the following concepts: state, event, action, cognition, display, impulsion and goal; and the relationships between them: the motivation, opposed to the psychological cause, and the physical cause, distinct from preconditions. Fayol (1985) concluded from different studies about recalling that he reviewed, that there is “a relatively stereotypical cognitive organization guiding the encoding process, in accordance with the modalities characteristic of a "conceptually driven processing"” (p. 60).

Rumelhart and Orthony (1977) developed a theory of schemas from Barlett (1932) and Piaget (1952)’ works. They defined schemas as “data structures intended to represent generic concepts stored in memory” (D. Rumelhart & Norman, 1995, p. 310; personal translation). Schemas exist for any generic concepts underlying objects, situations, events, event sequences, actions, and action sequences. They are a kind of stereotype, representing concepts’ constituents. Rumelhart (1980) and Rumelhart and Ortony (1977) listed the five most important characteristics of schemas:

1. Schemas contain variables;
2. Schemas can be embedded in each other;
3. Schemas represent knowledge at all levels of abstraction;
4. Schemas represent knowledge rather than definitions;
5. Schemas are active recognition devices.

The major characteristic of schemas is probably that they contain variables, with a constant part and a variable one. Rumelhart and Norman (1995) explain this characteristic with an

example of concept, the “dog” (p. 311). A dog has constant parts, such as “it has four legs”, and variable parts, such as “it is big” or “it is black”. Size and color are therefore variables. The second characteristic of schemas means that schemas generally constitute a configuration of sub-schemas. The third one implies that schemas can represent all levels of knowledge: “ideologies and cultural facts, the knowledge of what constitutes a correct sentence in our language, as well as the meaning of a given word or knowing what set of brain stimuli is associated with each letter of the alphabet” (ibid., p. 312; personal translation). The fourth one insists that schemas are not definitions but represent knowledge, and that all of our generic knowledge is hence embedded in the schemas. The last characteristic assumes that schemas are active processes which can evaluate their own ability to match the data being processed (ibid., p. 313).

Schank and Abelson (1977) reflected on the different types of schemas and introduced the concept of scenarios. A scenario is a sequence of frequently occurring events. As Rumelhart and Norman (1995) explained in their paper, a scenario is similar to a schema and contains a number of variables. They presented two categories of variables: those that require a person to be assigned to them (roles), and those that require an object of a certain type (props). Each scenario has several initial conditions, a sequence of scenes, and a set of results. The scenario provides the structure necessary to understand the chronological order of events (p. 314). Scenarios are the simplest schema type, and all situations do not correspond to a sequence of events that occur frequently. Rumelhart and Norman (1995) outlined more general and abstract schemas, called plans. Plans are produced by combining more elementary units (Memory Organisation Packets) that can be flexibly combined with each other to form different scenarios or plans. Plans are formulated in such a way as to satisfy motivations and achieve specific objectives (D. Rumelhart & Norman, 1995, p. 315). They refer to the reader’s problem-solving behaviour when they are confronted with a narrative.

Finally, some behavioural scientists have proceeded from Propp’s works on narrative structure and focused on the acquisition and use of narrative grammar structure by people processing a text. Their studies support “[...] the belief that the typical adult person assimilates input, particularly textual input, to an acquired, internal representation of narrative grammar structure” (Mancuso, 1986, pp. 91–92). In other words, the expectations developed by a person when confronted with a text, guides them “in retrieving the information required to make inferences and decisions about the flow of input” (ibid., p. 92). Such studies include Mandler (1984)’s theory of schemas (see above) as well as Colby (1973) and Lakoff (1972)’s narrative functions or Labov and Waletzky (1967)’s categories of action, which

include, for example, orientation, complication, evaluation, resolution, and coda (Mancuso, 1986).

As Campion (2015) concludes in his paper, “although all the approaches are quite varied (story schema, episodes, story grammars), these different works provide empirical clues to consider that the structures envisaged by classical narratology have a psychological existence and are part of cognitive mechanisms” (para. 6). They have led to the emergence of a narratology movement that approaches narratives from a cognitivist perspective and is known to this day as cognitive narratology.

8.3.2.2. *Cognitive narratology*

As Campion (2015) explains, cognitive narratology focuses on the cognitive operations necessary to understand the narrative as an object of interpretation, as well as on more complex cognitive operations using narratives as cognitive resources (para. 6). On the one hand, cognitive narratology focuses on cognitive operations needed to understand and interpret a narrative text. This approach considers cognitive narratology as an extension of classical structural narratology and aims to apply analytical tools developed within cognitive science to narrative logic (Campion, 2015; Paolucci, 2012). On the other hand, cognitive narratology is concerned with the way stories can support intelligence and cognition, mainly as resources for problem-solving and for organising experience (Paolucci, 2012). In this perspective, cognitive narratology is viewed as a new branch of cognitive science and places narrative at the centre of cognitive functioning (Campion, 2015; Herman, 2003a, 2013).

While the first approach focuses on narrative interpretation, description and categorisation, the second approach is concerned with the functions narrative performs from a cognitivist perspective. The latter includes studies on memory as a narrative form (Schank & Abelson, 1995), narrative as a construction of reality (Bruner, 1991) and narrative as a mode for organising experience (Herman, 2002, 2013) (see next section for more detail on this last function). Campion (2015) pointed out that the different approaches of cognitive narratology agree, however, on an “understanding of the narrative and the cognitive operations associated with it based on the construction of a mental model of the situation related to the diegetic world, called ‘storyworld’” (para. 7; personal translation). He added that “[...] the elaboration and exploration of the latter by the reader would make it possible to explain a certain number of cognitive properties associated with the narrative” (ibid.). Developed in the works of David Herman (2002), this theory postulates that the reader creates a storyworld as a support for

different cognitive operations, such as problem solving, causal relations identification, typification and so on.

Ryan (2015) highlighted three fields in which cognitive activity related to narrative can be studied: the mental activity of the characters, the mental activity of the reader and narration as a mode of thinking. The mental activity of the characters refers to intern monologue, psychonarration, direct or indirect discourse, and free indirect discourse as well as all mind's public manifestations and its interpersonal dimensions. Although the characters may have their own thoughts, they remain fictional. The extent to which this is really a cognitive issue is subject to discussion: characters do not exist outside the writer or reader's mind; they are a byproduct of the writer/reader's theory of mind ability. The literary approaches of the second field explore the interpretative activity of a model-reader or a standard-reader confronted with complex literary texts; they are labelled under the name of 'reader response criticism'. The scientific approaches use imaging technologies as MRI (Magnetic Resonance Imaging), create experiences to test texts' understanding and memorisation, or ask readers to describe in their own terms their narrative experience. The third field shifts the focus from the mind that decodes the story to the mind that conceives it. The latter is discussed in more detail in the next section.

According to Ryan (2015), the most obvious procedure for doing cognitive narratology is to apply concepts (from cognitive disciplines) from top to bottom to narratives. She listed a series of theories, among which the most popular is the theory of mind (see next section). She added five other theories referring to Herman's papers (Ryan, 2015, para. 45; personal translation):

1. Positioning theory: the way narrators present themselves to their audience and the way characters, including the narrator, impose roles to other characters.
2. Embodiment: the idea that mind is inseparable from the body and that thought is profoundly affected by this relationship.
3. Distributed cognition: the idea that external objects that stimulate thought are an integral part of the mind.
4. The discourse of emotion and 'emotionology': scientific theories of the nature of emotions;
5. Qualia: the philosophical term for the specific and intimately personal quality of experience.

Although these theories propose a new approach to study narrative, they do not specify a particular analytical method and cognitive concepts are subject to a large interpretation

(Ryan, 2015). Campion (2015) emphasised cognitive narratology's strengths and weaknesses. While its main contribution lies in "the production of cognitive processing models of the text or narrative universe", its main limitation lies in "the difficulty of its confrontation with empiricism: what efforts and what place should be given to experimental results and reception studies?" (para. 10; personal translation). Moreover, the aforementioned theories offer a unique way to do cognitive narratology, from top to bottom, that is, by using cognitive science concepts and applying their concepts in its own field. Ryan (2015) questioned therefore the value of narratology for cognitive science and stated that priority should be given to the ability of our intelligence to understand how it creates, decodes and uses stories, that is, the ability of intelligence to understand itself (para. 51).

8.3.2.3. *Narration as a mode for organising experience*

The theory of mind refers to the cognitive ability of an individual to assign non-observable mental states (e.g., intention, desire, belief...) to oneself or other individuals (Duval et al., 2011). This conception is popular among psychologists and critics who consider the self as a narrative construction, such as Jerome Bruner and Paul John Eakin (Ryan, 2015, para. 32). Ryan (2015) explains that, in the theory of mind, narrative can be both viewed as the product of mental operations (traditional perspective) or the source of our ability to perform these operations (inflationist perspective). Herman (2009) makes a clear distinction between these two perspectives, describing narrative as a 'tool for thinking' rather than a product, that is, as a tool that people use to communicate some types of experiences. As Ryan (2015) points out, "the conception of narrative as a tool of thinking encompasses the activity of telling stories and emphasises the importance of narrative communication for the development of human intelligence and the creation of social relations" (ibid., para. 33; personal translation).

A) Jerome Bruner: narrative as an instrument of mind

Jerome Bruner proposed a more interpretative approach to cognitive science concerned with meaning-making. In his famous piece of work *Acts of Meaning* (1990), he argued that the cognitive revolution should primarily aim "at discovering and describing formally the meanings that human beings created out of their encounters with the world and proposing hypotheses about what meaning-making processes were implicated" (p. 2). In this book, Bruner contested the computer model of the mind and advocated for a social constructivist theory of meaning according to which the construction of meaning is not operating in the mind but results from the interaction with the environment. A major work of Bruner consisted in studying how narrative operates as an instrument of mind in the construction of reality.

According to him, narrative is one mode of organising experiences which participates in the transfer of knowledge. As any other cognitive tool, narrative is related to cognitive issues of memory, constructed memory, and perceived memory.

For Bruner, narrativity has its own logic, structure and syntax, and corresponds to “a particular way of organising time, processes, events and connections between before and after” (Paolucci, 2012, p. 302; personal translation). Narrativity differs from cause-and-effect forms of organisation and is a form of meaning structuring the mind (*ibid.*). In this context, Bruner distinguished between the paradigmatic approach and the narrative one. While the former refers to classification and categorisation scientific methods (generally based on a cause-and-effect logic or on rules), the narrative approach interprets the world in storied form. As explained by Le Goff (1992), “the narrative approach captures the emotion of the moment described, rendering the event active rather than passive, infused with the latent meaning being communicated by the teller”. Bruner’s approach places the narrative in time, assuming a subjective experience of time rather than simply referring to actual historical events.

Bruner outlined a series of narrative features. The principal property of narrative is its inherent sequentiality. As Bruner (1990) explained, “a narrative is composed of a unique sequence of events, mental states, happenings involving human beings as characters or actors” (p. 43). These elements are narrative’s constituents and have meaning only in the sequence in which they fit together. Sequence refers to narrative plot or fabula. A second feature of narrative is that it can be real or imaginary without loss of its power as a story. “In other words, the sequence of its sentences, rather than the truth or falsity of any of those sentences, is what determines its overall configuration or plot” (p. 44). A third feature is the occurrence of a disturbing element that interferes with the canonical cultural pattern. The function of the story is “to find an intentional state that mitigates or at least makes comprehensible this deviation” (p. 49).

Another feature is the dual landscape of stories: “events and actions in a putative ‘real world’ occur concurrently with mental events in the consciousness of the protagonists”. Bruner referred to Paul Ricoeur’s mimesis and noted a certain mutual belongingness between ‘being in history’ and ‘telling about it’. In other words, “[t]he form of life in which narrative discourse belongs is our historical condition itself” (p. 46). Narrative offers therefore a new reading of reality and mimesis is one of the modalities of knowledge that produces new worlds, i.e., that leads to a ‘cognitive model of reality’ (Schaeffer, 1999). Finally, Bruner argued that stories can

be used to engage in problem-raising: “narrative is a means of redressing problems that arise when anticipated similar experiences do not materialize” (Herman, 2003a).

B) David Herman: narrative as a tool for thinking

David Herman (2002), another pioneer of the field, has argued that narrative constitutes a resource for structuring and comprehending experience. His studies are in line with the second axis of cognitive narratology which approaches stories as a resource of interpretation for sense-making. In this perspective, cognitive narratologists are concerned with the ways in which stories can serve as a basis for understanding and characterising humans’ intentions, goals, emotions, and conduct in the construction of meaning of their experiences (Herman, 2013). Stories are strategies that help people to understand situations and events in many contexts.

In this sense, narrative functions as a powerful and basic tool for thinking; enabling users of stories to produce and interpret literary texts, carry out spontaneous conversations, make sense of news reports in a variety of media, create and assess medical case histories, and provide testimony in court. (Herman, 2003b, p. 163)

Herman (2003b) assumes that narrative can be characterised as a cognitive artefact – an object that enables or enhances cognition – because “stories provide crucial representation tools facilitating humans’ efforts to organize multiple knowledge domains, each with its attendants sets of beliefs and procedures” (p. 165). Relevant domains include a variety of problem-solving activities, so that stories can be used as a resource for problem-solving. Herman’s approach differs from Bruner’s, shifting from a concern about the ways narrative takes part in the construction of reality to a taxonomy of the core problem-solving abilities supported by stories (Herman, 2003b, p. 165). Although Herman’s theories on narrative help us to better comprehend human experience, the concept of ‘artefact’ is problematic because it addresses narrative independently of its materialisation.

Herman (2003b, 2003a) listed five problem-solving activities supported by narrative. First, stories organise experience by enabling people to chunk it into workable segments. This process organises sequentially and concurrently the ongoing stream of experience into usable structures. Second, narrative enables people to find causal links between entities, states, and events in a sequentially presented array. Third, stories help people to solve problems thanks to the typification of phenomena: “typification facilitates a broad variety of cognitive tasks -

from the organization of objects into classes and members-of-classes, to the learning of the lexical and syntactic patterns of language, to the ascription of motives to others during social interaction” (Herman, 2003a, p. 5). Fourth, narratives support the sequencing of behaviours held by the parties engaged in narrative communication “[...] by modelling, in the story worlds they encode, what, how, where, and when a particular course of action can or should be pursued” (ibid., p. 7). Fifth, narrative constructs and distributes intelligence across people.

8.4. Postclassical Narratology

Postclassical narratology brings together various movements of narratology that takes the contributions of pragmatic and cognitive approaches into account. Among these, Patron (2018) has highlighted feminist and queer narratology, rhetoric narratology, transmedia narratology, non-nature narratology and cognitive narratology presented previously. The next subsections offer a recent definition of narrative through the lens of Ryan’s work (2007) and focus in particular on media narratology to identify new characteristics of design fiction narratives in the final section of this chapter.

8.4.1. Ryan: Dimensions of Narrative

After reviewing a series of definitions of ‘narrative’, Ryan (2007) presented “narrative texts as a fuzzy set allowing variable degrees of membership, but centred on prototypical cases that everybody recognizes as stories”. She proposed a definition which organises the conditions of narrativity into three semantic and one formal and pragmatic dimension.

Figure 8.4.

Dimensions of narrative (Ryan, 2007)

Spatial dimension

(1) Narrative must be about a world populated by individuated existents.

Temporal dimension

(2) This world must be situated in time and undergo significant transformations.

(3) The transformations must be caused by non-habitual physical events.

Mental dimension

(4) Some of the participants in the events must be intelligent agents who have a mental life and react emotionally to the states of the world.

(5) Some of the events must be purposeful actions by these agents.

Formal and pragmatic dimension

(6) The sequence of events must form a unified causal chain and lead to closure.

(7) The occurrence of at least some of the events must be asserted as fact for the storyworld.

(8) The story must communicate something meaningful to the audience

Ryan's definition of narrative considers the theories developed in cognitive science which state that narratives can produce the mental representation of a dynamic narrative world, i.e., a storyworld (see previous section on cognitive narratology).

According to Baroni (2017), the definition of narrative should also consider that "[...] any narrative representation is not only the representation of an event, but also an event in itself, which implies the space-time of its own actualisation (whether it is a reading, an audition or a performance)" (p. 168; personal translation). Based on Metz's work, he highlights two distinct temporalities: the time of the thing-narrated and the time of the narrative (in semiotics terms, the time of the signified and the time of the signifier)³³.

³³ These concepts are originally from the French language and are defined by Metz as: « *le temps de la chose racontée et le temps du récit (temps du signifié et temps du signifiant)* ».

8.4.2. Marion: Media Narratology

Media narratology is an approach to narratology that considers media as an essential part of the narrative. It is part of a pragmatic approach to narrative because it takes the context in which the narrative is deployed into account. Media narratology is based on the principle that narratives can be deployed in multiple forms on a number of media platforms. In this regard, Marion (1997) identified that narrative has a transmedia aptitude accompanied by a propensity for inter-generic shifting. In other words, a narrative can be formed across several media platforms (transmedia), just as the same narrative can be told across different media platforms (cross-media). In this respect, macro-narratives on the same topic may emerge and report the news daily across several platforms.

Media narratology leads us, among other things, to question the closure of the narrative. In the news first, some stories are never-ending, and we could consider the narrative as open-ended. Second, fiction narratives such as TV series or Mangas are also affected by this ‘non-closure’ because after watching a certain number of episodes, we can start to find the same narrative developments and the same characters’ structures. Marion (1997) suggested compensating for this non-closure by a form of ‘displaced’ closure, and proposed the concept of ‘meta-closure’ to refer to “[...] the certainty of a *same* that goes on indefinitely, over the series, beyond the codified and domesticated differences of punctual occurrences”³⁴ (p. 73; personal translation).

8.5. Applying Narrative Theories to Design Fiction

As concluded in Part 3, many stories circulate around and through the prototypes generated by the practice of design fiction. These stories can take the form of speculative scenarios or be ‘latent’, i.e., suggested by the design of the prototype. This section explores the properties of narrative mobilised in design fiction practice and question the way these properties can help students define a problem.

8.5.1. From A Closed Narrative to An Open One

Speculative scenarios are the closest form to what we used to define as a narrative. Some scenarios are consistent with structuralist models, while others question the narrative closure and are more open to interpretation. The next paragraphs apply narrative theories to design

³⁴ Original quote (from French): « [...] la certitude d'un même qui se prolonge indéfiniment, au fil des séries, par-delà les différences codifiées et apprivoisées des occurrences ponctuelles ».

fiction scenarios and highlight a first dichotomy, i.e., closed versus open narrative. The assumptions made here are based on the literature reviews in the previous chapters on the uses and productions of design fiction.

8.5.1.1. *Speculative Scenarios as Narratives (Structuralism)*

As a reminder, classical definitions of narrative assume the existence of a minimal structure to any narrative, referring to a succession of events (see section 8.1.: Classical Approaches to Narratology). Classical narratologists also agree that any narrative has a beginning and an ending. An element usually disrupts the initial situation, and the protagonist begins a quest to solve a problem (Propp, Greimas, Adam). The quest is full of pitfalls and difficulties that they have to overcome in order to restore the initial balance. The balance is restored once the problem is solved.

Stories produced by the practice of design fiction generally have a similar structure. In many fields, design fiction speculative scenarios explore the potential consequences of scientific and technological innovations. Two kinds of scenarios are usually addressed: the technology helps the protagonist to solve a problem or constitutes a problem. Both scenarios refer to Bremond's logic of narrative possibilities, which suggests that elementary sequences can take two directions: amelioration versus degradation. In the context of design fiction, speculative scenarios tell the story of an emergent technology that improves or degrades society.

Greimas' actantial schema enables us to situate the actants of both scenarios. In the first scenario (amelioration), the technology is an adjuvant or the object that the hero needs to restore the order. This is a typical scenario used in science fiction films' production and traditional design to promote a future product or service. On the one hand, design fiction is used as a form of pre-product placement in science fiction films and the objective is to convince people about the future technology's necessity, viability, and benevolence (Bleecker, 2009). On the other hand, storytelling is used in traditional design "as a technique to get insight into users, build empathy and access them emotionally" (The Interaction Design Foundation, n.d.). This technique refers to brand storytelling, whose goal is to create strong emotions for the customers to win in user experience design. Brand storytelling makes users the hero and confront them to a specific problem that can be resolved with the help of the product offered by the company.

In the second scenario (degradation), the technology is the origin of the problem or an opponent that is trying to interfere with the hero's quest. This kind of scenario is also typical of science-fiction genre and feeds fantasies about our fear of technology. Many science fiction

stories tell the failures of technologies that are initially created to provide solutions to societal problems, such as robots or artificial intelligence. Design-oriented research also uses this kind of scenario to envision the potential problems of a future piece of technology. However, the objective is different from the previous scenarios and consists in sharing one's ideas and opinions about future issues with the research community. Critical design and critical science fiction pursue the same goal and use design fiction first and foremost to open a discussion on what the future could be.

8.5.1.2. A Narrative Focused on The User (Post-Structuralism)

The theories of reception in narratology consider the reader in the construction of the message. For post-structuralists, narrative structure is not sufficient to understand a message; the text only makes sense if it is read and interpreted by a receiver. The theories also highlight the cooperative role of the reader in the understanding of the message. The model reader is the one who makes the correct interpretations desired by the writer (Eco, 1984) and accepts to willingly suspend their disbelief to enter in the fiction (Jouve, 1992). These last assertions are very similar to design theories of Norman (2004) which attest that the designers' conceptual model must coincide with the users' mental model and to Suvin's notion of cognitive estrangement which assumes the reader's disposition to fictionally estrange from the real world (Renault, 1980).

No matter the field, design fiction is undeniably focused on the receiver. The objective is either to convince the user about the merits of an emergent technology or to let them construct their own opinion. On the one hand, speculative scenarios are designed so that the reader can easily understand the way the technology works. The only requirement is that the reader accepts to suspend their disbelief about change (Sterling, 2009) and to enter in a cognitive estrangement from the author's empirical environment (Renault, 1980). On the other hand, speculative scenarios similarly invite the viewers to enter fictionally in an alternate reality. They are, however, free in their interpretation of the message. Scenarios are specifically designed to raise questions from the audience and to discuss social issues in relationship to technologies.

These last statements suggest that design fiction speculative scenarios can be open-ended. At this point, we are unable to determine a proper method of distinguishing an open-ended narrative from a closed one, but we can hypothesise that a way would be to observe the centration and the decentration of the narrative (Meunier & Peraya, 2015). As a reminder, centration refers to the notion of 'egocentrism' which characterises the point of view of the reader when they see events as they are experienced by the main character. Decentration

refers to the reader's ability to go beyond their own point of view and recognise that of others; these effects manifest themselves in narratives that tell multiple quests and stories as they are experienced by several characters. This recognition of multiple points of view would therefore make the narrative more open, allowing the reader to choose their own point of view. Another way to identify an open-ended narrative could be to observe if there is a narrative closure. I discussed this proposition in the next section.

8.5.1.3. *The Absence of Narrative Closure (Media Narratology)*

While the traditional uses of design fiction suggest narratives in their narrow definition as consisting of a structure with a beginning, a succession of events and an end, more critical uses make the narrative more open at the end. Media narratology studies have revealed a proliferation of narratives in the media that challenges the traditional definition of narrative. The new hypermedia and transmedia forms offer narratives that are so long that they have no end. Within the framework of design fiction, it is not so much the question of the length that is relevant to us but rather that of the open-ended narratives that have no definite end.

As discussed previously, some speculative scenarios are left open-ended to let everyone construct its own interpretation. SF films and TV shows do not always propose a real end and prefer to open new possibilities. For example, the film *Inception* (2010) ends with an ambiguity: in the near future, the United States has developed what is called 'shared dreaming', a method of influencing a victim's unconscious while dreaming. The main heroes explore the possibilities of this technique and improve it, allowing them to nestle dreams into each other. The film ends without us knowing whether we are in a dream or in the reality.

Another example is *Black Mirror* TV series: the episodes regularly also leave the viewer in a state of uncertainty. It is through an inquiry based on their own experience of the world that they will be able to overcome this ambiguity. The episode *White Christmas* (2014) is a special illustration of this lack of narrative closure where some questions remain unanswered and gives the impression that the episode lacks a definitive ending. The episode features multiple intertwined narratives involving moral dilemmas and includes several unresolved or open-ended situations that contribute to the overall feeling of an episode without a clear ending.

Not all design fiction speculative scenarios are obviously open-ended. However, such narratives are particularly interesting in media education because they focus on the process rather than the end and thereby brings the reader back to their own point of view. This kind of narrative allows us to consider the potential of design fiction to develop an inquiry method

in media education and to test our initial hypothesis according to which design fiction can help students question media technologies and their media representations.

8.5.2. From Written Scenarios to A Latent Storyworld

The second Part of the scientific literature (see Conclusion Part 3) has concluded that the practice of design fiction can operate in two directions, i.e., from world to object by materialising scenarios and from object to world by implementing an object into a storyworld. On the one hand, design fiction consists in producing prototypes that suggest a story by themselves. This story can relate to the uses of the object as well as the values embodied, and evoke a whole storyworld, as it is the case with steampunk artefacts. On the other hand, design fiction consists in producing speculative scenarios that contextualise the prototype. Speculative scenarios allow it to explain the uses of the object as well as to consider the larger consequences of its implementation.

While the second approach creates scenarios that can be defined as narratives, the stories produced in the first approach are undefined. They do not have a specific narrative structure and do not specify any characters or users. These stories can, however, be characterised by a greater openness than the scenarios, because they allow it to imagine all kinds of possible scenarios taking place in the storyworld. As explored in the literature review on cognitive narratology, the understanding of a narrative is based on the construction of a mental model of the situation related to the diegetic world (Campion, 2015). The elaboration of a storyworld can help students to operate cognitive operations, such as problem-solving.

8.5.3. From Problem-Solving to Problem-Finding

Design has been primarily used as a problem-solving practice to improve life being across industries. Critical design approaches serve a different purpose and are more concerned with bringing people to think about their consumption. They use design fiction as a problem-finding practice where the objective is to ask questions rather than provide answers. The two forms of speculative scenarios previously identified, opposing the two directions amelioration vs. degradation of the narrative, also highlight a real potential of design fiction for raising problems. While the first scenario suggests a narrative where the technology helps the protagonist to solve a problem, the second one suggests a narrative where the technology constitutes the problem. The second scenario can still be part of a problem-solving approach but questions more the technology than the first one.

As a reminder, a branch of cognitive narratology proposes to use narrative as a cognitive resource, particularly for problem-solving (Herman, 2013). These theories have demonstrated that narrative can help students structure a problem, in other terms, shift from an indeterminate to a determinate situation (Dewey, 1938b). Design fiction, in its narrative expression, could therefore help students problematise a question through a story. In this context, the outcome of a concrete solution to a problem would not be the final objective of the exercise, but rather the inquiry process during which they would reflect on the societal implications of their prototype.

8.6. Synthesis Chapter 8: Three Dichotomies Charactering Design Fiction as A Narrative

To conclude this chapter, we can highlight three dichotomies that reflect the narrative properties of design fiction. First, the practice of design fiction can generate speculative scenarios or evoke a whole storyworld. Design fiction narratives can be therefore either written or latent. Second, some stories follow the classical narrative schema, while others do not have a determined ending. DF narratives can be thus either closed or open-ended. Third, DF narratives can help define a problem or even solving it, in other words, they can be part of a problem-finding approach or a problem-solving one. The next table synthesises the dichotomies by opposing them.

Table 8.5.

Three dichotomies characterising design fiction as a narrative

Written	Latent
Closed	Open-ended
Problem-solving	Problem-finding

Although these three dichotomies divide the narrative properties of design fiction, some of them can work together in the context of the classroom. For example, the creation of a storyworld can help students to situate their speculative scenarios into a larger world and to agree on this one. Similarly, a problem-solving approach can be part of a problem-finding one and leads to the creation of prototypes that help students to solve a problem. Moreover, the association of some properties with each other can contribute to making design fiction's

narratives more critical. In the previous chapters on design fiction uses and productions, I reviewed that in critical design, design fiction goes beyond the functionalist narrative of traditional design by making people think about design's implications on society. Narratives produced within critical design's practice are latent, open-ended, and based on a problem-finding approach. Using these kinds of narratives could therefore help students define a social problem in relationship to media technology as well as to discuss broader issues connecting the imagined future society to contemporary society.

PART 5: METHOD & OUTPUTS

As I was exploring the scientific literature, I identified various approaches to how design fiction could be used in media education and how it could contribute to the development of critical thinking. This theoretical part enabled me to refine my research question, namely, *How can design fiction help build a critical inquiry method in media education and how can this method support the development of learners' critical inquiry competence?* Based on this, I developed a suitable method for answering my research question and set up the various phases of my design-based research project to build my outputs.

This fifth part of the manuscript defines my research problem in detail and explains the means I used to address it. It is divided into four chapters. The first chapter gets to the heart of the matter by explaining how the theory of the previous chapters was crystallised into the definition of the research problem and by defining the various constituent elements of the research question. The second chapter presents the first output of the DBR project, i.e., the educational programme, and details the content of the activities in the three phases that were carried out and that continue to animate the project. The third chapter explains the data management protocol, in terms of data collection and analysis, as well as ethical and legal issues (GDPR). Finally, the fourth chapter presents the second output of the DBR project, i.e., the rubric, and details the process of its construction and the categories as they were elaborated in their final form.

Chapter 9: Research Problem

As a reminder, my doctoral research consists in developing a critical inquiry method in media education, that is, a method that encourages students to ask critical questions about digital media and technology. In this context, I mobilise design fiction, i.e., a design practice that uses narrative structures to consider and explain possible futures for technologies. Its originality lies in its consideration of the technical characteristics of the invented prototype in the light of its implications for the imagined future society. This aspect might prove interesting in media education to enable learners to get a better understanding of the media environment and to situate their own media practices and uses. This is the whole purpose of my doctoral research, which aims to discover the potential of using design fiction in media education to develop learners' critical thinking.

The chapters on the fictional and narrative properties of design fiction highlighted benefits that design fiction could bring in a learning context. On the one hand, design fiction, borrowing from science fiction, encourages an attitude of estrangement that leads the reader to immerse themselves in the fiction while at the same time distancing from it. This particular attitude would allow them to reflect on the issues raised by the media text content while situating it in its more global context. The attitude of estrangement would therefore make it possible to use design fiction to question both the dimension of the media text and that of the technology represented on the screen. In a media education context, we could therefore hypothesise that this attitude would contribute to the development of students' knowledge of new technologies, as well as their critical questioning of digital and media issues.

In addition to the attitude of cognitive estrangement, design fiction, borrowing from speculative design, encourages a speculation attitude which consists in speculating on possible future worlds. The speculation attitude goes a step further than the attitude of cognitive estrangement when contemplating fictional scenarios and poses hypotheses about the future. This attitude encourages the suspension of disbelief about change, prompting participants to consider alternative realities, while questioning current norms and societal values. In a media education context, this attitude could foster an alternative perspective on the media landscape, stimulate discussions about potential future developments in the media, and inspire the creation of imaginative visions for the future. We could thus hypothesise that design fiction, through speculation, would help learners develop their critical thinking by encouraging them to question and analyse the impact of emerging media technologies on society.

On the other hand, in its narrative form, design fiction generates speculative scenarios that could contribute to the development of critical thinking. Studies in cognitive narratology have highlighted the role of narrative in the development of human intelligence and the creation of social relations (Ryan, 2015). Narrative constitutes a resource for structuring and comprehending experience and can be used for a variety of activities including problem solving (Herman, 2002). Speculative scenarios offer alternative visions of the future that can help to stimulate reflection on the potential implications of future technologies. My research aims to determine whether, as a result, design fiction could help learners to structure a problem and to reflect on the wider impacts of implementing a prototype in a future society.

It is in this framework that I have built the critical inquiry method using design fiction in a media education context. The critical inquiry method refers to a pedagogical method based on inquiry models in the world of education. Design fiction generally involves both a design process and the creation of a storyworld. While prototyping allows participants to build their own inventions, storytelling considers the wider consequences of the prototype in the imagined future society. The inquiry-based learning models can help to construct the different phases of the design fiction process, particularly with regard to the problematisation of the issues raised by the prototypes. In the framework of my doctoral research, the first goal is therefore to develop an educational programme based on inquiry models that enable students to investigate the issues of the future and relate them to current concerns.

In this context, I propose two ways of practising design fiction in a media education context: (1) to have students analyse design fiction texts and (2) to have students produce design fiction texts and diegetic prototypes. In chapters 5 and 6, I highlighted various uses of the practice in which the user can occupy multiple roles. I pointed out that the learner could participate in design fiction activities either through reception or analysis activities, or through production activities.

- (1) Design fiction can be first used as an object of study in media education. As any other media texts, design fiction texts ('texts' in the semiotic sense) can be deconstructed using core concepts to highlight the way that media represent technology and our interaction with it. The first suggestion is therefore to have students analyse design fiction texts by identifying their textual and contextual properties as well as the issues related to the visions they convey.
- (2) Design fiction, as a design practice, can offer a second way to practise media education. The practice of design fiction can engage students in the production of media texts (such as advertisements, podcasts, comics, etc.) and/or diegetic prototypes. The second

suggestion is therefore to have students follow a design fiction process by creating design fiction texts and/or imagining media technology prototypes.

Concerning the learning outcomes, I suggest developing students' critical inquiry competence with the help of key questions. As explored in Chapter 3, media education scholars have designed models of key questions (informed by core concepts) to guide students in their inquiry process when confronted with media texts. In the framework of my doctoral research, the second goal is to conceive my own rubric to help students ask critical questions about media representations of technology and technology itself as well as to help me evaluate students' critical inquiry competence. The rubric is based on descriptive scales developed in the world of education to assess students' performance. I use the rubric both as an assessment grid for evaluating students' critical questioning and as a guide for leading their questioning.

In the critical inquiry competence, I distinguish between their ability to ask (A) critical questions about media texts representing technologies and (B) speculative critical questions about technologies themselves and their future in society. I specify that the questions in the second suggestion are of a speculative nature, as this is a characteristic of questions about technologies in a design fiction context. As a result, I assume that speculation only concerns technologies represented on screen and that students are not expected to speculate on the future of media representing technologies.

(A) Due to its textual properties, design fiction can lead to critical questions about the different core concepts of media texts. Among other things, it is possible to stimulate reflection on the producers and target audience of design fiction texts, as well as on the languages used to convey the media message. The first suggestion thus aims to develop students' ability to ask critical questions about the key dimensions of media texts as studied in the literature on media literacy assessment.

(B) With diegetic prototypes, design fiction can also raise critical questions about new technologies. As they are close to the real world, diegetic prototypes help students to speculate about the future of technologies and to think about their implications in the near future. The second suggestion therefore aims to develop students' ability to ask speculative critical questions about technologies themselves and their future in society.

The two pedagogical proposals for using design fiction in media education presented above are ways of achieving the learning outcomes. Analysing design fiction texts can lead to ask questions about media texts representing technologies, as well as producing design fiction texts or diegetic prototypes can lead to questions about technologies themselves and their

future in society. The opposite result may also be possible: analysing design fiction texts can lead to ask questions about technologies themselves and their future in society, as well as producing design fiction texts or diegetic prototypes can lead to questions about media texts representing technologies. The methodological protocol of the research will seek to assess the progress made by students with regard to (A) and (B) but will not attempt to differentiate the specific effects of (1) and (2) on (A) and (B).

To support the development of the educational programme and the rubric, I set up a design-based research project that began in September 2018 in collaboration with a Belgian non-profit association called *Action Médias Jeunes*. We carried out two phases during which we developed media education activities using design fiction in the classroom. I implemented and tested the rubric during the second phase, and the association is currently conducting a third phase to propose a final version of the programme in a non-formal learning context. The following chapters present the different phases of the educational programme, the data collected and the rubric.

Chapter 10: The Educational Programme

The design-based research project was carried out in three phases which refer to three key moments for the construction of the educational programme: the exploratory stage, the critical inquiry method, and the final version of the educational programme for non-formal learning settings. This chapter presents the activities conducted in these three phases as well as the adjustments that have been applied and the challenges that have been addressed throughout the different phases.

10.1. Phase 1 – Exploratory Stage

My design-based research project began with an exploratory phase developed in collaboration with the non-profit association *Action Médias Jeunes*. Each year, the association organises several projects for young people with the objective of developing their critical thinking skills in a creative way. In 2018, *Action Médias Jeunes* set up a project called HACK to the Future that used design fiction in primary and secondary education. This project was conducted with another non-profit association, the *Scientothèque ASBL*, and was funded by the French Community Commission of Belgium (Cocof) which promotes partnerships between Belgian French-speaking cultural organisations and schools. The project consisted in imagining and designing fictional technological objects from a near future (year 2030). Two Belgian schools were involved in the project with a total of five classes: two classes of third-grade primary students (7 to 8 years old) and three classes of fifth- and sixth-year secondary students (16 to 18 years old). During the project sessions, students from both schools were invited to create their own prototype and to stage it through a media production (report, advertisement...). Objects and media were then exhibited and discussed during a conference between schools and an expert to address digital world issues.

Figure 10.1.

Illustration of the project name on the black board – HACK to the Future – Photo credit: Action Médias Jeunes



HACK to the Future constituted the first phase of my design-based research project. This phase aimed to collect exploratory data on how design fiction could be taught and applied at school in a media education context and served as a basis for the second phase. The project started in October 2018 and lasted a whole school year. For fifth-year secondary school students (16 to 17 years old), project sessions took place as part of the social sciences course. Activities were related to AI technology development and concerned issues related to ‘labour’ such as workplace wellness, automated hiring, and unemployment. Based on the problems identified in modern society, students developed fictional artefacts imagining the evolution of the world of labour in 2030. For sixth-year secondary school students (17 to 18 years old), sessions took place as part of their ‘implementation’ week, a week during the school year in which students are invited to participate in various projects. Activities were related to the artistic field (a constraint of the school) and students developed fictional artefacts questioning our future relationship with art in 2030.

I attended the sessions as an observer in the two primary school classes and in the sixth-year secondary class. I was invited to take part in this project, but I did not contribute to its design. Since I did not have control over the project, I only took field notes in a notebook without systematic recording. For the first project sessions, I always introduced myself to students by

explaining who I was (a researcher working for the university) and why I would take notes (observing the sessions for my own research). I was usually sitting at the back of the class, taking field notes in a notebook, and the students did not pay attention to what I was doing. I was sometimes invited to take part in the session, particularly during the prototyping and shooting phases that required more guidance. After each session, I participated in the debriefing session with the media educators and teachers: we were discussing the activity of the day and the ones to come. Finally, I attended the conference day during which I took part in discussions between fifth- and sixth-year secondary school students.

10.1.1. Activities Content

10.1.1.1. Third-Grade Primary School Students

During the first semester, children were introduced to the world of inventions. The activities of the first two sessions were related to the era of great inventors and aimed to define what an invention is, to explain how one becomes an inventor and to understand the process of inventing something new. The activities of the second two sessions were related to current inventions and the understanding of how an object works and its usefulness, distinguishing the advantages and disadvantages of an invention and identifying the problem that this object solves. The first activities in the second semester followed the steps of a design thinking process, except for the final phase which normally consists in testing and implementing the prototype. Three major phases could be identified in the project observed: the inspiration phase, the ideation phase, and the prototyping phase. The next paragraphs define the phases and explain how they were implemented in the project.

A) Design Thinking Process

The inspiration phase consists in developing a deep understanding of the problem so that we can find a solution. The first session of the second half of the year proposed identifying the needs that have not yet been addressed in the society. Based on a previous session on the five senses, children listed a series of needs and identified the one they wanted to meet for their object. In the first class, three needs were selected, namely “writing faster” (1), “watching through walls” (2) and “no longer doing housework” (3). Based on those, the educators organised three groups and launched the next phase.

The ideation phase takes the form of a brainstorming to select and develop the solution. By groups of eight, children were invited to imagine an object that respects the following instructions: an object that does not exist yet, that can fit in a backpack, that meets the need

and that can be used at school (Groups 1 and 6), outside (Groups 2 and 5), or at home (Groups 3 and 4). By subgroups of four, they first thought together about a potential object that could bring a solution and drew it individually. They then agreed on a unique object by group and proposed the following ones (see table 10.2.).

Table 10.2.

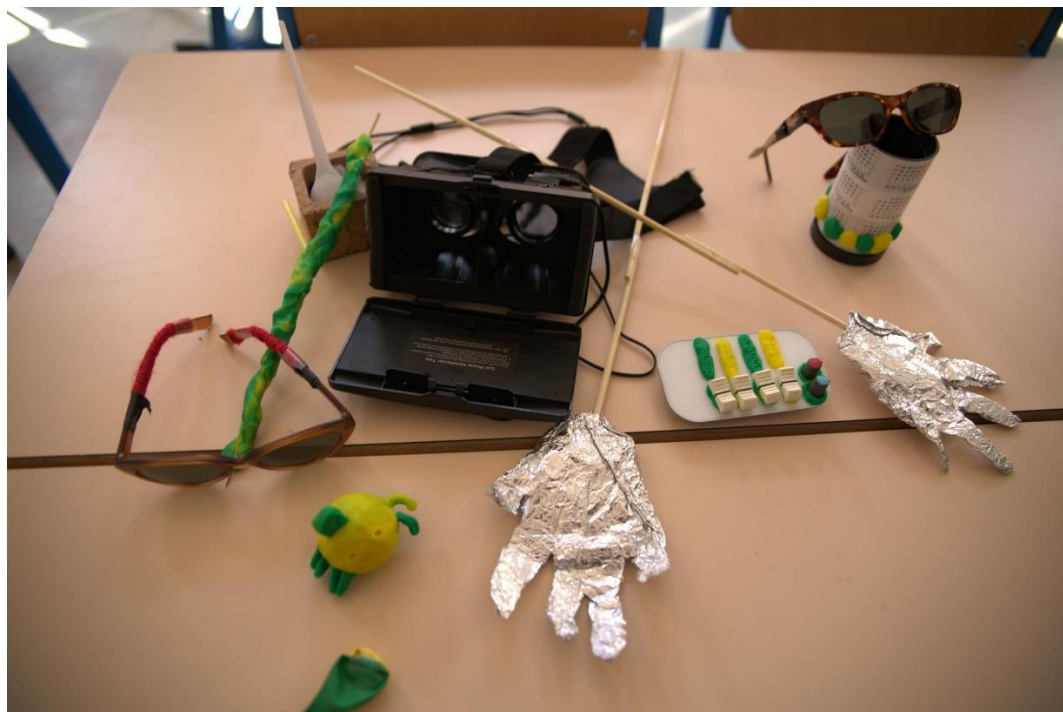
Inventions of primary school students – HACK to the Future

Group	Invention
1	A pen that writes the thought of its user autonomously
2	A small spider robot creeping under the doors
3	A household robot that can wash everything
4	A pair of glasses with which you can watch television anytime and everywhere
5	A robot that gives away money in the street
6	A robot that goes to school instead of its child owner

The prototyping phase consists in making the idea concrete. To this end, children had material at their disposal (plasticine, rope, spare parts, etc.) and a professional designer was available to help them (see figure 10.3. for examples of prototypes). The prototyping phase included several moments of discussion during which students specified how their object worked. Some debates led some subgroups to change the original purpose of the objects.

Figure 10.3.

Prototypes of third-grade primary school students – HACK to the Future - Photo credit: Action Médias Jeunes



B) Media Production Process

The next sessions consisted in staging children's prototypes through the production of a fictional media. Before shooting their short fiction, media educators introduced children to TV reports to understand their global structure. Once the groups were distributed, some subgroups prepared questions to ask to interviewees including designers, experts and users. For example, the third group working on the household robot asked the creator how they came up with the idea of designing this object. Some answers were connected to the students' daily lives: replacing the human, using other hands than theirs, spending more time with the family and avoiding that Mommy has to make breakfast.

After learning how to use the shooting equipment and how to capture interviews, children distributed the roles (journalist, cameraman, actors) and dressed up in costumes provided by the educators³⁵. While some students were shooting, others were invited to deepen the context

³⁵ All the videos shot (primary and secondary) are available on the project website at the following address:
<https://hacktothefuture201.wixsite.com/http/copie-de-decouvrir>

related to their object. Various issues were discussed, such as the economic system surrounding the production of the object and some questions relating to social justice.

10.1.1.2. Sixth-Year Secondary Students

The sessions with sixth-year secondary school students followed similar steps to those of primary school students: in this case, an introductory lecture on artificial intelligence, followed by a design thinking process (inspiration, ideation, and prototyping) and a media production process (storyboard, shooting, and editing). Activities were related to the artistic field and students developed fictional artefacts questioning our future relationship with art in 2030. Unlike the fifth-year group, which included about forty students, the sixth-year group included only eleven students, which allowed further reflection on their objects and media productions.

A) Design Thinking Process

Like the primary school students, sixth-year secondary students followed the phases of the design thinking process. However, they did not push the prototyping phase very far and focused mainly on the inspiration and ideation phases.

After the introduction to artificial intelligence, students exchanged stories about problems they had already encountered in the world of art. For example, a student talked about the problem of museums that are huge and cannot be fully visited, while another pointed out the lack of context and information about the artists during visits. After dividing the class in three groups, each group started to think about the problem they wanted to solve and the object they wanted to create.

At the end of the first morning, educators invited students to answer four questions individually: “Who is the solution for? What are their needs? How to meet them? Why does our work matter?” They wrote down their answers on Post-it notes of different colours and then agreed by group on the object they wanted to create as well as the media production they wanted to use. To help them develop their idea, the educators gave them a notebook containing a series of questions that they had to answer all along the week.

Before further developing their object on the second day, educators asked students, on my recommendation, to write a scenario to implement their object in the future world. Each group first worked on its own scenario and then negotiated with others to create a common script. This way of doing is in line with the goal of design fiction which considers the context of the technology.

After the scenario writing activity, each group worked separately on its notebook and then discussed the object they wanted to invent with others to share ideas. The first group decided to create a mobile application called Tind'Art which allows personalising one's visit in a museum. When the app starts, users are invited to like/dislike a few pieces of art (same way of working as Tinder but with artworks) and the app then proposes a personalised visit tour which takes ones' preferences into account. The second group addressed the problem of noisy people in cinemas and imagined a smart camera that detects people's behaviour when they are disturbing the film (e.g., eating popcorn loudly, screaming or picking up the phone). Once the person is identified, a slight electric shock is sent to a bracelet worn by the annoying person. The third group created a service similar to Netflix called N'Art. Through a virtual reality headset, users of N'Art have access to any form of art (not only movies and TV series) such as drawings, animations, artworks, music performances, video games and so on. Students from this group took the context of their technology into account and proposed an affordable cost for their invention (the common scenario described a period of crisis). Moreover, they considered the risks of such a technology to cut off social connections.

B) Media Production Process

After debating their object, students planned the media they wanted to produce. The previous day, media educators gave some examples of different kinds of media production. The first and second groups chose commercial videos that stage a presenter and potential users, while the third group selected a Brut³⁶ format which alternates images from the internet and interviews with the creator. Before shooting, students had to draw storyboards illustrating the main sequences of their video. Students were also introduced to the shooting equipment and each group received a complete set on the third day. Unlike the primary school students, teenagers edited a part of their video by creating a logo, adding animations and voice-over comments (see figure 10.4.). The rest of their video was edited in post-production by the educators.

³⁶ Brut is an online video format that includes texts, images from the Internet and archives as well as interviews. The videos report news and address topics such as culture, sports, sciences and technologies, economy or well-being. Website: <https://www.brut.media/fr>

Figure 10.4.

Logo of Tind'Art – HACK to the Future



10.1.1.3. The Conference Day

One request from the funding source was to organise a meeting between primary and secondary school students. At the end of the school year, *Action Médias Jeunes* planned a half-day event divided in three parts where students could meet and discuss their productions. To this end, educators organised a conference with a science university professor, an exhibition with children's objects and media productions, and reflection workshops with all the students. The goal of this day was also to continue the reflection and open the discussion about the social, cultural, political, ethical, and economic issues of new technologies.

To prepare the conference, educators asked the professor to answer two questions: how could we improve the brain in the future and which future could we foresee for algorithms? While the second question concerned only secondary school students, the first concerned all students and the professor explained the working of the brain in a child-appropriate language. While the secondary school students were still attending the conference, primary school students were then divided into two classes and watched the productions from the other class. For each video, educators asked children to explain how the object worked and what the pros and cons were. After the conference, fifth-year secondary school students were also invited to discuss the objects from other groups.

10.1.2. Modifications For Phase 2

HACK to the Future project was a success with young people. Although no tools were developed to evaluate the activities, the prototypes invented and the videos produced by the children demonstrated the great potential of the project. The students were able to develop their imagination and creativity, and the educators supported them in their exploration of the near future. During this first project, I took field notes and collected a range of data such as students' productions (designer's notebook, pictures of inventions, media productions, etc.) and teaching materials, while continuing to review the scientific literature on design fiction, media literacy and inquiry-based learning methods. Based on the data collected during this pilot project and the theory reviewed in the first chapters, I was able to draw a set of conclusions that helped me build the second phase of the project. The following sections summarise the main findings of the first phase on which the second phase adaptations are based.

10.1.2.1. *The Challenge of Adopting a Problem-Raising Attitude*

Design fiction is a practice that can be used for commercial purposes as well as for critical purposes (see Chapter 5: Design Fiction Uses). The challenge from the beginning of the project HTTF was to use design fiction in a critical way to encourage students to adopt a problem-raising attitude (as opposed to a problem-solving attitude). Media educators and I soon understood that it was very difficult for students to move away from a solutionist perspective in the design thinking process. For both age groups, there were a lot of debates about the construction of the prototypes. The more students tried to clarify their object, the more difficulties they encountered. In this context, I observed that primary students were more determined to find new solutions than to recognise that the perfect object did not exist.

This difficulty can be explained by the design of the educational activities, which oriented them towards technological solutionism. As early as the ideation phase, the activities were of a solution-oriented nature: the primary school students were instructed to imagine an object that would meet societal needs, while the secondary school students had to complete their designer's notebook by answering for whom they wanted to develop the solution and to meet what needs. During the inter-school conference, I could, however, see some progress in the reflection of some secondary school students. They understood that it was not easy to create a piece of technology that suited everyone and that many issues arose during the development of a new object. The following paragraph gives an example of debate.

I attended a discussion about a prototype called Application for Job which consists in deleting all the discriminating elements of a Curriculum Vitae (such as religion, ethnic background, picture...). The person is thus hired only based on their actual skills. To start the debate, the educator asked students if they found it a good idea. At the beginning of the discussion, they all agreed on the positive impact of the technology on the hiring process. Then, students pointed out that there are other steps in the hiring process (like the interview) and that it is difficult to select which elements are the most discriminating. The educator continued the conversation by mentioning the implicit bias of algorithms in repeating discrimination; the problem with creating a technology like Application for Job is that the algorithm is based on the current society where there is already discrimination. Rather than agreeing on a single answer, students discussed the different issues raised by this technology and proceeded in the same way with the other objects, balancing the pros and cons of each one.

Although the focus was on problem solving all along the design thinking process, this extract from a conversation shows that students managed to understand that their solutions to a problem could generate other problems, and a single solution did not exist. They progressed from a problem-solving attitude to a problem-raising attitude which is representative of design fiction purposes from a critical perspective (Mitrovic et al., 2015). I took these observations into account when developing the activities of the second phase of the DBR project, trying to foster a problem-raising attitude from a problem-solving attitude.

10.1.2.2. The Challenge of Broadening the Discussion to Societal Issues

Design fiction considers the technical aspects of the technology as well as its social, ethical, cultural, political, and economic implications on the imagined society. As the activities progressed, educators tried to encourage students to ask more than just purely technical questions about their prototypes. Primary school students, in particular, had difficulty overcoming this aspect. For example, during a conversation with a group, an educator asked children how people would talk about their object in 2030, in a positive or a negative way. They talked about its benefits and then considered the possibility that it may break down. To counter this problem, they came up with the solution of providing a warranty and the educator started a reflection about business profit. Although this discussion addressed important issues of their prototype, children did not really answer the original question and seemed more concerned about technical problems. During the conference day, educators again tried to challenge primary school students by trying to raise new issues, but they were still very focused on the technical aspects of the objects in the video clips.

Concerning the secondary school students, I observed that they succeeded to broaden their questioning about the future on two occasions. On the one hand, in their futuristic scenario, students covered many topics related to health, sciences, politics, ecology and culture. They drew inspiration from current events to consider the future world, particularly global warming, which seemed to affect them a lot. On the other hand, teenagers brought up many topics for discussion during the conference, such as death, artificial intelligence, sexuality (what distinguishes men and women), algorithms (which reproduce discrimination) and transhumanism (particularly organ transplants). After the conference, they also had the opportunity to discuss the broader issues raised by other participants' objects.

The objective of broadening the discussion was a challenge especially for primary school students, but it also proved equally challenging for older students. The time for reflection was quite limited for secondary school students and they did not have opportunities to reflect on the issues of their own prototypes. We addressed this challenge in the second phase of the DBR project by giving students more space for reflection during design activities.

10.1.2.3. The Challenge of Including Media Analysis Activities

Design fiction can offer two ways of practising media education, i.e., as a design practice and as an object of study (see Research Problem). Media educators particularly exploited design fiction as design practice and most of the activities were production-oriented. The project also provided a lot of space for discussion, but these discussions were strongly focused on the design production processes and lacked guidance. For example, in the design thinking process of a subgroup of primary school students, a lot of time was just spent choosing how the glasses were to be powered (the type of energy). This could have led to a discussion of economic issues but, as I explained above, students got stuck in a solutionist perspective.

Concerning the media production process, educators only provided a few explanations on video shooting, media roles and editing. The activities did not include any analysis of media texts, either design fiction texts or other types of media texts, although students were asked to make promotional videos about their objects and to watch others' videos. We addressed this shortcoming in the second phase of the DBR project by including more media analysis activities and providing tools that helped students interpret media texts, and more specifically design fiction texts.

10.1.2.4. *The Challenge of Mixing Perspectives*

Design fiction is an approach that takes our current concerns as a starting point for imagining possible futures. For both age groups, the design process started by identifying problems that the students encountered in their daily lives. This process led them to build very 'personal' prototypes for which they had trouble considering the societal consequences afterwards. For example, in the brainstorming sessions between sixth-year secondary school students, the discussions were exclusively related to their personal life; after sharing a problematic situation they have personally experienced, they thought about creating an object that could fix this very specific problem. The collaborative writing of the script later helped them to consider the wider implications for their common future.

Primary school students remained very individualistic throughout the creation of their prototype. When they formed subgroups in the ideation phase of the design thinking process, some of them were not open to negotiation and imposed their choices on other students. For example, despite the fact that one subgroup of the fifth group initially agreed that their robot had no gender, the two girls convinced the boy that the robot should be a female. Because the boy was outnumbered, he had no choice but to accept, so they added hair to the robot. Moreover, although the group had previously decided that the robot would not have a brain, the subgroup decided to install one. Many other prototypes did not respect what the main group had previously decided on and subgroups influenced each other about these changes.

For both age groups, the source of the problem was probably that the students stayed in the same groups in most of the activities (except for the conference). They were not confronted with the opinion of others on their prototype and locked into their own vision of the future. We adapted this by mixing the groups in some activities in the second phase of the DBR project.

10.2. Phase 2 – The Critical Inquiry Method

The second phase refines HTTF project and meets my scientific goals, which are to design a critical inquiry method using design fiction in media education. As a reminder, I define the critical inquiry method as a method which enables students to ask critical questions about digital media and technology with the objective of developing their critical thinking.

Unlike the first phase in which I had limited control over the activities, I developed each step of the second phase in collaboration with media educators employed by *Action Médias Jeunes*. This time we applied to a call for projects of the Wallonia Brussels Federation which promotes

the links between culture and education. We collaborated with a French-speaking middle school teacher from a school in Liège (Belgium) and proposed different activities around design fiction to his class of third-year secondary students (14 to 15 years old). We named the project Possible Futures (in French, *Futurs Possibles*) and defined its aim as “to encourage young people to adopt a reflective attitude about ICTs and their own media practices, through participatory workshops that stimulate their creativity and imagination”.

The project took place over a two-month period from January to March 2021. The activities were conducted during the course hours of several teachers, not only the project partner teacher. The educators and I did not have to fulfil any objectives linked to the school year and were quite free in the content of the sessions. Excluding pre- and post-tests, there were seven sessions of four fifty-minute periods³⁷. The new project took the exploratory results of phase 1 into account and proposed a new structure of activities based on inquiry-based learning models. I also developed assessment tools to observe the development of students’ critical thinking all along the project. My role in this second phase was therefore much more active than in the first: not only did I observe the activities, but I also coordinated the development of the project in order to make sure that it would answer my hypotheses.

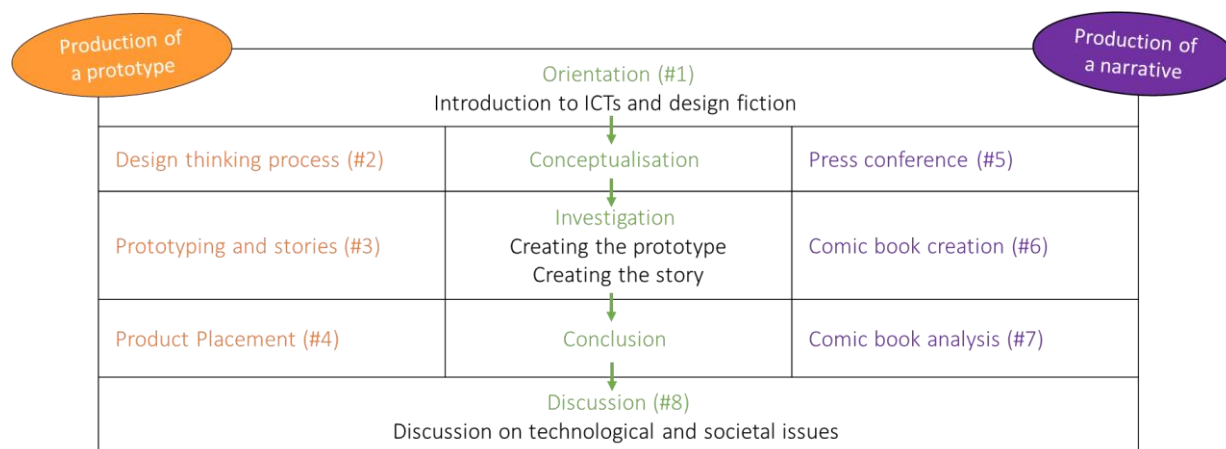
10.2.1. Activities Content

The critical inquiry method combines classical approaches on inquiry-based learning and media education scholars’ core concepts models. On the one hand, I built the structure of the educational programme based on IBL models to let students investigate the future through the practice of design fiction. On the other hand, I encouraged students to ask increasingly complex questions as they progressed in the inquiry process with the help of key questions (Schilder & Redmond, 2019). The next figure illustrates the structure of the programme coupled with the five main phases of Pedaste et al’s synthesized inquiry cycle (2015). The structure indicates that the programme included two inquiry processes: based on a problem, students created first a prototype (see the left part of the figure) and reiterated the process by producing a narrative where they explored a new problem generated by their prototype (see the right part of the figure).

³⁷ In many schools of Belgium, a period of teaching is fifty minutes.

Figure 10.5.

Structure of the educational programme, based on Pedaste et al.' synthetized inquiry cycle (2015)



The critical inquiry method illustrates the two ways of doing design fiction, i.e., design fiction as the production of a prototype and design fiction as the production of a narrative (see Chapter 6: Design Fiction Productions). As a reminder, design fiction is a two-way practice that can be used to materialise possible scenarios through the design of fictional prototypes as well as to imagine the storyworld in which the prototype is implemented. I wanted to include both types of production in the structure of the intervention so that students could both construct their diegetic prototype and contextualise it in the future society. In phase 1, the context had allowed them to consider the wider implications of their prototype. In the analysis of the data of the second phase, however, I did not consider the distinction between these two types of production to study which kind of production would be more effective in developing critical thinking. In this regard, the distinction does not matter, and we can consider these two activities as one, which is doing design fiction.

Furthermore, the inclusion of a second cycle of inquiry focused on narrative production is explained by the fact that I wanted to benefit from the cognitive properties of narrative (see Chapter 8: Design Fiction as Narrative). The scientific literature reviewed in the field of cognitive narratology has highlighted that narrative is one mode of organising experiences which participates in the transfer of knowledge (Bruner, 1990) and constitutes a resource for structuring and comprehending experience (Herman, 2002). In this respect, mobilising design fiction in its narrative form in a media education context should allow participants both to imagine a fictional world that makes sense of their reality and communicate their ideas (or knowledge) to other participants, as well as to structure their own experiences and understand current situations by projecting themselves into a fictional universe.

The next pages present the eight steps of the educational programme. For each step, I first present a summary of the step in a table, pointing out the following elements:

- **The role played by the student:** each step placed the students in a different role to encourage their participation in the activities and their projection into the future. They began by expressing themselves as students, then were invited to take on the role of designers to begin the design fiction process. They subsequently took on the roles of influencers, journalists, scriptwriters, and critics. At the end, they returned to their role as students to reconnect with the present day.
- **The goal of the step:** this is the learning objective which describes what students should be able to know or do after participating in the activities of the step.
- **The inquiry phase:** it refers to the phase of Pedaste et al's synthesized inquiry cycle (2015).
- **The core concepts addressed:** each step tried to introduce students to a series of media literacy core concepts. When the programme activities were being designed, I drew on the concepts of Funk, Kellner and Share (2016). I developed a rubric of key questions distinguishing between key questions on media technology and key questions on media text (see Appendix IV: second and third versions of the rubric on core concepts).
- **The important decisions that were taken** (from step 3): with media educators, we discussed a lot about activities to improve the phase 1 of the DBR project. Some of the decisions we made may have had an impact on the course of the activities.

Second, I explain in more detail the activities carried out with some illustrations of the teaching materials and the productions of the students.

10.2.1.1. *Introducing New Technologies and Design Fiction*

<i>Role</i>	Students as students: sharing ones' experiences with technologies
<i>Goal</i>	Gaining knowledge about emergent technologies and understanding the role played by them in everyday life
<i>Inquiry Phase</i>	
<i>Core concepts</i>	/

The first step consisted in introducing teenagers (third-year secondary school students) to new technologies in a way quite similar to HACK to the Future. The latter project proposed a set of participative activities related to artificial intelligence and its development in art. We decided to keep the same topic in the Possible Futures project and focused on AI and algorithms in four areas: education/learning, media/information, entertainment, and social networks / communication. The goal of this the step was to gain knowledge about emergent technologies and understand their role in everyday life. This step refers to the orientation stage of the inquiry cycle, which consists of exploring a new phenomenon and investigating it through theoretical elements.

The session began with an explanation of the process of design fiction and the project Possible Futures. We wanted to give the students a general idea of what the project would result in. I explained that design fiction consisted in imagining the future of technologies: “*During the project, we will identify problems and create technologies to address these problems*” (Field book, 01/02/2021). This day, one media educator summarised the project into three key stages: the creation of a prototype, a product placement video, and a science fiction story in comic book form.

The activities of the first session included a return to the past in which students were asked to compare past and present technologies, a brainstorming on artificial intelligence, and a Pictionary with QuickDraw, a Google AI. These activities started from students’ knowledge and experience with new technologies to comprehend algorithms. They were based on student participation and aimed at facilitating discussion.

10.2.1.2. Starting a Design Thinking Process

<i>Role</i>	Students as designers: inventing an object or a service in 2030
<i>Goal</i>	Identifying problems raised by current technologies
<i>Inquiry Phase</i>	
<i>Core concepts</i>	First approach to core concepts related to production (designers), audience (consumers, users) and justice (legislators) in the context of media technology

In a similar way to the exploratory stage, students were invited to follow the first three phases of a design thinking process: inspiration phase, ideation phase and prototyping phase. The

second step of Possible Futures consisted in starting the design thinking process by identifying problems raised by current technologies. It refers to the conceptualisation stage of the inquiry cycle and consists in defining a problem, formulating questions, and generating hypotheses.

Although design thinking is generally associated with a problem-solving approach, it seemed essential to the educators and I to start the activities with a traditional design process that the students would not have found difficult to follow. Design thinking is the process used in the production of everyday objects and services. The aim was to offer students a familiar situation in which to begin the design process and then to develop a problem-raising attitude in order to deconstruct the objects they had invented. This is how we proceeded in phase 1 with the HACK to the Future project.

The first activity consisted in identifying problems in their daily lives at school, on social networks or more generally in the field of communications. After sharing problems with other students, they chose one area and one problem per group (see table 10.6.).

Table 10.6.

Selection of problems by group – Step 2 – Possible Futures (2021)

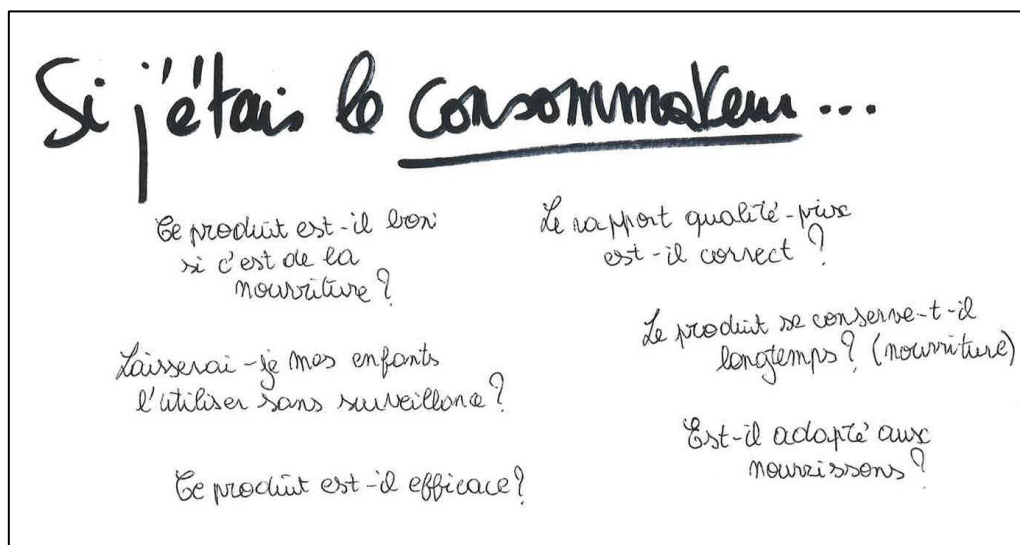
Group	Area	Problem
1	Education	The inconvenience of having to carry all your stuff to school.
2	Social Network	Cyberstalking; data collection; nude photos.
3	Media	Personal data leakage.
4	Entertainment	Accessibility of leisure activities.
5	Entertainment	Video games not taken seriously enough.
6	/*	/*
7	Entertainment	We only show the positive side of things.
8	Social Network	/*

(*) Not all the groups were progressing at the same pace. As a result, at this step of the project, groups 6 and 8 had not yet fully defined their area or/and problem.

The second activity, named *Café Mundo*, consisted in formulating questions as consumers, designers, and legislators (see figure 10.7. for an example). This activity was a first introduction to the core concepts applied to the context of media technology, including production (*Who created this piece of media technology?*³⁸), audiences (*How could this piece of media technology be used and appropriated differently?*) and social justice (*Whom does this piece of media technology advantage and/or disadvantage?*). This activity had no direct link with the previous activity and aimed to encourage students to ask diverse questions from the beginning. The media educators told the students that these questions would be useful later when they designed their objects. The questions helped the educators to create the card game in the next sessions.

Figure 10.7.

Example Café Mundo activity – “If I was consumer...” – Step 2 – Possible Futures (2021)



The third activity consisted in specifying the piece of media technology students wanted to create. Media educators gave ‘technologies cards’ to teenagers that helped them to identify the characteristics of their prototype (see figure 10.8. for an example). They could choose as many cards as they wanted. These cards allowed the students, among other things, to specify

³⁸ As explained in the introduction of this section (10.2.1.), these questions are based on the core concepts of Funk, Kellner and Share (2016). They are originally from one of the first versions of my rubric, which distinguished between key questions on media technology and key questions on media text.

what the prototype would look like and what materials they needed to bring to the next session.

Figure 10.8.

Example Card Technology – Virtual Reality – Step 2 – Possible Futures (2021)

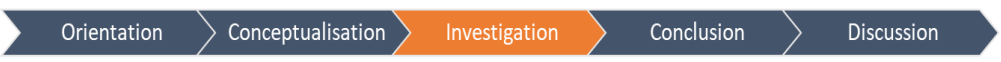


The second step ended with a pitch of each group presenting its prototype. The next table synthesises their creations (see table 10.9.).

Table 10.9.*Selection of problems by group – Step 2 - Possible Futures (2021)*

Group	Area	Problem	Creation
1	Education	Carry all your stuff to school	Connected benches with all the necessary equipment: touchscreen, digital recognition, hologram, etc.
2	Social network	Cyberstalking	Application to prevent a nude photo from going viral. It informs the victim so that they are aware that their photo is being circulated and so that they can report the abuser.
3	Media	Personal data leakage	Highly secure storage box, with hologram and digital recognition. Small box, easy to carry.
4	Entertainment	Accessibility to culture	Virtual reality helmet that takes you into a world where anything is possible. Accessible treadmill for every person.
5	Entertainment	Video games not taken seriously enough.	Virtual reality headset that immerses you in a video game world. Objective: open up the world of video games by forcing people to play.
6	Education	The speed of learning differs from student to student	Glasses showing lessons in augmented reality with holograms. Easy to learn.
7	Social network	We only show what we want on social networks	An application for people who are not comfortable in their appearance.
8	Social network	Hate Speech	The application puts the person in an artificial coma.

10.2.1.3. Prototyping and Stories Shooting

<i>Role</i>	Students as designers: inventing an object or a service in 2030
<i>Goal</i>	Questioning the design process
<i>Inquiry Phase</i>	
<i>Core concepts</i>	Production in terms of design choices and commercial implications, and purpose (reasons for creating the prototype) in the context of media technology
<i>Important Decisions</i>	Alternating individual and group activities Alternating analysing and designing activities

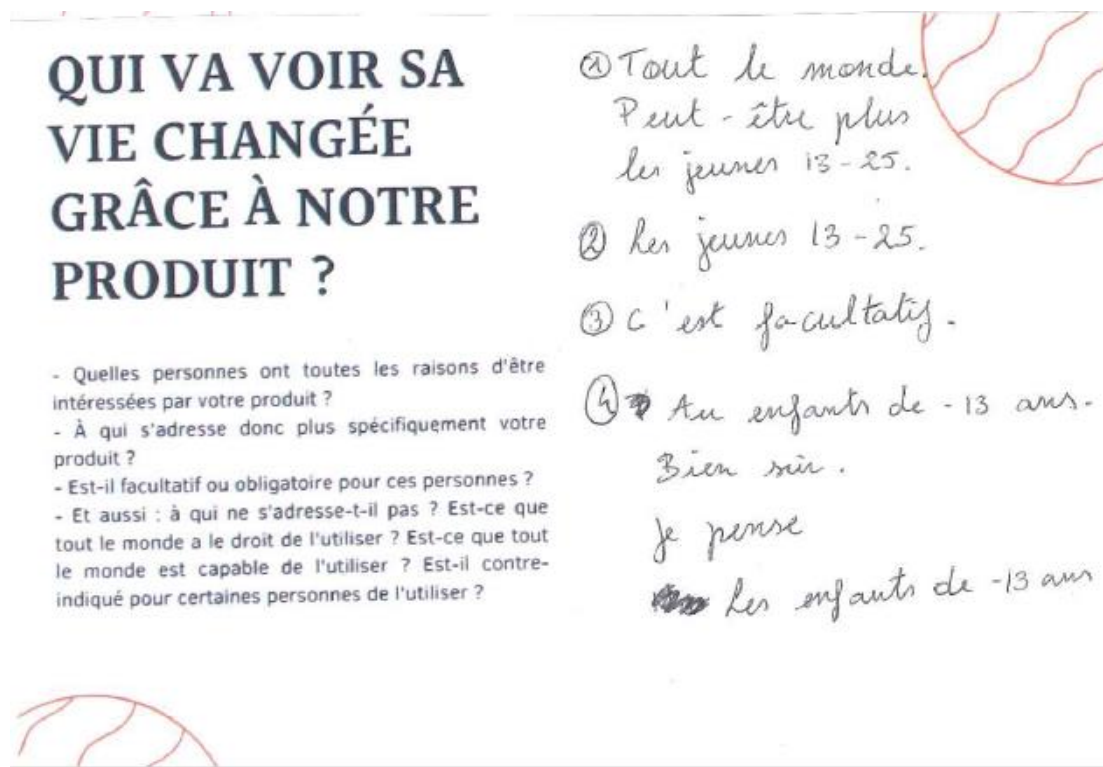
The third step consisted in prototyping the object or the service of the future. This step refers to the investigation stage of the inquiry cycle, which is a process of exploration or experimentation in which learners collect and analyse data. In the context of the project, this stage consists in exploring their problem through the materialisation of an object. Based on Café Mundo students' questions, we created a card game that accompanied them throughout the programme. Activities of the third step first consisted in answering the questions in the first deck of cards as designers. This first deck included mainly questions about the design and functioning of their inventions. They then presented their object in the form of stories on Instagram.

The first deck of cards included the next eight questions. These questions introduced students to the core concepts of production (*Who are all the possible people who made choices that helped create this piece of media technology?*) and purpose (*Why was this piece of media technology created?*) in the context of media technology. These questions were accompanied with sub-questions at the verso of the cards (see figure 10.10. for an example).

1. What is the name of our product?
2. What was wrong before creating our product?
3. Our product is an amazing solution because...
4. Who's life be changed by our product?
5. It looks like this...
6. This is how it works...
7. There are a few precautions to take...
8. Here is all the information you need to know to buy it...

Figure 10.10.

Example First Deck – Group 2 – Step 3 – Possible Futures (2021)



The next table synthesises the answers of the first and third questions of the deck: the name of the product and the solution it brings to the problem identified in the previous step.

Table 10.11.

Name and solution of prototypes – Step 3 – Possible Futures (2021)

Group	Name	Solution
1	EasyTech	Connected and touchscreen bench that is ergonomic, ecological, and easy to use; designed and created by students for students.
2	NudiStop	Privacy is ensured: the photos sent are traced. Photos and videos cannot be shared.
3	Holocloud	Data security is guaranteed: no more leakage of personal data, no more hacking and unlimited storage.

4	Virtuose	The product is not expensive and therefore accessible to everyone. The sensations are more realistic. The design is unbelievable.
5	J-C 24	Monitor health, live in a virtual world, assist people, etc.
6	Valentine's	The glasses allow everyone to learn at their own pace, to record their lessons, to learn more easily, to travel light and to feel less ashamed.
7	Lara	The bag allows you not to be bothered by the weight of your stuff, it improves safety in the streets, and makes you prefer to walk or cycle (which is positive from an ecological point of view).
8	TGL	It stops hate on social networks and only targets bad people.

The second activity consisted in watching videos. The first video was a conference of Steve Jobs presenting the first iPhone (2007)³⁹. The goal was to give an example of an entrepreneur showing a product, so that students could use it as a basis for their own video clip. Media educators also gave examples of Instagram stories (from companies such as Samsung, Razer...) and asked students to identify common features that were used in these examples. This activity addressed Phase 1's challenge of including more media analysis activities and highlighted the features that the brands used to promote a product.

The third activity was the shooting of the stories. After a short introduction on storyboarding, they thought in groups about how to stage their object: the content (the different scenes) as well as the form (filters, effects, transitions...). They shot their story with their phone in the schoolyard. During this activity, the class was divided in two groups: while a group was shooting, a second group was working on the economic model on its prototype. This last activity consisted in thinking about the economic implications of the production, distribution, and sale of its prototype.

³⁹ See the video here: https://www.youtube.com/watch?v=MnrJzXM7a6o&ab_channel=JohnSchroter (retrieved October 11, 2023)

Figure 10.12.

Sketch of the connected bench – Group 1 – Step 3 – Possible Futures (2021)



10.2.1.4. Product Placement

<i>Role</i>	Students as influencers: promoting the object of another group
<i>Goal</i>	Questioning the process of the media text creation
<i>Inquiry Phase</i>	Orientation > Conceptualisation > Investigation > Conclusion > Discussion
<i>Core concepts</i>	Production, purpose, audience, and representations in the context of media text
<i>Important Decisions</i>	Starting to raise questions on the audience and representations Including media decoding activities

The fourth step consisted in doing ‘pre-’ product placement and promoting the object of another group. This step acted as a conclusion in the inquiry cycle as it led learners to make connections and drew conclusions from their data, namely, their inventions. Still based on their questions collected in the second step, we created a second deck of questions to ask themselves as influencers: the kind of audience students would like to have, the values they would like to transmit, and so on (see the list below). The goal of this new step was to encourage students to ask key questions about the process of media text creation. This step made it possible to consider the approach of design fiction as an object of study.

The first activity of the session consisted in analysing an advertisement for a future product to (re)focus the project on design fiction (and its speculative nature) and engage students in media analysis. We chose the video clip on the *Teslasuit* product⁴⁰ and asked students to search the web for answers to four questions: *Does this object already exist? Who made this object? Who made this video? Why was this video made?* This activity encouraged students to question the producers of technologies as well as commercial videos, which are sometimes confused in the context of design fiction. This introduced them to the core concepts of production (*Who are all the possible people who made choices that helped create this text?*) and purpose (*Why was this text created and/or shared?*) in the context of media text.

The second activity consisted in decoding product placement videos. Media educators prepared examples with well-known YouTubers, and students were invited to identify their characteristics. They also watched a popular science video explaining what product placement is. They had several minutes of discussion at the end to summarise the video and highlight how product placement works.

The third activity consisted in answering the questions of the second deck of cards. Students first continued to play the role of designers and answered questions to identify their target audience for their product placement and the type of influencer they would like to work with (Questions 9 and 10). Second, as they learned to do with the popular science video, each group briefed another group to be each other’s influencers. Third, they answered the rest of the questions of the deck as influencers (Questions 11 to 15).

9. Which audience are we targeting with our product placement? Why this particular audience?
10. What type of influencer are we going to work with? What justifies our choice?
11. What kind of influencers are we?

⁴⁰ See the website of the development of the product: <https://teslasuit.io/> (retrieved October 11, 2023)

- a. What are our values? What is special about us?
- b. What relationship do we want to have with our audience?
- 12. Who is the target audience? How can we clearly explain to them what our technology is for?
- 13. What product benefits will we promote?
 - a. What is our audience interested in?
 - b. What are their needs?
 - c. What would they particularly like about the product?
- 14. What will we avoid mentioning about our object?
 - a. What features of the object do not interest our audience?
 - b. Are there any disadvantages we don't want to mention?
- 15. What consequences will this product placement have on our reputation?
 - a. What are the values of the product that are in line with our own?
 - b. What image do we want to give by promoting the product?
 - c. Would we be ready to use this object individually?

The questions of the second deck introduced students to the core concepts of audience (*How could this text be understood differently?*) and representations (*What values, points of view, and ideologies are represented or missing from this text or influenced by the medium?*) in the context of media text.

The last activity consisted in doing role-playing. After answering the questions of their deck, each group prepared a product placement pitch. Media educators filmed the scenes to put the students in a real-life situation.

10.2.1.5. Press Conference

<i>Student Role</i>	Students as journalists: finding the flaws or interests of the designers' objects
<i>Goal</i>	Adopting a problem-raising attitude
<i>Inquiry Phase</i>	
<i>Core concepts</i>	Production (incl. economics), audience/users and representations (incl. values, ideology, and ethics) for both media text and media technology
<i>Important Decisions</i>	Mixing groups

In the fifth stage, a second cycle of inquiry started, where students were required to go back to the conceptualisation stage. At the beginning of this new inquiry cycle, students embodied various media in simulated press conferences and tried to find the different interests or flaws of the others' objects. This step aimed to question their own invention and broaden their questioning to other issues (other than purely functional or structural) such as the environment, access, values, the credibility of the technology in 2030, and so on.

The goal of this new inquiry cycle was to get students to distance themselves from the problem-solving attitude and encourage them to adopt a problem-raising attitude. The problem-raising attitude is based on critical design approaches which uses design fiction as a speculative design practice to open up spaces for discussion about what the future could be and to propose alternatives to things as they are now (see Chapter 5: Design Fiction Uses). In our context, we wanted students to distance themselves from their inventions by questioning them about their societal impact.

Media educators began the session with a brainstorming of the word 'journalism' to assess students' knowledge. They then explained what a press conference was and gave some video examples of a press conference. After this short introduction, they presented the media that the students would have to embody in their press conferences. During a briefing session, we selected seven fictitious examples⁴¹:

- 1) *Business*: economics and profitability
- 2) *Etik*: ethics and values of technologies
- 3) *Tech*: working, characteristics of technologies
- 4) *Happiness*: wellness, self-development
- 5) *Mme Globalisation*: ecology, environment
- 6) *Test Conso*: consumers protection
- 7) *Branding*: communication and promotion of brands

The choice of these examples was not trivial and was intended to enhance students' understanding of a series of core concepts relating to both media text and media technology, in terms of production (including economics), audience, and representations (including values, ideology and ethics).

⁴¹ These examples are part of the association's teaching material. They are based on real life media organisations. Mme Globalisation, for example, is based on Mr Mondialisation, an independent citizen news media organisation that aims to encourage free debate on issues such as ecology, degrowth, capitalism and globalisation.

Students were invited to play each media during press conferences. They were grouped with other students than the designers' groups in order to mix perspectives on the objects and to distance themselves from their own invention.

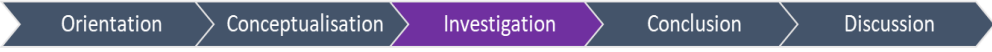
The press conferences took place in five stages. First, they watched the Instagram stories of the designers' group. Second, designers had a few minutes to give complementary information on their invention. Third, the other students, playing journalists, prepared questions according to the media they belong to. Fourth, to limit the time of the activity, they chose one question to ask by group. Fifth, the journalists asked their questions to the designers' group. The press conferences proceeded on these sequences.

Figure 10.13.

Example of questions asked during press conferences – Step 5 - Possible Futures (2021)

Notre magazine	La question qu'on a posée
ETIK	Pensez-vous que l'apprentissage sera le même ?
Business	Quels sont vos revenus ?
Tech	En quoi le casque VR et le tapis de course sont-ils une technologie révolutionnaire ? Est-ce réellement une nouvelle technologie ?
Une Globalisation	Les matériaux seront-ils réutilisés où vont-ils polluer la planète et en particulier les océans ?
Happiness	Est-ce que porter son sac n'est-il pas mieux que de risquer de se casser le poignet ?!
Branding	Pour quel âge ? Comment en faire la promotion ?
Test conso	Est-ce que on peut rester coimcar dans la réalité virtuelle sans pouvoir en ressortir ?

10.2.1.6. Comic Book Creation

<i>Role</i>	Students as scriptwriters: investigating the consequences of their object in 2030 in the form of a narrative
<i>Goal</i>	Questioning the problem-solving attitude
<i>Inquiry Phase</i>	
<i>Core concepts</i>	Social justice (incl. discrimination and accountability) in the context of media technology
<i>Important Decisions</i>	We asked students to contextualise their story at the beginning and we let them choose their type of ending (positive, negative, or open ending)

The sixth step consisted in creating a comic book with smartphone applications. Based on the interests/flaws highlighted at the press conferences, students were invited to investigate the consequences of their object in 2030. Similarly to the prototyping step in the first inquiry cycle, this step is associated with the investigation stage where students explore a problem through this time a comic strip.

As we discussed in Chapter 8 when exploring the cognitive properties of narrative, narratives can help students organise their experiences in order to construct new knowledge (Bruner, 1990) and can be mobilised as a problem-solving resource (Herman, 2002). In an approach to inquiry as a process of questioning, narratives can be particularly useful in defining and framing the problem, based on one's understanding of reality.

The objective of the sixth step was thus to focus on the creation of the comic strip on the definition of the problem to overcome the solutionist perspective by letting students understand that even an object created to address a problem could generate problems and that the perfect solution did not exist.

I introduced the session by explaining that this step was part of design fiction practice: “*after imagining technical characteristics of an object, designers speculated about consequences in the future society. As creators, they thus had to collaborate with scriptwriters to imagine the future impact of the marketing of their products*” (field notebook, 01/03/2023). Students played the role of scriptwriters in this session and were invited to take some distance with their object by speculating on the potential consequences of their future implementation.

Before embarking on the creation of their own comic strip, the students were introduced to the codes of the comic book. On the basis of several examples, they had to identify the common elements in the content and form of comics. They received a folder with some theories about the composition of the strips: the value of the plans, the linguistic and auditory dimensions (onomatopoeia, phylactery...), the main stages of the storyline, and so on. They also were quickly introduced to storyboarding so that they could prepare their scripts.

Based on the press conferences, media educators identified two problems per prototype (see figure 10.14. for an example of problems). They asked students to pick one problem, or to propose one by themselves, and to justify their choice. Students were then invited to answer questions of a third deck of cards. This deck helped them to imagine their fictional world and the people affected by the new problem. It introduced them to the core concept of social justice (*Whom does this piece of media technology advantage and/or disadvantage?*) and the issues related to discrimination and accountability. It included the next questions:

16. Imagine the world in which the story takes place.
 - a. How is the world of 2030 in which your story will take place?
 - b. Find three images on the Internet that are representative of the world that you imagine.
17. Is there someone responsible for the situation you have identified?
 - a. Is there someone responsible for the problem you have selected?
 - b. Is it intentional or accidental?
18. Who are the people affected by this situation?
 - a. Which people are affected by this issue and how?
 - b. Who is affected by the situation and who is not?
19. Who benefits? Who is harmed?
 - a. Does it benefit anyone? (It doesn't have to)
 - b. Does it harm any groups of people?
20. Is everyone aware of the situation?
 - a. Is everyone aware of the problem?
 - b. Is it possible to ignore it?

Figure 10.14.

Example of problems for comic strips – Group 5 – Step 6 – Possible Futures (2021)

 		Sur base des éléments évoqués lors de la conférence de presse, voici 2 pistes pour imaginer votre scénario. Sélectionnez-en une qui servira de point de départ à votre histoire de science fiction.
1.	La puce TGL met dans le coma les gens qui ont tenu des propos « méchants » sur Internet. Est-ce que quelqu'un (d'« innocent ») pourrait se retrouver piégé dans le coma sans savoir en sortir ?	
À partir de quand est-on considéré comme « méchant » par TGL ? À quoi ressemblerait un monde où chacun-e veut éviter d'être la cible de TGL ?		2.
Pourquoi avoir choisi cette thématique ? (Qu'est-ce qui vous inspire, vous interpelle, dans la thématique choisie ?)		

The next activity consisted in determining the characters and the main stages of the storylines. Students had to meet a set of conditions: define a maximum of 3 characters, choose a maximum of 3 places where the story would take place, identify a quest (an objective), a series of events, and an ending. The ending of the story could be closed or totally open, i.e., students were free to solve the problem or not. We determined this instruction based on the theory developed in Chapter 8 dedicated to the narrative properties of design fiction practice. As a reminder, I argued that design fiction could generate several types of narratives. I distinguished between closed and open narratives. The closed narrative refers to stories that follow the narrative scheme with a beginning, a sequence of events and an end. The open narrative refers to stories without a definite end. I therefore suggested to the educators that

they leave the choice to the students, in order to observe whether they would overpass the problem-solving attitude (vs. problem-raising attitude).

Once they determined the elements of their story in a document provided for this purpose (see figure 10.15.), students drew their storyboard on blank strips (see figure 10.16.). It was only at the very end that they used their smartphones to make the comics (see figure 10.17.). In this context, they used the Comica application.

The following table summarises the stories of the comic strips of the different groups:

Group	Name	Story
1	EasyTech	Wealth gap between people who possess the technology and those who do not. Two people in love are caught up in this conflict and fight for their love. Happy ending.
2	NudiStop	The application has made it possible to find the person behind the cyberbullying. The attacker was summoned to the courthouse, but the victim did not attend. We have no idea what happened.
3	Holocloud	A malicious person manages to hack into the holocloud and demands a ransom from its inventor (Elon Musk). Musk gives in to prevent his SpaceX rocket from taking off.
4	Virtuose	Two people meet in the virtual world of Virtuose and have sex. They later realise that they know each other and are none other than mother and son.
5	J-C 24	Stouline used the technology to control people in his communist regime. Opponents were locked into a video game and this led to the end of humanity.
6	Valentine's	The glasses were hijacked years ago by a teacher. He was attracted by the highly immersive features of the glasses and used them to teach his classes. Two young girls discovered a pair of these glasses in an abandoned house and tried them on.
7	Lara	The bag's success has made some people jealous, and a hacker hijacks the technology's functionality. He injured one of the designers in the public arena.
8	TGL	A person falls into a coma because of his offensive behaviour. He can observe the real world from within the virtual world. Time passes and he grows old. His father is getting on in years and to see him one last time, he decides to become kind.

Figure 10.15.

Example "Construire son Histoire" – Group 6 – Step 6 – Possible Futures (2021)

CONSTRUIRE SON HISTOIRE

Y a-t-il un personnage principal?

Qui est-il? Quel est son signe distinctif? (détail physique, accessoire, trait de caractère...)

Quel est son lien par rapport à la problématique?

Oui, 3 personnes qui vont explorer une école abandonnée.
3 jeunes filles: Louise, Manon, Valentine

→ blonde, fillette, gentille, intelligente

→ brune, sportive, froussarde aussi, gentille

→ chétive, aime nous faire peur, courageuse

On va découvrir l'ancien modèle des lunettes

Qui sont les autres personnages (max 3)? Quels sont leurs liens par rapport à la problématique?

1. le professeur fou → il a hacké les lunettes

Votre action peut se dérouler dans maximum 3 lieux.

Quels sont-ils? Téléchargez 3 fonds sur Unsplash

1. l'école abandonnée et les différentes pièces de celle-ci.

les filles trouvent les anciennes lunettes et l'une d'entre elles les mettent.

Quelle impulsion lance la quête?

Que se passe-t-il à partir de là?

Quelle fin envisagez-vous?

Figure 10.16.

Example of storyboard, Strip 1 – Group 6 – Step 6 – Possible Futures (2021)

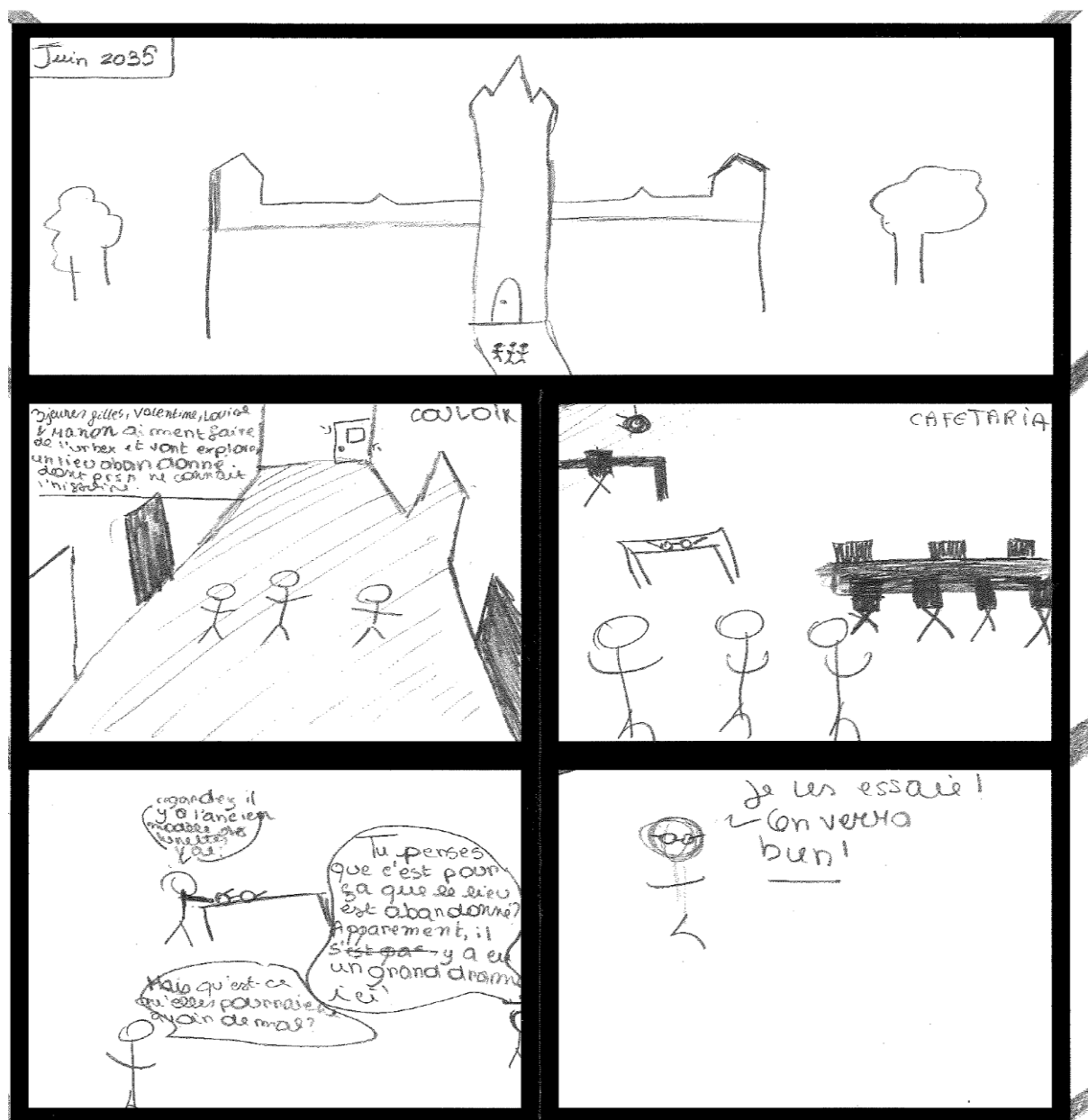


Figure 10.17.

Example of students' comics, Strip 1 – Group 6 – Step 6 - Possible Futures (2021)



10.2.1.7. Comics Book Analysis

<i>Role</i>	Students as reviewers: reviewing others' comic books
<i>Goal</i>	Mastering all the core concepts
<i>Inquiry Phase</i>	
<i>Core concepts</i>	Representations, languages/semiotics, and interpretation in the context of media text
<i>Important Decisions</i>	Creating an analysis grid for analysing others' comic books

The seventh step consisted in reviewing others' comic books. It closed the second cycle of inquiry by drawing conclusions on participants' visions of the future. This activity encouraged students to ask new questions on core concepts related to representations (*What values, points of view, and ideologies are represented or missing from this text or influenced by the medium?*), languages/semiotics (*How was this text constructed and delivered/ accessed?*) and interpretation (*How could this text be understood differently?*) in the context of media texts. At this stage, the students had been introduced to all the core concepts to develop a constructive review.

The session took place in two parts. First, students wrote quick reviews of each other's comics (see figure 18 for an example). They did this in pairs, with a student who was not part of the same group, to confront their perspectives on their own comics. They had to analyse the following items:

- The way the world and the piece of the technology were depicted;
- The role of the piece of the technology in the storyline;
- The problem narrated;
- The people responsible for the problem;
- The consequences of the problem on the world depicted;
- The end of the story;
- The emotions felt when reading the comic strips;
- The artistic choices that influenced the creation of the comic and the story;
- The message that the scriptwriters wanted to communicate through the comic book.

Second, the students had to choose a comic strip and write a constructive review about it on their own (see figure 10.19. for an example). Media educators provided advice to help them to

feed their arguments, such as thinking about writing about both form and content or about the recommendations they could make to a readership.

Figure 10.18.

Example of student's short critique – Step 7 - Possible Futures (2021)

CRITIQUE DE LA BD N° *x.24*

COMMENT LE MONDE DE 2030 EST-IL REPRÉSENTÉ ?
Le monde est gouverné par Stouline et les communistes

COMPRENDS-TU L'HISTOIRE RACONTÉE ? ☒ OUI ☐ NON ☐ BOF

LE MONDE DE 2030 RESSEMBLE-T-IL À CE QUE TU IMAGINES ? ☒ OUI ☐ NON ☐ BOF

COMMENT LA TECHNOLOGIE EST-ELLE REPRÉSENTÉE ?
Par un jeu - vidéo
QUEL RÔLE OCCUPE LA TECHNOLOGIE DANS L'HISTOIRE ?
Elle permet d'imprisonner les opposants
QUEL EST LE PROBLÈME MIS EN RÉCIT ?
le communisme
QUI EST RESPONSABLE DU PROBLÈME ?
Stouline
QUELLES CONSÉQUENCES A CE PROBLÈME SUR LE MONDE ?
Les personnes sont opprimées et non-libres
COMMENT L'HISTOIRE SE TERMINE-T-ELLE ?
Le monde est perdu

QUELLES ÉMOTIONS RESENS-TU EN LISANT CETTE BD ?
C'est : ~~triste~~ bizarre mais drôle

QUELS CHOIX ARTISTIQUES ONT ÉTÉ RÉALISÉS LORS DE LA CRÉATION DE LA BD ET EN QUOI CEUX-CI ONT-ILS INFLUENCÉ L'HISTOIRE ?
*Le filin pour faire ancien
C'est cool.*

QUEL MESSAGE VEULENT FAIRE PASSER LES SCÉNARISTES À TRAVERS LEUR BD ?
Faut faire attention au communisme

COMBIEN D'ÉTOILES POUR CETTE BD ?
☒ ☒ ☐ ☐ ☐

Figure 10.19.

Example of a student's long critique - Possible Futures (2021)

ECRIS UNE CRITIQUE

CHOISIS L'UNE DES BD QUI T'A PLUS ET RÉDIGE ENSUITE UNE CRITIQUE D'UNE DIZAINE DE LIGNES. POUR T'AIDER, VOICI QUELQUES INDICATIONS SUR LE GENRE LITTÉRAIRE DE LA CRITIQUE...

Conseils pour rédiger une critique :

- Prévoyez un peu d'informatif (le nom de la BD par exemple), un peu de narratif (mentionner la thématique abordée par exemple) mais surtout de l'**argumentatif** (donnez votre avis de manière constructive !)
- Pour écrire ce que vous en avez pensé, vous pouvez parler du **fond** :
 - Quelles réactions/émotions cette histoire a-t-elle suscité en vous ?
 - La thématique abordée vous semble-t-elle importante ? actuelle ? surprenante ? audacieuse ?
- Vous pouvez aussi parler de la **forme** :
 - Quelle est la qualité des images ? des choix en terme de valeur des plans ? de présentation des personnages ? du texte ?
 - La découpe en cases rend-elle le scénario compréhensible ?
 - La manière dont l'histoire est représentée est-elle originale ? surprenante ? inventive ? drôle ? dramatique ? Et à quoi le voit-on ?
- Pour **conclure** :
 - Conseilleriez-vous cette lecture à d'autres ? Pourquoi ?
 - Pourquoi pas une formule choc !

du'ais-je pense' de la BD TGL? y'ai trouve' la Bd pour le contenu assez bonne même si en je ne comprends pas bien la ~~troisième~~ deuxième planche. Les dessins sont bien mais trop flous pour qu'on voit les conversations sur le téléphone, ce que je trouve dommage. L'histoire est bien trouvée, on voit bien la différence entre les ^{deux} mondes. Je conseille cette BD marzante à lire et attend la suite.

Bonne bande dessinée! Je reste à l'acheter!!



10.2.1.8. *Televised Debate*

<i>Role</i>	Students as students: going back in the present time by linking prototypes and stories to current societal issues
<i>Goal</i>	Discussing current technology issues
<i>Inquiry Phase</i>	
<i>Core concepts</i>	/
<i>Important Decisions</i>	Organising a debate in the form of a TV show

The last step consisted in discussing current technology issues. This step refers to the final stage of the inquiry cycle, which involves sharing findings with others and conducting reflective activities. In the context of the educational programme, this stage consisted of discussing and debating together the prototypes and narratives created by students and relating them to current concerns in society. With the media educators, we had a long conversation about the form that this last activity should take, and we decided on a televised debate. We could not just gather the students around the table and discuss with them as we had done with the students in the Hack to the Future project (because they were simply younger) and looked for a dynamic form where the students would be more involved.

Educators prepared the session by identifying three common issues in the students' comics. First, based on Easy Tech and Valentine's comics, they launched the debate on the current possibilities of teaching with distance learning, the use of new technologies such as interactive whiteboards or tablets, and the digital divide. The second debate was based on Holocloud, NudiStop, Lara's and JC24's comics. The educators animated discussion on the collection and security of personal data with recent examples of cyber-attacks or leakage of sensitive data. Third, based on TGL, Virtuouse and NudiStop's comics, they focused on topics such as cyberbullying, online (hate) speech moderation and anonymity. The current moderation on social networks such as Twitter or social movements such as #metoo were examples that stimulated the discussion.

The students played several roles in the televised debates. Three students acted as columnists and two as community managers. The rest of the class was the audience and could react to the show via the Wooclap application they used on their smartphones. An educator played the role of the presenter of the TV show and read out sentences on which the columnists had to

take a position (agree/disagree) and discuss the proposals. The community managers had to manage the reactions of the audience and select the most appropriate ones to report them to the columnists.

The session ended with a final activity related to the issues of emotions. This issue had not been addressed in the previous activities (only mentioned in the reviews but not really discussed), and we wanted to let students express themselves on the topic during the project. They watched a video named *Uninvited Guests* edited by Superflux Studio⁴². It tells the story of a 70-year-old man whose wife has recently died. His son gives him various smart technologies to help him in his daily life, but he finds it difficult to follow their instructions. This speculative video made by critical designers encourages people to think about the issues raised by technology through an illustrative everyday situation. As the situation addresses sensitive issues relating to grief and care, we found it appropriate to address the issue of emotions with the students and let them express their emotions freely.

10.2.1.9. Evaluation of the Project

At the end of the project, the students received an evaluation sheet. Accompanied by a timeline recalling the different activities (see figure 10.20.), they were invited to give their opinion on:

- What they liked about the project;
- What they liked less;
- What they learned;
- What they already knew;
- What interested them;
- What interested them less.

⁴² See the website of the project: <https://superflux.in/index.php/work/uninvited-guests/#> (retrieved October 11, 2023)

Figure 10.20.

Timeline of the evaluation report - Possible Futures (2021)



10.2.2. Key Observations

Possible Futures was a well-documented project that generated immediate enthusiasm among students. Although this project tried to overcome the challenges of HACK to the Future by proposing a new pedagogical structure based on models of inquiry-based learning, I observed that it was very difficult for the students to adopt a problem-raising attitude and to distance themselves from their prototypes. The next few paragraphs summarise some key observations which will be contrasted with the results of the pre- and post-tests in the chapter dedicated to the discussion of the findings.

10.2.2.1. *Solutionism To Reach Problem-Raising Attitude*

In phase 1, with the HACK to the Future project, I observed that it was difficult for students to go beyond the solutionist perspective and also to design an educational intervention using design fiction without using a problem-solving process. In phase 2, the educators and I therefore considered setting up different phases that would gradually lead students to adopt a problem-raising attitude.

Right from the start of the design thinking process, a number of initiatives were implemented to ensure that the students would not be too much entrenched in a solution-oriented perspective. For example, we designed the design thinking process so that the students would first identify the problem before thinking about the solution. I noticed, however, that several of the students were already imagining the object to be created before clearly formulated the problem. During the activity when they were answering the questions of the first deck of cards, I also noted that some students reoriented their problem to fit the object they were designing. For example, Group 7 wanted to create a dress with different designs that changed its appearance depending on who was looking at it. To make the project more feasible, they finally decided to create a magnetic bag with an implant in the skin that automatically came close to them. They chose the same problem as Group 1 about “carrying all your stuff at school”.

These observations show that it is not easy to detach the problem from its solution. As I explained in the previous section (see 10.2.1.2.: Starting a Design Thinking Process), however, educators and I felt that it was difficult to initiate a design fiction process adapted to the students without going through the traditional design stages. Certainly, some mistakes could have been avoided (such as the question from the first deck of cards which explicitly stated that “our product is an amazing solution because...”), but we felt that it was important to start

from a familiar situation and then distance oneself from it. This process of distancing should therefore take place in the second cycle of inquiry.

The second cycle aimed to move away from the solutionist perspective and adopt a problem-raising attitude. In the creation of comics, students again encountered some difficulties in formulating the problem. Although the problems suggested by the educators were quite open-ended, students had difficulty in choosing and justifying their problem. One of my observation notes suggests that the material lacked a clarification of the problem-situation that students wanted to illustrate in their comics before coming to the justification. One solution would probably have been to give students more time to appropriate the problem. This lack of clarification was also a difficulty when they answered the questions of the third deck of cards. This activity took longer than expected because students did not have enough time to clarify their story and the people affected by the problem.

During the construction of their storyline, I noted that some groups became very detached from their prototypes. For example, one group wanted to create a love story like Romeo and Juliet first, and then think about integrating their prototype in the story. Their intention seemed laudable, but they were once again anchored in a solutionist perspective because they were thinking about the result (a love story) before the problem (the wealth gap). Another group was more interested in telling a horror story set in a haunted castle than a science fiction story. In contrast, one group was still very attached to its invention and attempted to defend it, although the aim of the activity was to distance themselves from it as a scriptwriter. In the debriefing session with the educators, we discussed a lot about these situations and agreed that students in this age group was a real challenge in a media education context. They seem to be an audience that needs a lot of guidance to encourage them to adopt a critical attitude.

These examples show that the students were primarily focused on the creation of their solution before addressing the problem. In phase 1, the design process showed similar results, and yet the secondary school students were able to overcome their problem-solving attitude in later stages. Consequently, I could hypothesise that, even if students adopt a problem-solving attitude in the early step of the inquiry cycles (in particular, conceptualisation and investigation), they would be able to adopt a problem-raising attitude in the later steps (in particular, conclusion and discussion). In this context, problem-solving and problem-raising are not seen as opposing but complementary approaches to the development of students' critical thinking. This hypothesis will be discussed in the final chapter of the manuscript.

10.2.2.2. *From Several Decks to A Single Card Set*

I suggested the card game to the educators to introduce some of the media literacy core concepts as the activities proceeded. I encountered several obstacles in the creation and implementation of the card game that did not allow me to fully achieve my objectives. Concerning the first deck of cards, I did not have access to the final version of the cards used for this session. The third question (“*Our product is an amazing solution because...*”) engage students in technological solutionism, which I would have liked to avoid during the project, as some of the students were already very focused on their solution rather than their problem during the second session. Concerning the second deck (influencer-creator), the students had little time to answer the questions of cards. They particularly had trouble with the questions about values and ideologies and have not been supported to answer them properly. Concerning the third deck (storyline), as I mentioned above, the lack of clarification of their problem in the previous activity made it difficult to answer the questions in the card game. The activity was also time consuming, and the students had trouble in specifying the people involved in their story.

The card game took up a lot of time to be completed in the project Possible Futures and lacked consistency when students changed roles. In phase 3, we thus decided to simplify it to focus exclusively on the design process and to include questions with broad societal implications. We built a designer deck with questions to be asked during the design process, which are both technical (functioning, materials used, etc.) and social (users, ethics, etc.).

10.2.2.3. *Role-playing as a Means of Expression*

Evaluation sheets indicated that most students enjoyed roleplaying activities, such as putting oneself in the shoes of influencers or journalists. My observation notes suggest that these activities allowed them not to be afraid to express themselves verbally in front of the class. Concerning the influencer-creator, students had a lot of fun, but we could not go very far from a ‘critical’ perspective. Some groups of designers disagreed with the way the influencers presented their product. The exercise therefore did not go exactly as planned, and most of the questions that needed to be addressed could not be answered.

It was during the press conferences that I observed a real shift in students’ critical thinking. As the conferences progressed, students grew more discerning in their evaluation of the products from the other groups and questioned their usefulness, usually in relation to what already existed. In this context, the role-playing game allowed students to express themselves

freely and they played the game to the hilt, sometimes asking more questions than they were allowed to do (as a reminder, the groups were limited to one question per round). Some students even managed to anticipate the questions of others, such as those about money or the ecological impact of their product.

As role-playing encouraged students to express themselves more freely and to think more deeply, the educators and I decided to keep this approach to learning in the third phase of the DBR project, while thinking about how to optimise it.

10.2.2.4. Analysing Media Texts

Media educators included more media analysis activities in phase 2. Students were quite receptive to these activities, and the aim will be to check whether this had an impact on their critical questioning on media texts (see findings of the thesis).

The activity of quick analysis of the other groups' comics was difficult for some groups. Several students found it difficult to complete the reviews or spent little time on them. Most only completed the documents with a few key words. The activity worked well for a few pairs of students, but the majority did not complete all the critiques. Concerning the longer critiques, students were more committed, and one educator highlighted the good work of students. *"Many of you understood comic book codes: catchy endings, text-image relation, critique of the plot, and/or critique of the topicality of the subject"* (field notebook, 11/03/2023). The comics that received the most reviews were: Valentines', NudiStop et EasyTech.

10.3. Phase 3 – The Final Version of the Educational Programme

The third phase consists in producing an educational programme that the association *Action Médias Jeunes* can transfer to other practitioners. This is the final stage of our collaboration on the DBR project, and it no longer includes any data collection stages. It essentially involves the refinement and dissemination of the programme.

In this context, I helped the educators to develop the final version of the programme. We held several meetings to create a simplified version, drawing on the lessons learned from the previous phases. I took part in the creation of two tools to support the learner in the design process: the card game and the design notebook. I was also involved in the search for new funding. Our original plan was to apply for funding from the education sector, so we designed the sessions to fit in with a specific teaching programme in Belgium, namely the philosophy and citizenship education programme. In particular, we focused on the 'ethics and technology'

teaching unit for secondary school students, whose competences include “explaining the impact of ICTs on our freedom and responsibility”, and “justifying responsible behaviour in relation to ICTs”⁴³. As funding is limited and difficult to obtain in school contexts, we finally reviewed our objectives, and the association *Action Médias Jeunes* applied for funding in the cultural sector (non-formal learning settings).

The structure of the new programme presented below is therefore the one that was originally developed for the ethics and technology teaching unit. Some of the choices made in the activities, such as the conceptualisation of notions like digital identity or digital justice, are justified in this context. I propose to present the structure of the new version of the programme and the draft of the tools.

10.3.1. Activities Content

The new programme is divided into four main sessions, during which participants are invited to play different roles: designer, journalist, participant (themselves) and organisation. The aim of this role-playing is to broaden their questioning as they progress through the activities. The previous phase demonstrated the effectiveness of role-playing, and it is for this reason, among others, that we have decided to continue using this teaching approach. The sessions are therefore presented according to the role played by the participant.

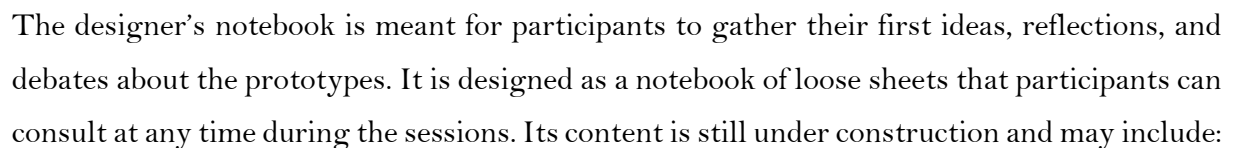
10.3.1.1. Participants as Designers

The first session is quite similar to the design thinking process of phases 1 and 2. After a short introduction to the concept of artificial intelligence, participants are invited to put themselves in the shoes of designers of near-future technologies. In this context, they receive two tools that accompany them all along the process: the card game and the designer’s notebook.

The card game includes ‘issues’ and ‘technology’ cards. The rulebook explains that participants must first select a problem (i.e., an ‘issues’ card) from the range of the proposals on which they would like to develop their fictional prototype. The proposals are based on the Possible Futures project’s problems that were identified by the students. For example, one problem is “on social networks, we show everything on the bright side” (in other words, with a lack of authenticity). ‘Technology’ cards refer to the possible features of the prototypes and may include hologram, geolocalisation, virtual reality, sound capture, and so on.

⁴³ The content of the programme is available on the website of the Wallonia-Brussels Federation: <http://www.enseignement.be/index.php?page=27915&navi=4429> (retrieved October 11, 2023)

Design Fiction Card Game – Phase 3



- The first session therefore consists of an initial introduction to foster an understanding of the features of digital media and technology as well as an initial questioning of the technical, legal, and economic issues raised by the emergence of an ICT. From a theoretical point of view, this session helps participants conceptualise the notions of artificial intelligence, digital identity, big data, and the harvesting of personal data. From a practical point of view, it helps them

position themselves on the risks and opportunities associated with the use of a new piece of technology.

10.3.1.2. Participants as Journalists

In the second session, participants are invited to write a press article by putting themselves in the shoes of a journalist. The article must tell an anecdote that allows the participants to explain the potential opportunities and risks of their prototype in a near future. The aim is to encourage them to adopt a more detached and critical perspective on their prototype, while at the same time enabling them to explain the impact of this new piece of technology to a specific audience.

In particular, the second session invites participants to tell a positive or negative anecdote about their prototype. In both cases, we ask them to be nuanced at the end of their article and to counterbalance their statements in order to distance themselves from their creation. The activities introduce participants to the work of journalists, help them distinguish between news, rumour, and personal opinion, and teach them the basic structure of a press article (headline, lead, body, etc.).

10.3.1.3. Participants as Participants

In the third session, the participants do not play a role and are invited to give their opinion on the prototypes developed by the other groups. The aim is to teach participants to read and interpret information based on other participants' press articles, as well as to encourage them to take a position on others' inventions and to justify their position.

The first activity of the session consists of reading the press articles from each group and summarising the characteristics of the technology depicted. The second activity is to answer a set of questions about the technologies:

- Which one would you like to have?
- Which one should never see the light of day?
- Which could make the greatest contribution to improving society?
- Which would be the most dangerous for society?
- Which would be the least useful in everyday life?
- Which would be the most useful in everyday life?
- Which is most likely to see the light of day?

The third activity consists of debating the answers to the previous questions. In this context, the role of the supervisor is important, and consists of encouraging participants to justify and argue their answers.

10.3.1.4. Participants as Organisations

In the fourth session, participants are asked to engage in further reflection through the perspective of an organisation concerned with the design of the prototype. Each group has to choose the cause (i.e., the reason) for which their organisation is fighting: ecology, social justice or digital justice. The aim is to encourage participants to broaden their questioning of the societal impact of their creations.

The session includes analytical reading, production and debate activities. First, participants are invited to read an article on the subject of ‘algorithmic governmentality’, a concept theorised by the philosopher Antoinette Rouvroy (2020). Her theory is essentially based on the idea that society is currently governed by algorithms rather than by politics, law, or social norms. The aim of reading and analysing this article would be to encourage advanced thinking on the impact of massive data on our daily lives.

Second, participants are divided into various organisations based on the three causes presented above. One half of the group is responsible for creating a sign with a slogan, while developing an argument on a sheet of paper explaining their position regarding the prototype in question. The other half of the group is in charge of preparing questions related to their cause for the creators of the prototype.

Third, similarly to phase 2, a press conference is organised. The designer groups briefly present their prototype and then answer questions from activists from the various organisations. The role of the supervisor is to support the debate by raising questions that have not already been addressed at the press conference.

The session (and the whole project) ends with an evaluation based on the rubric that I built in the context of my doctoral research (see Chapter 12: The Rubric). The aim is to create an assessment grid similar to mine, in a form that is accessible and appropriate for practitioners.

10.3.2. For the Future

Before embarking on the full construction of the final version of the educational programme, *Action Médias Jeunes* waited for a response from the funding body to which it submitted its application. It was only a few weeks before submitting this thesis manuscript (at the end of

September 2023) that we learned that the association was going to receive funding from the Government of the Wallonia-Brussels Federation (FWB) in Belgium. In June 2023, the association had applied to a call for projects in media education launched and coordinated by the Higher Council for Media Education (CSEM). The aim of this call was to “support the development of media education for specific audiences and social, cultural and educational sectors beyond the school context” (CSEM, 2023; personal translation). This call for projects was part of the implementation of the FWB Government’s media education plan.

Action Médias Jeunes has applied to this call by developing a project based on the practice of design fiction, called “The future is now!” (in French: “*Le futur, c’est maintenant !*”), which aims to prompt young people to think about the possible futures of technologies in order to better understand the societal issues they raise. The project will take place in three main phases. It will begin in November with a test phase in collaboration with a youth centre. In this context, *Action Médias Jeunes* will have the opportunity to adapt and test the pedagogical approach presented above (final version of the educational programme) with this new audience. Second, the project will consist of creating a toolkit to enable all youth supervisors to reappropriate the pedagogical approach in order to offer similar activities to their own audience. Finally, the project will offer training courses for youth supervisors wishing to learn more about the topic and go a step further in practice by putting themselves in the shoes of the future young people they will have to lead.

To conclude, the recent confirmation of funding by the FWB government represents an exciting opportunity for *Action Médias Jeunes*. The funding secures not only the successful implementation of the programme but also paves the way for a practical and versatile educational programme that will transcend traditional classroom boundaries. With this support, *Action Médias Jeunes* harnesses the means to create a transferable programme, thereby facilitating effective knowledge transmission through their training programmes to reach a broader audience. These training programmes will serve as the ideal complement to the educational programme and will enhance the association’s already extensive offerings to equip every youth supervisor and media educator comprehensively.

Chapter 11: Data Collection, Analysis and Management

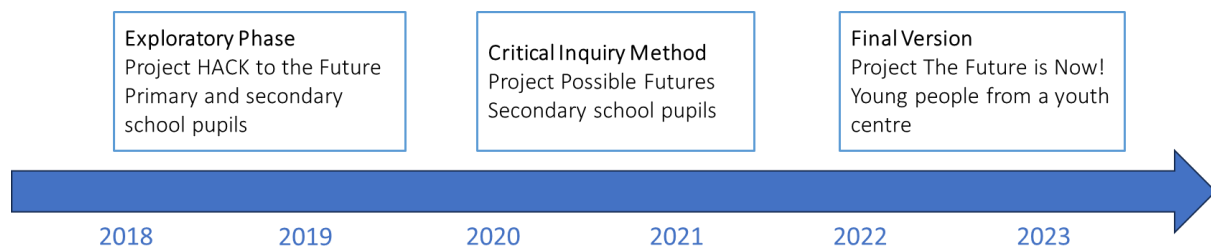
Throughout the different phases of the design-based research project, I collected a wide range of data, which led me to confirm or refute a series of hypotheses to answer my research question. This chapter presents the data collected, describes how it was analysed and discusses some issues related to data management.

11.1. Research Context

Although the last phase of the DBR project is still under development, I distinguish three key moments in the present project: the exploratory phase, the critical inquiry method and the final version of the educational programme. The types and the amount of data collected are different from one phase to another. The second phase has the most data because this is the most refined phase and the one on which the analysis is conducted.

Figure 11.1.

Timeline of our design-based research project



During the exploratory phase, I collected teaching materials and field notes that helped me to refine the prototype of the critical inquiry method. In the second phase, I kept taking field notes of the activities in a notebook and recorded some of the conversations with the students. I made copies of the teaching materials developed for the project as well as the students' productions. I also recorded a debate activity and collected data through pretests and post-tests to assess students' critical inquiry competence. In the third phase, I only gathered teaching materials developed for the final version of the educational programme.

All these data are intended to address the research question, namely how design fiction can help build a critical inquiry method in media education and how this method can support the

development of learners' critical inquiry competence. In particular, the data collected contributed to building the subsequent phases and to refine the outputs (the programme and the rubric). In the second phase, I collected data in pre- and post-test to test a series of hypotheses, the main one being that the educational programme had an impact on students' ability to ask critical questions about media texts and the technologies they depict.

11.2. Data Collection as Part of the Media Education Activities

Various types of data were collected during the activities of this research. The next table summarises the data according to their name (label), their type, their format, their volume, and their time of collection (phase).

Table 11.2.

Summary of the data collected during the DBR project

Data	Type	Format	Volume	Phase
Fields notes (Observational data)	Notebook 1. Handwritten 2. Numerical	1. Paper Notebook 2. Transcribed in OneNote	Small volume	1, 2
Teaching materials	Text document	Word Document	Small volume	1, 2, 3
Students' productions	Multimedia data: 1. Groups' folders with sheets, drafts... 2. Pictures of the prototypes 3. Copy of video clips 4. Copy of comics	1. Scanned documents 2. PDF files 3. Video files 4. Image files	Huge volume	1, 2
Activities Documentation	Multimedia data: 1. Pictures of the sessions 2. Audio recording of some activities	1. Image files 2. Audio files	Average Volume	1, 2
Students' questions (During pretest, the educational programme and post-test)	Text documents: • Café Mundo's questions • Press conferences' questions • Questionnaires	• Scanned and transcribed questionnaires • Questionnaires analysed with: Excel, FileMaker, SPSS	Small volume	2

11.2.1. Field Notebook

The notebook was used in the first two phases on the field. It describes both the course and preparation of the classroom activities and subjective observations on the phenomenon studied. On the one hand, it gathers my notes taken during briefing and debriefing sessions with teachers and media educators. The debriefing sessions consisted in discussing the activities carried out during the day and the involvement of the students, while the briefing sessions consisted in discussing the next ones, by specifying the type of activities, the time dedicated, the resources needed, and so on. I also took some notes on pedagogy and students' participation during the activities. On the other hand, I took note of some of the reflections and questions asked by the students and accompanied them with personal reflections on the potential outcomes that this could bring.

11.2.2. Teaching Materials

The teaching materials include all the materials needed for the activity to run successfully. For example, when students had to conduct a press conference (session 5, phase 2), the media educators prepared a glossary of concepts related to the world of journalism they wanted to cover and the videos they wanted to show them. I collected additional materials from some teachers who included the activities of the educational programme in their lessons. For example, a third-grade primary school teacher (phase 1) created a small notebook summarising the activities carried out by the educators, with some additional information, and included short quizzes. This notebook was very useful to remind the children of the activities because they took place throughout the whole year.

Action Médias Jeunes educators prepared 'pedagogical sheets' detailing the activities and the necessary equipment for each session of the three phases. I participated in their elaboration to align their objectives with the objectives of the present research. In the first phase, these sheets were discussed with the teacher before and after each session in order to agree on the way the activities will be carried out. They enabled to evaluate the time of the activities, the working methods (group/individual) and the equipment available. An example of a pedagogical sheet is presented in the appendices of the manuscript (see Appendix I).

11.2.3. Students' Productions

In both phase 1 and phase 2, students made three types of productions: a prototype, a video clip, and a fictional scenario. They made these productions in groups and used multiple materials for this purpose. The instructions changed a little bit between the two phases and so some productions collected are different.

In the exploratory phase, third-grade primary school students built physical prototypes and presented them through a video they shot themselves. I took pictures of the children during the design and shooting activities, and I collected the video clips. Secondary school students did not produce physical prototypes but filled notebooks where they specified the characteristics of their object and drew a storyboard. I photographed the pages of their notebooks and collected the videos they shot. Unlike primary students, they wrote a common scenario that implemented their objects into a larger world. I transcribed the scenario and integrated it into my database.

During the second phase, secondary school students again used a notebook to develop their design ideas. I collected the sheets and the drafts that helped them specify the prototypes' characteristics. I took pictures of the design process and the prototypes as well. They were invited to produce Instagram stories and science fiction comics to contextualise their invention. In this regard, I collected copies of their video clips and comics, as well as all the materials used for their development (drafts, storyboards, scenarios, and so on). At the end of the programme, I audio-recorded the class during the televised debates.

11.2.4. Students' Questions

Students' questions included the questions that students asked during pre- and post-tests, as well as questions that they asked all along the programme of the second phase. While the first set of questions was collected through a questionnaire during the pre/post-tests, the second set was collected during conceptualisation's steps of the inquiry cycles (Café Mundo and Press Conferences activities). Only the pre- and post-test questions were analysed in depth as part of this research (see the following section).

11.3. Data Collection as Part of The Assessment Protocol

To assess students' critical inquiry competence, I conducted a pretest and a post-test in two classes. The first class participated in the educational programme (the treatment group), while the second class did not participate in the educational programme (the control group). The

aim of such tests was to observe any difference between the two groups to test the hypothesis that the activities had an impact on the development of the concerned competence. I collected the tests from 23 students from the control group and from 26 students from the treatment group.

Table 11.3

Assessment Protocol for Students' Tests

	Pretest	Treatment	Post-test
Class 1	x	x	x
Class 2 (control)	x		x

In the context of the research, students were invited to watch two design fiction video clips. I selected clips from the film *Minority Report* (Spielberg, 2002) where they could see future technology such as automatic cars, holograms, and personalised advertising. I also showed the video of Microsoft named *Productivity Future Vision*⁴⁴ which depicts different aspects of the future world of work, transport, and home. I chose these videos because they present two different ways of speculating (cultural production vs. commercial production) and allow students to ask questions about the future. Here were the guidelines:

The activity consists of watching two videos carefully and formulating questions about them. We ask you to formulate different questions about the technologies present in these two videos, as well as about the videos themselves and the way they present these technologies on the screen.

To do this, we suggest that you write down (1) questions that you ask yourself after watching the videos, and (2) questions that you might ask guests in a talk show about the videos. This second category of questions can include questions from the first category.

You can formulate as many questions as you like. There are no right or wrong questions, feel free to express yourself!

The suggestion to formulate two types of questions was an idea from the media educators. They were concerned that students were too sketchy with their formulation and suggested that they rephrase their questions in a second stage. During the tests, I therefore proposed the following timing:

⁴⁴ See the video here: https://www.youtube.com/watch?v=SO49Q-HcuKE&ab_channel=BrioWebTV (retrieved March 17, 2023)

1. Watching the Microsoft video (5')
2. Writing the first type of questions on the first video (5')
3. Watching the Minority Report video (5')
4. Writing the first type of questions on the second video (5')
5. Writing the second type of questions (i.e., rephrasing) (10')

The pretests took place the week before the programme activities began. I always started the session by introducing myself as follows: *"I am a researcher in media education, and I am interested in new technologies and digital media."* For the treatment group, I specified that *"I will accompany you throughout the project with other educators and we will do design fiction together"*. I then presented my research, as the study of young people's perception of digital media and new technologies. I briefly explained to the treatment group that design fiction is a design practice for imagining and questioning the technologies of the future.

Afterwards, I talked about the anonymity of the data and distributed the consent form (see the following section on Data Management: ethical and legal issues). I emphasised that this was not an evaluation in any way for the current course. Then we read the instructions for the activity together. I explained that the videos were made up of clips I had edited myself and that I had added French subtitles for the Microsoft video. The activity took thirty minutes and at the end, I thanked them, reminded them of the anonymity of the data and that I needed their signature on the consent form.

The post-tests took place one week after the end of the programme. They were identical in every respect to the pretests. With my PhD supervisor, we hesitated to change two elements: the video clips and the categories of questions. On the one hand, we were afraid that the videos clips would be very repetitive for students of that age and that they would not do the exercise properly. Our biggest fear was that the control class would see less of the point. On the other hand, several students did not follow the instruction to formulate two types of questions, and we were afraid that it might not be relevant to include it in the analysis. In the end, we preferred not to change anything to avoid any bias in the data analysis.

11.4. Data Analysis

The analysis focused on pre- and post-test data. The following sections describe the three main steps that were carried out to process this data.

11.4.1. Step 1: Transcription in Excel

The first step was to transcribe students' questions into an Excel file. The questions were transcribed by a student worker specialised in the field of Translation. She transcribed the students' questions and provided a corrected version of them. In addition, she provided the following information for each question:

- The name of the student
- The class of the student:
 - Control Group
 - Treatment Group
- The step:
 - Pretest A): for questions of the 'first type' at the pretest stage
 - Pretest B): for questions of the 'second type' at the pretest stage
 - Post-test A): for questions of the 'first type' at the post-test stage
 - Post-test B): for questions of the 'second type' at the post-test stage
- Comment: any of her comments on the transcription or correction

The work by a jobber was justified by the large number of questions to be transcribed and the difficulty of proofreading them. Nearly 1,000 questions were transcribed and, in addition to the precious decoding of the handwritten questions, the correction by the student in Translation made it possible to highlight certain specificities in the formulation of questions by the third-year students.

11.4.2. Step 2: Implementation in FileMaker

The questions were then implemented in a custom FileMaker database. Together with my PhD supervisor, we built a flexible structure that allowed me to code the questions one after the other. This structure integrated the rubric with the three criteria and their categories (see Chapter 12: The Rubric). As coding progressed, new elements were added to support the coding of the questions, including a comment section on coding. The following figure shows what the interface looked like in its final form.

Figure 11.4.

FileMaker Coding Interface

The screenshot displays the 'CodageQuestion' FileMaker interface. At the top, there is a menu bar with options: Fichier, Edition, Affichage, Insertion, Format, Enregistrements, Scripts, Fenêtre, and Aide. Below the menu is a toolbar with navigation and search icons. The main area is divided into several sections:

- Question Details:** Includes fields for 'id_question' (355), 'etape' (Pré-test A), 'question_brute' (Aurons-nous autant de liberté que maintenant ?), 'question_corrige' (Aurons-nous autant de liberté que maintenant ?), and 'commentaire_correction'.
- Significatif:** A checkbox labeled 'significatif' with the value 'oui'.
- Themes:** A grid of checkboxes for various themes such as 'Acceptabilité', 'Economie', 'Liberté, autonomie', 'Sécurité infos', 'Accès', 'Emploi', 'Maintenance', 'Sécurité, danger', 'Accès écon', 'Enseignement', 'Mode de vie', 'Sémiotique', 'Anti-solutionnisme', 'Environnement', 'Police, crime', 'Transport', 'Autre', 'Ethique', 'Politique', 'Vie privée', 'Bien-être', 'Facilité, rendement', 'Ressources', 'Vie sociale', 'Communication', 'Guerre', 'Sans Techno', 'Autre...', 'Construction', 'Individuel', 'Santé', and 'Science'.
- Dimensions:** A list of dimensions with radio buttons for '0 non' and '1 oui'. Examples include 'dimension_100_ContexteProduction', 'dimension_110_ContexteProduction_Auteur', 'dimension_120_ContexteProduction_Objetif', 'dimension_130_ContexteProduction_Dissémination', 'dimension_140_ContexteProduction_Autre', 'dimension_200_ContexteRéception', 'dimension_300_AspectsSémiotiques', 'dimension_400_ContenuExplicite', 'dimension_410_ContenuExplicite_ContexteProduction', 'dimension_411_ContenuExplicite_ContexteProduction_Designer', 'dimension_412_ContenuExplicite_ContexteProduction_Commerce', 'dimension_413_ContenuExplicite_ContexteProduction_Objetif', 'dimension_414_ContenuExplicite_ContexteProduction_Création', 'dimension_415_ContenuExplicite_ContexteProduction_Dissémination', 'dimension_416_ContenuExplicite_ContexteProduction_Autre', and 'dimension_420_ContenuExplicite_ContexteUsage'.
- Postures:** A list of postures with radio buttons for '0 non' and '1 oui'. Examples include 'Documentaire', 'Immersion fictionnelle', 'Incertitude', 'Indéterminé', 'Prédiction', 'Spéculation', and 'Autre...'.
- Valence:** Radio buttons for '-1 négatif', '0 aucun', and '1 positif'.
- Enjeu:** Radio buttons for '0 Pas de problème/enjeu', '3 Problématique représentée SANS réponse', '5 Problématique indéterminée', '2 Nouvelle problématique', and '4 Problématique représentée AVEC réponse'.
- Commentaire_codage:** A text area containing the text: 'Contenu < Storyworld: L'élève questionne la société future/représentée dans sa globalité. Posture **Prédiction** car l'élève s'interroge sur le monde futur, comment celui-ci va-t-il évoluer, dans quelles circonstances. **NOUVEL** enjeu: liberté'.
- Metadata:** Fields for 'nombre_dimensions' (1), 'nombre_sousdimensions_contenu' (1), 'nombre_sousdimensions_contexte' (0), 'spss_step' (Pré-test), and 'spss_include' (1).

We coded a total of 959 questions and ended up retaining a total of 724 questions for the final analysis. We first excluded questions that were redundant between type ‘A’ and type ‘B’ questions. These referred to questions that were identical, or almost identical, and were coded in the same categories. Question type ‘B’ was therefore retained in the analysis and its duplicate excluded. Second, we decided to exclude questions that did not contain verbs, questions that were off-topic (i.e., not related to the topic of the video clips) or sentences that did not contain a question mark (i.e., that were not questions). Other questions were too ambiguous and open to multiple interpretations, so it was not possible to code them. Finally, we excluded questions from students whose tests at certain stages were missing (pre or post),

and thus reduced the sample size. Three students from the treatment group were excluded from the analysis, to arrive at the same number of students as in the treatment group ($n = 23$).

11.4.3. Step 3: Analysis in SPSS

The questions were then analysed in the IBM SPSS software. This platform offers advanced statistical analysis for qualitative and quantitative data. After creating the rubric assessing the level of criticality of the students, we used this software to test a series of hypotheses. The main one was that *the educational programme caused an increase in the number of students asking critical questions*.

We proceeded in several steps in order to find out which protocol was the best to follow. First, we copied the 724 questions with their codes from FileMaker into a SPSS data file and generated descriptive statistics on all questions. Secondly, we restructured the initial questions dataset into a dataset where students were the primary observations, providing a count of the number of questions each student was able to ask in each of our coding categories. Thirdly, we converted each variable counting the number of questions in a given category into dichotomous variables indicating whether each student was able to ask at least one question in the corresponding category (presence or absence of questions in the category concerned). This final choice is explained by the fact that we were not concerned so much with the ability of the student to ask a significant number of questions in a category considered more critical than another, but that they managed to ask at least one question in that category. The results generated by SPSS in the Chapter 13 are thus presented according to the number of students who asked at least one question in the category concerned.

Figure 11.5.

Final dataset in the IBM SPSS software

PupilsSPSSAnalysisBinaryFinal.sav [DataSet1] - IBM SPSS Statistics Data Editor

File Edit View Data Transform Analyze Graphs Utilities Extensions Window Help

Visible: 173 of 173 Variables

	groupe	id_eleve	GrandTotal	PRE_Total	PRE_dimension _100_Contexte Production	PRE_dimension _110_Contexte Production_Aut...	PRE_dimension _120_Contexte Production_Obj...	PRE_dimension _130_Contexte Production_Dis...	PRE_dimension _140_Contexte Production_Autr...	PRE_dimension _200_Contexte Réception	PRE_dimension _300_AspectsS émotiques	PRE_dimension _400_ContentuE xplicite	PRE_dimension _410_ContentuE xplicite_Context...	PRE_dimension _411_ContentuE xplicite_Context...	PRE_dimension _412_ContentuE xplicite_Context...	PRI _41 xplic
1	Control group	27	15	5	Absence	Absence	Absence	Absence	Absence	Absence	Absence	Presence	Absence	Absence	Absence	
2	Control group	29	12	7	Absence	Absence	Absence	Absence	Absence	Absence	Absence	Presence	Absence	Absence	Absence	
3	Control group	30	5	4	Absence	Absence	Absence	Absence	Absence	Absence	Absence	Presence	Absence	Absence	Absence	
4	Control group	31	22	12	Absence	Absence	Absence	Absence	Absence	Absence	Absence	Presence	Presence	Absence	Absence	
5	Control group	32	21	12	Absence	Absence	Absence	Absence	Absence	Absence	Absence	Presence	Presence	Absence	Presence	
6	Control group	33	15	5	Absence	Absence	Absence	Absence	Absence	Absence	Absence	Presence	Presence	Absence	Absence	
7	Control group	34	14	7	Absence	Absence	Absence	Absence	Absence	Absence	Absence	Presence	Absence	Absence	Absence	
8	Control group	35	18	10	Absence	Absence	Absence	Absence	Absence	Absence	Absence	Presence	Presence	Absence	Absence	
9	Control group	37	19	9	Absence	Absence	Absence	Absence	Absence	Absence	Absence	Presence	Absence	Absence	Absence	
10	Control group	38	14	6	Absence	Absence	Absence	Absence	Absence	Absence	Absence	Presence	Presence	Absence	Presence	
11	Control group	40	14	8	Absence	Absence	Absence	Absence	Absence	Absence	Absence	Presence	Absence	Absence	Absence	
12	Control group	41	15	6	Absence	Absence	Absence	Absence	Absence	Absence	Absence	Presence	Presence	Absence	Absence	
13	Control group	43	16	6	Absence	Absence	Absence	Absence	Absence	Absence	Absence	Presence	Presence	Absence	Absence	
14	Control group	45	6	5	Absence	Absence	Absence	Absence	Absence	Absence	Absence	Presence	Absence	Absence	Absence	
15	Control group	46	16	10	Absence	Absence	Absence	Absence	Absence	Absence	Absence	Presence	Presence	Absence	Absence	
16	Control group	47	30	14	Absence	Absence	Absence	Absence	Absence	Absence	Absence	Presence	Absence	Absence	Absence	
17	Control group	49	12	6	Absence	Absence	Absence	Absence	Absence	Absence	Absence	Presence	Presence	Absence	Absence	
18	Control group	28	13	10	Presence	Absence	Absence	Presence	Absence	Absence	Absence	Presence	Presence	Presence	Absence	
19	Control group	42	6	4	Presence	Absence	Presence	Absence	Absence	Absence	Absence	Presence	Presence	Absence	Absence	
20	Control group	44	21	11	Absence	Absence	Absence	Absence	Absence	Absence	Absence	Presence	Presence	Presence	Absence	
21	Control group	36	28	17	Presence	Presence	Absence	Absence	Absence	Absence	Presence	Presence	Presence	Absence	Absence	
22	Control group	39	26	18	Absence	Absence	Absence	Absence	Absence	Absence	Absence	Presence	Presence	Absence	Absence	
23	Control group	48	18	12	Presence	Absence	Presence	Presence	Absence	Absence	Absence	Presence	Presence	Presence	Presence	
24	Treatment group	1	11	6	Absence	Absence	Absence	Absence	Absence	Absence	Absence	Presence	Absence	Absence	Presence	
25	Treatment group	2	12	7	Absence	Absence	Absence	Absence	Absence	Absence	Absence	Presence	Presence	Absence	Absence	
26	Treatment group	3	20	8	Absence	Absence	Absence	Absence	Absence	Absence	Absence	Presence	Absence	Absence	Absence	
27	Treatment group	4	13	10	Absence	Absence	Absence	Absence	Absence	Absence	Absence	Presence	Absence	Absence	Absence	
28	Treatment group	6	22	9	Absence	Absence	Absence	Absence	Absence	Absence	Absence	Presence	Presence	Absence	Absence	
29	Treatment group	8	23	8	Absence	Absence	Absence	Absence	Absence	Absence	Absence	Presence	Presence	Absence	Absence	
30	Treatment group	9	14	10	Absence	Absence	Absence	Absence	Absence	Absence	Absence	Presence	Absence	Absence	Absence	
31	Treatment group	11	15	10	Absence	Absence	Absence	Absence	Absence	Absence	Absence	Presence	Absence	Absence	Absence	
32	Treatment group	12	15	12	Absence	Absence	Absence	Absence	Absence	Absence	Absence	Presence	Presence	Absence	Absence	
33	Treatment group	16	11	5	Absence	Absence	Absence	Absence	Absence	Absence	Absence	Presence	Absence	Absence	Absence	
34	Treatment group	19	18	7	Absence	Absence	Absence	Absence	Absence	Absence	Absence	Presence	Presence	Absence	Absence	
35	Treatment group	20	16	10	Absence	Absence	Absence	Absence	Absence	Absence	Absence	Presence	Presence	Absence	Absence	
36	Treatment group	23	6	4	Absence	Absence	Absence	Absence	Absence	Absence	Absence	Presence	Absence	Absence	Absence	

Data View Variable View

IBM SPSS Statistics Processor is ready Unicode:ON

11.5. Data Management

In the framework of a design-based research project, data management is an important issue because this type of research generate data in real contexts. The following subsections provide an overview of data documentation, storage, sharing as well as ethical and legal issues.

11.5.1. Data Documentation and Metadata

Design-based research requires to document the construction of the educational intervention. “What is needed is a profile for each implementation as to how each of the critical elements were implemented and how well the elements in the implementation worked together toward the designer’s goals” (Collins et al., 2004, p. 34). As the method is characterised by iterative phases, the design-based researcher must also take note of the structural changes between each phase; any addition, modification or deletion of activities or materials, resulting from a rational decision. “It is important to analyze why it is not working, and take steps to fix whatever problems appear to be the reasons for failure” (ibid.). This documentation is accompanied by metadata contextualising these revisions such as the date and the people involved in these decisions.

In the present research, each step within each phase of the DBR process was documented in the field notebook. To remember, the field book includes both meeting notes (briefing and debriefing sessions) and observation notes (activity sessions). I related the important choices that had an impact on the evolution of the structure of the activities. I have made a colour code to identify them easily to be able to report them later.

11.5.2. Storage and Backup

As seen above, the data collected is diverse in its format. In order to facilitate their analysis, I have digitised all the documents collected. I also proposed to the educators to work on a shared OneDrive, which gathers teaching materials and descriptions of the activities. OneDrive is the university’s institutional platform that provides security and backup for the documents stored on it. In addition to this, I deposited all the scanned documents locally on my computer, and at the end of each phase, on a personal external hard drive.

11.5.3. Ethical and Legal Issues

In the European Union, researchers are required to comply with the General Data Protection Regulation (GDPR), which involves protecting individuals about the processing of personal

data. In a research context, GDPR requires both the free and informed consent of the people participating in the research project and the security of the data collected about them (European Council, 2023).

As the analysis focused on the data from the second phase, I designed an information and consent form for parents and students of the Possible Futures project (see Appendix II). I explained that the school had agreed to participate in a scientific research project to which the student could contribute. I detailed the scientific objectives of the project, the reasons for and nature of the student's participation (period of participation, type of activities) as well as the issue of anonymity and confidentiality of the data. I invited the student and the parents to read the contents of this document together and to sign the consent form at the end if they agreed to participate.

Regarding the issue of confidentiality, the data was processed to ensure the anonymity of the participants. As explained in the form, I asked students to write down their name or group number at different steps of the project. This information was only used to establish that their answers to the various questionnaires and/or personal productions were produced by the same person. Once this cross-checking was carried out, the identifying information was permanently deleted from the data collected. I also mentioned in the form that the data from the project might be published in scientific journals or shared with pairs in scientific discussions but that no publication or communication from the project will contain any identifying information about the student.

11.5.4. Data Sharing

As reported in Chapter 2, design-based research generally produces a large amount of data. In this regard, Collins et al. (2004) propose to share analysed data: "[...] it makes sense for the design research community to establish an infrastructure that would allow researchers at other institutions to analyze the data collected in design studies, in order to address their own questions about learning and teaching" (p. 40). I have obtained consent from the children and parents to use the data in this project but have not asked permission to use the data outside of this context. I cannot share this data and even if I could, I am not aware of any infrastructure that allows such data to be shared. However, I think this is an important issue that could be considered for a future design-based research in a media education context.

Chapter 12: The Rubric

The doctoral research aims to develop students' critical inquiry competence. Such an objective requires the creation of a tool that can effectively measure the evolution of such a competence. In this context, I worked to build a framework within which this competence could be developed (the educational programme) as well as a rubric to assess the participants' competence. In the world of education, a rubric typically consists of a set of criteria to evaluate students' work or performance. It breaks down the key components of the task performance and provides different levels of achievement for each component. In the present research, this tool was used to distinguish between critical and non-critical questioning by identifying a set of criteria. This chapter presents the rubric as constructed and the criteria that compose it.

The following sections first briefly review the scientific literature to present the different types of scoring scales used in the world of education, before moving on to the specific features of the rubrics. The aim is to introduce the reader to the performance-based assessment method with rubrics and the jargon associated with it. Second, I present the context in which the rubric was created and look back at three key moments in its construction. The rubric is the result of a long-term and collective effort, which provides an initial reflection on what we can distinguish from what is critical and what is not. Third, I present the three criteria that constitute my rubric for assessing students' critical inquiry competence, namely the dimension, the issue and the attitude, and present their categories and subcategories in detail. Fourth, I construct the rubric step by step, combining the three criteria and taking into account the specific nature of design fiction to encourage questions about the media text as well as the diegetic prototype.

12.1. Performance-based Assessment with Rubrics

Evaluators, including teachers, use scoring scales to assess students' performances or productions. In his book, Scallon (2009) distinguishes two types of scoring scales for evaluating students' productions. First, uniform scales are scales that can be applied to all criteria of an assessment grid. This gives them a universal dimension. They are easy to elaborate, so they do not require any particular experience, which is both an advantage and a disadvantage as they can be open to amateurism and subjectivity.

Figure 12.1.

Example of uniform scales (Scallon, 2009, p. 178; personal translation)

In this competence, the student progresses:			
☐ Very easily	☐ Easily	☐ Hardly	☐ Very hardly

Second, as their name suggests, descriptive scales describe each level in more detail. They ensure a greater consistency in the assessments made by different reviewers and provide better feedback to students. Although these scales require a more expert level in their construction, their application remains limited to a very small number of criteria.

Figure 12.2.

Example of descriptive scales (Scallon, 2009, p. 180; personal translation)

Comparison between two types of scales to assess cooperation			
Criterion: cooperation (exchanging ideas)			
Uniform scale	☐ Not satisfactory	☐ Satisfactory	☐ Great
Descriptive scale	☐ does not give ideas and does not accept those of others	☐ gives their ideas or accepts those of others	☐ gives their ideas and accepts those of others

To assess students' performances, multiple scales are generally combined into an assessment grid. An assessment grid contains either a descriptive scale specific to each of its criteria or a uniform scale repeated for each of them (Scallon, 2009, p. 182).

In the English Language Literature, the term ‘rubrics’ is used to refer to descriptive scales. Tardif et al. (2006) based their definition of rubrics on that of Wiggins and Edd (1998) by associating them to “criteria that distinguish levels of performance in terms of relative quality using elements that matter most” (p. 189; personal translation). Tardif et al. (2006) use the term ‘descriptor’ to refer to the feature of the rubrics that they have to describe each level in a specific way. “The rubric, as Wiggins and Edd (1998) assert, makes explicit qualitative differences between levels of performance. [...] In addition, a rubric specifies situations in which performances occur and the resources they require to be mobilised and combined” (Tardif et al., 2006, p. 201; personal translation).

Scallon (2009) distinguishes holistic rubrics from analytic rubrics. While analytic rubrics include several independent criteria in an assessment grid, holistic rubrics combines “[...] them into a single sequence of levels, usually four or five in total. The levels are presented in the form of elaborate statements of expected qualities to be assigned to a specific score” (Scallon, 2009, p. 183; personal translation). To build a rubric, there are thus two scoring strategies, analytic or global. The analytic strategy consists in breaking down the task into specific criteria with separate scores for each, while the global or holistic strategy consists in providing a single overall score or grade. Both types of rubrics have their merits, and the choice between analytic and holistic rubrics depends on the nature of the assignment, the level of detail required for assessment, and the educational objectives. As I use a holistic strategy to build my own rubric, I only present one example of this type of rubric in the figure below.

Figure 12.3.

Example of holistic rubric for an induction task (Scallon, 2009, p. 185; personal translation)

Holistic Rubric	Score
The student clearly expresses their point of view (the answer to the question asked), mentions several cases that they have explored and gives an illustration.	4
The student's perspective is clearly expressed and alludes to a few cases that have been explored. However, there is no illustration.	3
The student does not clearly answer the question, although several cases have been explored and illustrated.	2
There is no answer to the question asked and there is no evidence of exploration of various cases.	1

Regarding competence assessment, Tardif et al. (2006) define the rubrics as “[c]riteria that, as a consequence of the establishment of a level of development from a cognitivist model of learning, distinguish degrees of mastery of internal and external resources in qualitative terms by using dimensions deemed essential⁴⁵” (p. 218; personal translation). In other words, the rubric serves as an intermediary for the resources that need to be mobilised to reach a certain level of development. “In the evaluation of competences, the rubrics support an assessment of the ‘degree of mastery’ type, which cannot be estimated otherwise than by the assessment of the mobilisation and combination of resources” (Tardif et al., 2006, p. 218; personal translation). To build a rubric in this area, it is essential to determine the dimensions, the parameters, the situations, the degrees of mastery and the descriptors.

- The **dimensions** are “the basic, necessary and sufficient elements for which parameters, degrees of mastery and descriptors are subsequently established. For a given competence, these dimensions characterise each stage of development” (ibid. p. 219; personal translation).

⁴⁵ Original quote (in French): « Des critères qui, à la suite de l'établissement d'un niveau de développement à partir d'un modèle cognitif de l'apprentissage, distinguent des degrés de maîtrise de ressources internes et externes en termes qualitatifs en recourant à des dimensions jugées essentielles ».

- “The **parameters** identify the ‘domains’ of resources that students must be able to mobilise and combine in the service of competencies given the stage of development in question. In essence, the parameters specify the categories of resources” (ibid.).
- The **degrees of mastery** “aim at distinguishing in a qualitative way the correctness, the power and the extent of the mobilisations and the combinations of resources. It is then necessary to specify the particularities and characteristics that can differentiate each degree” (ibid.).
- “The **descriptors** specify precisely these features [the features that significantly differentiate the various degrees]. They characterise the degrees of mastery by focusing on learning about resources. They are linked to these degrees. [...] In the evaluation of competencies, the descriptors identify the essential traits that distinguish degrees of mastery” (ibid.).

When I was constructing my rubric, I used and adapted several of the previous concepts to circumscribe the critical inquiry competence. I avoided using the term ‘dimension’ proposed by Tardif et al. (2006), as it conflicted with my criterion of ‘dimension’ associated with the core concepts in media literacy. In contrast, I did use the notion of ‘descriptors’ as defined above and used the notion of ‘level’ to refer to students’ degrees of mastery. The question of parameters, on the other hand, was not addressed. The full list of concepts used in the present research can be found in the Appendix III (Glossary in the context of Rubrics); I suggest that the reader refers to it from section 12.3.: Determining Criteria for Assessing Critical Inquiry Competence.

12.2. Context of Creation: Processing Step by Step

After collecting students’ key questions (June 2021), I started building the rubric. The development of the rubric took as much time to build as the educational programme. It is based on an important body of scientific literature as well as on numerous discussions with colleagues through brainstorming and workshops. Three key moments marked its creation, namely the paper and pencil work on a corpus of approximately 150 first questions, a workshop with colleagues from my laboratory (GReMS – Research Group on Knowledge Mediation) and a research trip to Montreal in Canada.

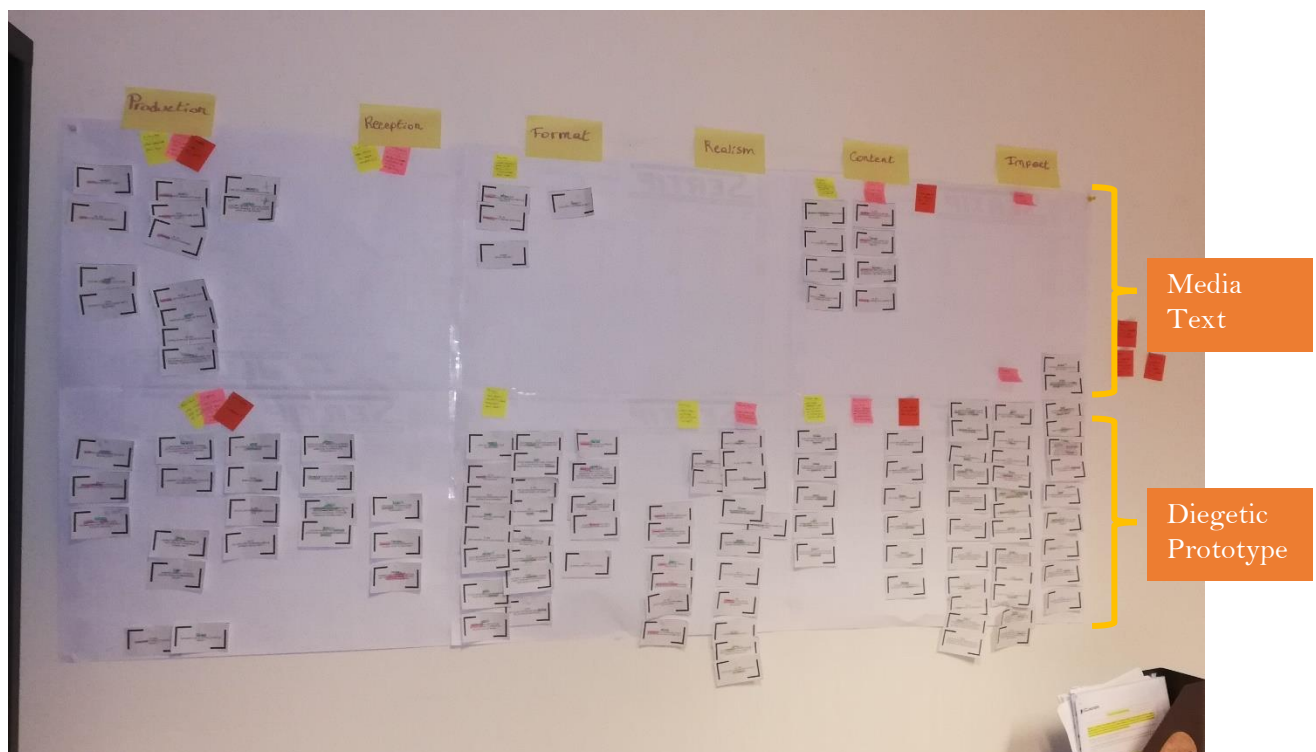
12.2.1. DIY in the Office

The first technique to form the categories of the rubric was to print out questions from the data set and try to categorise them. I selected 150 questions that I considered to be quite varied and that came from both pre- and post-tests.

In the example below (see figure 12.4.), I grouped the questions according to two criteria: the object and the core concept (or dimension). First, I looked at whether they concerned the diegetic prototype or the media text. At that time, it was the first criterion that allows me to categorise the students' questions (see Appendix IV for the complete history of the development of the rubric). Second, I looked at the media literacy core concept based on existing categories in the literature. I used first the CML concepts of Funk, Kellner and Share (2016) but I quickly realised that they were difficult to apply to my research context. As we will see later, I used those of Schilder and Redmond (2019) and created many new ones to take design fiction specificities into account.

Figure 12.4.

Classing students' questions in the office

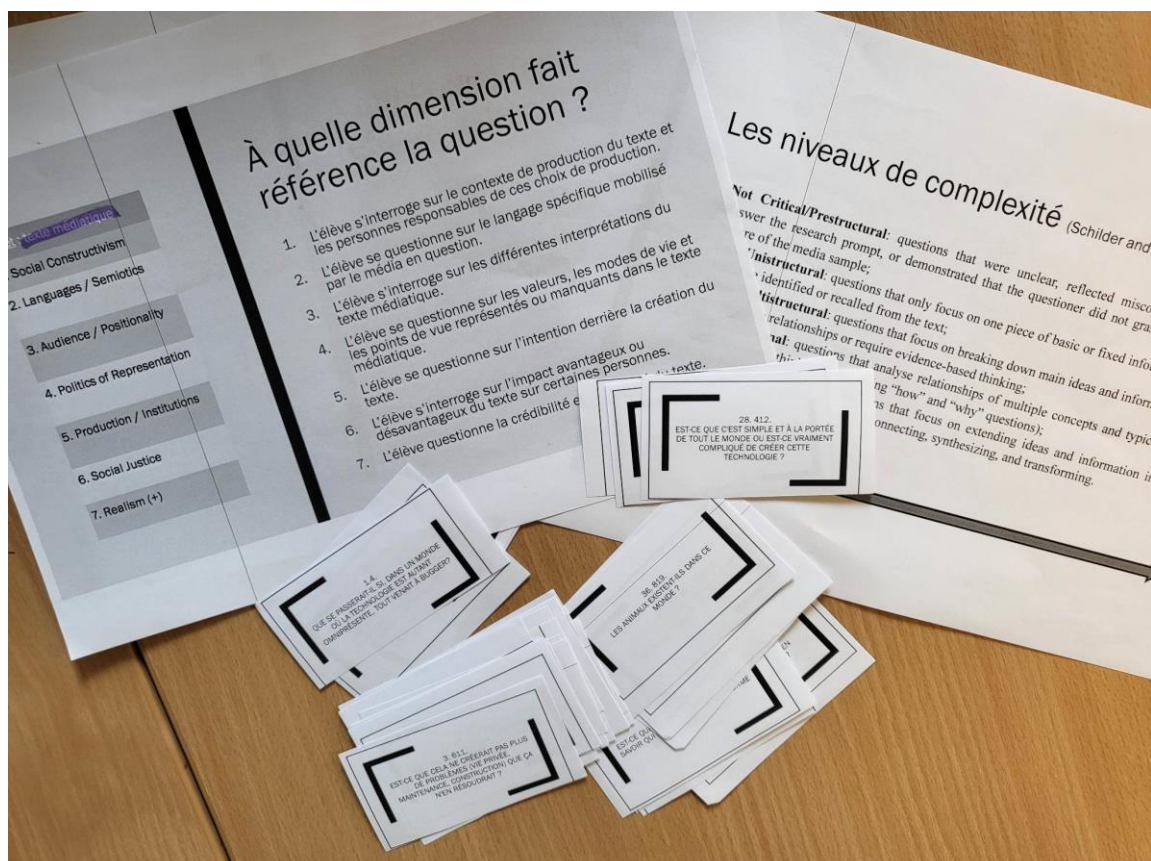


12.2.2. GReMS Doctoral Workshop

I organised a doctoral workshop within my research group to get their feedback on three criteria: the object, the dimension, and the complexity. This workshop lasted two hours and we were about ten people divided into two groups (an online group and a face-to-face group). I first introduced them to the distinction between the questions about media text and diegetic prototype, CML concepts of Funk, Kellner and Share (2016), and questions' complexity of Schilder and Redmond (2019) (see figure 12.5.). Second, in a similar way to my DIY at the office, I proposed to both groups to categorise a set of 30 questions according to these three criteria.

Figure 12.5.

GReMS workshop materials – 16/12/2021



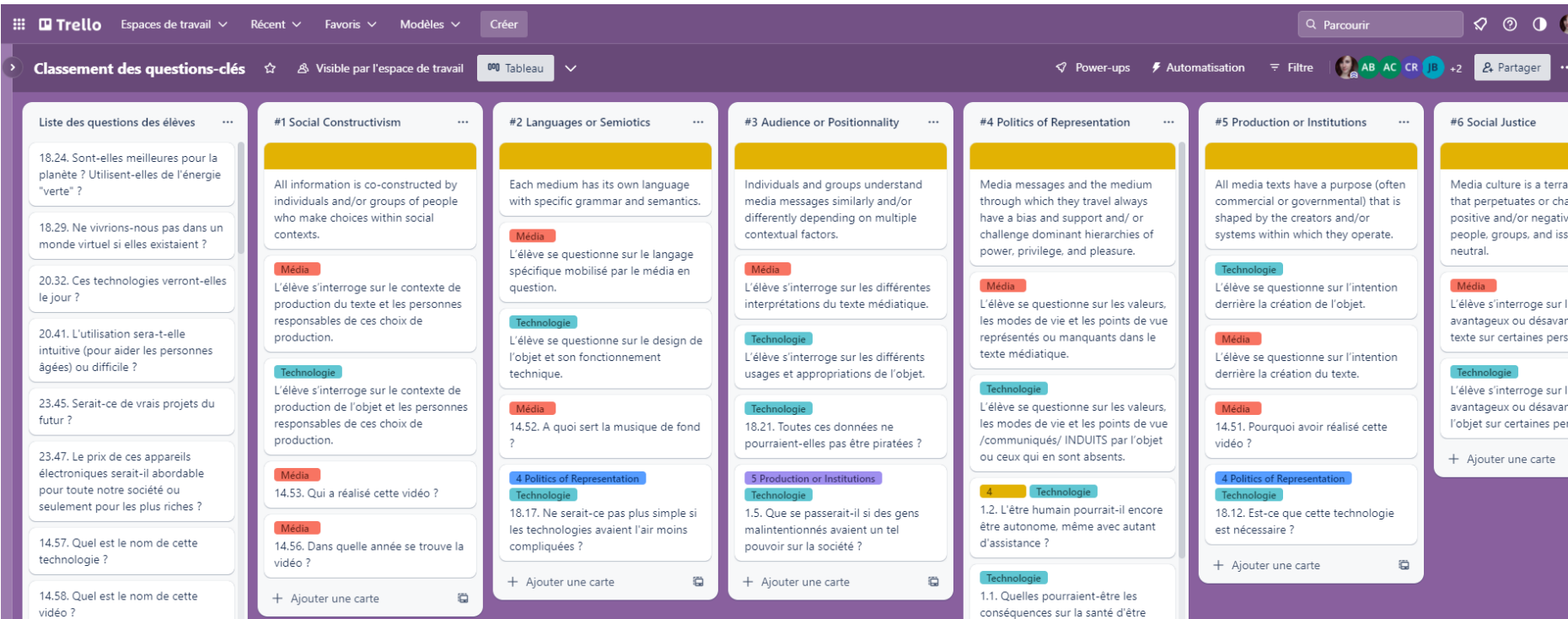
The face-to-face group used different coloured sheets to distinguish the object of the question and glued the questions on different sheets to distinguish the dimension (see figure 12.6.). On some sheet, i.e., for some dimension, they indicated the level of complexity of the question.

GReMS workshop materials – Face-to-face group - 16/12/2021

The online group worked on a shared Trello (see figure 12.7.). I had already incorporated the students' questions in the first column and core concepts in the other columns. The group added the object on the questions, classified them in the corresponding dimension and order them to illustrate their complexity (low levels up, and high levels down).

Figure 12.7.

GReMS workshop materials – Online group – Trello - 16/12/2021



Most participants found it very difficult to categorise the questions and did not have much time to assess their complexity. However, the discussion at the end of the session highlighted several elements that I considered in the further construction of the rubric. In particular, some participants questioned the distinction between media text and diegetic prototype. On the one hand, they suggested that I deepen my definition of media text to better understand how I distinguished it from the diegetic prototype. On the other hand, they found that some core concepts were not exploited at all by one of the objects and that the distinction of these two objects might not make sense. As we will see below, I decided not to distinguish between the two objects afterwards, and rather nested the concepts together.

12.2.3. Research Trip in Montréal

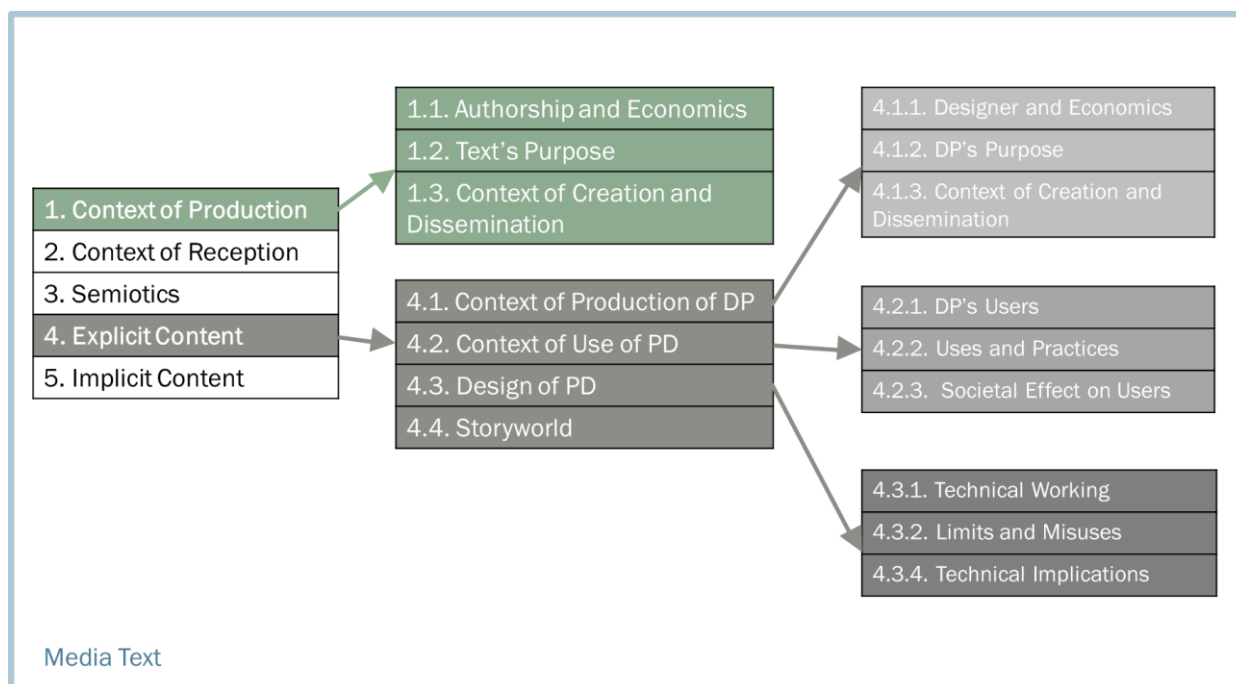
I went on a research trip from March to June 2022. During this trip, I continued my reflection on the construction of my rubric with an expert in the field of media literacy, PhD Nathalie Lacelle. Several changes were crucial in the final form of my rubric.

First, we adjusted some core concept names to match the reality of students' questions. The concepts are generally succinctly named in the scientific literature as 'Production', 'Reception/Audience' and 'Format', and have therefore been renamed in my research project as 'Context of Production', 'Context of Reception' and 'Semiotics'. The mention of 'context' enables us to consider all aspects related to the production and reception of media texts, while the semiotics dimension allows us to focus on more than just the technical aspects of media texts.

Second, we decided to take the diegesis, or the storyworld, into account. We first created an additional object with media text and diegetic prototype, and then we stopped distinguishing the three objects. Instead, we proposed nesting between the dimensions (see figure 12.8.). The next figure illustrates a version of the different levels at that time, but the structure continued to evolve as new data was classified (see Appendix IV for the complete history of the development of the rubric).

Figure 12.8.

The Different Levels of the Dimensions of the Media Text [27th June 2022 version]



Third, we found leads to measure the level of criticality according to the multidimensionality of the question, the 'weight' of the issue raised by the question, and the 'degree of realism' of the nature of the diegetic prototype or its representation referenced in the question. The last two criteria were first core concepts that helped us categorise students' questions according to their dimension (impact and realism).

The next figure gives the definitions of the criteria that were used at that time. The criteria later evolved, and I managed to specify different levels for the issue as well as different categories for realism, which became the criterion of the attitude. The dimension, the issue, and the attitude formed the basis on which I was able to construct the rubric for assessing students' critical inquiry competence.

Figure 12.9.

Three criteria for measuring criticality [27th June 2022 version]

1. The multidimensionality of the question:

Multidimensionality refers to the number of dimensions covered by the question asked by the student. This is also measured in terms of clusters, i.e., by taking all the questions asked by a student into consideration, in order to calculate the diversity of the dimensions of the questions asked per student (and per class).

2. The weight of the issue raised by the question

The issue refers to the implications of the diegetic prototype (or the media text) on the individual, a group, or the society. These implications may be of various kinds: cultural, economic, social, political, or ethical. The issue is linked to the dominant positions, to the power relationships between the different actors, and concerns the benefits and the limits of the digital.

3. The degree of realism of the diegetic prototype

Realism refers to the nature of the prototype and its representation, when the student doubts or, on the contrary, does not doubt that it exists in terms of reality. When the students are unable to ask themselves the question of realism, we will say that they are in a state of fantasy, or in a fictionalising activity (Langlade, 2008): they are engaged in the game of fiction, or even of design fiction.

12.3. Determining Criteria for Assessing Critical Inquiry Competence

To properly assess the students' ability to ask critical questions, I distinguished a set of criteria based on both the scientific literature and the data collected. There are three of them: the dimension, the issue, and the attitude. The definitions and categories of these criteria have evolved as the data have been coded to take the specificities of the procedure into account. Only the final categories are presented in this section, but the reader is invited to consult the Appendix IV to see the evolution of the dimensions and rubrics.

To facilitate the writing of the following subsections, I have created a glossary of the different concepts related to the rubrics (see Appendix III). I strongly recommend that the reader refer to it in the next paragraphs. For the examples in each category of criteria, namely the questions of the students, I have used a format from the world of translation: Source Text [ST] is the original question of the student in French, and Target Text [TT] is the final translated question of the student in English. The translator Deepl helped me translate most of the students' questions.

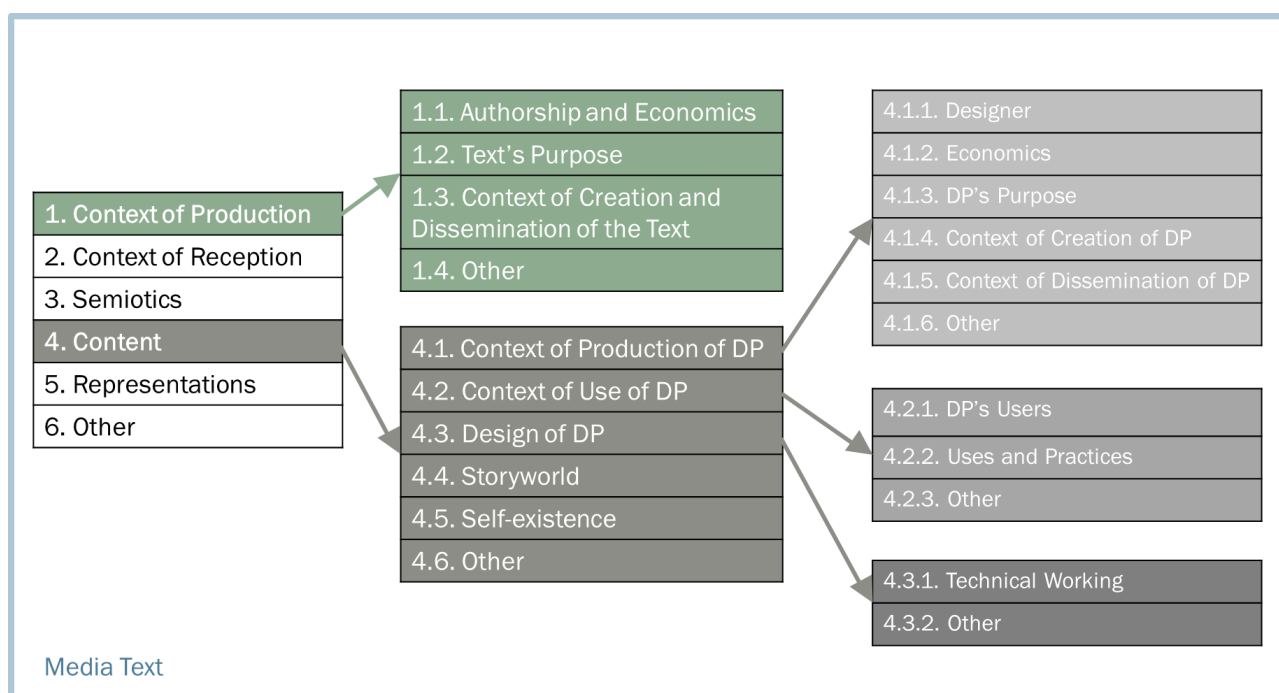
12.3.1. The Dimension

Media literacy core concepts are a common criterion to consider when analysing media texts (see Chapter 3: Media Literacy). “These core concepts are a set of guiding principles that young people need to know in order to make sense of life in a media-saturated age” (Hoechsmann & Poyntz, 2011). They are part of an inquiry-based media education framework and are usually associated with guiding questions that help the learners construct and deconstruct media texts. As seen previously, there are many tools in media education with core concepts. For the creation of my rubric, I relied on the work of de Redmond et al. (2016) and Schilder and Redmond (2019) who are the only scholars to date to have assessed data in the form of questions in this context.

Based on Schilder and Redmond (2019)’s categories (Purpose, Text, Production, Audience, Representations, Realism and Not Critical), I built my own dimensions. The dimensions consider the specificity of design fiction which leads to questions concerning the media text as well as the diegetic prototype (DP). The diagram below illustrates the different dimensions I was able to highlight in my corpus of data, which includes the pre- and post-tests questions: there are core dimensions, which can extend to two sub-levels (see figure 12.10.).

Figure 12.10.

The Different Levels of the Dimensions of the Media Text



12.3.1.1. Context of Media Text Production [*n* = 16]

I defined the context of media text production the same way Schilder and Redmond (2019) defined their category labelled Production (Code 1), i.e.: “Questions focus on the purpose of the [media text], including aspects related to authorship, context of dissemination, and economics”. I subdivided this dimension into three sub-dimensions.

A) Authorship and Economics [*n* = 4]

This first sub-dimension gathers questions about the ownership and commercialisation of media texts, insofar as they raise issues about the financial sources and/or commercial purpose of texts.

- [TT]⁴⁶ 53. Who made this video?
[ST]⁴⁷ 53. *Qui a réalisé cette vidéo ?*
- [TT] 310. Who stages these objects? (MD⁴⁸ question)
[ST] 310. *Qui met ces objets en scène ? (Question MD)*
- [TT] 663. Has the film made a partnership with any brands for the tablets, screens, cereal box, etc.?
[ST] 663. *Le film a-t-il fait un partenariat avec des marques pour les tablettes, les écrans, la boîte de céréales, etc. ?*
- [TT] 665. How did the filmmakers come up with these ideas of the future?
[ST] 665. *Comment les réalisateurs ont-ils eu ces idées du futur ?*

B) Text's Purpose [*n* = 8]

This second sub-dimension gathers questions about the purpose or the general point of view of the media text. These questions may question the need for realising the video.

- [TT] 51. Why was this video made?
[ST] 51. *Pourquoi avoir réalisé cette vidéo ?*
- [TT] 186. Is it useful to imagine the impossible (the future)?
[ST] 186. *Plus généralement : est-il utile d'imaginer l'impossible (le futur) ?*
- [TT] 321. What is the moral meaning of the video?

⁴⁶ TT: Target Text

⁴⁷ ST: Source Text

⁴⁸ MD question: acronym for « multidimensional » question (in French : *question multi-dimensionnelle*). A multidimensional question intersects several dimensions (or core concepts).

[ST] 321. *Quel est le sens moral de la vidéo ?*

C) Context of Creation and Dissemination [n = 3]

This third sub-dimension gathers questions about the context of creation and dissemination of the media text, including when and how the message was created and shared.

- [TT] 409. How did they make this video?
[ST] 409. *Comment ont-ils réalisé cette vidéo ?*
- [TT] 415. How did they make the film and the advertisement?
[ST] 415. *Comment ont-ils réalisé le film et la publicité ?*
- [TT] 430. How did they find this video?
[ST] 430. *Comment ont-ils trouvé cette vidéo ?*

D) Sub-dimension ‘Other’ of the Context of MT Production [n = 1]

This fourth sub-dimension gathers questions that could not be classified in the other sub-dimensions of the context of the media text production.

- [TT] 58. What is the name of this video?
[ST] 58. *Quel est le nom de cette vidéo ?*

12.3.1.2. Context of Media Text Reception [n = 1]

As with the first dimension, I defined the context of reception the same way Schilder and Redmond (2019) defined their category labelled Audience (Code 4), i.e.: “Questions focus on who the audience is in general terms, in addition to eliciting information about the experiences, interpretations, emotions, or opinions of the viewers/audiences of [the media text]”. There is only one question in the corpus illustrating this dimension, namely:

- [TT] 52. What is the purpose of background music? (MD question)
[ST] 52. *À quoi sert la musique de fond ?* (Question MD)

12.3.1.3. Media Text Semiotics [n = 4]

To construct this dimension, I drew on multiple scientific sources in the field of media literacy. This dimension gathers questions about language elements, multimodality, sign systems (fixed/animated images, sounds, dialogues, texts...), scenography, settings, their effects, and the media genre.

- [TT] 52. What is the purpose of background music? (MD question)
[ST] 52. *À quoi sert la musique de fond ?* (Question MD)
- [TT] 220. Why did you put these different scenes in the video and not others?
[ST] 220. *Pourquoi avoir mis en place ces différentes scènes dans la vidéo et pas d'autres ?*
- [TT] 310. Who stages these objects? (MD question)
[ST] 310. *Qui met ces objets en scène ?* (Question MD)
- [TT] 656. Is it a commercial?
[ST] 656. *Est-ce une pub ?*

12.3.1.4. Media Text Content [n = 696]

The content dimension is defined in a similar way to Schilder and Redmond's (2019) explicit content category (Code 2): "Questions focus on the explicit content of the [media text] as a narrative, encompassing what is happening and who is involved". This dimension is divided into multiple sub-dimensions that take the specificity of design fiction into account and focus on the different characteristics of the diegetic prototypes.

A) Context of DP Production [n = 120]

The first sub-dimension of the content is the context of production of the diegetic prototypes. In a similar way to the context of production of the media text, this sub-dimension gathers questions relating to the purpose of the diegetic prototype, including aspects related to ownership, context of dissemination, and economics. It has five sub-levels covering the same sub-divisions as the context of media text production but allowing for more refined coding due to the larger number of questions.

Designer [n = 9]

The dimension 'Designer' gathers questions relating to the property of prototypes, insofar as they raise questions about the inventor of the piece of the technology.

- [TT] 331. Who came up with the ideas for the electronic devices?
[ST] 331. *Qui a eu les idées pour les appareils électroniques ?*
- [TT] 416. Who invented or will one day invent this technology?
[ST] 416. *Quelle personne a inventé ou inventera un jour cette technologie ?*
- [TT] 660. Is Microsoft the only one with this project?
[ST] *Microsoft est-il le seul à avoir ce projet ?*

- [TT] 988. Why are inventors not trying to find more solutions to protect our environment? (MD question)
[ST] 988. *Pourquoi les inventeurs n'essayent pas de trouver plus de solutions pour protéger notre environnement ?* (Question MD)

Economics [n = 17]

The dimension 'Economics' gathers questions relating to the commercialisation of prototypes, insofar as they raise questions about the financial sources and/or commercial purpose of the inventions.

- [TT] 6. How much money would such constructions cost?
[ST] 6. *Combien d'argent de telles constructions pourraient-elles coûter ?*
- [TT] 377. Will these technologies be profitable?
[ST] 377. *Est-ce que ces technologies seront rentables ?*
- [TT] 615. What is the total cost of this technology?
[ST] 615. *Combien coûte en tout cette technologie ?*
- [TT] 978. Do they [the gloves] have any guarantee?
[ST] 978. *Ont-ils [les gants] une garantie ?*

DP's Purpose [n = 24]

The dimension on the diegetic prototype's purpose gathers questions that raise questions about the intention to produce this diegetic prototype. These questions may question the need for producing this piece of technology.

- [TT] 12. Is this technology necessary?
[ST] 12. *Est-ce que cette technologie est nécessaire ?*
- [TT] 370. Is it really useful to have such a developed technology?
[ST] 370. *Est-il vraiment utile d'avoir une technologie aussi développée ?*
- [TT] 569. How is this better than what we already have?
[ST] 569. *En quoi est-ce mieux de ce qu'on a déjà ?*
- [TT] 608. How would this solve current problems? (MD question)
[ST] 608. *En quoi cela résoudrait des problèmes du présent/actuels ?* (Question MD)

Context of Creation [n = 33]

The context of creation refers to questions about the process of creation of the diegetic prototype, including how they can be implemented and the possibility of their development.

- [TT] 89. How do you create all these technologies?
[ST] 89. *Comment créer toutes ces technologies ?*
- [TT] 225. Where do we stand in terms of development?
[ST] 225. *Où en sommes-nous au niveau du développement ?*
- [TT] 371. How is it possible to create such a technology?
[ST] 371. *Comment est-ce possible de créer une technologie pareille ?*
- [TT] 711. Is there any point in creating all this (MD question)
[ST] 711. *Est-ce vraiment utile de créer tout ça ?* (Question MD)

Context of Dissemination [n = 48]

The context of dissemination refers to questions about the availability of the piece of the technology; when the diegetic prototype was (or will be) created and shared.

- [TT] 107. When will we have 100% electric cars?
[ST] 107. *Quand aurons-nous des voitures 100% électriques ?*
- [TT] 429. Will this technology be available soon?
[ST] 429. *Cette technologie arrivera-t-elle bientôt ?*
- [TT] 450. Est-ce que la technologie aura autant évolué dans 50 ans ? (MD question)
[ST] 450. *Will the piece of technology have evolved as much in 50 years?* (Question MD)
- [TT] 554. Comment faudra-t-il faire pour se procurer cette nouvelle technologie ?
[ST] 554. *How will it be possible to get this new technology?*

Sub-dimension 'Other' of the Context of Production of DP [n = 0]

This sub-dimension gathers questions that could not be classified in the other sub-dimensions of the context of production of the diegetic prototype.

B) Context of Use of DP [n = 268]

This second sub-dimension of the content gathers questions about user identity and experiences as well as the potential uses and practices of the diegetic prototype.

DP's Users [n = 113]

The sub-dimension on diegetic prototype's users is quite similar to the core dimension of the context of media text reception and gathers questions which focus on whom the *diegetic user* is in general terms, in addition to eliciting information about the experiences, *appropriations*, emotions, or opinions of the *users of the prototype*⁴⁹.

- [TT] 2. Could humans still be autonomous, even with so much assistance? (MD question)
[ST] 2. *L'être humain pourrait-il encore être autonome, même avec autant d'assistance ?* (Question MD)
- [TT] 41. Will it be intuitive to use (to help the elderly) or difficult?
[ST] 41. *L'utilisation sera-t-elle intuitive (pour aider les personnes âgées) ou difficile ?*
- [TT] 290. How will people get used to the working/functions?
[ST] 290. *Comment les gens pourront-ils s'habituer au fonctionnement/aux fonctions ?*
- [TT] 635. Will we be dependent on this technology?
[ST] 635. *Serons-nous dépendant de cette technologie ?*

Uses and Practices [n = 161]

The sub-dimension on diegetic prototype's uses and practices gathers questions which focus on future practices or possible uses of the diegetic prototypes depending on multiple contextual factors.

- [TT] 5. What would happen if malicious people had such power over society? (MD question)
[ST] 5. *Que se passerait-il si des gens malintentionnés avaient un tel pouvoir sur la société ?* (Question MD)
- [TT] 66. Will identity fraud become more common?
[ST] 66. *L'usurpation d'identité sera-t-elle plus fréquente ?*
- [TT] 111. Will we solve more crimes with technology?
[ST] 111. *Eluciderons-nous plus de crime avec la technologie ?*
- [TT] 538. Wouldn't knowing where people are and what they are doing all the time result in a kind of dictatorship? (MD question)

⁴⁹ The words in italics refer to the differences between the definition of the dimension of the context of media text reception and the definition of the dimension of the diegetic prototype's users.

[ST] 538. *Est-ce que savoir où sont et ce que font les gens en permanence ne mènerait pas à une sorte de dictature ?* (Question MD)

Sub-dimension 'Other' of the Context of Use of DP [n = 0]

This sub-dimension gathers questions that could not be classified in the other sub-dimensions of the context of use of the diegetic prototype.

C) Design of DP [n = 147]

This third sub-dimension of the content gathers questions about the technical functioning and the materials used for the diegetic prototypes. These questions also take into account the functional limits of the technology, its potential undesirable effects and the technical implications.

Technical Working [n = 142]

This sub-dimension includes most of the questions relating to the design of DP, i.e., questions about the working and technical characteristics of DP. This sub-dimension was created because there were previously other sub-dimensions in the design of DP, but which were deleted during the process of building the rubric.

- [TT] 19. Can people know where we are?
[ST] 19. *Est-ce que des personnes peuvent savoir où nous sommes ?*
- [TT] 124. How protected is our information?
[ST] 124. *Comment nos informations sont-elles sécurisées ?*
- [TT] 530. Will cars be able to handle accidents?
[ST] 530. *Les voitures pourront-elles gérer des accidents ?*
- [TT] 592. Are the screens equipped with blue light filters?
[ST] 592. *Les écrans sont-ils équipés de filtre lumière bleue ?*

Sub-dimension 'Other' of the Design of DP [n = 5]

This sub-dimension gathers questions that could not be classified in the sub-dimension of the technical working of the diegetic prototype.

- [TT] 57. What is the name of this technology?
[ST] 57. *Quel est le nom de cette technologie ?*
- [TT] 159. Is there any real food in the fridge?
[ST] 159. *Est-ce qu'il y a de la vraie nourriture dans le frigo ?*

- [TT] 494. fridge -> is there really anything in it?
[ST] 494. *frigo -> y a-t-il vraiment les choses dedans ?*
- [TT] 614. What is the brand of this technology?
[ST] 614. *Quelle est la marque de cette technologie ?*
- [TT] 897. What are the flaws?
[ST] 897. *Quels sont les défauts ?*

D) Storyworld [n = 202]

This fourth sub-dimension of the content gathers questions that usually consider the broad consequences that an element of the story might have. They generally focus on a particular aspect of the world (social, political, economic, cultural, ecological or ethics), as well as being rather evasive about the advantages and disadvantages that the piece of technology would bring if it existed. They often intersect with other dimensions and consider the wider implications of implementing the prototype.

- [TT] 49. Wouldn't it be dangerous to have so many electronic devices in our daily lives? (MD question)
[ST] 49. *Ne serait-il pas dangereux d'avoir autant d'appareils électroniques dans notre quotidien ?* (Question MD)
- [TT] 69. Won't technology lead to more pollution?
[ST] 69. *La technologie n'entraînera-telle pas plus de pollution ?*
- [TT] 445. Would the world be better with more technology?
[ST] 445. *Est-ce que le monde serait mieux avec plus de technologie ?*
- [TT] 741. Will cultures and languages disappear because of artificial intelligence?
[ST] 741. *Les cultures et langues auront-elles disparu à cause des intelligences artificielles?*

E) Self-existence of DP [n = 33]

This fifth sub-dimension of the content is the last one created for the corpus. It includes questions concerning the existence of the project or the technology. They are typically questions that raise doubts about its self-existence.

- [TT] 39. Will the technologies displayed be available in the near future? (MD question)
[ST] 39. *Les technologies montrées verront-elles le jour dans un avenir proche ?* (Question MD)

- [TT] 91. Why don't these technologies exist yet?
[ST] 91. *Pourquoi ces technologies n'existent pas encore ?*
- [TT] 222. Is it possible that in 2037 (as in the film) we can reach this level of technology? (MD question)
[ST] 222. *Est-il possible qu'en 2037 (comme dans le film) on puisse arriver à ce niveau de technologie ?* (Question MD)
- [TT] 671. Will there still be cash?
[ST] 671. *Y aura-t-il encore de la monnaie en liquide ?*

F) Sub-dimension 'Other' of the MT Content [n = 4]

This sub-dimension gathers questions that could not be classified in the other sub-dimensions of the media text content.

- [TT] 15. Will we not lose sight of the essentials with technologies?
[ST] 15. *Ne perdrons-nous pas l'essentiel de vue avec des technologies ?*
- [TT] 683. Is this technology ethically right?
[ST] 683. *Cette technologie est-elle correcte en termes d'éthique ?*
- [TT] 888. How would these technologies be good or bad for us?
[ST] 888. *En quoi ces technologies seraient bien ou mauvaises pour nous ?*
- [TT] 917. What do you think about these technologies?
[ST] 917. *Que pensez-vous de ces technologies ?*

12.3.1.5. Media Text Representations [n = 2]

The media text representations dimension is a common category in media literacy core concepts. It refers to the particularity of the media text to represent, convey or omit values, points of view and ideologies. In the context of the corpus, I have identified only two questions that raise issues related to representations in a general way.

- [TT] 232. How can you know what will (maybe) happen in the years to come?
[ST] 232. *Comment pouvez-vous savoir ce qu'il va (peut-être) arriver dans les années à venir ?*
- [TT] 694. Is the technology well represented or real?
[ST] 694. *La technologie est-elle bien représentée ou réelle ?*

12.3.1.6. *Dimension ‘Other’ of the Media Text* [$n = 7$]

This sub-dimension gathers questions that could not be classified in the other core dimensions of the media text.

12.3.2. **The Issue**

Design fiction is defined as a practice considering technical aspects of a technology in relationship to its social, cultural, economic, political, and ethical implications on the imagined future society (Tanenbaum, 2014). By its very nature, design fiction therefore raises societal issues, and this is a criterion to be considered in students’ questions. A question that raises an issue is defined as a question that poses a problem, i.e., a question that relates the diegetic prototype to a societal implication. In this context, the criterion of societal issue is defined as the problematisation of a societal implication.

There is little scientific literature on this aspect for assessing media literacy inquiry habits. As we saw above, the media literacy core concepts are indeed focused on the media text and not on the technologies represented by the text. Nevertheless, the literature on critical design and critical media literacy pointed out a similar criterion that helps clarify what is meant by the criterion of the issue, which is ‘the change of perspective’ (see Chapter 3: Media Literacy). It is defined as the “ability to shift one’s perspective about a given phenomenon”, i.e., the ability to extend one’s perspective from a strictly limited understanding of the media text to a broader understanding of the issues in today’s society (Bardzell & Bardzell, 2013). This ability to take societal issues into account may be observed in the questions asked by the students, if they raise societal issues, directly related or not to the media text or the piece of the technology represented. On that basis, I have distinguished the categories of the issue criterion according to the presence of an issue raised in the question (presence or absence), the reference to the video clip⁵⁰ (issue represented in the video or new issue), and the answer to the question when the issue is represented in the video (with or without answer).

In addition to the building of these categories, the issues were also identified according to their areas. The coding of the data highlighted thirty-one areas (see table 12.11.). Some of these areas address important issues in critical media literacy, such as social justice, power structures, freedom, and ethics.

⁵⁰ As a reminder, students watched video clips from the film *Minority Report* (2002) and Microsoft’s *Productivity Future Vision* (2014) during the pre- and post-tests.

Table 12.11.*Areas of the issues addressed in students' questions*

Adoption	Acceptance of the technology by users
Access	Access to technology for users (e.g., minorities)
Affordability	Economic access for users
Solutionism	Questioning the usefulness or need for the technology
Construction	Construction issues: creation of technologies, e.g., roads
Trust	Trust in technology, issues of domination, control, and trust
Economy	Financial and economic issues for producers and users
Labour	New way of working, jobs substituted by machines
Teaching and learning	School practices and materials
Environment	Technological impact on the environment
Ethics	Ethically correct technology, good or bad
Productivity	Machines performances, impact on the daily life of the users in terms of efficiency and ease of use
War	New technologies trigger wars
Experience	User experience and perceptions
Intelligence	Increased or decreased intelligence
Freedom	Autonomy and addiction of the user, freedom in the world
Maintenance	Technical disaster, breakdown
Lifestyle	The impact on the daily life of the users (in general)
Police	Police, crime, and law
Politics	The type of state regime, the issue of power (e.g., dictatorship)
Without Tech	A world without technology (e.g., screens, Wi-Fi, electricity)
Health	Consequences of the exposure to technology on health
Science	Research and technology development
Data security	Data protection, reliability, hacking, hijacking...
Security, risks	Material hazards, defective equipment
Transport	Means of travel, issues related to accidents or traffic
Privacy	Data tracing, violation of privacy and targeted advertising
Social life	Human relationships with friends and family
Well-being	Improvement of daily life, benefits for well-being
Communication	Communication between individuals, using networks or Wi-Fi
Resources	Sufficient resources of the planet, energy and human resources
Others	Varied issues

12.3.2.1. *The Absence of An Issue* [*n* = 253]

The questions that do not raise an issue have a simple formulation and are limited to the understanding of one aspect of the media text or the diegetic prototype.

Examples of ‘no issue’ questions about media texts:

- [TT] 51. Why was this video made?
[ST] 51. *Pourquoi avoir réaliser cette vidéo ?*
- [TT] 310. Who stages these objects?
[ST] 310. *Qui met ces objets en scène ?*

Concerning the prototype, the category mainly includes basic questions about the timing of the technology, its working, and its feasibility.

Examples of ‘no issues’ questions about diegetic prototypes:

- [TT] 10. When will there be such technologies?
[ST] 10. *Quand y aura-t-il ce type de technologies ?*
- [TT] 127. How is it possible for holograms to become real, in 3D?
[ST] 127. *Comment est-il possible que des hologrammes deviennent vrais, en 3D ?*
- [TT] 709. How do the cars work?
[ST] 709. *Comment les voitures fonctionnent ?*
- [TT] 812. Why is this technology not used in real life?
[ST] 812. *Pourquoi cette technologie n'est-elle pas utilisée dans la vraie vie ?*

12.3.2.2. *An Issue Represented in The Video with An Answer* [*n* = 85]

This category is specific to the media text content. It gathers questions that raise societal issues addressed in the video clips and whose answer is provided in these ones. There are mainly questions relating to privacy, travel, data security, social life, labour, police (including crime and law), economics and productivity issues.

- [TT] 38. Would autonomous cars not be dangerous for the road?
[ST] 38. *Des voitures autonomes ne seraient-elles pas dangereuses pour la route ?*
- [TT] 74. Will it be easier to arrest thieves?
[ST] 74. *Sera-t-il plus facile d'arrêter des brigands ?*
- [TT] 382. Will we be able to identify people with cameras that detect eyes?
[ST] 382. *Pourrons-nous reconnaître des gens grâce à des caméras qui reconnaissent les yeux ?*

- [TT] 745. Will we still have a social life?
[ST] 745. *Aurons-nous encore une vie sociale ?*

12.3.2.3. An Issue Represented in The Video with No Answer [*n* = 52]

This category is specific to the media text content as well. It gathers questions that raise societal issues addressed in the video clips and whose answer is not provided in these ones. The areas of the issues are quite similar to those of the previous category and sometimes encompass new ones, such as freedom, autonomy, politics, ethics and (anti)-solutionism.

- [TT] 18. Is it good to be constantly filmed?
[ST] 18. *Est-ce bien d'être constamment filmé ?*
- [TT] 279. Will we have more freedom if we let technology overwhelm us?
[ST] 279. *Aurons-nous plus de liberté si on laisse les technologies nous submerger ?*
- [TT] 538. Would not knowing where people are and what they are doing all the time lead to a kind of dictatorship?
[ST] 538. *Est-ce que savoir où sont et ce que font les gens en permanence ne mènerait pas à une sorte de dictature ?*
- [TT] 611. Would this not create more problems (privacy, maintenance, construction) than it would solve?
[ST] 611. *Est-ce que cela ne créerait pas plus de problèmes (vie privée, maintenance, construction) que ça n'en résoudrait ?*

12.3.2.4. A New Issue [*n* = 251]

The questions in this category raise new issues, i.e., issues that are not raised by the media text or content.

Regarding the media text, this category refers to questions that go beyond the general framework of the media text, such as questions about the marketing environment of media text's production, the necessity of producing such media content, or its moral meaning. Examples of 'new issue' questions about media texts:

- [TT] 186. More generally: is it useful to imagine the impossible (the future)?
[ST] 186. *Plus généralement : est-il utile d'imaginer l'impossible (le futur) ?*
- [TT] 321. What is the moral meaning of the video?
[ST] 321. *Quel est le sens moral de la vidéo ?*

- [TT] 663. Has the film made a partnership with any brands for the tablets, screens, cereal box, etc.?
[ST] 663. *Le film a-t-il fait un partenariat avec des marques pour les tablettes, les écrans, la boîte de céréales, etc. ?*
- [TT] What is the point of putting so many actions, images, etc. of the future if we are not there yet?
[ST] 862. *Quel est l'intérêt de mettre autant d'actions, d'images, etc. du futur si on y est pas encore ?*

New issues on diegetic prototypes refer to issues that are not addressed in the video clips and that consider the consequences of implementing the technology in contexts other than those depicted. They are varied and the most frequent areas are affordability, environment, and health. Examples of 'new issue' questions about diegetic prototypes:

- [TT] 40. Will the price of these technologies have an impact on our buying power and the current economy?
[ST] 40. *Le prix de ces technologies aura-t-il un impact sur notre pouvoir d'achat et l'économie actuelle ?*
- [TT] 69. Won't technology lead to more pollution?
[ST] 69. *La technologie n'entraînera-t-elle pas plus de pollution ?*
- [TT] 144. Is it good for children to use a screen so young?
[ST] 144. *Est-ce bon pour les enfants d'utiliser un écran aussi jeune ?*
- [TT] 968. Wouldn't people with a handicap be disadvantaged and excluded?
[ST] 968. *Les personnes handicapées ne seraient-elles pas désavantagées et mises à l'écart ?*

12.3.2.5. An Indeterminate Issue [*n* = 81]

The category or the area of the issue can be difficult to identify. On the one hand, the issue can be too broad, typically when the student is questioning the advantages and disadvantages of the prototype for society (see below: examples 473 and 567). On the other hand, the student can be too vague in the formulation of their questions (see below: examples 15, 215 and 863).

- [TT] 15. Will we not lose sight of the essentials with technologies?
[ST] 15. *Ne perdrons-nous pas l'essentiel de vue avec des technologies ?*
Coding comment: What does the student mean by 'essential'?
- [TT] 215. Wouldn't too much technology kill technology?
[ST] 215. *Trop de technologies ne tuerait pas la technologie ?*

Coding comment: What does the student mean by ‘killing technology’?

- [TT] 473. Can technology really be dangerous for us?

[ST] 473. *Est-ce que la technologie peut être vraiment dangereuse pour nous ?*

Coding comment: Dangerous in which area? From a safety point of view?

- [TT] 567. How do these technologies benefit society?

[ST] 567. *En quoi ces technologies sont bénéfiques pour la société ?*

Coding comment: Beneficial for what? In which area?

- [TT] 863. Will we be like this tomorrow?

[ST] 863. *Demain, on sera comme ça ?*

Coding comment: How will we be?

12.3.3. The Attitude

In addition to the particularity of design fiction to raise societal issues, design fiction is expected to lead the reader to suspend disbelief about change (see Chapter 7: Design Fiction as Fiction). This attitude refers to Coleridge’s concept of willing suspension of disbelief (1817) that characterises the attitude proper to enter the fiction. As a reminder, the scientific literature highlighted two types of opposite attitudes: the fictionalising mode vs. the documentary mode of Odin (2000b), as well as the (fictional) immersion vs. the distancing or reflective mode (Bonenfant, 2013; Delbouille et al., 2019). These two modes can be used to distinguish first two attitudes in our relationship to design fiction productions, namely the documentary attitude and the fiction attitude.

In Chapter 7, we also saw that design fiction can be characterised by an attitude of cognitive estrangement, which was described as both immersion and distance. The attitude of cognitive estrangement describes the reader’s mental state when confronted with a fictional world that seems both familiar and strange. In a media education context, this attitude would encourage learners to immerse themselves fully in the content of a work of fiction while being able to distance themselves from it in order to interpret it. Coupled with the speculation attitude, design fiction would enable individuals to adopt an alternative perspective on the events narrated. Design fiction challenges readers by asking them ‘what if?’ and lead them to speculate on possible worlds. The criticality of a question could thus also be defined by the student’s speculation attitude. I distinguished it from the prediction attitude which is a variant of the fiction attitude and is anchored in the future. In addition to these attitudes, I pointed out the attitude of doubt that leads students question media text content and representations. This attitude is consistent with the inquiry method which is based on doubt.

Before presenting the different categories, I would like to clarify that I use the term ‘attitude’ in line with film studies. There is a long tradition of using this concept to characterise the spectator’s filmic experience (Meunier, 2019). The attitude is defined in terms of knowledge, perception and behaviour which makes it possible to be conscious of whether it is a fiction work or not. This concept highlights two modes of participation in the filmic experience, the documentary attitude and the fiction attitude, that I have extended with new attitudes specific to design fiction.

12.3.3.1. *Fiction Attitude* [$n = 313$]

The concept of fiction attitude is based on theories of fiction that approach fiction as mental state (see Chapter 7: Design Fiction as Fiction). It refers to Odin’s fictionalising mode (2000b) and can be defined as the attitude according to which the subject accepts to suspend their disbelief (Coleridge, 1817) and to play the game during the viewing of the piece of fiction (Jenny, 2003). In this attitude, the student is totally absorbed by the fiction and can therefore be considered as being in a fictionalising activity (Langlade, 2008). This attitude is the most common in the data collected.

There are two types of questions in this category, distinguished by the time conjugated used by the student. On the one hand, students formulated questions in the present mode. These questions were usually factual: the students pretended that the technologies exist and that it was possible to create them. They adhered to the fiction and acted as if the diegetic world existed. Some questions referred to existing technologies that coincided with the technologies depicted.

- [TT] 50. Are there any such projects already in progress?
[ST] 50. *Y a-t-il déjà des projets comme cela en cours ?*
- [TT] 153. Is it better or worse for people to have such advanced technologies?
[ST] 153. *Est-ce mieux ou moins bien pour les gens d'avoir des technologies si avancées?*
- [TT] 531. Are all these technologies hackable?
[ST] 531. *Toutes ces technologies sont-elles piratables ?*
- [TT] 780. How can you create all this technology?
[ST] 780. *Comment peut-on créer toute cette technologie ?*

Prediction Attitude [$n = 221$]

On the other hand, students formulated questions in the future mode. This type of question has the same properties that characterise the student’s fiction attitude and adds a predictive

aspect to the questions. Typically, the students' questions concerned the world of the future, how it would evolve, and under what circumstances. In this attitude, the student assumed that the technologies would one day exist and wondered when they would appear.

- [TT] 10. When will there be such technologies?
[ST] 10. *Quand y aura-t-il ce type de technologies ?*
- [TT] 621. Will this technology harm our health?
[ST] 621. *Cette technologie sera-t-elle néfaste pour notre santé ?*
- [TT] 798. When will this technology exist?
[ST] 798. *Quand cette technologie va-t-elle exister ?*
- [TT] 985. Will we become slaves to our own inventions?
[ST] 985. *Nous deviendrons esclaves de nos propres inventions ?*

12.3.3.2. Documentary Attitude [*n* = 20]

The documentary attitude is based on Odin's concept and definition of the documentary mode (2000b). In the context of the present research, the documentary attitude refers to the students' questions about the media text read in a documentary mode, that is, viewed as a semiotic text with its own signs. This category includes most of the students' questions from the core dimensions of Context of MT Production, Context of MT Reception, MT Semiotics and MT Representations.

- [TT] 51. Why was this video made?
[ST] 51. *Pourquoi avoir réalisé cette vidéo ?*
- [TT] 52. What is the purpose of background music? (MD question)
[ST] 52. *À quoi sert la musique de fond ?* (Question MD)
- [TT] 310. Who stages these objects? (MD question)
[ST] 310. *Qui met ces objets en scène ?* (Question MD)
- [TT] 232. How can you know what will (maybe) happen in the years to come?
[ST] 232. *Comment pouvez-vous savoir ce qu'il va (peut-être) arriver dans les années à venir ?*

12.3.3.3. Attitude of Doubt [*n* = 21]

This category emerged in the classification of the data to identify the questions of students who doubted the existence of technology represented. It usually includes questions about whether this piece of technology or this world depicted is real.

- [TT] 116. Is it so really easy to use?
[ST] 116. *Est-ce réellement si facile d'utilisation ?*
- [TT] 247. Is this technology really possible?
[ST] 247. *Est-ce que cette technologie est vraiment réalisable ?*
- [TT] 304. Can this technology be real in other countries?
[ST] 304. *Cette technologie peut-elle être réelle dans d'autres pays ?*
- [TT] 810. Do this life and these objects really exist?
[ST] 810. *Cette vie et ces objets existent-ils vraiment ?*

12.3.3.4. Speculation Attitude [*n* = 135]

The speculation attitude is specific to design fiction productions and was defined in Chapter 7 as an attitude that encourages participants to speculate about the possible futures of technologies. In the corpus of questions, the speculation attitude manifested itself when the student raised questions about whether the technology could ever exist or be produced. Usually, the questions were in the conditional mode and the student wondered *what would happen if* the vision occurred.

- [TT] 1. What could be the possible consequences for the health of being in constant contact with electronic devices?
[ST] 1. *Quelles pourraient être les conséquences sur la santé d'être constamment en contact avec des appareils électroniques ?*
- [TT] 193. How could devices connect to our gestures, ideas, etc.?
[ST] 193. *Comment les appareils pourraient-ils se connecter à nos gestes, à nos idées, etc. ?*
- [TT] 511. Wouldn't people be sceptical about such a change?
[ST] 511. *Les gens ne seraient-ils pas sceptiques face à un tel changement ?*
- [TT] 715. Will we always have the right to anonymity?
[ST] 715. *Pourrons-nous toujours avoir droit à l'anonymat ?*

12.3.3.5. Indeterminate Attitude [*n* = 14]

The attitude of some students was sometimes difficult to identify. It could oscillate between two attitudes, such as fiction and speculation, when it was not clear whether the student was referring to the fictional world or the real world (see below: examples 14 and 224). It was also too vague to be determined (see below: examples 115 and 917)

- [TT] 14. Wouldn't these technologies be too present?

[ST] 14. *Ces technologies ne seraient-elles pas trop présentes ?*

- [TT] 115. How is this possible?

[ST] 115. *Comment c'est possible ?*

- [TT] 224. What is the priority in terms of technology: the environment, cars, phones, computers, space, etc.?

[ST] 224. *Quelle est la priorité au niveau technologique : l'environnement, les voitures, les téléphones, les ordinateurs, l'espace, etc. ?*

- [TT] 917. What do you think of these technologies?

[ST] 917. *Que pensez-vous de ces technologies ?*

12.4. Constructing the Rubric

The rubric is based on the previously defined criteria: the dimension, the issue, and the attitude. To determine the student's criticality level, I decided to construct the rubric on the basis of the question by looking at the most critical question the student is capable of asking at the pretest and post-test stages. I therefore did not take all their questions into account and calculate a result per test, but rather looked at their maximum level in each test.

The second choice for the construction of the rubric was to subdivide it in two. I distinguished between questions on media content, i.e., focused on diegetic prototypes and storyworld, and questions on media text, i.e., questions of other four core dimensions of the media text. As only some categories of the issue criterion concerned media content's questions (questions relating to an issue represented in the video with and without an answer), the questions could not be assessed with the same criteria. I also found that the attitude criterion was not relevant to the questions on media texts because most of them was classified in the documentary attitude. Concerning the dimension 'Other' of the media text, I excluded it of the analysis because of the small number of questions ($n = 7$), but above all the questions of this dimension were too vague, and the types of attitudes and issues associated with them were often indeterminate.

The third choice was to construct holistic rubrics. This form of rubric allowed me for a gradual construction of the levels of criticality. In particular, there were many criteria for the questions relating to media content and the holistic rubric made it possible to integrate all possibilities as they arise.

12.4.1. Questions on Media Text

The questions on media text refer to questions about core dimensions of context of production, context of reception, semiotics, and representations. I started to construct the rubric based on the **dimension criterion** and looked at whether the questions on media text crossed several core dimensions or sub-dimensions. The data collected indicated that a question crosses at most two core dimensions (see table 12.12.) and that no question crosses several sub-dimensions of the context of the media text production (see table 12.13.).

Table 12.12.

Number of unidimensional and multidimensional questions in the core dimensions of media text

		Number of Dimensions		Total
		1	2	
Core Dimensions of Media Text	Context of Production	15	1	16
	Context of Reception	0	1	1
	Semiotics	2	2	4
	Representation	2	0	2
Total of unidimensional and/or multidimensional questions		19	2	21

Table 12.13.

Number of unidimensional and multidimensional questions in the sub-dimensions of the Context of Media Text Production

		Number of Sub-Dimensions		Total
		1	2	
Sub-dimensions of Context of Media Text Production	Authorship	4	0	4
	Purpose	8	0	8
	Creation & Dissemination	3	0	3
	Others	1	0	1
Total of unidimensional and/or multidimensional questions		16	0	16

The scientific literature highlighted a criterion on which the criticality levels of the number of dimensions can be determined, which is the complexity of the question (see Chapter 3: Media Literacy). The complexity is defined on the basis of the structure of the question and varies from lower order thinking to higher order thinking (Schilder and Redmond, 2019). The levels of Unistructural and Multistructural were used to define the categories of the criterion of the number of dimensions in students' questions. As a reminder, here are their definitions:

- **Low/Unistructural:** questions that only focus on one piece of basic or fixed information that can easily be identified or recalled from the text.
- **High/Multistructural:** questions that focus on breaking down main ideas and information, but do not examine relationships or require evidence-based thinking.

Although the classification of Schilder and Redmond (2019) diverges a bit from mine, the criterion of the number of dimensions is based on the same idea that a question can include one or multiple elements, here the dimensions. In a similar way to Schilder and Redmond (2019)'s levels, I have established that unidimensional questions are of a lower critical level than the multidimensional question. I included a category for questions that are not clear or irrelevant, i.e., do not answer the research prompt. These questions are excluded from the analysis.

Table 12.14.

First draft of the rubric for evaluating questions of media text

Descriptors	Codes
The question is unclear or irrelevant.	0 (excluded)
The question is unidimensional; it contains only one core dimension.	1
The question is multidimensional: it crosses two core dimensions or two sub-dimensions of the context of the media text.	2

Secondly, regarding the **issue criterion**, the data indicated that only two categories concerned the questions on the media text: ‘no issue’ or ‘new issue’ (see table 12.15.).

Table 12.15.

Number of questions that do not raise an issue or that raise a new issue in the core dimensions of the media text

		Types of issues	
		No issue	New issue
Core Dimensions	Context of Production	12	4
	Context of Reception	1	0
	Semiotics	4	0
	Representations	2	0
	Total	19	4

In the scientific literature, the ability to problematise was seen as a high critical level. This ability refers to the relational level of SOLO taxonomy and that of Schilder and Redmond (2019). This level is one step above the multi-structural level.

As a reminder, here are their definitions:

- SOLO Taxonomy: At the **relational level**, the ideas are linked, and provide a coherent understanding of the whole. Student learning outcomes show evidence of comparison, causal thinking, classification, sequencing, analysis, part whole thinking, analogy, application and the formulation of questions.

- Schilder and Redmond (2019): **High/Relational**: questions that analyse relationships of multiple concepts and typically reflect evidence-based thinking (e.g., asking “how” and “why” questions).

Similarly to their classification, the levels of the issue were distinguished depending on whether the question raises an issue or not. Questions that raise an issue were thus considered of a higher level than questions without issues, no matter how many dimensions they had. The rubric was updated as follows.

Table 12.16.

Final version of the rubric for evaluating questions of media text

Descriptors	Codes
The question is unclear or irrelevant.	0 (excluded)
No issue + unidimensional	1
No issue + multidimensional	2
New issue	3

Finally, regarding the **attitude criterion**, a quick analysis showed that the questions asked in the four core dimensions of media texts were associated with the attitude (see table 6). All the questions, except one in the dimension of representations, were in line with the documentary attitude. Due to these findings and the small number of the questions ($n = 21$), the questions were not assessed based on the attitude criterion. The final rubric for media text questions therefore remained as in table 12.17.

Table 12.17.

Number of questions that are asked in a documentary attitude or attitude of doubt in the four core dimensions of media text

		Core Dimensions of Media Text			
		Context of Production	Context of Reception	Semiotics	Representation
Attitudes	Documentary Attitude	16	1	4	1
	Attitude of Doubt	0	0	0	1
	Fiction Attitude	0	0	0	0
	Speculation Attitude	0	0	0	0

12.4.2. Questions on Media Content

For the questions in the dimension of the media content, I built the rubric based on the number of their sub-dimensions, the level of the issue, and the type of attitude.

First, concerning the **sub-dimensions**, the question is multidimensional if it crosses the sub-dimensions of the core dimension of content. I did not take the lower levels of the sub-dimensions into account for multiple reasons. The ‘sub-sub-dimensions’ were created because there were many questions in these categories but obviously, they go into details. Some of them are quite similar and therefore cannot be representative of the multidimensionality criterion (e.g.: sub-sub-dimensions of the context of use). Another reason is that the design sub-dimension, as a result of its various developments, now comprises only one sub-sub-dimension and cannot be analysed according to this criterion.

The data indicated that a question crosses at most three sub-dimensions of the media content (see table 12.18.).

Table 12.18.

Number of unidimensional and multidimensional questions in the sub-dimensions of the Media Content

		Number of Sub-Dimensions			Total
		1	2	3	
Sub-dimensions of Media Text Content	Context of Production	97	23	0	120
	Context of Use	223	43	2	268
	Design	112	33	2	147
	Storyworld	166	34	2	202
	Self-existence	18	15	0	33
	Others	4	0	0	4
Total of questions		620	74 ⁽⁵¹⁾	2 ⁽⁵²⁾	696 ⁽⁵³⁾

To establish the levels of criticality, I used the same classification as for the other four core dimensions: ‘uni-sub-dimensional’ questions are of a lower critical level than the ‘multi-sub-dimensional’ questions. I did not make a distinction according to the number of questions: as soon as the question crosses several dimensions, it is of a higher critical level.

Table 12.19.

First draft of the rubric for evaluating questions of media content

Descriptors	Codes
The question is unclear or irrelevant, i.e., does not answer the research prompt.	0
The question is uni-sub-dimensional; it contains only one sub-dimension.	1
The question is multi-sub-dimensional: it crosses at least two sub-dimensions of the media content.	2

Second, regarding the **issue criterion**, I identified four cases. First, the question does not raise a societal issue. Second, the question raises an issue that is addressed in the test videos and whose answer is suggested. Third, the question raises an issue that is addressed in the test videos and whose answer remains unresolved. Fourth, the question raises a new issue that is

⁵¹ The number ‘74’ is obtained by summing the number of questions with two sub-dimensions and dividing it in two.

⁵² Similarly, the number ‘2’ is obtained by summing the number of questions with three sub-dimensions and dividing it in three.

⁵³ The number ‘696’ is obtained by summing the totals in the line.

not addressed in the video clips. The indeterminate issue is not considered because it does not provide information on the student's level of criticality.

In the context of media text questions, we previously built our rubric on the relational level of SOLO taxonomy and that of Schilder and Redmond (2019). They also defined a higher level of cognitive complexity, which is 'extended abstract' and that helped me to distinguish the levels of criticality of the issue in the context of media content questions. It is defined as:

- SOLO Taxonomy: At the **extended abstract level**, understanding at the relational level is re-thought at a higher level of abstraction, it is transferred to another context. Student learning outcomes at the extended abstract level show prediction, generalisation, evaluation, theorising, hypothesising, creation, and or reflection.
- Schilder and Redmond (2019): **High/Extended Abstract**: questions that focus on extending ideas and information into other domains or contexts in new ways—connecting, synthesizing, and transforming.

Similarly to their classification, I distinguished the levels of the issue depending on whether the student's question concerned an issue that was already raised in the video or not. This highlighted new higher levels of criticality. Regarding the distinction of whether or not the video clip provided an answer to the issue that was raised by the question, I decided not to take this into account given the small number of questions in these categories (12% of questions 'with an answer' and 7% of questions 'without answer', in comparison to 34,5% of questions with 'no issues' and 34,9% of questions with 'new issues'). Finally, if the question did not raise an issue at all, then I looked at whether it was multidimensional. The rubric was updated as follows.

Table 12.20.

Second draft of the rubric for evaluating questions of media content.

Descriptors	Codes
The question is unclear or irrelevant, i.e., does not answer the research prompt.	0
The question does not raise an issue AND is uni-sub-dimensional .	1
The question does not raise an issue AND is multi-sub-dimensional .	2
The question raises an issue addressed in the video (with or without answer).	3
The question raises a new issue that is not addressed in the video clips.	4

Third, concerning the **attitude**, three cases were possible. First, the attitude of the student asking the question is the fiction attitude (including prediction). Second, the attitude of the student asking the question is the doubt. Third, the attitude of the student asking the question is the speculation. The indeterminate attitude is not considered because it does not provide information on the students' level of criticality. The documentary mode is not considered because it is related to the other core dimensions.

In the scientific literature, the fiction attitude is considered as a lack of distance or reflexivity (see Chapter 7: section 7.1.5.3.: Immersion vs. Distance). So a question asked by a student in this attitude was automatically considered as of not critical. In this context, the most basic and therefore one-sub-dimensional and non-issue questions were admittedly not critical.

Regarding doubt and speculation, there was not much scientific literature on the matter. In the elaboration of these categories (see sections 7.2.3. and 12.3.3.), I compared speculation with the attitude of estrangement typical of science fiction in which students can simultaneously immerse themselves and take distance from the fiction, and established that speculation went a step further with its ability to hypothesise on the future. As for the attitude of doubt, I associated it as an attitude consistent with the inquiry method in which students question media text content and representations. The ability to distance or question media text is a highly critical skill in the scientific literature. I therefore consider doubt and speculation attitudes as critical high levels.

Given the lack of scientific literature and the small number of questions asked in the attitude of doubt (n = 21), I decided not to distinguish the levels of the questions asked in the two attitudes.

On this basis, the rubric was updated by establishing that:

- 1) The question is not critical when the attitude is fiction attitude, does not raise an issue and is uni-sub-dimensional.
- 2) For the other levels, no matter what other categories it crosses, the question asked in a fiction attitude will always be of a lower critical level than the question asked in an attitude of doubt or speculation.

Table 12.21.

Final version of the rubric for evaluating questions of media content

Descriptors	Codes
The question is unclear or irrelevant.	0 (excluded)
No issue + Fiction attitude + Uni-sub-dimensional	0 (not critical)
No issue + Fiction attitude + Multi-sub-dimensional	1
No issue + Speculation or Doubt	2
Issue (with or without answer) + Fiction attitude	3
Issue (with or without answer) + Speculation or Doubt	4
NEW Issue + Fiction attitude	5
NEW Issue + Speculation or Doubt	6

12.5. Synthesis Chapter 12: Holistic Rubrics

To conclude this chapter, I propose to group here the two rubrics that will be used in the chapters dedicated to the results.

Question on media text:

Descriptors	Codes
The question is unclear or irrelevant.	0 (excluded)
No issue + unidimensional	1
No issue + multidimensional	2
New issue + unidimensional	3
New issue + multidimensional	4

Question on media content:

Descriptors	Codes
The question is unclear or irrelevant.	0 (excluded)
No issue + Fiction attitude + Uni-sub-dimensional	0 (not critical)
No issue + Fiction attitude + Multi-sub-dimensional	1
No issue + Speculation or Doubt	2
Issue (with or without answer) + Fiction attitude	3
Issue (with or without answer) + Speculation or Doubt	4
NEW Issue + Fiction attitude	5
NEW Issue + Speculation or Doubt	6

PART 6: FINDINGS

Once the method had been developed and the outputs constructed, I was able to carry out analyses to assess students' critical inquiry competence. As explained in the previous chapters, this competence was assessed in terms of their ability to ask critical questions about media texts and the technologies they depict. To this end, two rubrics were constructed: one assessing the critical level of their questions about the dimensions of the media text and one assessing the critical level of their questions about the sub-dimensions of the media content.

Students' critical inquiry competence was trained throughout the educational programme activities. The following analyses aim to observe the impact of the programme on the number of students asking critical questions about media texts and the technologies they depict (i.e., did this number increase in the treatment group and, conversely, did it decrease in the control group?) The analyses are of a quantitative nature and test a series of hypotheses with the aim of identifying the contribution of design fiction in developing critical thinking in a media education context.

Part 6 of the manuscript is divided into two chapters. The first chapter presents the findings of the quantitative analysis and addresses the research hypotheses. The second chapter discusses the findings and interprets them in the light of the scientific literature reviewed in the theoretical part and the activities carried out during the educational programme.

Chapter 13: Findings Presentation

This chapter presents the results of the data analysis. The data analysis was carried out on the pre- and post-test data to assess students' critical inquiry competence. The objective was to test my main hypothesis and to see if the educational programme had an impact on the ability of students to ask critical questions. In this context, I have applied the rubrics developed in the previous chapter to assess the maximum level of criticality of the students in each question type (media text and media content questions). Based on more precise hypotheses, I then looked more closely at the categories in the criteria in which students were most frequently asking questions, in order to observe the impact of the educational programme on students' ability to ask questions in certain categories. These calculations are based on the presence or absence of the category in the student's test, and do not take into account the number of questions asked by a student in a category.

The Chapter is divided into two parts. First, I carry out a pretest diagnosis to examine whether the two groups, the control class and the treatment class, are similar. I produce descriptive statistics highlighting the general characteristics of the sample. In particular, I calculate the maximum level of criticality of students' questions, the diversity and the frequencies of the dimensions and the sub-dimensions of their questions, the frequencies of the levels of the issues and the maximum level of the issue of their questions, and the frequencies of the types of the attitudes of their questions. Second, I compare the pre- and post-test to observe if the educational programme had an impact on the ability of the students to ask critical questions. Similarly, I produce descriptive statistics highlighting the differences between the groups based on the elements mentioned above (maximum level of criticality, frequencies of the dimensions, and so on). I carry out also inferential statistics to test whether the differences between the two groups are significant.

13.1. Pretest Diagnosis

The first step in data analysis consists in comparing the treatment group and the control group to examine whether they are similar, i.e., students from both classes start with the same kind of questioning before the experimentation. In the context of the present research, a chi-square independence test was used for each criterion: the core dimensions, all the sub-dimensions, the levels of issues, the types of attitudes, and the levels of criticality. I compared the two groups, and all the tests, except one⁵⁴, showed a p-value higher than 5% (see Appendix V). We can interpret these results as no significative difference between the two groups. The two groups are therefore similar at the pretest stage, and I can highlight general trends in the various variables.

The next sections first present the students' maximum level of criticality based on the rubrics constructed in the previous chapter and then detail the categories of criteria most frequently used by students in pretest stage.

13.1.1. Level of Criticality

Regarding the level of criticality, I looked at the maximum level of the students' questions to determine their ability to ask critical questions at the pretest stage.

I used the rubric to calculate the mean maximum level of both groups at the pretest stage. The next table indicates that at least one student in each class was able to achieve the maximum level of criticality in each question type. The mean maximum level of criticality of the questions related to media text is quite low and estimated to .30 out of 3 per student, while the mean max level of criticality of the questions related to media content is 4.76 out of 6 per student. These results highlight a lower mean ability of students to ask critical questions about the media text than about the media content (.30 out of 3 is lower than 4.76 out of 6).

⁵⁴ The Chi-Square test of the variable of the *Presence of pretest questions asked in speculation and doubt attitude* gave a p-value of .036. As the reader shall see later, the number of students in the control group asking questions in this type of attitude is significantly more important than the number of students in the treatment group at the pretest stage. As this is the only exception, however, the comparison between the two groups is maintained.

Table 13.1.*Maximum level of criticality of students for pretest in two groups*

		Max level of criticality for pretest media text related questions	Max level of criticality for pretest media content related questions
Control Group	N	23	23
	Minimum	0	2
	Maximum	3	6
	Mean	0,30	4,96
	Std. Deviation	,765	1,186
Treatment group	N	23	23
	Minimum	0	0
	Maximum	3	6
	Mean	,30	4,57
	Std. Deviation	,765	1,727
Total	N	46	46
	Minimum	0	0
	Maximum	3	6
	Mean	,30	4,76
	Std. Deviation	,756	1,479

The following table gives a clearer idea of where the students scored in the rubric related to media content questions⁵⁵. More than half reached level 5 at the pretest stage, i.e., 35 students out of 46 students were able to ask questions that raise new issues by adopting a fiction attitude.

⁵⁵ I focused the results on the rubric related to media content questions, as the scores of the rubric related to media text questions are quite low.

Table 13.2.

Students' criticality score in the rubric related to MT content questions for pretest in total.

Group	Levels	Descriptors	Number of Students
Total	0	The question is unclear or irrelevant OR No issue + Fiction attitude + Uni-sub-dimensional	2
	1	No issue + Fiction attitude + Multi-sub-dimensional	0
	2	No issue + Speculation or Doubt	1
	3	Issue (with or without answer) + Fiction attitude	6
	4	Issue (with or without answer) + Speculation or Doubt	2
	5	NEW Issue + Fiction attitude	19
	6	NEW Issue + Speculation or Doubt	16

13.1.2. Dimensions

Regarding the dimensions, I focused the results on the most frequent dimensions and sub-dimensions in both groups. I also looked at the mean degree of diversity of students' questions at this stage.

12.1.2.1. Core Dimensions

The next table shows that the most frequent core dimension in the pretest in both classes was the media content. All students asked questions in this core dimension. Very few students asked questions in the other core dimensions. Proportionally to the other core dimensions, the media content dimension represented therefore an important part of the students' questioning at the pretest stage.

Table 13.3.

Number of students asking at least one question in each core dimension in the pretest

Dimension	Control Group	Treatment Group	Total
Context of Production	4	2	6
Context of Reception	0	1	1
Semiotics	1	2	3
Content	23	23	46
Representations	0	1	1
Others	1	2	3

Regarding the diversity of the core dimensions present in the questions of the students, the next table indicates a mean of 1.30 of core dimensions per student. In other words, students generally asked questions in the same core dimension.

Table 13.4.

Diversity of the questions in the core dimensions asked by students in the pretest

Group	Control Group	Treatment Group	Total
N	23	23	46
Mean	1,26	1,35	1,30
Median	1,00	1,00	1,00
Std. Deviation	,541	,775	0,662
Min	1	1	1
Max	3	4	4

12.1.2.2. Sub-dimensions Context of Media Text Production

In the pretest, four students from control group asked questions on media text production, while two students from the treatment group asked questions on this dimension. The following table shows the distribution of students' questions in the sub-dimensions of the core dimension.

Table 13.5.

Number of students asking at least one question in each sub-dimension of context of media text production in the pretest

Dimension	Control Group	Treatment Group	Total
Authorship and Economics	1	1	2
Text's Purpose	2	2	4
Context of Creation and Dissemination	2	0	2
Sub-dimension "Other" of the Context of MT Production	0	1	1

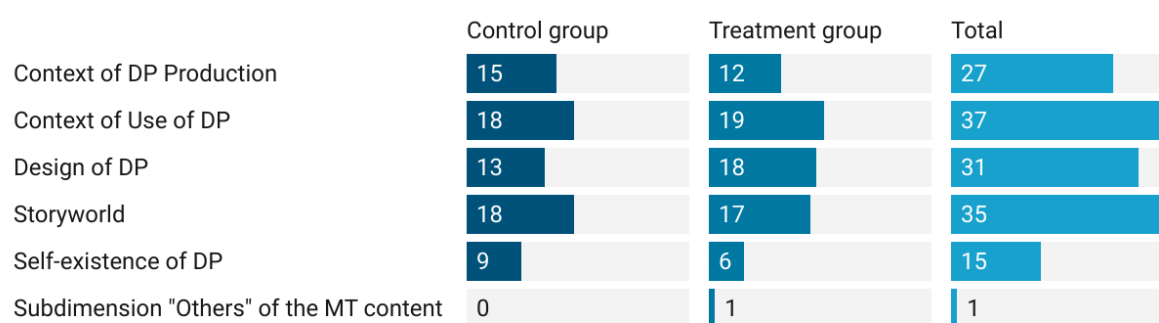
Given the small number of questions in this dimension, I did not calculate the diversity of the sub-dimensions of the context of media text production.

12.2.2.3. Sub-dimensions Content of Media Content

The next graph reveals the distribution of the sub-dimensions of the core dimension of the media content. It indicates that there are no dominant sub-dimensions, although one is under-represented in both groups which is the self-existence of the diegetic prototype.

Graph 13.6.

Number of students asking at least one question in each sub-dimension of media content in the pretest



Created with Datawrapper

I have calculated the diversity of the sub-dimensions of media content and the mean is 3.15 of sub-dimensions per student (see table 13.7.). In other words, students generally asked questions related to three sub-dimensions of media content at the pretest stage. The standard deviation indicates most of the students asked questions into 2.14 to 4.16 sub-dimensions of the media content. It was therefore quite standard for students to ask questions about different sub-dimensions of this dimension at the pretest stage.

Table 13.7.

Diversity of the questions in the sub-dimensions of media content asked by students in the pretest

Group	Control group	Treatment group	Total
N	23	23	46
Mean	3,17	3,17	3,15
Median	3,00	3,00	3,00
Std. Deviation	1,267	1,302	1,010
Min	1	1	1
Max	5	5	5

13.1.3. The Student's Level of Issue

Regarding the levels of the issue, I focused the results on the most frequent level of issue at the pretest stage. I also looked at the maximum level of the issue to see what students were capable of at the pretest stage.

The next graph indicates a certain balance in the number of students asking questions that do not raise issues (39 out of 46), raise issues in the video (35 out of 46) and raise new issues (36 out of 46).

Graph 13.8.

Number of students asking at least one question in each level of the issue in the pretest in the two groups

	Control group	Treatment group	Total
New Issue	18	18	36
Issue raised in the video	18	17	35
No Issue	19	20	39

Created with Datawrapper

Table 13.9. shows the maximum level of issue reached by the students in the pretest in the two groups. Only two students did not ask questions that raise issues.

Table 13.9.

Maximum level of issue reached by the students in the pretest in the two groups

Level of issue	Control group	Treatment group	Total
New Issue	18	18	36
Issue raised in the video	4	4	8
No Issue	1	1	2

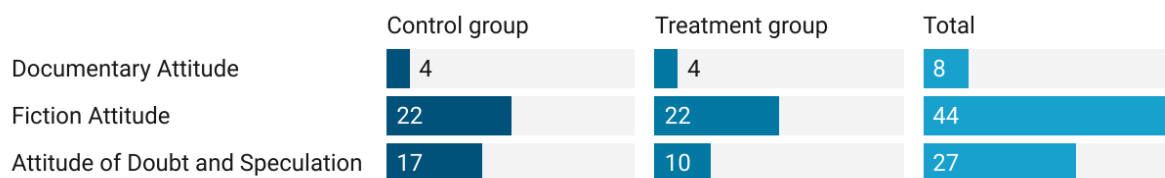
13.1.4. The Types of Attitudes

Regarding the types of attitudes, I focused the results on the most frequent category of attitudes at the pretest stage. I also specifically observed the frequencies of questions asked in the highest level of attitude, i.e., the speculation attitude and the attitude of doubt, to determine the number of students able to ask questions at this level at the pretest stage.

The next graph indicates that the most frequent category is the fiction attitude; except for two students, all the students asked questions in this type of attitude. Only 8 out of 46 students asked questions with a documentary attitude. A little more than half of the students asked questions in a speculation attitude and an attitude of doubt. More specifically, 10 out of 23 students in the treatment group were able to ask questions in these last attitudes at the pretest stage.

Graph 13.10.

Number of students asking at least one question in each type of attitude in the pretest in the two groups



Created with Datawrapper

13.2. Summary of the Main Results of the Pretest

To summarise, the main results from the pretest stage are as follows:

- 1) Students had a lower mean ability to ask critical questions about the media text than about the media content (.30 out of 3 vs. 4.76 out of 6).
- 2) Regarding the questions related to media content questions, more than half reached level 5 at the pretest stage, i.e., 35 students out of 46 students were able to ask questions that raise new issues by adopting a fiction attitude.
- 3) The most frequent core dimension in both classes is the media content dimension; all students asked questions in this core dimension. Very few students asked questions in the other dimensions of the media text (diversity mean: 1.30).
- 4) There are no dominant sub-dimensions of the media content dimension. However, the students' questions in this dimension are quite varied (diversity mean: 3.15).
- 5) There is a certain balance in the number of students asking questions that do not raise issues (39 out of 46), raise issues in the video (35 out of 46) and raise new issues (36 out of 46). Only two students did not ask questions that raise issues.
- 6) The most frequent type of attitude is the fiction attitude (44 out of 46), while the less frequent is the documentary attitude (8 out of 46). Little more than half of the students asked questions in a speculation attitude and an attitude of doubt (27 out 46).

13.3. Pre- and Post-Test Comparison

The pre- and post-test comparison determines if the educational programme had an impact on the development of students' critical thinking in terms of critical inquiry competence. I start by comparing the maximum level of criticality of the two groups at the pre- and post-test stages and draw first conclusions. I then discuss these results with a focus on specific criteria and categories. In this context, I test the following hypotheses:

- The educational programme caused an increase in the number of students asking critical questions.
- More students asked diverse questions after participating in the programme activities.
- More students asked questions that raise issues after participating in the programme activities.
- More students asked questions in a speculation attitude and attitude of doubt after participating in the programme activities.

13.3.1. Level of Criticality

Hypothesis: the educational programme caused an increase in the number of students asking critical questions.

Before testing this hypothesis, I would like to point out two possible biases that are likely to affect the results that follow. On the one hand, as the exercise was quite repetitive, the students in both groups may vary their questions in the post-test and did not necessarily repeat questions that were already critical in the pretest. On the other hand, students were simply not motivated to reformulate as many critical questions at the post-test stage. These two factors need to be considered when testing the hypothesis.

As with the pretest diagnosis, I first used the rubrics to calculate the mean maximum level of both groups, here at the pre- and post-test stages. The next table indicates that the mean maximum level of criticality for questions related to media text has decreased for both groups. The mean max level of criticality of these questions dropped from 0.30 to 0.17 out of 3 for the control group as well as for the treatment group. Concerning the questions related to media content, the mean max level of criticality decreased by one whole level for students from the

control group and went from 4.96 to 4.00 out of 6. The mean max level of criticality of students from the treatment group increased by almost one level and went from 4.57 to 5.26 out of 6.

Table 13.11.

Maximum level of criticality of students in the pre- and post-test

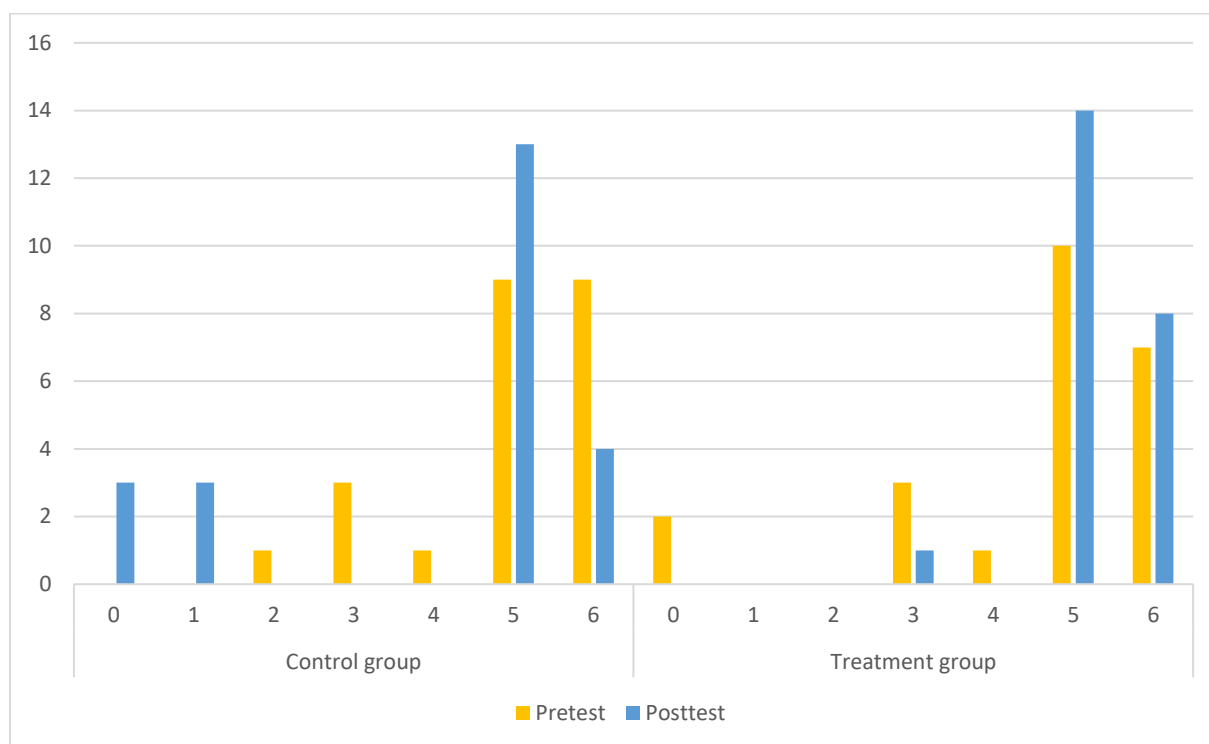
		Max level of criticality for media text related question		Max level of criticality for media content related question	
		Pretest	Post-test	Pretest	Post-test
Control Group	N	23	23	23	23
	Minimum	0	0	2	0
	Maximum	3	3	6	6
	Mean	,30	,17	4,96	4,00
	Std. Deviation	0,765	,650	1,186	2,174
Treatment group	N	23	23	23	23
	Minimum	0	0	0	3
	Maximum	3	3	6	6
	Mean	,30	0,17	4,57	5,26
	Std. Deviation	,765	,650	1,727	,689

In order to interpret these results, I looked in detail at the evolution of the students' scores. I focused particularly on the questions related to media content, as they are the most numerous and the most likely to produce significant results.

In this context, I generated three graphs. The first is a standard representation comparing the scores of the students at the pre- and post-test stages in the two groups (see Graph 13.12.). The second considers the progress that was made since the pretest stage and compares the pretest to the combined pre- and post-test (see Graph 13.13.). This last graph takes into account the possibility that the students who formulated less critical questions in the post-test than in the pretest are still considered able to formulate questions at the maximum level they had reached in the pretest. The third graph subtracts the results of the pretest from those of the post-test to make it possible to directly observe changes in students' maximum level of criticality between tests (see Graph 13.14).

Graph 13.12.

Comparison of the levels of criticality reached by the students in the pre- and post-test in the two groups

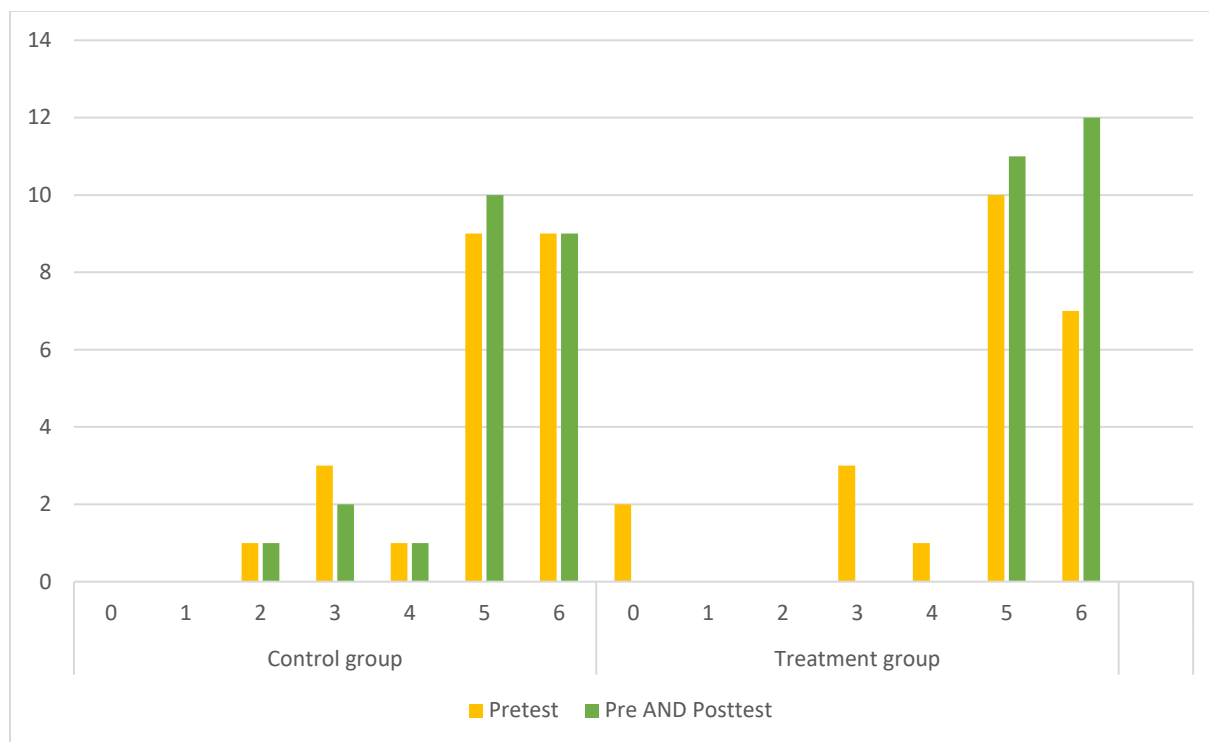


The Graph 13.12. illustrates why the mean maximum criticality level dropped in the control group. The reader can see that fewer students from the control group asked questions in the highest level of criticality and that more students asked questions in lower levels. In the treatment group, the mean maximum criticality level indicated a slight increase in the distribution of students' score. The Graph 13.12. illustrates this result by showing an increase in the number of students asking questions in levels 5 and 6.

Since the control group regressed and the treatment group showed progress, these results can be interpreted in the following way: the control group would have regressed because the students who had not taken part in the activities would have been (much) less motivated to ask questions a second time.

Graph 13.13.

Comparison of the levels of criticality reached by the students in the pretest and pre/post-test in the two groups

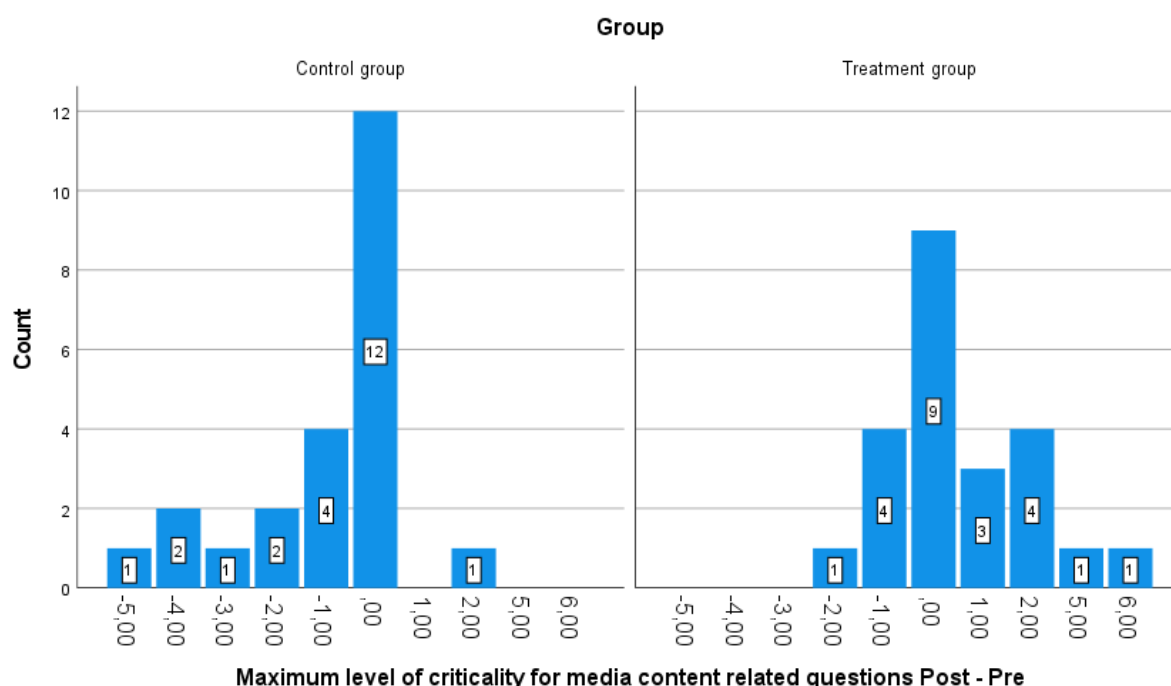


The Graph 13.13. brings more nuance to the previous finding. It is based on the pre- and post-test data combined, in such a way that we can see more clearly the progress made by some students. In pre-post-test combined, we notice that all students from the treatment group are distributed in levels 5 and 6. In particular, half of the treatment group reached the maximum level (12 out of 23 students). In the control group, we see that the scores are quite constant.

Basing the calculations on the pre- and post-tests combined, we can see the impact of the programme in reaching the high critical level questions. The students in the control group kept a very similar critical level while almost all students in the treatment group reached the highest critical level (pre and post combined).

Graph 13.14.

Post-test Minus Pretest: maximum level of criticality for media content related questions



The last graph provides a more detailed illustration of the progression and regression of the students in the different levels of criticality between the tests. The reader can see that 12 students of the control group remains at the same level, 10 of them downgraded, and only 1 gained levels at the post-test stage. Progress is more visible in the treatment group, where 9 students reached a higher level of criticality, 9 remains at the same level and 5 downgraded.

Although some students in the treatment group regressed, the previous graph (13.13.) allows us to conclude that these students would still have achieved a high critical level overall (pre and post combined). As explained previously, one of the reasons for this regression may be that these students, similarly to the students of the control group, would have been less motivated to repeat the task proposed by the test. Another reason may be that the students from the treatment group would simply have wanted to vary their questions.

In order to observe whether the differences between the two groups are significant concerning students' level of criticality, I carried out an Independent-Samples Mann-Whitney U Test⁵⁶. The test revealed the difference between the two groups concerning students' level of criticality to be significant ($U = 383.000$; $p = .006$)⁵⁷. Since both groups were at a similar level at the pretest stage, this result means that the treatment group obtained a higher level at the post-test stage. The educational programme therefore had a significant impact on the ability of students to ask questions about media content with a high level of criticality.

13.3.2. Dimensions

Hypothesis: more students asked diverse questions after participating in the programme activities.

13.3.2.1. Core Dimensions

Table 13.15. shows that there are not many differences between pre- and post-test. In both groups, similar numbers of students asked questions about the core dimensions in the pretest and in the post-test. The table also shows that fewer students in the treatment group asked questions related to the media text. I did not calculate and compare the diversity of the core dimensions present in the questions of the students at the two stages due to the low number of students asking questions in the core dimensions of media text.

⁵⁶ The Mann-Whitney Test is equivalent to the two-sample independent t-test and is typically used for small sample size and/or non-parametric data.

⁵⁷ The chi-square test of the pretest diagnosis gave non-significant results for the levels of criticality (see Appendix V), so we can interpret the p-value of Mann-Whitney Test.

Table 13.15.

Number of students asking at least one question in each core dimension in pre- and post-test

Group	Dimension	Pretest	Post-test	Diff
Control Group	Context of Production	4	2	-2
	Context of Reception	0	0	0
	Semiotics	1	0	-1
	Content	23	22	-1
	Representations	0	0	0
	Others	1	1	0
Treatment Group	Context of Production	2	1	-1
	Context of Reception	1	0	-1
	Semiotics	2	1	-1
	Content	23	23	0
	Representations	1	1	0
	Others	2	2	0

13.3.2.2. Sub-dimensions Context of Media Text Production

The next table indicates that only one student of the treatment group asked a question in the core dimension of MT Production in the post-test. The number also decreased in the control group and only two students asked a question in this core dimension. For the same reasons explained in the pretest diagnosis (small number of questions), I did not calculate the diversity of the questions.

Table 13.16.

Number of students asking at least one question each sub-dimension of context of media text production in pre- and post-test

Group	Dimension	Pretest	Post-test	Diff
Control Group	Authorship and Economics	1	0	-1
	Text's Purpose	2	2	0
	Context of Creation and Dissemination	2	0	-2
	Sub-dimension "Other" of the Context of MT Production	0	0	0
Treatment Group	Authorship and Economics	1	1	0
	Text's Purpose	2	0	-2
	Context of Creation and Dissemination	0	0	0
	Sub-dimension "Others" of the Context of MT Production	1	0	-1

13.3.2.3. Sub-dimensions Content of Media Content

As the students were already asking questions about many sub-dimensions of the media content in the pretest, I directly started by calculating the diversity to observe if there was an evolution between the tests. The next table shows that students did not ask questions in more categories after the programme; it is still a mean of three sub-dimensions per student in control and treatment groups. Calculations combining the pre- and post-tests show a slightly higher mean of 4; in other words, although the number of sub-dimensions used by students is constant between pre- and post-tests, students varied the sub-dimensions in which they asked their questions between the tests.

Table 13.17.

Diversity of the questions in the sub-dimensions of media content asked by students in the pre- and post-test

Group		Diversity of Pretest Sub-dimensions Content	Diversity of Post-Test Sub-dimensions Content	Diversity of Pre/Post-Test Sub-dimensions Content
Control group	N	23	23	23
	Mean	3,17	3,17	3,78
	Median	3,00	3,00	4,00
	Std. Deviation	1,267	1,154	1,166
	Minimum	1	0	1
	Maximum	5	5	5
Treatment group	N	23	23	23
	Mean	3,17	3,13	3,87
	Median	3,00	3,00	4,00
	Std. Deviation	1,302	,869	,869
	Minimum	1	1	2
	Maximum	5	5	5

The next table shows that the treatment group varied more their questions in the dimension of media content than the control group. The educational programme would therefore encourage students to ask questions on other sub-dimensions of the media content. In particular, we can note that students from the treatment group less focused on the design of diegetic prototype and extended their questioning on its context of production after participating in the programme.

Table 13.18.

Number of students asking at least one question each sub-dimension of context of media content in pre- and post-test

Group	Dimension	Pretest	Post-test	Diff
Control Group	Context of DP Production	15	15	0
	Context of Use of DP	18	19	+1
	Design of DP	13	14	+1
	Storyworld	18	17	-1
	Self-existence of DP	9	6	-3
	Sub-dimension "Others" of the MT content	0	2	+2
Treatment Group	Context of DP Production	12	17	+5
	Context of Use of DP	19	22	+3
	Design of DP	18	13	-5
	Storyworld	17	16	-1
	Self-existence of DP	6	3	-3
	Sub-dimension "Others" of the MT content	1	1	0

13.3.3. The Student's Level of Issue

Hypothesis: students ask more questions that raise issues after participating in the programme activities.

The next table shows that students from the control group asked fewer questions that raise issues in the post-test. In contrast, more students in the treatment group asked questions that raise new issues in the post-test.

Table 13.19.

Number of students asking at least one question in each level of issue in pre- and post-test

Group	Level of issue	Pretest	Post-test	Diff
Control Group	New issue	18	17	-1
	Issue raised in the video	18	13	-5
	No issue	19	20	+1
Treatment Group	New issue	18	22	+4
	Issue raised in the video	17	17	0
	No issue	20	19	-1

I also looked at the maximum level of issue reached by the students to see if there was an evolution between pre- and post-test stages. The next table shows that the control group has a level that remains fairly comparable, while the treatment group has a rising level. Calculations combining pre- and post-tests indicate that all students from the treatment group have reached the maximum level of issue.

Table 13.20.

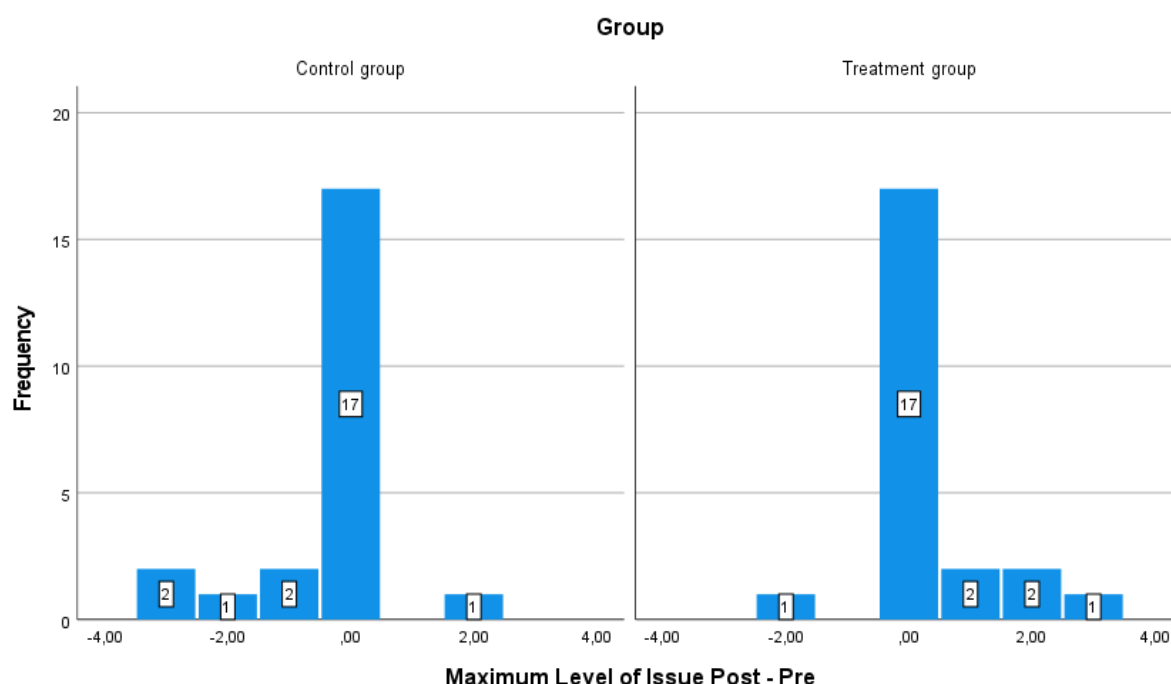
Maximum level of issue reached by the students in pre- and post-test

Group	Level of issue	Pretest	Post-test	Pre/Post
Control Group	New issue	18	17	19
	Issue raised in the video	4	0	3
	No issue	1	6	1
Treatment Group	New issue	18	22	23
	Issue raised in the video	4	1	0
	No issue	1	0	0

The next graph provides a more detailed picture of the progression of the students regarding the levels of the issues. The reader can see the evolution of five students in the treatment group, and the regression of one of them. In the control group, the reader can observe the evolution of one student, and the regression of five of them.

Graph 13.21.

Post-test Minus Pretest: Maximum level of issue reached by the students



In order to observe whether the differences between the two groups are significant concerning students' maximum level of the issue, I carried out an Independent-Samples Mann-Whitney U Test. The test revealed the difference between the two groups concerning students' level of issue to be significant ($U = 344.000$; $p = .024$). Since both groups were at a similar level at the pretest stage, this result means that the treatment group obtained a higher level at the post-test stage. The educational programme therefore had a significant impact on the ability of students to ask questions with a high level of issue.

13.3.4. The Types of Attitudes

Hypothesis: more students asked questions in a speculation attitude and attitude of doubt after participating in the programme activities.

The following table shows that 6 fewer students in the control group asked questions in a speculation attitude and attitude of doubt at post-test, in contrast to the treatment group where 7 more students asked questions in these attitudes after participating in the programme.

Table 13.22.

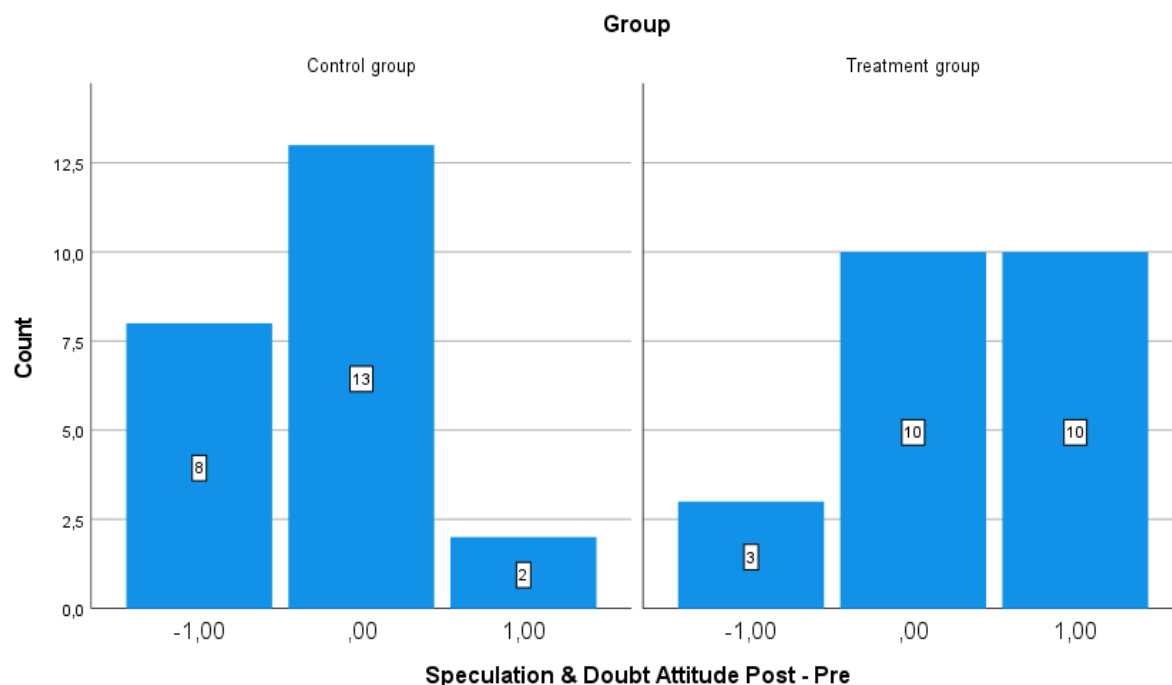
Number of students asking at least one question in a speculation attitude and attitude of doubt in the pre- and post-test

Group	Attitude	Pretest	Post-test	Diff
Control Group	Speculation Attitude + Attitude of Doubt	17	11	-6
Treatment Group	Speculation Attitude + Attitude of Doubt	10	17	+7

The next graph provides an illustration of the progression of the students towards the speculation attitude and attitude of doubt. The reader can clearly see the evolution of ten students in the treatment group, and the regression of three of them. In the control group, the reader can observe the evolution of two students, and the regression of eight of them.

Graph 13.23.

Post-test Minus Pretest: number of students asking questions in a speculation attitude and doubt attitude



In order to observe whether the differences between the two groups are significant concerning students' speculation and doubt attitude, I carried out a Chi Square Test⁵⁸. The test gave a p-value of .018. As the p-value of the Chi Square Test is below 5%, we can say that the differences between the two groups are significant.

As the Chi-Square test of the pretest diagnosis gave significant results for the speculation attitude and attitude of doubt (see Appendix V), i.e., the number of students from control group asking questions in this type of attitude was significantly more important than the number of students from the treatment group, we can suggest an interpretation of this result which highlights the considerable progress made by the treatment group. Since neither group were at a similar level at the pretest stage, this result means that the control group regressed and was overtaken by the treatment group. The treatment group not only caught up, but also surpassed the level of the control group. The educational programme therefore had a significant impact on the ability of students to ask questions in a speculation attitude and attitude of doubt.

⁵⁸ The Chi-Square Test for this variable was used because of the small number of the categories (-1, 0 and 1).

13.4. Synthesis Chapter 13: Confirming and Refuting Hypotheses

To summarise, I propose to go back over the four hypotheses that drove the pre-post analyses.

The first hypothesis, i.e., the educational programme caused an increase in the number of students asking critical questions, has been partially verified. The results showed that the mean maximum level of criticality of the questions on media text decreased for both groups throughout the tests and was not high enough to produce significant results. The results were more revealing for the questions relating to media content, indicating a decrease in the mean maximum level of criticality for the control group and a slight increase for the treatment group. The descriptive analyses showed that students in the control group tended to regress in terms of levels of criticality, while those in the treatment group tended to progress. These analyses were confirmed by an inferential test, which confirmed the impact of the educational programme on in their ability to ask questions about media content with a high level of criticality.

The second hypothesis, i.e., more students asked diverse questions after participating in the programme activities, was not verified. Concerning the core dimensions, the students were again few in number to ask questions about the core dimensions of media texts at the post-test stage, so I did not calculate the diversity of their questions. The small number of students asking questions in the sub-dimensions of the context of MT Production also meant that I did not calculate the diversity of their questions at the post-test stage. The calculation of the diversity of sub-dimensions of media content indicated a constant mean of three sub-dimensions per student in control and treatment groups. Despite this stability, the results showed that the students in the treatment group did not ask questions in similar categories between tests, unlike the control group. The educational programme would therefore encourage students to ask questions on other sub-dimensions of the media content.

The third hypothesis, i.e., more students asked questions that raise issues after participating in the programme activities, has been verified. The results showed that, although the two groups had a similar level at the pretest stage, the treatment group obtained a higher level of the issue at the post-test stage. Descriptive analyses indicated that five fewer students from control group asked questions that raise issues in the video, while four more students from the treatment group asked questions that raise new issues. Furthermore, calculations combining pre- and post-tests showed that all students from treatment group reached the maximum level of issue.

The fourth hypothesis, i.e., more students asked questions in a speculation attitude and attitude of doubt after participating in the programme activities, has been verified. The results showed that the control group, which started with a head start, regressed, while the treatment group improved significantly. The treatment group not only managed to catch up, but also surpassed the control group in its ability to ask questions in a speculation attitude and attitude of doubt. Descriptive analyses indicated that six fewer students from control group asked questions in these attitudes, while seven more students from the treatment group asked questions in these attitudes. In particular, the Graph 13.23. illustrated the evolution of ten students in the treatment group and the regression of eight students in the control group in these attitudes.

Chapter 14: Discussion

The results of the previous chapter lead us to four main conclusions. First, the students had difficulty asking critical questions about the core dimensions of the media text. The results not only indicated that a low number of them asked questions (and critical questions) on these core dimensions, but also that the questions collected were not very diverse. Second, the results indicated that more students asked critical questions about the media content dimension after participating in the educational programme. This leads us not only to consider the rubric as a way of structuring the assessment of critical thinking but also to consider a first approach to critical thinking in terms of levels of criticality based on our rubric. Third, the results indicated that more students asked questions that raise societal issues after participating in the programme activities. In particular, more students in the treatment group asked questions that raise new societal issues that were not addressed by the video clips in the post-test. This finding suggests a second approach to critical thinking from the perspective of the criterion of the issue, i.e., as the ability to extend one's perspective to wider societal issues. Fourth, the results indicated that more students asked questions in a speculation attitude and attitude of doubt after participating in the programme activities. This finding suggests a third approach to critical thinking based on speculation⁵⁹ that encourages participants to consider alternative realities and to question current social norms.

The present chapter interprets the results of the pre- and post-tests in the light of classroom observations and other data collected, such as teaching materials and students' productions. I also draw on the scientific literature reviewed in the theoretical part of the thesis. The aim is to answer the research question, and in particular the second part of it: *how can design fiction help build a critical inquiry method in media education and how can this method support the development of learners' critical inquiry competence?*

14.1. Media Texts Relegated to the Background

In the analysis of the quantitative data, the hypothesis that the educational programme caused an increase in the number of students asking critical questions, has been partially verified. While the results were significant for the rubric concerning students' questions on the media content dimension, we were unable to verify the other media text dimensions. I propose first

⁵⁹ As the reader will see in the section dedicated to this finding, we will focus the discussion on the speculation attitude, since it is specific to the practice of design fiction.

to understand why there were few students asking questions on these core dimensions, before focusing on the media content dimension.

14.1.1. Lack of Students' Questions on Media Texts

Despite our attempt to include media text analysis activities in the second phase of the DBR project (Possible Futures), the results indicated not only a small number of students asking questions about these dimensions in the corpus, but also a very low mean maximum level of criticality. One possible reason for this is the young age of the students. The study by Schilder and Redmond (2019), on which our data collection method is based, questioned postgraduate students. The present study asked third-year secondary students, aged between 14 and 15, to ask questions twice about the same video content. In addition to the redundancy of the task and the weariness it may have caused some students, it was an unusual task to be asked in a school setting, as the students are more used to answering questions than formulating them, as well as a difficult task, as the students do not yet have all the basic language skills in French to formulate good questions. In this context, encouraging the students to ask questions about both the media content and the media text was undoubtedly very challenging and complicated for them.

Some (other) reasons may explain why the students had greater difficulty asking questions about the media text than about the media content. On the one hand, the design of the experiment could be behind this result: the videos selected for the tests were fictional texts, thereby encouraging fictional immersion. As a reminder, the first was made up of various clips from the film *Minority Report* depicting probable technologies in a future world, while the second was an advertisement envisioning possible futures from the perspective of Microsoft. Although they could be considered as design fiction productions, these two clips were not created for critical distancing but rather for entertainment and commercial purposes. The students may therefore have encountered difficulties in taking the necessary distance to consider the clips in their entirety, with their textual and contextual properties.

On the other hand, my final conceptual model of the dimensions placed media content at the same level as the other four core dimensions of the media text. However, right from the start of the conceptual model's construction, sub-dimensions and sub-sub-dimensions kept emerging and soon made the media content dimension very unbalanced with the other four. In the context of design fiction, media content is a very special dimension with multiple branches. The large number of questions asked by students in the media content dimension can therefore also be explained by the design of the conceptual model of dimensions.

Although the previous paragraphs provide a number of clues about the reasons for students' disregard for the dimensions of media texts, the test results point to one major insight: it is easier for students to reflect on the content of a work of art, particularly a work of fiction, than on its textual and contextual properties. They have greater difficulty distancing themselves from fiction texts and recognising them as sophisticated forms of media texts able to convey intricate messages, provoke emotions, and influence audience perspectives. Educators play a pivotal role in helping students to unravel these challenges by promoting media literacy and enabling the analysis of underlying meanings in fiction. In this context, it would be a matter of inventing pedagogical methods that would support students' exploration of fictional worlds while enabling them to take the necessary distance that would go with it.

In the Possible Futures project, we can observe *a posteriori* that the media analysis activities did not go far enough in developing students' critical questioning of the core dimensions of media texts. In addition to the fact that few of the activities dealt with fiction texts, they were generally limited to a discussion of the general characteristics of the media concerned. For example, in step 3 of the educational programme, we asked the students to identify the characteristics common to Instagram stories. We did the same for product placement videos and press conferences. Although these activities attempted to introduce students gradually to the core concepts of media literacy, they did not offer any tools for decoding media texts in their various dimensions. I think that providing the students with a decoding grid such as a popularised version of my rubric could have guided them in their interpretation of media texts. This was the primary objective of the card game, but it was not entirely successful and mixed-up questions relating to the dimensions of technology and media text. If I had to do it again, I would suggest developing a similar tool with the students as the activities progressed, considering the specific features of fiction.

14.1.2. Lack of Diversity in Students' Questions

The second hypothesis of the findings chapter, according to which more students asked diverse questions after participating in the programme activities, was not verified. We were unable to confirm it either for the core dimensions or for the sub-dimensions. However, the results showed that the educational programme did lead students to ask questions about other sub-dimensions of the media content, in particular the context of production and the context of use of diegetic prototypes. The outcome is therefore more of a 'qualitative' nature, and we could speak of a qualitative shift in terms of dimensions to describe the shift in the dimensions of questions asked by students between the tests.

As the following table illustrates, four sub-dimensions of the media content were constructed based on four core dimensions⁶⁰. Another way of approaching the core dimensions would be to start from the sub-dimensions of the media content. Design fiction could thus enable students to question, for example, aspects of media production and reception from aspects of the production and use of diegetic prototypes. This would simplify the activities associated with the practice of design fiction, as well as the rubric itself.

Table 14.1.

Comparing Core Dimensions and Sub-dimensions of Media Content

Core Dimensions	Sub-dimensions of Media Content
Context of Production	Context of Production of DP
Context of Reception	Context of Use of DP
Semiotics	Design of DP
Content	Storyworld
Representations	Self-existence

In the Possible Futures project, we generally separated the two categories of dimensions (those associated with media texts and those associated with diegetic prototypes). However, they often collided, as happened in the activities where students were asked to watch and discuss videos about emerging technologies. The video of the Teslasuit prototype is a good example because there was a lot of confusion among the learners about who designed the piece of technology and who produced the clip (see 10.2.1.4.: Product Placement). In a design fiction framework, these aspects may generally be linked, and different facets of media texts could be addressed in this way. In addition to this method, another suggestion would be to support the transition from ‘intradiegetic’ questions (about the sub-dimensions of the media content) to ‘contextual’ questions (about the other core dimensions of the media text) in a media education context. One activity could be to start with a design fiction video featuring media technologies, analyse them first as diegetic prototypes with the sub-dimensions of media content, and then

⁶⁰ As explained in the context of creation of the rubric (see section 12.2.), I first built the rubric by distinguishing between the dimensions relating to media text and dimensions relating to media technology. In the process, I created very similar categories for both objects, which are always apparent in the core dimensions of the media text and the sub-dimensions of the media content of the final rubric.

link them to existing technologies to make the connection with the contextual properties of media texts.

14.2. The Focus on the Media Content Dimension

While a very small number of students asked questions (and critical questions) about the core dimensions of the media text, the quantitative results indicated a significant number of students asking critical questions about the core dimension of the media content after participating in the educational programme. This leads us not only to consider the rubric as a tool for structuring the assessment of critical thinking, but also to consider critical thinking in terms of levels of criticality based on our rubric. I propose, first of all, to look back at the process of constructing the rubric and then to discuss the quantitative results of the rubric.

14.2.1. The Rubric as a Way for Structuring the Assessment of Critical Thinking

Rubrics are a way of evaluating learning in the world of education. They refer to several criteria that can be broken down into several levels of performance (Tardif et al., 2006). Two strategies can be used to construct rubrics: either an analytical strategy that separates the criteria from each other, or a holistic strategy that combines the criteria. The latter strategy was adopted for the construction of my rubrics.

I built two rubrics: I distinguished between questions on media content, i.e., focused on diegetic prototypes and storyworld, and questions on media text, i.e., questions of other four core dimensions of the media text. The rubric for media text questions has four levels, while the rubric for media content questions has seven. While the former takes into account the dimensions of the questions and the issues they raise, the latter takes into account an additional criterion, namely the attitude. The first rubric does not take this last criterion into account because the type of attitude adopted by the students asking questions about the media text is for the most part the same. It is therefore only relevant to include it in the questions relating to media content.

Rubrics are a common tool for assessing media literacy. As I explained in Chapter 3 (Media Literacy), there are as many different methods of assessing media literacy as there are different conceptions of media literacy. In the approach of media literacy as the expression of competence, performance is observed in situ to take account of the complexity of the task asked of the participant. In this context, researchers develop scales which enable them to

assess various competences or practices in a specific domain. What is less common, however, is using students' questions as data to assess their critical thinking. Schilder and Redmond (2019) developed a rubric based on core concepts in media literacy and complexity levels of students' questions.

Schilder and Redmond's (2019) levels of complexity consider critical thinking in terms of different thinking order levels. As a reminder, they established five levels of questions, prestructural level (not critical), unistructural level (low level), multistructural level (high level), relational level (high level) and extended abstract (high level). Based on their criteria, I have distinguished the first levels of criticality of my two rubrics. First, for the dimension criterion, I distinguished the unidimensional level from the multidimensional level, i.e., questions with a single dimension from questions crossing several dimensions. Then, regarding the issue criterion, I distinguished between questions that do not raise any issues, questions that raise issues mentioned in the test videos (relational level), and questions that raise new issues (extended abstract level). Finally, I identified different types of attitudes based on additional scientific literature and distinguished, in the rubric relating to questions about media content, the fiction attitude (lower order thinking level) from the speculation attitude and attitude of doubt (higher order thinking level).

14.2.2. Critical Thinking as Criticality Levels

The rubric on questions about media content, for which the hypothesis was confirmed, leads us to consider critical thinking as the articulation of these three criteria (see table 14.2.). The lowest level of criticality refers to excluded or non-critical questions. Non-critical questions are questions that do not raise any issues, that have only one dimension and that correspond to an attitude of fiction. At the lowest critical levels, questions are multidimensional or do not raise any issues. At the highest critical levels, the questions are those that raise new issues and correspond to a speculation attitude or attitude of doubt.

Table 14.2.

Rubric for evaluating questions of media content with examples of students' questions

Descriptors	Codes
The question is unclear or irrelevant. • [TT] 474. Technology is the future? • [ST] 474. <i>La technologie est le futur ?</i>	0 (excluded)
No issue + Fiction attitude + Uni-sub-dimensional • [TT] 23. How do the technologies work? • [ST] 23. <i>Comment fonctionnent les technologies ?</i>	0 (not critical)
No issue + Fiction attitude + Multi-sub-dimensional • [TT] 705. Is it not too transparent to read? • [ST] 705. <i>N'est-ce pas trop transparent pour lire ?</i>	1
No issue + Speculation or Doubt • [TT] 323. In what year could we live like this? • [ST] 323. <i>En quelle année pourrait-on vivre comme ça ?</i>	2
Issue (with or without answer) + Fiction attitude • [TT] 231. Is this spying on our private lives? • [ST] 231. <i>Est-ce de l'espionnage pour atteindre nos vies privées ?</i>	3
Issue (with or without answer) + Speculation or Doubt • [TT] 889. Could these technologies make our lives easier? • [ST] 889. <i>Ces technologies nous faciliteraient-elles la vie ?</i>	4
NEW Issue + Fiction attitude • [TT] 342. Is it harmful to health? • [ST] 342. <i>Est-ce nocif pour la santé ?</i>	5
NEW Issue + Speculation or Doubt • [TT] 725. Would there be an ecological impact? • [ST] 725. <i>Y aurait-il un impact écologique ?</i>	6

Returning to the results, the mean maximum level of criticality first indicated a trend for students in the treatment group to be able to ask questions at a higher critical level after participating in the programme. The students went from a maximum level of 4.57 to 5.26, in other words, they were able to ask questions with new societal issues. In the control group, the trend was reversed, and the mean maximum level dropped from 4.96 to 4.00, i.e., fewer students asked questions raising new societal issues.

These trends were illustrated in the graphs that followed in the findings chapter, which revealed that the students who had taken part in the programme had made particular progress in levels 5 and 6 of the rubric. In other words, these students were more likely to ask questions raising new societal issues. The control group did ask more questions at level 5 in the post-test, but regressed on questions at level 6, i.e., questions concerned with an attitude of doubt and speculation. The graph combining pre- and post-test data clearly showed that the scores of the control group were fairly constant while the progress of the control group were significant. All the students who took part in the programme were distributed in levels 5 and 6. In particular, half of the treatment group reached the maximum level (12 out of 23 students).

The previous results indicate that the educational programme enabled students to ask questions at level 5 of the rubric, and even to reach level 6 for half of them. In a media education context using the practice of design fiction, this leads us to refine critical inquiry as an attitude of speculation or doubt encouraging the learner to ask questions that raise new societal issues about media content. The discussion in the following sections provides a number of clues about the reasons why students may progress to levels 5 and 6 of the rubric.

14.3. Design Fiction as a Means of Contextualising New Societal Issues

The analysis of the quantitative data confirmed that more students asked questions that raise issues after participating in the programme activities. The results showed that, although the two groups had a similar level at the pretest stage, the treatment group reached a higher level of the issue at the post-test stage. These results lead us to consider critical thinking from the perspective of the criterion of the issue. Based on the scientific literature and the structure of the educational programme, we can interpret these results as follows.

One of the major characteristics of design fiction is that it considers the technical aspects of a technology in relation to its economic, political, cultural, ethical and social implications. Design fiction not only imagines the future applications of a technology, but also looks at the wider consequences of its implementation in the imagined future society. In this way, design fiction generally proposes a process of prototyping and storytelling, which consists of prototyping a piece of technology and contextualising it in a near-future world. This process can go in both directions and contributes to the creation of a storyworld.

In Chapters 5 and 6 (Design Fiction Uses and Productions), we reviewed various productions generated by the practice of design fiction, including speculative scenarios. Although they have many possible uses, speculative scenarios allow us to explore in more depth the potential

implications of future technologies. As narratives, speculative scenarios contribute to the development of critical thinking. As demonstrated in Chapter 8, narrative constitutes a resource for structuring and comprehending experience (Herman, 2002) and can be used for a variety of activities including problem solving. Design fiction, through the production of speculative scenarios, helps therefore learners to investigate problems and reflect on the societal implications of their prototype they create.

In the corpus of the students' questions, this characteristic of design fiction in considering the global consequences of prototypes was identified as the criterion of the issue. I defined this criterion as the problematisation of a societal implication in students' questions. Based on the scientific literature, different levels of issue were identified: questions with no issues, questions raising issues addressed in the test videos (with and without answers provided in the videos) and questions raising new issues. I drew on Schilder and Redmond's (2019) complexity levels of questions to build the last two levels in my rubric. As a reminder, their relational level refers to "questions that analyse relationships of multiple concepts and typically reflect evidence-based thinking", while their extended abstract level refers to "questions that focus on extending ideas and information into other domains or contexts in new ways" (p. 121).

The results indicated that more students asked questions with new issues after participating in the educational programme. Calculations combining pre- and post-tests showed that all students from the treatment group reached the maximum level of issue as well. These results can be explained based on the structure of the programme, which encouraged students to consider not only the global implications of their invention in a fictional universe, but also to relate them to society's current concerns. The following paragraphs look back at the activities that might be the reason for the confirmation of the present hypothesis.

First, the educational programme activities involved the students carrying out a design fiction process in two main stages: a prototyping phase, followed by a storytelling phase. While the prototyping phase consisted of specifying the functional and technical characteristics of their product, the storytelling phase consisted of inventing a storyworld implementing their invention in a wider fictional universe. We noticed in the first project, HACK to the Future (HTTF), that it was difficult to get primary school children to broaden their questions about their creations. The students were very focused on their own objects and did not go beyond the purely technical questioning of the technologies. This is how we came up with the idea of the speculative scenario activity with the secondary school participants of the project HTTF. In their scenario of the future, they addressed issues related to the health sector, sciences, politics, ecology and culture. It was in this context that we saw the potential for design fiction

to bring societal issues into the discussion and that we built the second phase (Possible Futures).

In Possible Futures, we have not only included the speculative scenario activity but also used the core concepts to encourage students to ask questions about increasingly broader issues. First, students were asked to think about the technical and financial aspects of their objects: how it works, what it looks like, how much it costs, and so on. Second, they had to consider increasingly broader aspects such as the issues surrounding their production, marketing and purpose. Press conferences then led them to reflect on other students' creations from different perspectives, such as ethics, ecology or wellness. Finally, they created the comic strip (speculative scenario) and explored the consequences of their prototype on the society they imagined. Among other things, they identified the people responsible for the situation and the people affected (positively or negatively) by it.

For example, in the comic strip about the Easy Tech prototype, the students problematised the wealth gap between those who have technology and those who do not. They highlighted issues of access, power and education by telling the story of two young people who fall in love at a time of crisis for society. After completing the programme, at the post-test stage, these same students formulated questions that raise new issues such as the economic access, the environment, and the need to create this type of technology.

- [TT] 583. Is it good for the environment?
[ST] 583. *Cela est-il bon pour l'environnement ?*
- [TT] 681. Wouldn't this increase the income gap even further, creating a gap?
[ST] 681. *Est-ce que ça ne permettrait pas d'encore accroître les différences de revenus, de créer un gouffre ?*
- [TT] 569. How is it better than what we already have?
[ST] 569. *En quoi est-ce mieux de ce qu'on a déjà ?*

The activity of creating the comic strips probably made a major contribution broaden the young people's questioning of the societal issues raised by the implementation of a new piece of technology and this, in a wide variety of areas (economy, environment...). More specifically, the post-test questions show that this activity enabled students to transfer their questioning to other contexts, as the test videos do not address these topics. However, it would not have been possible to raise these types of questions without the continuity of the previous activities. As I underlined in my field notebook, it seemed necessary to start with situations that were familiar to the students. In this respect, the problem-solving attitude provides a situation that young people are familiar with, and that makes it possible to deconstruct the design process

better in the following steps. This confirms the hypothesis put forward in Chapter 10 that problem-solving and problem-raising are complementary approaches to the development of students' critical thinking (see section 10.2.2.1.: Solutionism to Reach Problem-Raising Attitude).

Finally, the last activities, involving comic strip reviews and televised debates, enabled the students to connect the issues raised in their comic strips with real-world concerns. By analysing their classmates' comics, the students were first encouraged to understand others' visions of the future based on a series of items such as the problem narrated or the people responsible for the problem. Since any imagination of the future is grounded in our comprehension of the present (Dourish & Bell, 2014) this analysis confronted them for the first time with their peers' concerns about today's society. They were then encouraged to discuss the issues raised by the comics more freely during the televised debate, and to relate them to current societal concerns. Various topics were addressed, such as: the possibilities of teaching with distance learning, the use of new technologies such as interactive whiteboards or tablets, the digital gap, the collection and security of personal data, cyberbullying, online (hate) speech moderation and anonymity. Some of these topics came up in the students' questions at the post-test stage and enabled them to ask questions that extended the context of the test videos.

These last activities, and the way in which the programme was structured with core concepts, may explain why we have observed a greater number of students formulating questions raising new issues after completing the programme. The criterion of the issue is not conceptualised as such in media education as a way of developing critical thinking. Nevertheless, the literature on critical design and critical media literacy pointed out a similar criterion that helped clarify what is meant by the criterion of the issue, which is 'the change of perspective' (see 2.4.2.1.: To Be or Not to Be Critical). It is defined as the "ability to shift one's perspective about a given phenomenon" (Bardzell & Bardzell, 2013), i.e., the ability to extend one's perspective from a strictly limited understanding of the media text to a broader understanding of the issues in today's society. The quantitative results allow us to support this approach to critical thinking, and to point to the contribution of design fiction in media education in raising questions about societal issues that can be extended to other contexts. This conception takes us back to the foundation of the inquiry-based approach, which aims to develop habits and skills beyond learning context. As I pointed out in Chapter 4, inquiry-based learning enables learners to develop content knowledge but also, and probably mostly, learn how to learn in a variety of contexts. In this context, IBL develops Habits of Mind that

include a set of thinking dispositions “[...] that enhance the ways students produce knowledge and develop a critical stance with their work, which further lead to success in school and the larger world” (Harvard University, n.d.). These habits are in line with the objectives of media education to promote questioning habits beyond media education activities.

14.4. Speculation as a Means of Questioning Assumptions About Reality

The most significant result of this research is probably the confirmation of the hypothesis that more students asked questions in a speculation attitude and attitude of doubt after participating in the programme activities. The students from the treatment group significantly improved in their ability to ask questions in these types of attitudes. This leads us to consider speculation and doubt as attitudes specific to critical inquiry. To interpret these results, we can go back to the scientific literature and the structure of the programme, as we did for the previous hypotheses.

Design fiction, through its proximity with speculative design, is characterised by a speculation attitude that encourages participants to speculate about the possible futures of technologies. As for the attitude of doubt, it is an attitude at the heart of all critical inquiry process that leads the individual to be sceptical about what surrounds them. In my rubric, the attitude of doubt has been positioned at the same critical level as the speculation attitude, because of the limited scientific resources on the topic. Since the attitude of doubt is not specific to design fiction, the next part of my interpretation of the results is focused on the speculation attitude.

The speculation attitude was developed based on theories of fiction. In Chapter 7 (Design Fiction as Fiction), I outlined three approaches to fiction in the practice of design fiction, one of which concerns the mental state specific to design fiction productions. First of all, design fiction is characterised by a suspension of disbelief about change (Bosch & Fritcke, 2012), i.e., it leads both the receiver and the designer to suspend their disbelief to immerse themselves fully in an imaginary world. This attitude is prone to fictional worlds and close to Coleridge’s concept of willing suspension of disbelief (1817) according to which the subject must agree to put aside its scepticism and to play the game as long as the fictional work requires. This attitude to fiction is now conceptualised in the literature as ‘fictional immersion’ (Schaeffer, 1999), ‘fictionalising mode’ (Odin, 2000a) or ‘fictionalising activity’ (Langlade, 2008) to describe the mental state of the recipient (and to some extent the producer) of works of fictions.

Second, design fiction is characterised by an attitude of estrangement, which is described as both immersion and distance. This attitude is based on the concept of cognitive dissonance and allows it to distinguish science fiction from fantasy (Suvin, 1972). SF is characterised by staging familiar elements while at the same time making them unfamiliar. The attitude of estrangement describes the reader's state when confronted with a fictional world that seems both familiar and strange. As Laz (1996) demonstrated, this attitude helps the reader to adopt an alternative perspective on the events. Through the property of SF cognitive estrangement, SF works thus help learners develop their sceptical and questioning stance.

Third, design fiction is characterised by a speculation attitude, which consists in speculating about possible future worlds. This attitude encourages participants to consider alternative realities and question current norms and values. This attitude differs from cognitive estrangement because it does not limit itself to making strange elements familiar in fiction to distance oneself, but also formulates hypotheses about the future. The speculation attitude encourages participants to explore a variety of technological alternatives and to question current choices. This fosters in-depth reflection on aspects as diverse as ethics, social relations, and environmental issues. These various characteristics have led me to situate the speculation attitude at a higher level than the fiction attitude in my rubric.

Returning to the results, the treatment group not only managed to catch up, but also surpassed the control group in its ability to ask questions in a speculation attitude and attitude of doubt. Descriptive analyses indicated that six fewer students from control group asked questions in these attitudes, while seven more students from the treatment group asked questions in these attitudes. In particular, ten students from the treatment group made progress and the eight students from the control group regressed in these attitudes. The educational programme would thus have made a major contribution to fostering a speculation attitude and attitude of doubt among the students thanks to the activities proposed around the practice of design fiction. The following paragraphs explore several reasons that could explain the high scores in the treatment group, particularly regarding the speculation attitude.

First, the media educators and I made sure to encourage the speculation attitude (to the detriment of the prediction attitude), by insisting from the beginning of the activities on the 'prototype' aspect of the objects they were going to create. As I repeatedly reminded the students during the project, design fiction is a mix of design (prototyping) and fiction (as the objects do not exist, but rather are fictional), making it possible to speculate on the future technologies we imagine. From a critical perspective, the aim of design fiction is not so much

to design new products and services by anticipating the needs of future consumers, but to make people think how the world could be by generating an alternative to how things are now.

Second, we encouraged the speculation attitude through roleplay. As the students progressed through the activities, they were invited to take on different roles that enabled them both to immerse themselves fully in the future world contextualising their fictional prototype and to distance themselves from their invention. Starting out as designers, they were succinctly asked to play the roles of influencers, journalists, scriptwriters, and critics. The role of journalist, in particular, enabled them to identify the interests and flaws of the other groups' prototypes as well as their own (because the students' groups were mixed), which enabled them to take an initial distance from their inventions.

It was probably the creation of the comic strips that helped them best adopt the speculation attitude as theorised in this research. This activity led the students to imagine the consequences of implementing their prototype in the imagined world. Although this research does not analyse them in depth, students' comic strips generally tell the story of a problem that occurred during the use of their object in a specific situation and the repercussions on a given population. Comics all respect the science fiction genre, and four out of eight do not have an ending, leaving the reader to their own reflections (see figure 14.3. for an example⁶¹). As we saw in Chapter 8 (Design Fiction as Narrative), this non-closure is a feature of some design fiction scenarios, typically those of critical design. As I explained in Chapter 6 (Design Fiction Productions), these scenarios are open-ended, so that everyone is encouraged to construct their own interpretation.

⁶¹ In the NudiStop story, a person is harassed by nude photos. At the end of the story, we do not know what happens to the victim. In the last panel, we see an exchange of text messages between two people, one of whom no longer replies to the other, and we do not know whether anything dramatic has happened to her.

Figure 14.3.

Last panel of the third page of the comic strip NudiStop⁶²



These last reasons surely explain why we have observed a greater number of students formulating questions in a speculation attitude after completing the programme, at the post-test stage. This attitude manifested itself when the student raised questions about whether the technology could ever exist or be produced. Usually, the questions were in the conditional mode and the student wondered *what would happen if* the vision occurred.

- [TT] 646. Could we be lost with all these technologies?
[ST] 646. *Ne serions-nous pas perdus avec tant de technologies ?*
- [TT] 691. Could small structures and small shops disappear?
[ST] 691. *Les petites structures et les petits magasins ne disparaîtraient-ils pas ?*
- [TT] 720. Could it be harmful to have a screen in front of you all the time?
[ST] 720. *Ne serait-il pas nocif d'avoir un écran sous les yeux en permanence ?*

⁶² Translation of the texts: “Kisses, I’ll wait for you” – “Kisses” – “Sorry, I couldn’t make it, love you, take care” – “I am on my way, don’t move” – “Anna???” – “Answer me, I am worried” – “Everything is ok?”.

The speculation attitude is not conceptualised, at least not as such, in the development of critical thinking in media literacy. However, the quantitative results of the tests, coupled with the theories of (science) fiction and speculative design, lead us to consider the contribution of speculation in this area. Speculation is an attitude that encourages both fictional immersion and the questioning of current choices through the exploration of alternative realities. The speculation attitude allows learners to stimulate their imagination and their creativity, while encouraging them to critically examine the ideas, values and assumptions underlying new technologies. Approaching critical thinking through the speculation attitude thus meets the objectives of media literacy, which are to prepare citizens for the social reality of the media world around them. This attitude not only gives them access to fictional worlds that enable them to develop certain knowledge or specific skills for analysing media texts, but also gives them the means to act in an ever-changing society.

14.5. Synthesis Chapter 14: Contribution of DF to Critical Inquiry Competence

The previous discussion sections shed light on the various contributions of design fiction to building a critical inquiry method in media education and, in particular, the contributions of this method to supporting the development of learners' critical inquiry competence. The following paragraphs summarise these different contributions and thus provide an answer to the second part of the research question, namely: *how can design fiction help build a critical inquiry method in media education and how can this method support the development of learners' critical inquiry competence?*

By partially confirming the first hypothesis that “the educational programme caused an increase in the number of students asking critical questions”, I suggested a first approach to critical thinking in terms of levels of criticality based on my rubric. In the research problem, I have distinguished between students' ability to ask (A) critical questions about media texts representing technologies and (B) speculative critical questions about technologies themselves and their future in society. The quantitative results lead us to emphasise the contribution of the educational programme to developing questions of category (B). In particular, the activities encouraged a speculation attitude and attitude of doubt, leading students to ask questions about the new issues raised by the content of media texts. Concerning category (A) questions, the few questions collected did not allow me to draw conclusions about the students' critical questioning, and I highlighted the students' difficulty in asking questions -

including critical questions and diverse questions - about the textual and contextual properties of fiction texts. I, however, put forward various ideas for stimulating critical questioning of the dimensions of the media text based on the dimensions of the media content.

The second hypothesis confirmed that more students asked questions that raise societal issues after participating in the programme activities and led us to consider critical thinking from the perspective of the issue criterion. The quantitative results specifically highlighted the ability of students in the treatment group to ask questions that raise new societal issues that were not addressed by the video clips in the post-test. This ability refers to the knowledge and skills that are targeted in media education to promote questioning habits beyond learning context. This approach considers the development of critical thinking as an ability to extend one's perspective from a strictly limited understanding of the media text to a broader understanding of the issues in today's society.

The third hypothesis confirmed that more students asked questions in a speculation attitude and attitude of doubt after participating in the programme activities. Since the attitude of doubt is not specific to design fiction, the discussion focused on the speculation attitude and highlighted the important role it plays in developing learners' critical thinking. By encouraging both fictional immersion and the exploration of potential future scenarios through hypothesis generation, the speculation attitude enables us to reevaluate our own perceptions of reality and gain insight into the challenges confronting society. This approach to critical thinking enables learners to develop their critical thinking by adopting an attitude that enables them to access works of fiction while taking the necessary distance to open up a space for discussion on possible futures.

To conclude, we can address the second part of the research question concisely by stating that: design fiction can contribute to the development of the critical inquiry competence through 1) its ability to generate critical speculative questions, 2) its ability to generate questions that raise new societal issues about technologies and their futures, and 3) its ability to generate questions that encourage a speculation attitude. Another way of formulating the answer to the research question is simply to say that design fiction can contribute to the development of the critical inquiry competence through the adoption of a speculation attitude that encourages the generation of critical questions raising new societal issues about technologies and their future.

CONCLUSION

In this concluding chapter, I provide a comprehensive response to my research question and offer insights into the implications of my findings. I begin by going back to my research question and answering it in five central points within the context of media education. I then address the limitations inherent in my research method. By adopting a design-based research approach, I was able to set up a long-term collaboration with the association *Action Médias Jeunes*, with whom we have developed various projects over the years. This collaboration has highlighted a series of benefits but also several limitations to the mobilisation of DBR in the specific context of my research (which I discuss in the Limitations of My Research Method) and in the general context of media education (which I discuss in the Design Principles: Using DBR in Media Education).

Following that, I propose a set of design principles derived from my study. The design principles make it possible to generalise the educational intervention to other educational contexts. In the context of the present study, I formulate a) design principles for using DBR in media education, b) design principles for using design fiction in other learning contexts and c) design principles for assessing media literacy with critical inquiry. Lastly, I discuss the prospects for future research development underscoring its significance in advancing educational intervention design and critical thinking assessment.

This conclusion chapter serves as a culmination of my research, presenting a synthesis of my key contributions to design-based research and media education (research and practice), and suggesting directions for further research.

Back to the Research Question

As this thesis reaches its conclusion, I am prepared to provide a comprehensive answer to the research question: *How can design fiction help build a critical inquiry method in media education and how can this method support the development of learners' critical inquiry competence?* In the research problem, I defined the critical inquiry method as a method that encourages students to ask critical questions about digital media and technology. This method was built on inquiry-based learning approaches and implemented in the form of an educational programme as part of our design-based research project. The following paragraphs demonstrates how the

inherent characteristics of design fiction has played a pivotal role in shaping this educational framework.

The first characteristic of design fiction that has made a major contribution to the construction of the critical inquiry method and to the development of students' critical inquiry competence is undoubtedly its speculative aspect. This is one of the first defining aspects of design fiction, and which characterises it as an attitude that encourages participants to speculate on possible futures. In a media education context, this speculative aspect serves as a catalyst for critical inquiry, prompting students to question current choices, explore alternative realities, and challenge the prevailing norms and societal values embedded within media transformations.

Second, design fiction allows participants to consider the technical aspects of a piece of technology in relation to its social, cultural, economic, political, and ethical implications on the imagined society. This aspect is essential in media education, where students are encouraged to consider the context of the media texts that they are analysing to gain a more global understanding of the media environment around them. The results indicated that design fiction also raised questions about the societal issues of technologies that can be extended to other contexts. This aspect aligns perfectly with inquiry-based learning approaches aimed at promoting questioning habits beyond learning context.

Third, the practice of design fiction produces diegetic prototypes which embody of both contemporary design considerations and speculative visions of what design could become in the future. Translating this concept to media education, students are engaged in prototype production, where the prototyped technology is information and communication technology, which is highly relevant in the context of media education. Throughout the design process, they are encouraged to pose thoughtful questions, critically assess design choices, and contemplate the ethical dimensions of media creation. By fostering a culture of inquiry during the creation of prototypes, this approach reinforces students' critical thinking, heightening their awareness of the intricate decisions and repercussions associated with media production.

Fourth, design fiction employs narratives as vehicles for exploring speculative scenarios. Narratives are essential within media education, as they provide students with a structured framework to deeply assess the multifaceted dimensions of emerging media technologies and their societal implications. Students actively participate in the creation of media texts through their production of speculative scenarios. Speculative scenarios enable a more profound exploration of technology's repercussions and open the door to discussions about possible technological futures. By embracing an approach that involves hypothesis generation,

exploration of “what-if” scenarios, and a problem-raising orientation, these scenarios contribute significantly to the development of a critical inquiry method.

Fifth and finally, design fiction, by its very nature, delves into futuristic realms. When applied to media education, this forward-looking approach challenges students to think critically about emerging media technologies and their potential societal impact. By contemplating the future of media, students engage in discussions that revolve around responsible media consumption and production. This process fosters the development of their critical inquiry competence, enabling them to analyse, evaluate, and adapt to the ever-evolving media landscape. In this way, design fiction contributes to future literacy, a crucial skill that empowers individuals to better understand the role of the future in their actions and decisions (UNESCO, 2020).

Incorporating these characteristics of design fiction into the pedagogical framework of media education enables the construction of a robust critical inquiry method. It not only equips students with the tools to navigate the intricate world of media but also nurtures their critical inquiry competence, empowering them to become discerning, engaged, and proactive citizens.

Limitations of My Research Method

Although the DBR project highlights significant results in terms of developing critical thinking, there are a number of limitations to be considered. First, the results of the previous chapters pointed out the contribution of design fiction, especially in generating critical speculative questions about technologies and their futures, to the detriment in generating critical questions about media texts. This limitation reflects the students’ difficulty in asking critical questions about the textual and contextual properties of fiction texts. This challenge will be explored in greater depth in the following sections, which are devoted to design principles and further research developments, and which offer ideas for research and teaching around the practice of design fiction.

Second, although the design-based research approach has enabled me to develop innovative outputs that meet the practical and theoretical needs of media education, I have nevertheless encountered difficulties in implementing it. I want to highlight three limitations that emerge from using design-based research in my study. First, collecting data in the field within the context of the DBR project posed challenges related to collaboration with practitioners and the researcher’s influence on outcomes. Second, due to the extensive data generated in DBR and time constraints, this research exclusively focused on the analysis of quantitative pre- and

post-test, necessitating the omission of qualitative data. Third, the DBR project faced constraints in implementing ideal iterative cycles for testing the educational programme and the rubric, leading to limited opportunities for refinement. The following paragraphs present these three limitations in detail, while suggesting ways of overcoming them in the next section through design principles.

Gathering Data in the Field: A Double-Edged Sword

Design-based research implies the collaboration among researchers and practitioners in each step of designing educational interventions (artefacts, techno-pedagogical devices, or educational programmes) (Jacobsen, 2014). In the present project, this collaboration took place between the organisation *Action Médias Jeunes*, the partner schools and me (researcher). Although this collaboration was beneficial in many ways for each side, it also had several consequences in the data collection process.

On the one hand, regarding my collaboration with *Action Médias Jeunes*, the whole exercise consisted of negotiating the content of the activities together. While the association had its own objectives in terms of media education, I had mine in terms of data collection. For the most part, the collaboration worked well, but as the pace of the educators' work was fundamentally different from mine, I was not always able to check the content of activities before they took place and therefore control all the variables. For example, during the Possible Futures project, the educators usually finished the teaching material the day before. As a result, I was unable to check the questions on the card game and avoid some of the formulations that must have had an influence on the students' solution-oriented attitude.

On the other hand, concerning schools, the second phase of the project was carried out in partnership with the French teacher. The sessions took place, however, in different class time slots, with sometimes other teachers than the French teacher. Some of them were very receptive to what we were doing while others lacked critical distance. For example, at the last TV debate activity, the teacher participated in the discussion and was quite negative about the opportunities of distance learning. He was opposed to technology and was very critical of young people's media use.

Another limitation of collecting data in the field is the researcher's own influence. Design-based research is a research paradigm grounded in the reality of practices that aimed to provide solutions to complex educational problems (McKenney & Reeves, 2014). Its pragmatic and grounded aspect constitutes one of its strengths as well as one of its limitations, as the

researchers are involved right from the beginning in the conceptualisation of the pedagogical intervention (Barab & Squire, 2004). In Chapter 2 (DBR), I pointed out that the researcher could nevertheless ensure the credibility and trustworthiness by drawing on methodological practices consistent with other methods. With this in mind, I conducted pre- and post-tests in the second phase of our DBR project. The objective of this collection method was to cross-reference the test data (quantitative data) with other data collected during the activities (qualitative data), such as observations, teaching materials and students' productions, in order to interpret the results.

An Analysis Restricted to Quantitative Data for a Small Sample

Because of their iterative nature, DBR projects generally generate a large amount of data. Our DBR project was no exception and I collected various data, including field notes, teaching materials, students' productions, pictures of the sessions, audio recordings and students' questions. I implemented various strategies to store them, such as creating a OneDrive shared with the educators and copying the documents onto an external hard drive. Given the extensive volume of data collected, the study prioritised the analysis of quantitative data, specifically focusing on the pre- and post-test results, to ensure a thorough and focused examination within the scope of this research.

Two key reasons explain the direction of this study's analysis. On the one hand, considerable effort was dedicated to the development of the rubric, a central objective of the DBR project. This focus was chosen to develop relevant design principles, which are discussed at the end of this manuscript. On the other hand, the volume of data collected throughout the project phases was substantial. While the initial intent included combining question analysis with qualitative examination of students' speculative scenarios, i.e., their science fiction comics, a decision was made to prioritise the research's core objective: examining students' critical inquiry competence. This choice was informed by literature reviews in fiction theory, narratology, and cognitive science. Although the qualitative analysis of narrative production was not conducted, the data collected were not disregarded. They provided valuable context in discussing the pre- and post-test results and inspired several reflections on potential future research avenues, as noted in the concluding section of the manuscript.

Dede (2004) noted a common challenge in his article, mentioning that DBR generates an unmanageable (and almost unstorable) amount of data that can cause bias in the selection of which cases to highlight (see Limitations of DBR in Chapter 2). He stated that only a small amount of data is finally processed and shared in the findings. I have noticed, however, that

the difficulty lies not so much in choosing which cases to analyse, but in managing the frustration associated with abandoning part of the data. It is not possible to carry out a DBR project without generating a large quantity of data, and it would be better from the outset to anticipate the data that will be analysed by using a meticulous method.

In my doctoral research, I certainly collected a large amount of data in terms of quantity and variety, but I can conclude *a posteriori* that the method could have been supplemented by conducting interviews during the second phase of the DBR project. In the analysis of the quantitative results, I was concerning about students' motivation, wondering whether they found the exercise repetitive and trying to explain the fact that some students who had a good level at the pretest regressed at the post-test. As pointed out by Collins et al. (2004), DBR projects do not generally focus on a single variable and take other variables into account, particularly those relating to their dispositions to learning, cooperation and motivation. In this respect, conducting an interview before and after the tests could therefore have given me information about students' overall motivation, at school and on the exercise required, and given meaning to certain quantitative results.

Finally, the size of the sample can be questioned to determine whether the analysis method is entirely quantitative. As a reminder, the sample consisted of two classes: a treatment group of 23 students and a control group of 23 students. The questions were classified one by one in FileMaker Pro, then analysed in SPSS. As I emphasised in the conclusion to Part 1, this research intersects multiple epistemological paradigms and, in terms of methodology, is aligned with dialectical pluralism. It interprets quantitative results in the light of qualitative findings, offering a comprehensive and multi-dimensional understanding of the data. This approach therefore allows for a more nuanced analysis, providing a first approach to design fiction in a media education context to develop learners' critical thinking.

A Lack of Iterations for the Outputs and the Analysis

DBR implies iterative cycles of design, enactment, data collection, analysis, and redesign to improve the educational practices (McKenney & Reeves, 2012). Generally, an initial prototype of the educational intervention is built based on the scientific literature and the expertise of practitioners, and the data collected is then analysed to build the next intervention. In our DBR project, we produced two outputs: an educational programme and a rubric. As we had to adapt to the realities of the school environment, we did not have the opportunity to follow the DBR revision process strictly. The educational programme was therefore tested twice, and the rubric only once.

Regarding the educational programme, I played little part in the design and implementation of the HACK to the Future project, my role being limited to that of adviser and observer of activities. I did not have the opportunity at that time to develop a strategy for data collection and analysis, so we revised the activities of the exploratory phase mainly based on field notes and new scientific literature. We implemented a more refined educational intervention in the Futures Possibles project and mobilised a more rigorous method of data collection and analysis. Although the foundations of the final phase of the DBR project were built on the initial results of the second phase, the final phase is now being led by the association, which will decide whether to take the final results of the research into account.

Concerning the rubric, I built this tool over many months with the help of several researchers. It was only tested once, during the second phase of the DBR project, and enabled me to gather the essential data on which my analysis is based. It would have been relevant to test the rubric a second time, especially after the results we obtained that indicate that more students are asking speculative critical questions about technologies and their future after having participated in the educational programme. In this context, the discussion chapter offered a number of suggestions for adapting the rubric and using the dimensions of the media content to raise critical questions about the dimensions of the media text.

Design Principles

The aim of design-based research is to generate design principles, i.e., “[...] a particular set of theoretical constructs that transcends the environmental particulars of the contexts in which they were generated, selected, or refined” (Barab & Squire, 2004, p. 10). The design principles are aimed at practitioners or researchers wishing to set up a similar intervention. They highlight the variables to be taken into account when designing such a learning environment. These variables may relate to technical details such as software or time management, as well as the age of the participants or the cost of the technological innovation. The following paragraphs first present these variables, then generate the design principles relating to our DBR project, and finish by presenting the principles specific to our rubric.

Identifying Variables

As discussed in Chapter 2 (Design-based Research), Collins et al. (2004) wrote a paper distinguishing, among other things, between dependent and independent variables in design experiments. As a reminder, they categorised dependent variables into climate variables (engagement, cooperation, risk taking, student control), learning variables (content

knowledge, skills, dispositions, meta-cognitive strategies, learning strategies), and systemic variables (sustainability, spread, scalability, ease of adoption, costs) (ibid., p. 36). In our DBR project, we focused specifically on the study on the learning dependent variable that refers to the critical inquiry competence. We used pre- and post-tests measurements, combined with qualitative data, to assess the competence.

Several independent variables came to affect the dependent variables, both intentionally and unintentionally. Throughout the DBR phases, the context changed based on the calls for projects that we applied, i.e., the subsidies that we received. Collins et al. (2004) underlined a series of independent variables, on which we can directly rely to identify our own:

- **Setting:** In our study, the setting referred to the learning environment of our experimentation within the framework of our DBR project. During the exploratory phase, this took place in a school context, involving third-grade primary and fifth- and sixth-year secondary students. In the second phase, the setting remained within a school context, but with third-year secondary students. In primary school, the teacher used design fiction as a cross-curricular approach. In secondary school, the activities were carried out in social sciences and French lessons as well as during a specific week in which students were invited to participate in various projects. The social science teachers aligned the project with their theme for the year (labour), the sixth grader teacher with the theme of the week (art), while the French teacher allowed more flexibility in carrying out the activities and defining the objectives. Finally, in the third phase, the setting will shift to a non-school context, involving young participants from a cultural centre.
- **Nature of learner:** Participants' age varied significantly across phases. In the first phase, this involved two distinct groups with children aged 7-8 and adolescents aged 16-18. In the second phase, we carried out activities with adolescents aged 14-15. The age range for participants in the third phase is yet to be determined. Regarding participants' socio-economic status, there is no available data for the three phases; however, we note that all participants have a minimum knowledge of media technologies and have access to them.
- **Required resources and support for implementation:** In terms of teaching materials, media educators adapted to each setting based on the available resources (such as interactive whiteboards or using students' smartphones) or brought necessary

equipment (like cameras or tablets). Educators also adapted to the characteristics of the audience. For example, in the first phase, students of different ages employed diverse resources for prototyping: primary students used materials like clay to craft their prototypes, while secondary students sometimes relied solely on sketches without materialising their ideas.

- **Professional development:** As the activities were designed and implemented by media education experts (both scientists and practitioners), there was no formal training organised for the teachers who provided their classrooms. However, upstream of the DBR project, the experts had to familiarise themselves with the practice of design fiction to successfully carry out the activities. They reviewed scientific literature, organised workshops to test outputs with colleagues, and conducted numerous design meetings.
- **Financial requirements:** As the DBR project was conducted in collaboration with a non-profit association, we sought subsidies to finance the three phases. In Belgium, media education projects are generally funded by institutions such as the CSEM (Higher Council for Media Education). These projects are the result of collaboration between several partners, such as an organisation, a school and/or a researcher who respond to a call for projects together. To finance the three phases of our project, we responded to various calls for projects which enabled us to receive several subsidies of varying amounts. These subsidies had mainly covered expenses related to teaching materials, professional travel, and educator salaries.
- **Implementation path:** The implementation required a significant time investment in both tested projects. In the first phase, the primary school project extended across a series of 2-hour sessions throughout the year, while the 5th-grade project unfolded through multiple 2-hour sessions over a semester. In contrast, the 6th-grade project lasted for an entire week with full-day sessions. In the second phase, the project lasted for two intense months, with eight sessions of four hours each. The third phase reduces the number of sessions and hours devoted to it.

Generating Design Principles

The first two phases of our DBR project enable us to formulate some design principles that can be used to generalise the educational intervention to other educational contexts. These design principles are based on the above variables to offer various avenues for any practitioner or researcher wishing to set up a similar intervention.

Design Fiction Fits into a Number of Learning Contexts

Design fiction is adaptable to various learning contexts, whether within or outside of the school environment. However, the implementation varies between these contexts.

In a school context, design fiction demonstrates adaptability to the curriculum and transcends disciplines, presenting it as a relevant approach for project-based learning. Just like media education, which is itself conceived as a cross-curricular approach, design fiction makes it possible to address several aspects of the same theme through a project. For example, the creation of scenarios speculating on the future of the climate can be a project carried out in various disciplines such as geography, French and science.

However, the structured nature of formal educational settings, with limited time slots and evaluation constraints, can be restrictive. In a media education context, it is necessary to negotiate extended sessions with teachers for optimal project implementation. Conversely, informal settings, such as summer internships or youth centres, offer greater flexibility, granting facilitators autonomy and allowing participants to progress at their own pace. While objectives may differ from formal curricular goals, the overarching aim remains the development of critical thinking competences.

Design Fiction is for All Ages

Design fiction is an activity that can be suitable for all ages. The activities just need to be adapted and the expectations reviewed depending on the age.

From an early age, design fiction can be used with children to encourage them to think about their everyday use of technologies. The HACK to the Future project, for example, encouraged students to design their own objects of the future and to think about different aspects of their production, from both a technical and an economic point of view. The activities also led the students to stage their prototypes by producing short videos. This not only gave them a first

experience of media production, but also enabled them to question the intentions behind the creation of their objects.

For teenagers, the reflection can be more in-depth, and the activities can address the challenges of algorithms and their role in one's daily lives. In a school context, the cross-disciplinary aspect of design fiction constitutes an asset, as design fiction can be used to address a range of current issues such as ecology and digital justice.

For students in higher education or adults, design fiction allows them to question their prototypes before they take physical form. In the fields of engineering or the hard sciences, for example, design fiction can be used to consider the ethical issues involved in a piece of technology before it enters the market.

Design fiction therefore has a real role to play in being practised and taught at different levels of education in order to develop a critical attitude to new technologies, and in particular to encourage learners to think about their own creations and the relationships they have with technologies in their everyday lives.

Design Fiction Requires a Minimum Understanding of Technologies

While design fiction is inclusive and applicable to all age groups and populations, it does necessitate a baseline familiarity with technology. This requirement stems from the essence of design fiction, a design practice that critically examines the future of technology. Design fiction requires basic knowledge of, or experience with, everyday technologies right from the start of the process, in order to be able to speculate about the technological future. This background enables participants to envision the consequences of implementing a piece of technology in the future and contributes to the development of their critical thinking. In this context, educating with design fiction helps one to develop advanced media literacy competences.

However, design fiction is difficult to address across all populations, particularly those affected by the digital divide. As soon as people do not even have access to information and communication technologies, their ability to imagine and speculate about the future of these technologies is limited. Educating with design fiction therefore seems limited to a certain segment of the population, and anyone who wants to create an educational intervention using this practice shall first consider the experience of the learners.

Design Fiction Implies Design and Creativity

Design fiction stands out for its adaptability, requiring no specific teaching materials. Its flexible nature allows easy adjustments to the learning context, accommodating the resources available on site and the financial constraints of the project, even when dealing with technology-related topics.

While design fiction involves crafting prototypes of the near future, participants do not need specialised technical or software skills; they can get by with paper and pencils. But then creativity plays an important role in conceptualising the prototypes and projecting them into the future world. In instances where minimal material is used during the prototyping stages of design fiction, there may be challenges in inspiring imaginative visions of the future. Practitioners looking to incorporate design fiction into educational interventions should consider these factors for effective implementation.

Design Fiction Focuses on Emergent Technologies

Undoubtedly, design fiction, as a distinctly speculative practice, focuses on emerging technologies. This approach engages participants in anticipating and envisioning future scenarios, placing particular emphasis on current technological development. As a result, projects incorporating design fiction inherently demand a commitment to staying current and informed about the latest technologies and recent developments. In the context of design-based research, particularly when iterating phases, this necessitates the ongoing effort to update and refine the content of activities as the project evolves. The evolving nature of technology requires a dynamic approach, ensuring that the design fiction activities remain relevant and aligned with the latest advancements. This adaptability becomes a crucial aspect of maintaining the effectiveness and resonance of design fiction projects over time.

While staying informed and up to date on emerging technologies may pose a challenge in projects utilising design fiction, it may become a strength, enabling the exploration of pressing societal issues. In a world where the future is becoming more and more uncertain, design fiction allows people to express themselves and question the present through the future. As Dourish and Bell (2014) point out, “[...] any imagination of a possible future is grounded in expectations, frustrations, and understandings of the present” (p. 778). Design fiction provides a link between the present and the future through the creation of technology prototypes and speculative scenarios that reflect current societal concerns.

Design Fiction Needs Time for Implementation

Engaging in design fiction activities demands a considerable time investment due to the multi-step nature of such projects. These steps typically include an introduction to new technologies, prototyping, storytelling, and discussion. Each of these steps must be carefully prepared in advance and, in the context of design-based research, involves negotiation among project partners. Aligning the objectives of each project partner is crucial, and the more partners involved, the more challenging this alignment can be.

Additionally, accounting for everyone's schedule is essential in ensuring smooth coordination and collaboration throughout the project. On the one hand, the DBR researchers must carry out several iterations to refine the educational intervention. It is important that they have time to carry out various phases of data collection, analysis and evaluation between these iterations. On the other hand, practitioners must respect certain time periods, such as the school year for teachers who would like to integrate design fiction activities into their lessons, or conversely school holidays for educators who would like to organise internships. If applicable, the source of funding should also be taken into account, as it sometimes requires a deadline for starting the project and/or finishing it with the submission of a project evaluation report.

Finally, facilitators and scientists may need to undergo training, especially if they lack prior knowledge of design fiction. Training may involve gaining insights into speculative design methods to guide participants through each phase of the design fiction process. Furthermore, they may develop observational techniques to assess students' engagement, collaboration, and critical thinking throughout the design fiction project.

Generating Assessment Principles

In addition to the design principles outlined above, a critical aspect of the thesis lies in its evaluative dimension and the valuable insights derived from the constructed assessment framework. The rubric effectively assessed students' critical inquiry competence, leading to two significant methodological lessons. First, the method encouraged students not to answer questions but to actively generate them — an uncommon practice in media education. Second, the analysis considered the objects of students' questions (media text and media technology) and identified multiple levels of criticality, all situated at the intersection of core concepts, societal issues, and attitudes. Coined as 'assessment principles', these insights offer a versatile framework that can be readily applied in future research endeavours and may even serve as

guiding principles for future pedagogical activities, underscoring the enduring impact of this research on both methodology and practice.

Assessing Educational Practices using Design Fiction through Questions Formulation

The effects of educational practices using design fiction on students' media literacy development, specifically in fostering critical inquiry competence, can be effectively assessed through instruments explicitly probing students' ability to formulate questions rather than merely responding to them. Unlike traditional assessment methods in media literacy, this approach shifts the onus from answering predetermined questions to empowering students to actively generate questions. Choosing this evaluative method is rooted in the fundamental nature of design fiction, prompting individuals to critically question the implications of emerging technologies.

The advantages of using this evaluation method are multifaceted. It not only aligns with the inquiry-driven essence of design fiction but also cultivates a proactive questioning mindset, a crucial aspect of media literacy. However, it is essential to acknowledge potential challenges, such as formulating clear instructions for tasks requiring participants to generate questions. To address this, researchers and practitioners can integrate role-playing situations that immerse participants in real-world contexts and encourage them to raise relevant questions about the media texts they engage with.

Analysing Questions with a Multi-Dimensional Rubric

The analysis of students' questions went beyond traditional assessments focused solely on core concepts, introducing a diverse range of categories reflecting the uniqueness of design fiction. Apart from considering questions related to core concepts in media texts, the research identified questions centred on the technology represented on the screen, i.e., the diegetic prototype, underscoring the nuanced perspectives fostered by design fiction. Additionally, the evaluation identified two supplementary dimensions, namely the societal issue and the attitude, each with intricacies unique to design fiction context.

The rubrics showcased the richness of design fiction assessment while unveiling inherent challenges. The complexity of interpreting the data in the context of quantitative analysis of questions presents a primary challenge. It is recommended to complement this quantitative approach with other qualitative data, such as field notes or interviews, to provide context to the results. However, caution must be exercised to avoid excessive data collection. Aligning

data methods with research goals and implementing efficient data storage strategies can contribute to better data management.

Further Research Developments

The previous design principles have already offered valuable guidelines for using design fiction into various educational contexts. These principles provide a solid starting point for exploiting the potential of design fiction as an educational tool as well as for evaluating activities based on this practice. The following paragraphs delve further into this exploration, offering fresh perspectives and proposing avenues for future research.

Comparing the Effectiveness of the Two Types of Productions of Design Fiction for Cultivating Critical Thinking

In Chapter 6 of the manuscript, I distinguished two main types of production resulting from the practice of design fiction: design fiction as the production of a prototype and design fiction as the production of a narrative. The critical inquiry method of our design-based research project included both types of production: the students first designed a diegetic prototype and then contextualised it through the creation of a science fiction comic strip. Each production was part of a cycle of inquiry in which the students were invited to identify a problem and use it as a basis for the construction of their production. As stated at the beginning of Chapter 10 on the educational programme, these productions were not studied separately to see if one might have been more effective in developing learners' critical thinking about digital media and technology. Instead, they were considered as complementary, as a single activity, which is doing design fiction.

However, my classroom observations provided some interesting insights into how each of these productions could contribute to the development of learners' critical thinking. On the one hand, the production of the prototypes would have largely contributed to the development of the students' problem-solving competences. Throughout the design thinking process, they deliberated on how to address their problem by materialising it into a prototype that was most conducive to delivering an effective solution. On the other hand, the production of the comic strips would have contributed to the development of the students' problem-raising competence. They were invited to question their prototype by defining a new problem and to explore its repercussions on the characters in their story.

An assessment tool could be used to evaluate and compare the effectiveness of the two types of production in developing learners' critical thinking. Each production encourages learners to explore a problem in its own way: by looking for a solution or by raising questions. This tool could be built on inquiry-based learning approaches that offer these two possibilities for exploring a problem. Activities would test the two productions, with different groups of learners, and would assess, using a series of criteria, which method would be the most effective in developing their critical thinking about digital media and technology.

Furthermore, we may consider studying the ability to develop learners' problem-raising competence via prototypes⁶³. In Chapter 6, I pointed out that diegetic prototypes are social objects that tell a story about society. Bleecker (2009) calls them 'conversation pieces' to emphasise this characteristic of prototypes which "speculate about new, different, distinctive social practices that assemble around and through these objects" (p. 8). Prototypes do not necessarily need context to be understood, and through their design alone they are able to communicate the ideas and values of their designers. Therefore, it might be quite relevant to build an activity around the ability of prototypes to raise questions about the stories they tell (what time period do they evoke? What world? What users? etc.) and to evaluate this. Once again, IBL approaches could help to construct the activity as well as to evaluate it.

Analysing Speculative Scenarios Using Narrative Theories

As mentioned in the limitations of the research method, my ambition was to conduct a qualitative analysis of the students' speculative scenarios. The aim, through this analysis, would have been to see how the narrative could help students to define a problem, i.e., contribute to the development of the critical inquiry method. The following paragraphs present an overview of the method for analysing students' scenarios.

Based on the research I have carried out on narrative theories in narratology and cognitive science, I have designed an initial draft method on the analysis of the narrative structure and the characters of the speculative scenarios. The analysis of the narrative structure consists in determining the kind of narrative produced by the students and examines the way the narrative form of design fiction allows them to structure a problem. To this end, I suggest analysing students' speculative scenarios created during the educational programme by identifying their general structure

⁶³ As reviewed in Chapter 8 (Design Fiction as Narrative), problem-solving competence via narratives has already been well studied in the scientific literature, in contrast to problem-raising which is a competence still little explored.

(amelioration/degradation), openness (closed/open-ended) and approach (problem-solving/problem-raising).

First, I propose to dissect the narrative structure of the scenarios by identifying the elementary sequences: the initial situation, the different events, and the final situation. The central objective is to discern the source of the initial balance disruption to determine the role of the technology in the narrative. To this end, we shall initially ascertain the trajectory of these elementary sequences, discerning whether they signify amelioration or degradation (in accordance with Bremond). Subsequently, we will proceed to delineate the actants within the narrative, adhering to the framework set forth by Greimas.

Second, we need to determine whether the student's scenario is closed or open-ended based on a set of criteria discussed in Chapter 8 (Design Fiction as Narrative). A scenario warrants classification as open-ended if it satisfies any of the ensuing conditions: presenting multiple perspectives on unfolding events or abstaining from proposing a definitive conclusion. To gauge this openness effectively, reference shall be made to the narrative's structural components, coupled with an analysis of the roles inhabited by the characters.

Third, it is essential to examine whether the narrative aspires towards problem resolution and is more from a solutionist perspective, or whether primarily seeks to raise questions and foster discussion. To this end, we should examine both the narrative structure (whether the problem is resolved by the story's conclusion) and the students' reactions to each other's scenarios.

The outlined analytical strategies should have provided an initial framework for delving into the students' speculative scenarios, thus advancing our understanding of the narrative's role in problem definition and fostering critical inquiry competence. Despite the limitations faced in my research methodology, these strategies could offer a promising avenue for future research. By deciphering the narrative structures, the character dynamics, and problem-solving orientations embedded within these scenarios, we should not only enrich our comprehension of design fiction but also lay the groundwork for enhancing critical thinking in educational contexts.

Using Worldbuilding to Stimulate a Problem-Raising Attitude

In the conclusion of part 3, which aimed at defining design fiction, I highlighted the fact that the practice of design fiction can operate in two directions: it consists of materialising scenarios (world to object) and implementing an object in a storyworld (object to world). The various phases of the DBR project proposed starting from the design of the diegetic prototype and then imagining its consequences in a wider universe. In the HACK to the Future project, secondary school students first created their prototype and made their video clip, and then wrote a speculative scenario implementing their object in a future world. Similarly, in the Possible Futures project, the students first designed their prototype, staged it in their Instagram story, then contextualised it in their comic strip.

Different methods involve doing exactly the opposite, i.e., first building the universe and then imagining the technologies. This is particularly true of worldbuilding, a process used in fiction to create a detailed and coherent universe in which to set a story. There are several stages in this process, including: defining the theme of the universe (name, genre, etc.), create a map of the territory, populate the world with people, elaborate civilisation's history, create systems of technology and magic, distribute resources with a working economy and determine the world's power structure (Reedsy Team, 2023). Worldbuilding makes a major contribution to the process of writing fiction in its many forms, whether books, films or video games. This process offers a creative approach to designing a fictional universe, while ensuring the coherence of that universe for the reader.

Worldbuilding is a method used in the field of research and design to explore new ideas and solutions. It allows designers to develop detailed and immersive environments that serve as a backdrop for their creations (Zaidi, 2019). This creative approach stimulates innovation by encouraging deep and imaginative thinking about how products, policies, and strategies fit within these fictional worlds. By designing coherent worlds, researchers and designers can test their ideas through various scenarios and interactions, helping anticipate potential implications of their inventions. Furthermore, worldbuilding promotes a better understanding of emerging contexts, such as climate change, by aiding in aligning creations with the current and future reality (ibid.).

Worldbuilding could provide new perspectives for developing activities around the practice of design fiction. In particular, it might be possible to create an activity starting with the construction of a storyworld and leading to the invention of diegetic prototypes in order to assess learners' critical thinking about digital media and technology. From the outset, this

method would include a study of current societal issues in order to create a fictional universe, since the latter would have to be based on the actual world in order to imagine an alternative or future version of it. It would encourage a problem-raising approach in terms of the number of questions to be taken into consideration in the design of the fictional universe and by the production of diegetic prototypes designed above all to give material form to the stories (and not to solve a problem).

Studying and Assessing Digital Literacy With Design Fiction

In my research problem, I specified the critical inquiry competence by distinguishing between students' ability to ask (A) critical questions about media texts representing technologies and (B) speculative critical questions about technologies themselves and their future in society. The quantitative results led us to emphasise the contribution of the educational programme to developing questions of category (B). In particular, the activities encouraged a speculation attitude and attitude of doubt, leading students to ask questions about the new issues raised by the content of media texts.

These results prompt us to consider the contribution of design fiction to the development of new competences, particularly in digital literacy. According to Landry and Basque (2015), digital literacy is "the ability to act responsibly, prudently and ethically on digital networks in accordance with its own values and identities" (p. 56; author's translation). New knowledge and skills are needed due to the new ethical and behavioural issues raised by digital media environments. Algorithms provide a good example illustrating the new abilities that are needed today; these sequences of actions raise questions about the producer of the message and its intention. Digital literacy "overlaps with [the] goals [of media literacy] with broader technical skills, a greater capacity for research, information processing and production, and the development of a personal awareness of the risks and ethical issues of digital environments" (ibid., p. 57; personal translation).

Design fiction could significantly contribute to the development of digital literacy by engaging learners in critical and creative thinking about technology and its societal impact. Through design fiction, learners would be exposed to speculative scenarios that depict future technologies and their implications. This might prompt them to critically evaluate these digital representations, enhancing their ability to assess the credibility, reliability, and potential biases in digital information - a fundamental aspect of digital literacy. Furthermore, design fiction could stimulate discussions about the ethical and responsible use of emerging

technologies. Learners might explore the ethical dilemmas presented in these scenarios, leading to a better understanding of their roles as responsible digital citizens.

Comparing the Two Ways of Practising Design Fiction in Media Education for Developing Critical Thinking

In my research problem, I have distinguished two ways of practising design fiction in a media education context: (1) to have students analyse design fiction texts and (2) to have students produce design fiction texts and diegetic prototypes. I explained that design fiction can be first used as an object of study in media education. As any other media texts, design fiction texts can be deconstructed using core concepts to highlight the way that media represent technology and our interaction with it. On the other hand, design fiction, as a design practice, can offer a second way to practise media education. The practice of design fiction can engage students in the production of media texts (such as advertisements, podcasts, comics, etc.) and/or diegetic prototypes.

When I was designing the educational programme, I did not distinguish between the two approaches to design fiction. With the media educators, we created activities that alternated the roles occupied by the students to vary and dynamise the activities in which the students took part. Given the difficulty students have in asking questions about media texts, it would be legitimate to question whether one approach is more effective than the other (i.e., analysis or production of media texts) for exploring this aspect. For several years now, media production seems to have been favoured in media education:

Some educators believe that young people cannot become truly critical consumers of the mass media until they have had experience making photographs, planning and organizing ideas through storyboards, writing scripts and performing in front of a camera, designing their own web pages, or reporting a news story (Hobbs, 1998, p. 20).

Creative skills and artistic expression are highlighted by some educators, as is 'learning by doing'. However, we soon see the limitations of these approaches, such as the materials needed to set up such activities and the training required for supervisors (ibid.).

With the advent of new technologies, more and more schools are equipping themselves to educate students in new media, using media production as a means of doing so. However, the results of my research call this approach to media education into question and suggest that it should not be the only way of approaching the dimensions of media texts. Media analysis

activities could be the key to deepening students' questioning of the many facets of media texts, and a new (re)consideration of these kinds of activities by practitioners would probably enable learners to integrate the core concepts better.

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Appendices

Appendix I: Example of a Pedagogical Sheet

English version (original version below)

Design fiction Athénée Chênée // Animation activities 1

Materials: cards, post-it notes

Duration: 2x50 minutes

Public: 26 young people in 3rd year secondary

Intro : (15')

ACMJ Presentation + general explanation of the project

- ➔ What are we going to do? Design Fiction (*i.e. explore the implications of future developments and debate these scenarios*)
- ➔ How? Conducting a project in several parts in February and March
- ➔ Show the example of the London Design Museum (plan to ask a few questions)

What are we going to do?

- Imagine technologies for the near and probable future- 2030
- That respond to the problems we identify
- We're going to bring them to life, make them real
- Then you will turn them into product placements
- Then you will take on the role of journalists who are interested in these objects
- Finally, you will create a mini science fiction story in the form of a comic strip.

How our ancestors imagined the technological future: (10')

Show the Power Point.

Which current technology is it closest to? What does the representation of the past evoke for them?
How can such a (time) gap be explained?

Introduction to AI and algorithms (25')

If you had to explain in your own words what artificial intelligence is, how would you explain it?

Game: Quick draw with Google

Video clip: "L'esprit sorcier" --> Summary instructions

Show clip : « Roger et ses humains »

Game: <https://botor.no/>

Brainstorming: (50')

- ➔ Brainstorming and formation of groups (according to areas: Education, Entertainment, News media, Social networks / media of communication) (15')
 - Use of post-it notes? why not a version of what we did for the evaluation of the ultimate tool with the post-it notes?
 - ➔ Creation of groups based on the chosen area and research problem
-

Presentation of the technology cards (10')

Connected objects, voice assistants, facial recognition, deep fake, prostheses, etc.

(How can this be done interactively? simply ask what they know about technological innovations? give areas to guide the brainstorming? prepare innovations to be shown for each area).

Café Mundo : (30')

- ➔ !!! 4 minutes + 2 minutes (the moment when creativity is at its peak)
- ➔ 2 x 3 rotating tables, each with a different point of view: producer / consumer / legislator.
"If you were what questions would you have to ask yourself?"

Creation of a prototype of the technology (30')

- ➔ They start from the chosen research problem
- ➔ Select one or more technologies from the cards (not exhaustive)
- ➔ We are investors: you have to convince us to believe in your product in order to develop it: a pitch of one minute max (and we want concrete, technical information).

Pitch to investors (15')

8 pitches of 1 minute each

Feedback on technological possibilities (15')

Design fiction Athénée Chênée// Démarche animation 1

Matériel : cartes, post-it

Durée : 2x50 minutes

Public : 26 jeunes 3^{ème} secondaire

Intro : (15')

Présentation ACMJ + explication globale du projet

- ➔ Qu'est-ce qu'on va faire ? Du Design Fiction (*càd explorer les implications d'évolutions futures et mettre en débat ces scénarios*)
- ➔ Comment ? projet en plusieurs parties en février et mars
- ➔ Montrer exemple du musée du Design londonien (prévoir qqes questions à poser)

Qu'est-ce qu'on va faire ?

- Imaginer des technologies d'un futur proche et probable- 2030
- Qui répondent à des problèmes que nous identifions
- On va leur donner vie, les matérialiser
- Puis vous en ferez des placements de produit
- Après, vous prendrez le rôle de journalistes qui s'intéressent à ces objets
- Pour finir, vous construirez un mini récit de science fiction sous forme de BD

Comment nos ancêtres imaginaient le futur technologique : (10')

Montrer le Power Point.

De quelle technologie actuelle ça se rapproche le plus ? Qu'est-ce que la représentation du passé leur évoque ? Comment expliquer un tel décalage ?

Intro sur l'IA et les algorithmes (25')

Si vous deviez expliquer avec vos mots ce qu'est une intelligence artificielle, comment vous expliqueriez ça ?

Jeu : Quick draw with Google

Vidéos « L'esprit sorcier » --> consigne résumé

Montrer extrait : « Roger et ses humains »

Jeu : <https://botor.no/>

Brainstorming : (50')

- ➔ Brainstorming et constitution des groupes (en fonction des domaines : Enseignement, Divertissement, Médias d'information, Réseaux sociaux / médias de communication) (15')
- Utilisation de post-it ? pourquoi pas une version de ce qu'on avait fait pour l'éval de l'outil ultime avec les post it ?
- ➔ Constitution des groupes sur base du choix du champ et de la problématique choisie

Présentation des cartes technologies (10')

Objets connectés, assistants vocaux, reconnaissance faciale, deep fake, prothèses, etc.

(Comment le faire de façon interactive ? demander simplement ce qu'ils connaissent comme innovations technologiques ? donner des domaines pour guider le brainstorming ? préparer des innovations à montrer pour chaque domaine ?)

Café Mundo : (30')

- ➔ !!! 4 minutes + 2 minutes (le moment de plus grande créativité)
- ➔ 2 x 3 tables tournantes avec à chaque fois un point de vue différent : producteur / consommateur / législateur. « Si tu étais quelles questions devrais-tu te poser » ?

Création d'une ébauche de la technologie (30')

- ➔ Ils partent de la problématique choisie
- ➔ Choix d'une ou plusieurs technologies parmi les cartes (non exhaustif)
- ➔ On est des investisseurs : vous devez nous convaincre de croire en votre produit pour le développer : un pitch d'une minutes max (et on veut des informations concrètes et techniques).

Pitches aux investisseurs (15')

8 pitches de 1 minute

Retour sur les possibles technologiques (15')

Appendix II: Information and Consent Form

English version (original version below)

Information and Consent Form

Dear parents,

The [name of the school] has agreed to take part in a scientific research project to which your child could contribute. This document has been designed to inform you about the terms and conditions of this research. We invite you to read the content of this document together (pupils and parents) and to sign the last page of the consent form if you agree to take part.

Scientific Research Project (2017-2023)

Study on how future technologies are perceived in the media

People in charge of the research project

Head of the research project: Pierre Fastrez- pierre.fastrez@uclouvain.be

Researcher: Géraldine Wuyckens – geraldine.wuyckens@uclouvain.be [telephone number]

Funding and support for the research project

This research project is funded by the Université catholique de Louvain (UCLouvain).

Scientific goals of the research project

This project is the result of a collaboration between UCLouvain, the *Action Médias Jeunes* association and the [name of the school]. It aims to offer a new approach to media education through the practice of design fiction and to measure the effects on young people's perception of their relationship with technology and digital media. The goal is to encourage pupils to adopt a critical attitude towards their media practices and to reflect on current social and technological issues as responsible citizens.

Purpose and nature of the pupil's participation

We are requesting the pupil's participation during the period running from January to March 2021. This participation will take place in the context of the pupil's attendance at school during class sessions. In concrete terms, the pupil will be invited to watch short video clips and to formulate a series of questions relating to the future technologies presented in them, and to the way in which these clips portray these technologies.

In the case of the [number of the class] class, pupils will be invited to take part in various educational activities (prototyping, production of videos and comic strips) and, in the process, complete various working documents (such as a notebook) throughout the project. These documents will gather the questions they will have asked during the prototyping and media production stages.

Participation in this research project will contribute to the advancement of knowledge in the field of media education. The main findings of the project, as well as the general recommendations for media education that will emerge, may also be shared with the participating school if it so requests.

Anonymity and data confidentiality

All data collected during the pupil's participation will be processed anonymously. Pupils may be asked to provide identifying information at various stages of the project. This information will be used exclusively to make sure the answers to the various questionnaires and/or personal productions were produced by the same person. Once this cross-checking will have been carried out, any identifying information will be permanently deleted from the data collected.

The people responsible for the project will use these data for research purposes in order to fulfil the scientific objectives described hereabove. Data from the project may be published in scientific journals or shared with others in scientific discussions. No publication or communication resulting from the project will contain information that could enable the pupil to be identified.

Should you require further information about this research project, please contact us by e-mail or telephone via the contact details given at the beginning of this document.

Free and informed consent

Consent of the parent or legal guardian

I, undersigned (Surname, Forename) _____, declare that I have read this form and understood the nature of and reason for the participation of my child (Surname, Forename) _____ in the research project.

I hereby give my free and informed consent for my child to take part in the research project, and for the data resulting from his or her participation to be used as described hereabove. I am also free to withdraw my consent at any time, without any pressure and without having to justify myself.

Signed in _____, on the _____

Signature:

Pupil's consent

I, undersigned (Surname, Forename) _____, declare that I have read this form and understand the nature of and reason for my participation in the research project.

I hereby give my free and informed consent to take part in the research project, and for the data resulting from my participation to be used as described hereabove. I also reserve the right to withdraw my consent at any time, without any pressure and without having to justify myself.

Signed in _____, on the _____

Signature:

FORMULAIRE D'INFORMATION ET DE CONSENTEMENT

Chers parents,

La [nom de l'école] a accepté de participer à un projet de recherche scientifique auquel votre enfant pourrait contribuer. Le présent document est conçu pour vous renseigner sur les modalités de cette recherche. Nous vous invitons à prendre connaissance du contenu de ce document ensemble (élèves et parents) et à signer le consentement à la fin de celui-ci si vous êtes d'accord d'y participer.

Projet de recherche scientifique (2017-2023)

Étude de la perception des technologies du futur dans les médias

Personnes responsables du projet de recherche

Directeur de la recherche : Pierre Fastrez - pierre.fastrez@uclouvain.be

Chercheuse : Géraldine Wuyckens – geraldine.wuyckens@uclouvain.be [numéro de téléphone]

Financement et soutien du projet de recherche

Ce projet de recherche est financé par l'Université catholique de Louvain (UCLouvain).

Objectifs scientifiques du projet de recherche

Ce projet est le fruit d'une collaboration entre l'UCLouvain, l'association Action Médias Jeunes et la [nom de l'école]. Il vise à proposer une nouvelle approche en éducation aux médias à partir de la pratique du design fiction⁶⁴ et à en mesurer les effets sur la perception qu'ont les jeunes de leur relation aux technologies et aux médias numériques. L'objectif est d'encourager les élèves à adopter une attitude critique à propos de leurs pratiques médiatiques et à réfléchir aux enjeux sociaux et technologiques actuels en tant que citoyen·nes responsables.

Raison et nature de la participation l'élève

Nous sollicitons la participation de l'élève durant la période du mois de janvier au mois de mars 2021. Cette participation se déroulera dans le cadre de sa présence à l'école lors des sessions de cours. Concrètement, l'élève sera invité·e à visionner de courts extraits vidéo et à formuler une série de questions relatives aux technologies futures présentées dans ceux-ci, et à la façon dont ces extraits mettent en scène ces technologies.

Dans le cas spécifique des élèves de la classe [numéro de la classe], l'élève sera invité·e à participer à différentes activités pédagogiques (prototypage, production de vidéos et de bandes dessinées) et, à cette

⁶⁴ Le design fiction est une pratique de design permettant d'explorer le futur des nouvelles technologies et de questionner leurs implications dans la société. Dans le cadre du projet actuel, les activités consisteront à imaginer des prototypes de technologies, à les présenter dans des productions vidéos et à les illustrer dans des bandes dessinées.

occasion, à remplir différents documents de travail (comme un carnet de notes) tout au long du projet. Ceux-ci rassembleront les questions qu'il/elle se posera lors des étapes de conception du prototype et de productions médiatiques.

La participation à ce projet de recherche contribuera à l'avancement des connaissances dans le domaine de l'éducation aux médias. Au terme de la recherche, ses principaux résultats, de même que les recommandations générales en matière d'éducation aux médias qu'ils permettront de dégager, pourront par ailleurs être transmis à l'école participante si elle en fait la demande.

Anonymat et confidentialité des données

L'ensemble des données récoltées à l'occasion de la participation de l'élève seront traitées de manière anonyme. Il est possible que l'élève soit amené-e à fournir des informations permettant de l'identifier aux différentes étapes du projet. Ces informations seront utilisées exclusivement pour établir que ses réponses aux différents questionnaires et/ou ses productions personnelles ont été produites par la même personne. Une fois ce recoupement effectué, les informations permettant de l'identifier seront définitivement détruites des données recueillies.

Les personnes responsables du projet utiliseront ces données à des fins de recherche dans le but de répondre aux objectifs scientifiques précédemment décrits. Les données du projet pourront être publiées dans des revues scientifiques ou partagées avec d'autres personnes lors de discussions scientifiques. Aucune publication ou communication issue du projet ne contiendra d'information permettant d'identifier l'élève.

Si vous souhaitez obtenir plus d'informations sur ce projet de recherche, vous pouvez nous contacter par e-mail ou par téléphone, à l'aide des coordonnées reprises en début de document.

Consentement libre et éclairé

Consentement du parent ou du responsable légal

Je, soussigné-e (Nom, Prénom) _____, déclare avoir lu le présent formulaire et avoir compris la nature et le motif de la participation de mon enfant (Nom, Prénom) _____ au projet de recherche.

Par la présente, je consens de manière libre et informée que mon enfant participe au projet de recherche, et que les données issues de sa participation soient utilisées comme décrit ci-dessus. Par ailleurs, je garde la liberté de retirer mon consentement à tout moment, sans aucune pression et sans avoir à me justifier.

Fait à _____, le _____

Signature :

Consentement de l'élève

Je, soussigné-e (Nom, Prénom) _____, déclare avoir lu le présent formulaire et avoir compris la nature et le motif de ma participation au projet de recherche.

Par la présente, je consens de manière libre et informée à participer au projet de recherche, et que les données issues de ma participation soient utilisées comme décrit ci-dessus. Par ailleurs, je garde la liberté de retirer mon consentement à tout moment, sans aucune pression et sans avoir à me justifier.

Fait à _____, le _____

Signature :

Appendix III: Glossary in the context of Rubrics

- The **dimensions**: the dimension is a synonym for the media literacy concept. An example of dimension is the context of production of the media text.
- The **criteria**: the criteria are the basic elements that defines the concerned competence, here the critical inquiry competence. There are three of them: the dimension, the issue, and the attitude.
- The **categories**: the categories refer to the divisions identified in the different criteria. An example of a category in the criterion of the attitude is the speculation attitude.
- The **levels**: the levels refer to the different levels of performance that we can identify by articulating the different criteria. The levels range from not critical to high order.
- The **codes**: the codes are numerical values that we can associate with the levels. They are typically used to code the levels in the database. Ex. of code: 3.
- The **values**: the value is a synonym for the codes and refers to a number.
- The **descriptors**: descriptors are the descriptions for each category of the criteria.

Appendix IV: Evolution of the Criteria for The Critical Inquiry Competence

First version of the rubric – Sept 2021

A) The object of the question

The object is the first dimension of the critical inquiry competence. I identify four possibilities of object: media text, media technology, both and none. In the context of the experiment, media texts refer to the video clips shown during the tests and media technologies to the technologies displayed in these video clips.

For each question, the first step is to determine its object.

To which object the question refers to?	1. The student questions the media text.
	2. The student questions the technology depicted (diegetic prototype).
	3. The student questions both the media text and the technology.
	4. Student's question is off topic.

B) The media literacy concept of the question

The media literacy concept is the second dimension of the critical inquiry competence. To date, we have identified seven categories⁶⁵. These categories will be revised based on preliminary analysis.

1. **Social Constructivism:** All information is co-constructed by individuals and/or groups of people who make choices within social contexts.
2. **Languages / Semiotics:** Each medium has its own language with specific grammar and semantics.
3. **Audience / Positionality:** Individuals and groups understand media messages similarly and/or differently depending on multiple contextual factors.
4. **Politics of Representation:** Media messages and the medium through which they travel always have a bias and support and/ or challenge dominant hierarchies of power, privilege, and pleasure.
5. **Production / Institutions:** All media texts have a purpose (often commercial or governmental) that is shaped by the creators and/or systems within which they operate.
6. **Social Justice:** Media culture is a terrain of struggle that perpetuates or challenges positive and/or negative ideas about people, groups, and issues; it is never neutral.
7. **Realism:** link between the imagined world and the actual world (question of truth and credibility of media texts).

⁶⁵ The first six are from Funk, Kellner and Share (2016). They focus on media text and I will modify them later so that they also concern media technologies.

For each question, after identifying its object, it will be necessary to determine the content area it concerns. The following tables provide descriptors for each category.

Object: technology To which core concept or area does the question refer?	1. The student questions the production process of the object and the people responsible for the choices made.
	2. The student questions the design of the object and what it can communicate.
	3. The student questions the different uses and appropriations of the object.
	4. The student questions the present and missing values transmitted or not by the object.
	5. The student questions the intention behind the creation of the object.
	6. The student questions whether the object has an advantageous or disadvantageous impact on certain people.
	7. The student questions the object's plausibility in the real world.

Object: media text To which core concept or area does the question refer?	1. The student questions the process of media production of the text and the people responsible for the production choices.
	2. The student questions the specific language used by the medium in question.
	3. The student questions the different interpretations of the media text.
	4. The student questions the present and missing values conveyed by the media text.
	5. The student questions the intention of the text.
	6. The student questions the beneficial or detrimental impact of the text on certain people.
	7. The student questions the credibility and veracity of the text.

C) The perspective of the question

The perspective is the third dimension of the critical inquiry competence. Literature on critical design and critical media literacy allows identifying several perspectives that could be assumed by the students in their questions.

1. **Consensual perspective:** consensual point of view on the situation represented.
2. **Limited perspective:** strictly limited to the category related to the piece of the media technology or the media text (e.g., the production processes).
3. **Broader perspective:** extended to the deep issues raised by the media technology / text.
4. **Alternative perspective:** alternate point of view on the situation represented.

The next tables provide descriptors for each perspective depending on the object.

Object: technology Which perspective does the question take?	1. The student asks a restrictive question about a particular aspect of the object, such as its design or manufacturing process [entry through the object].
	2. The student questions the wider issues surrounding the object as raised in the video [entry through the world].
	3. The student asks a question about an aspect of the object that does not challenge the assumptions made in the video. (to specify)
	4. The student asks a question about an aspect of the object that is not addressed in the video. (to specify)

Object: media text Which perspective does the question take?	1. The student asks a restrictive question about a particular aspect of the media text, such as its language or its values.
	2. The student questions the global media issues raised by the media text.
	3. The student does not question the presuppositions conveyed by the media text. (to specify)
	4. The student questions the preconceived ideas conveyed by the media text. (to specify)

By crossing the first two dimensions with the dimension of the perspective, we can determine different critical levels for students' questions.

> For the dimension of the perspective, question's criticality can vary under four conditions:

- If the question expresses a consensual perspective, it is not critical (0).
- If the question expresses a limited perspective, it is of a low critical level (1).
- If the question expresses a broader perspective, it is of a high critical level (2).
- If the question expresses an alternative point of view, it is of a high critical level (3).

Perspective of the question	Codes
1. Consensual perspective	0 (not critical)
2. Limited perspective	1 (low order)
3. Broader perspective	2 (high order)
4. Alternative perspective	3 (high order)

D) The complexity of the question

The complexity of the question is the fourth dimension of critical inquiry. As a reminder, here are the levels of complexity defined by Schilder and Redmond (2019).

1. **Not Critical/Prestructural:** questions that were unclear, reflected misconceptions, did not answer the research prompt, or demonstrated that the questioner did not grasp the constructed nature of the media sample;
2. **Low/Unistructural:** questions that only focus on one piece of basic or fixed information that can easily be identified or recalled from the text;

3. **High/Multistructural:** questions that focus on breaking down main ideas and information, but do not examine relationships or require evidence-based thinking;
4. **High/Relational:** questions that analyse relationships of multiple concepts and typically reflect evidence-based thinking (e.g., asking “how” and “why” questions);
5. **High/Extended Abstract:** questions that focus on extending ideas and information into other domains or contexts in new ways—connecting, synthesizing, and transforming.

By crossing Redmond and Schilder (2019) complexity levels and the first two dimensions, I can determine different critical levels for students’ questions.

> For the dimension of the object, question’s criticality can vary under five conditions:

- If the question does not address one of these objects, the question is not included in the evaluation and is considered as “not critical” (0).
- If the question addresses one of these objects, it is of a low critical level (1).
- If the question addresses both objects, it is of a high critical level (2).
- If the question makes links between the objects, it is of a high critical level (3).
- If the question “extends ideas and information into other domains or contexts in new ways”, it is a high critical level (4).

Object of the question	Codes
1. None	0 (“not critical”)
2. Media text OR media technology	1 (low order)
3. Media text AND media technology	2 (high order)
4. Relationships between objects	3 (high order)
5. “Extended Abstract”	4 (high order)

> For the dimension of the media literacy concept, question’s criticality can vary under five conditions:

- If the question concerns none of the media literacy concept, the question is not included in the evaluation and is considered as “not critical” (0).
- If the question concerns one of the MLC, it is of a low critical level (1).
- If the question concerns more than one MLC, it is of a high critical level (2).
- If the question makes links between MLC, it is of a high critical level (3).
- If the question “extends ideas and information into other domains or contexts in new ways”, it is a high critical level (4).

Media literacy concept of the question	Codes
1. None	0 (“not critical”)
2. One MLC	1 (low order)
3. Multiple MLC	2 (high order)
4. Relationships between MLC	3 (high order)
5. “Extended Abstract”	4 (high order)

E) The rubric (first version)

By combining the previous tables, we can build a single grid.

Here is a first draft of a holistic rubric without any analysis yet carried out:

Is the question more or less critical?	
Not critical (0)	The question does not concern the technologies displayed on the screen or the media processes implemented in the video clip. OR the question expresses a consensual perspective on the situation.
Low order (1)	The question focuses on a specific object or MLC OR the question expresses a limited perspective on the situation
High order (2)	The question concerns both objects or multiple MLC OR the question expresses a broader perspective on the situation
High order (3)	The question makes relationships between the objects or multiple MLC OR the student considers another perspective than the one presented
High order (4)	The question extends ideas and information into other domains or contexts in new ways.

If we take the following example: “What could be the health consequences of being in constant contact with electronic devices?” (in French: « *Quelles pourraient-être les conséquences sur la santé d’être constamment en contact avec des appareils électroniques ?* »), we quickly get stuck, because the question concerns two levels.

Analytical rubric revised:

Dimensions / Levels	Not critical (0)	Low critical (1)	High critical (2)	(3)	(4)
Object	The question is irrelevant, off-topic.	The question addresses media text or media technology.	The question addresses both media text and media technology.	Link	Extend
MLC	The question does not address any of the MLC.	The question addresses one of the MLC	The question concerns multiple MLC.	Link	Extend
Perspective	The perspective of the question is consensual.	The question expresses a limited perspective.	The question expresses a broader perspective.	Other	?

To calculate the level of criticality of a question, the results of each dimension must be added together. The total gives the criticality score of a question. If the total is greater than 3 (the question would then have at least 1 point in each dimension), then the question is considered as highly critical.

With the same previous example: “What could be the health consequences of being in constant contact with electronic devices?”:

- Object: technology
- MLC: impact (the student questions whether the object has an advantageous or disadvantageous impact on certain people)

- Perspective: broad (the student questions the wider issues surrounding the object)

⇒ Calculation : $1 + 1 + 2 = 4$. Highly critical question.

Second version of the rubric (core concepts and criticality) – Dec 2021

A) List of core concepts and definitions for media text

	Definitions	Key questions
Autorship <i>All media are constructions.</i>	All information is co-constructed by individuals and/or groups of people who make choices within social contexts.	<i>Who created this text?</i>
Purposes <i>Media have commercial implications.</i>	All media texts have a purpose (often commercial or governmental) that is shaped by the creators and/or systems within which they operate.	<i>Why this text is being sent? When was this made? Who paid for this?</i>
Interpretations (or Audience) <i>Audiences negotiate meaning in media.</i>	Individuals and groups understand media messages similarly and/or differently depending on multiple contextual factors.	<i>How might different people understand this text differently?</i>
Format <i>Each medium has a unique aesthetic form.</i>	Each medium has its own language with specific grammar and semantics.	<i>What techniques are used and why? How do the techniques communicate the text?</i>
Impact <i>Media have social and political implications.</i>	Media culture is a terrain of struggle that perpetuates or challenges positive and/or negative ideas about people, groups, and issues; it is never neutral.	<i>Who might benefit this text? Who might be harmed by it?</i>
Representations (or Content) <i>Media contain ideological and value messages.</i>	Media messages and the medium through which they travel always have a bias and support and/ or challenge dominant hierarchies of power, privilege, and pleasure.	<i>What, or who, does the media text choose to include and exclude? What values, lifestyles and point of view are represented in or omitted from this text?</i>
Realism <i>Media construct reality.</i>	Self-evidently, the media do not offer us a transparent ‘window on the world’, but a mediated version of it. They don’t just present reality: they re-present it. (Buckingham, 2019)	<i>How does the media text claim to tell the truth, be realistic or authentic? In this fact, opinion, or something else? How credible is this?</i>

Comments: The first six definitions come from Funk, Kellner and Share (2016). I change the names of the categories; originally, they were social constructivism, production/institutions, audience/personality, language/semiotics, social justice, and politics of representation. I have

added a seventh category, which is realism. The last definition will have to be adjusted, for the moment it is very similar to that of the representation.

The sentences in italics come from AML (cited in Jolls & Wilson 2014) and I have associated them with the concepts.

The key questions are a mix from scientific literature and my data.

They are six colours in the categories because I am hesitating to combine the first two into one, which would be the “production”.

B) List of core concepts and definitions for diegetic prototypes

	Definitions	Key questions
Autorship	The actors behind the creation of diegetic prototypes are varied and multiple.	<i>Who created this piece of technology?</i>
Purposes (or Context)	Diegetic prototypes are developed for a specific purpose (generally for critical or commercial uses), and responds to broader issues determined by their creators and society.	<i>Why this piece of technology was created? When was this made? Who paid for this? How is this technology marketed? (distribution)</i>
Uses	Speculative scenarios consider the different uses of diegetic prototypes depending on multiple contextual factors.	<i>How might different people use this piece of technology differently?</i>
Design	Each diegetic prototype has its own design with specific working and the technical implications that this entails.	<i>How does the piece of technology work? What production and deliberation techniques are used?</i>
Impact	Diegetic prototypes address issues of societal significance and question their positive or negative impact on individuals, groups and the world.	<i>Who might benefit this piece of technology? Who might be harmed by it?</i>
Representations (or Content)	Diegetic prototypes address specific users and are part of a particular value system. Speculative scenarios question the ideological presuppositions of the object.	<i>What, or who, do this piece of technology choose to include and exclude? What values, lifestyles and point of view are represented in or omitted from this piece of technology? (questions about emotions, ethics)</i>
Realism	Diegetic prototypes are fictional artefacts reflecting present concerns.	<i>Is this an authentic piece of technology? How plausible is this piece of this technology?</i>

Comments: I have created the definitions. The key questions are similar to those related to the media text. I have adapted the names of some categories (design and uses) but they are essentially the same as those of the media text.

C) The level of complexity

Based on my preliminary analysis, I have developed two scales for assessing questions' complexity.

First, concerning media text:

	Low critical (structural)	High critical (relational)	High Critical (ext. abst.)
Production	Authorship <i>Who created this text?</i>	Purposes / Context <i>Why/when the text was created and disseminated?</i>	Necessity <i>What's the point?</i>
Reception	Audiences <i>Who is the target audience?</i>	Interpretations <i>How might different people understand this message differently?</i>	
Format	Language <i>What techniques are used? How these techniques are used?</i>	Purposes <i>Why these techniques are used?</i>	
Impact	<i>Who might benefit this text? Who might be harmed by it?</i>		
Content	Explicit content <i>What, or who, do media choose to include and exclude?</i>	Representations <i>Why some values, lifestyles or point of view are represented in or omitted from this text?</i>	Ethics <i>What ethical considerations does this entail?</i>
Realism	<i>How does the media text claim to tell the truth, be realistic or authentic?</i>		
Not critical	Irrelevant questions.		

Second, concerning media technology:

	Low critical (structural)	High critical (relational)	High Critical (ext. abst.)
Production	Authorship <i>Who created this piece of technology?</i>	Purposes <i>Why/when will this piece of technology emerge?</i>	Necessity <i>Is it necessary?</i>
Reception	Audiences <i>Who are the (potential) users?</i>	Uses <i>How might different people use this piece of technology differently?</i>	
Format	Design <i>How does it work? Which materials are used?</i>	Purposes <i>Why does it work / look like this?</i>	
Impact	<i>Who might benefit this piece of technology? Who might be harmed by it?</i>		

Content	Explicit content <i>What values, lifestyles and point of view are represented in or omitted from this piece of technology?</i>	Representations <i>Why some values, lifestyles or point of view are represented in or omitted from this piece of technology?</i>	Ethics <i>What ethical considerations does this entail?</i>
Realism	<i>How plausible is this piece of this technology?</i>		
Not critical	Irrelevant questions.		

Suggestions:

- I can add the level of “multistructural” when the question addresses multiple categories of core concepts, but I do not see any point in it otherwise. The student sometimes asks questions about several categories without making any apparent connections.
- The category “not critical” will gather irrelevant questions...
 - Exemples : “*est-ce que l’acteur est célibataire ?*”
 ... But ALL the questions must be listed in at least one of the categories.
- The category “realism” could be the highest critical level of the category “format” but, in the literature, it is often included into that of the “content”.
- At this stage, I have not managed to distinguish between different levels of impact. I wonder whether I should include it in another category, like content. There would be “low-critical” questions that question the ideological presuppositions/values embodied by the object, and highly critical questions about the wider issues they raise (societal repercussions). The “extended abstract” level would include questions that challenge technological solutionism.
- This last suggestion only works for technology. We could keep the content category, but in the case of media text it would refer to explicit content, and in the case of technology to implicit content. Here's how Schilder and Redmond define these two categories:
 - **Representations:** Questions focus on the **implicit content** of the text and issues related to representations, ideologies, and values. Questions provide an entry for the answerer to consider how media impact social norms and cultures, including conceptions of gender, race, ethnicity, sexuality, etc.
 - **Text:** Questions focus on the **explicit content** of the text as a narrative, encompassing what is happening and who is involved. Questions typically require the answerer to recall or respond to the story of the media in some way.

New tables:

	Low critical (structural)	High critical (relational)	High Critical (ext. abst.)
Production	Authorship <i>Who created this text?</i>	Purposes / Context <i>Why/when the text was created and disseminated?</i>	Necessity <i>What's the point?</i>
Reception	Audiences <i>Who is the target audience?</i>	Interpretations <i>How might different people understand this message differently?</i>	
Format	Language <i>What techniques are used? How these techniques are used?</i>	Purposes <i>Why these techniques are used?</i>	
Impact ?	<i>Who might benefit this text? Who might be harmed by it?</i>		
Content	Explicit content <i>What, or who, do media choose to include and exclude?</i>	Representations <i>Why some values, lifestyles or point of view are represented in or omitted from this text?</i>	Realism <i>How does the media text claim to tell the truth, be realistic or authentic?</i>
Not critical	Irrelevant questions.		

	Low critical (structural)	High critical (relational)	High Critical (ext. abst.)
Production	Authorship <i>Who created this piece of technology?</i>	Purposes <i>Why/when will this piece of technology emerge?</i>	Necessity <i>Is it necessary?</i>
Reception	Audiences <i>Who are the (potential) users?</i>	Uses <i>How might different people use this piece of technology differently?</i>	
Format	Design <i>How does it work? Which materials are used?</i>	Purposes <i>Why does it work / look like this?</i>	Realism <i>How plausible is this piece of this technology?</i>
Content	Implicit content <i>What values, lifestyles and point of view are represented in or omitted from this piece of technology?</i>	Impact <i>Who might benefit this piece of technology? Who might be harmed by it?</i>	Solutionism <i>Would this not create more problems than it would solve?</i>
Not critical	Irrelevant questions.		

Third version of the rubric (only core concepts) – Feb 2022

A) List of core concepts and definitions for media text

	Definitions	Key questions
Authorship and Economics	Questions focus on issues of media ownership and marketing in so far as they cultivate inquiry into the financial roots and/or commercial purpose of the media.	<i>Who created this media?</i> <i>Has the film made a partnership?</i>
Purpose	Questions focus on the purpose or general point of the media.	<i>What is the purpose of this media?</i> <i>What is the purpose of producing this media?</i>
Context of creation and dissemination	Questions focus on the context of creation and dissemination of the media, including when and how the message was created and disseminated.	<i>What is the name of this media?</i> <i>What time of year is this media played?</i> <i>How did they find this video?</i> <i>How did the directors come up with these ideas of the future?</i>
Audience (Code 4)	Questions focus on who the audience is in general terms, in addition to eliciting information about the experiences, interpretations, emotions, or opinions of the viewers/audiences of the media, including their subsequent feelings, physical responses, and actions.	<i>Who is this media directed towards?</i> <i>How did this clip make you feel?</i> <i>How might different people understand this media differently?</i> <i>Mood, perception...</i>
Languages and semiotics	?	?
Production Techniques (Code 3)	Questions focus how the media was constructed, what production techniques were used, and why these techniques were used.	<i>How was the video made?</i> <i>What techniques was used and why?</i> <i>How did the techniques communicate the message?</i>
Impact <i>Media have social and political implications.</i>	“Media culture is a terrain of struggle that perpetuates or challenges positive and/or negative ideas about people, groups, and issues; it is never neutral”.	<i>Who might benefit this media?</i> <i>Who might be harmed by it?</i>
(Narrative of) Text (Code 2)	Questions focus on the <i>explicit</i> content of the text as a narrative, encompassing what is happening and who is involved. Questions typically require the answerer to recall or	<i>What are some things that stood out to you during this video?</i> <i>Why did you set up these different scenes in the video and not others?</i> <i>Why are some things very advanced and others not?</i>

	respond to the story of the media in some way.	
Representations (Code 5)	Questions focus on the <i>implicit</i> content of the text and issues related to representations, ideologies, and values. Questions provide an entry for the answerer to consider how media impact social norms and cultures, including conceptions of gender, race, ethnicity, sexuality, etc.	<i>What values, lifestyles and point of view are represented in or omitted from this text?</i>
Realism (Code 6)	Questions focus on eliciting information about the <i>constructedness</i> of the media, specifically prompting the answerer to critically consider the nature of the media in terms of reality.	<i>How does the media text claim to tell the truth, be realistic or authentic?</i> <i>In this fact, opinion, or something else?</i> <i>How credible is this?</i> <i>How do you know that it is a commercial?</i> <i>Does this video seem like an advertisement?</i>

B) List of core concepts and definitions for diegetic prototypes

	Definitions	Key questions
Designer and Economics	Questions focus on issues of technologies property and commerce in so far as they cultivate inquiry into the financial roots and/or commercial purpose of the objects.	<i>Who created this piece of technology?</i> <i>Are there several designers?</i> <i>Who paid for this?</i>
Purpose / Necessity	Questions that raise issues about the intention and necessity of producing such a piece of technology.	<i>Why this piece of technology was created?</i> <i>Is it necessary?</i> <i>Will it create more problems than it solves?</i>
Context of creation and dissemination	Questions focus on the context of creation and dissemination of the prototype, including when and how the prototype will be created and disseminated.	<i>How/When will this piece of technology emerge?</i> <i>How will it be procured?</i> <i>How will this piece of technology be marketed?</i>
Users	Questions focus on who the user is in general terms, in addition to eliciting information about the experiences, appropriations, emotions, or opinions of the users of the prototype,	<i>Would people be sceptical of such a change? How can we get everyone to accept this change?</i> <i>Is it really that easy to use?</i>

	including their subsequent feelings, physical responses, and actions.	<i>Questions about appropriations by minorities: blind people, elderly people...</i>
Uses	“Speculative scenarios consider the different uses of diegetic prototypes depending on multiple contextual factors”.	<i>What are the possible uses of this piece of technology? How will we learn to use this kind of technology?</i>
Technical working	Questions focus on the technical working, the materials used and the semiotics of the diegetic prototypes.	<i>How does the piece of technology work? Which materials are used? Why does it work like this?</i>
Technological implications	Questions focus on the technical implications that the prototypes’ design and working entail (generally they are very specific questions).	<i>Is our data not at risk of being hacked? Is it dangerous if we no longer control what cars do? Are glasses harmful to the brain?</i>
Impact	“Diegetic prototypes address issues of societal significance and question their positive or negative impact on individuals, groups and the world.”	<i>Who might benefit this piece of technology? Who might be harmed by it?</i>
Representations (or Content)	“Diegetic prototypes address specific users and are part of a particular value system. Speculative scenarios question the ideological presuppositions of the object.”	<i>What, or who, do this piece of technology choose to include and exclude? What values, lifestyles and point of view are represented in or omitted from this piece of technology? (questions about emotions, ethics)</i>
Realism	Questions focus on the fictional nature of the prototype, doubting its existence in terms of reality.	<i>Is this an authentic piece of technology? How plausible is this piece of this technology? How is it possible for this piece of technology to work like this? How is it possible that it looks like this?</i>

Fourth version of the rubric (only core concepts) – March 2022

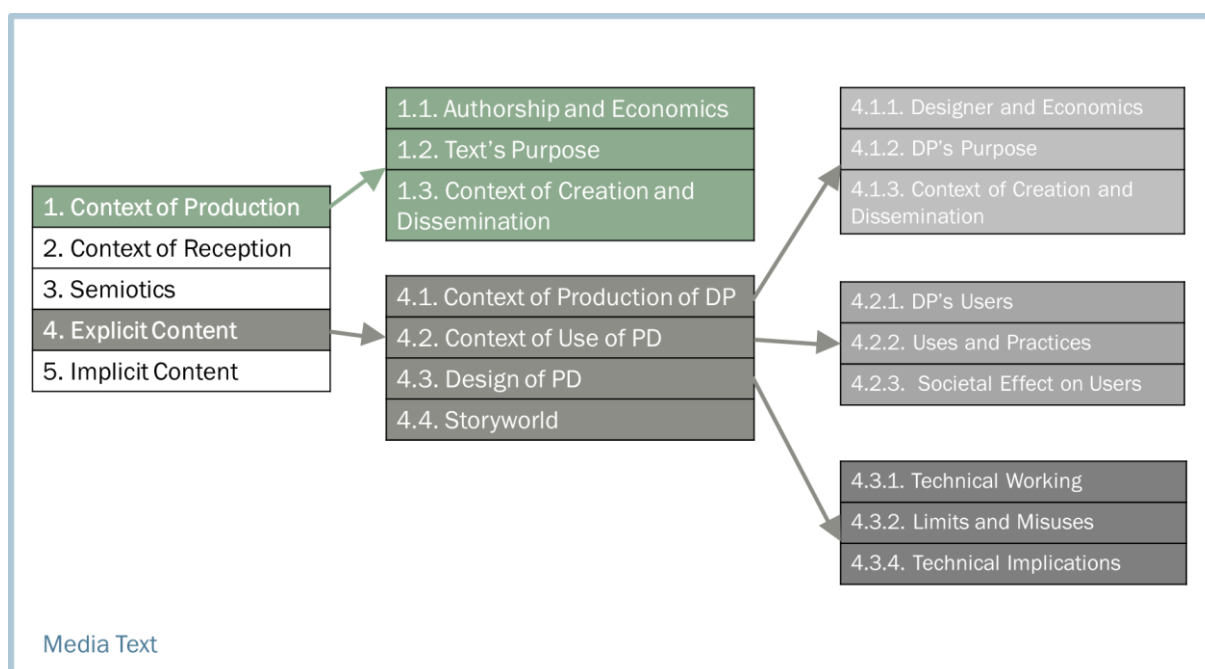
Key concepts / Object	MEDIA TEXT			DIEGETIC PROTOTYPE		
1. PRODUCTION	AUTHORSHIP & ECONOMICS Questions focus on issues of media ownership and marketing in so far as they cultivate inquiry into the financial roots and/or commercial purpose of the media.	PURPOSE Questions focus on the purpose or general point of the media.	CONTEXT OF CREATION AND DISSIMINATION Questions focus on the context of creation and dissemination of the media, including when and how the message was created and disseminated.	DESIGNER & ECONOMICS Questions focus on issues of technologies property and commerce in so far as they cultivate inquiry into the financial roots and/or commercial purpose of the objects.	PURPOSE Questions that raise issues about the intention of producing this piece of technology.	CONTEXT OF CREATION AND DISSIMINATION Questions focus on the context of creation and dissemination of the prototype, including when and how the prototype will be created and disseminated.
2. RECEPTION	Questions focus on who the audience is in general terms, in addition to eliciting information about the experiences, interpretations, emotions, or opinions of the viewers/audiences of the ad, including their subsequent feelings, physical responses, and actions.			USERS Questions focus on who the user is in general terms, in addition to eliciting information about the experiences, appropriations, emotions, or opinions of the users of the prototype, including their subsequent feelings, physical responses, and actions.	USES Questions focus on the possible uses of diegetic prototypes depending on multiple contextual factors.	

3. FORMAT / DESIGN	CONSTRUCTION TECHNIQUES Questions focus how the media was constructed, what production techniques were used, and why these techniques were used. For example, lighting, music, framing, camera language, and other audio-visual elements.	LANGUAGES AND SEMIOTICS Questions focus on language elements, multimodality, sign systems (fixed/animated image, sounds, dialogs, texts...), scenography, arrangements, their <u>effects</u> and media genre.	TECHNICAL WORKING Questions focus on the technical working, the materials used and the semiotics of the diegetic prototypes.	FUNCTIONALITY MISUSE Questions about the functional limits of the technology, the possible misuse of its functionality, and its undesirable effects.	TECHNOLOGICAL IMPLICATIONS Questions focus on the technical implications that the prototypes' design and working entail (generally they are very specific questions).
4. CONTENT / IMPACT	TEXT Questions focus on the explicit content of the text as a narrative, encompassing what is happening and who is involved. Questions typically require the answerer to recall or respond to the story of the media in some way.	REPRESENTATIONS Questions focus on the implicit content of the text and issues related to representations, ideologies, and values. Questions provide an entry for the answerer to consider how media impact social norms and cultures, including conceptions of gender, race, ethnicity, sexuality, etc.	Questions that address issues of societal significance and question their positive or negative impact on individuals, groups and the world. Sub-dimensions: values, lifestyles; abuses; individual impact; ethics; necessity; solutionism.		
5. REALISM	Questions focus on the nature of the prototype and its representation, doubting its existence in terms of reality.				
6. NOT CRITICAL	<u>Unclear</u> questions, misconceptions, not answer the research prompt, etc.				

Fifth version of the rubric (June 2022)

A) The media literacy core concept

The dimension of the question refers to the area of knowledge covered by the question asked by the student. Whether the question addresses aspects of production (who is the author of the media text?) or reception (what is the effect on the viewer or listener?), or how the text was produced (language, semiotics...).



B) The multidimensionality of the question

Multidimensionality refers to the number of dimensions covered by the question asked by the student. This is also measured in terms of clusters, i.e. by taking all the questions asked by a student into consideration, in order to calculate the diversity of the dimensions of the questions asked per student (and per class).

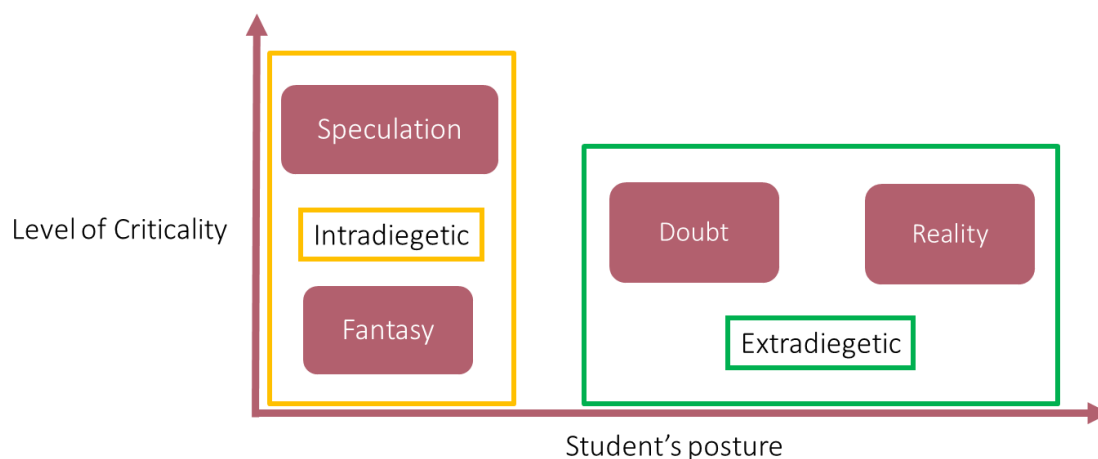
C) The “weight” of the issue raised by the question

The issue refers to the **implications** of the diegetic prototype (or the media text) on the individual, a group, or the society. These implications may be of **various** kinds: cultural, economic, social, political or ethical. The issue is linked to the **dominant** positions, to the **power** relationships between the different actors, and concerns the **benefits** and the **limits** of the digital.

Some students do not consider issues in their questions, and these questions therefore have a zero level of criticality in this criterion.	<i>What is the name of this video?</i> <i>How do the technologies work?</i>
Some questions are low level . It is unclear whether the impact will be positive or negative. There are general question.	<i>How could we get everyone to accept this technology?</i> <i>Would prices be affordable?</i>
Other questions have a higher level . The issue is clearly identified: the people affected, the advantages and/or disadvantages caused by the prototype (or the text).	<i>How does this technology benefit us?</i> <i>Could the technology be misused?</i> <i>Wouldn't it create more problems (privacy, maintenance, construction) than it solves?</i>

D) The degree of realism of the prototype

Realism refers to the nature of the prototype and its representation, when the student doubts or, on the contrary, does not doubt that it exists in terms of reality. When the students are unable to ask themselves the question of realism, we will say that they are in a state of fantasy, or in a fictionalizing activity (Langlade, 2008): they are engaged in the game of fiction, or even of design fiction.

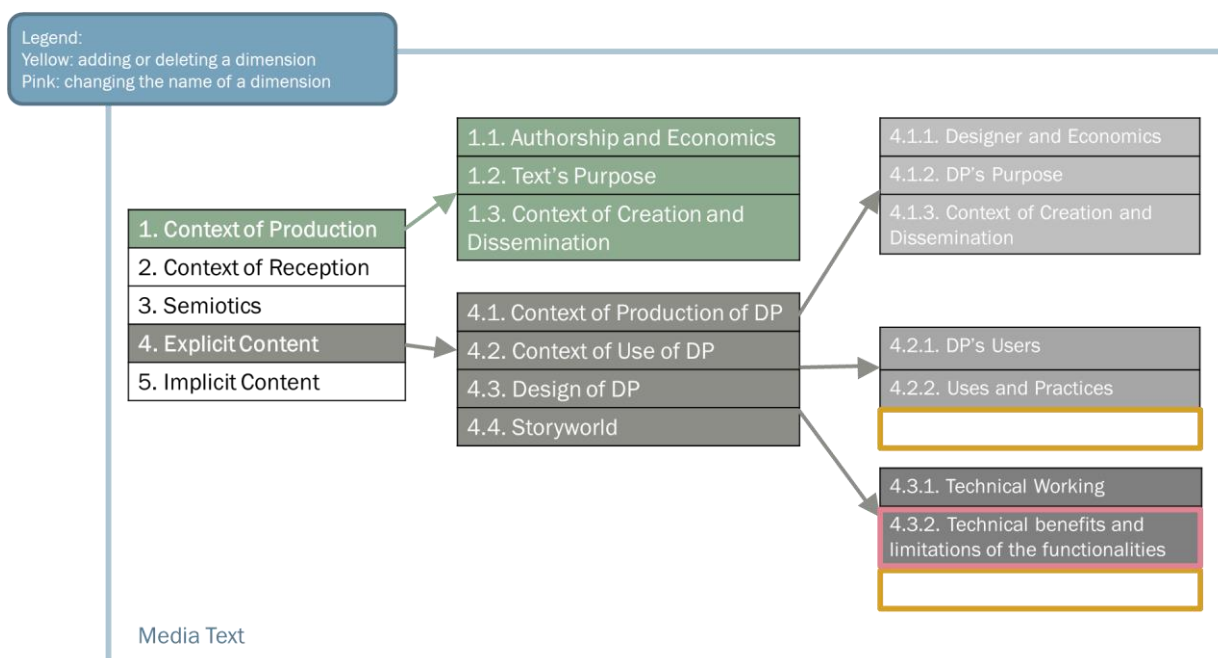


Examples of questions:

FANTASY (intradiegetic) The student does not question the fiction and fully embraces it.	<i>When does it [Microsoft] plan to release this project?</i> <i>Are glasses harmful to the brain?</i>
SPECULATION (intradiegetic) The student plays the game of design fiction and formulates questions that extend the reflection on the technologies represented in the video.	<i>Will wars not be able to put people's lives (even) more at risk thanks to new technologies?</i> <i>Is it a danger that we will no longer be able to control what cars do?</i> <i>What would happen if, in a world where technology is so ubiquitous, everything went wrong?</i>
DOUBT (extradiegetic) The question concerns the nature of the prototype or its representation in the video.	<i>Is the technology well represented or real?</i> <i>Is all this really possible?</i>
REALITY (extradiegetic) The student has understood that it is a fiction and asks a question about the media text.	<i>Who made this video?</i> <i>Who is putting these objects on stage?</i>

Sixth version of the rubric (September 2022)

A) The Dimension



B) The issue

The issue refers to the **implications** of the diegetic prototype or media text for the individual, a group or society.

- ➔ Concerning the diegetic prototype, the issue may be purely technical (low level) or consider the societal consequences that the implementation of the prototype could generate (high level). In the latter case, the implications may be of various kinds: cultural, economic, social, political or ethical.
- ➔ For media texts, the issues may be of a semiotic nature (low level) or ethical (high level).

The levels of the issue

It is the combination of the issue criterion with the other dimensions that highlights different levels of criticality.

Level zero: explicit content and no issue (n=102)

- [TT] 10. When will there be this type of technology?
[ST] 10. *Quand y aura-t-il ce type de technologie ?*
- [TT] 12. Is this technology necessary?
[ST] 12. *Est-ce que cette technologie est nécessaire ?*
- [TT] 23. How do the technologies work?
[ST] 23. *Comment fonctionnent les technologies ?*

Low level: explicit content + issue (n=42)

- [TT] 74. Will it be easier to arrest brigands?
[ST] 74. *Sera-t-il plus facile d'arrêter des brigands ?*
- [TT] 120. Will it be easier to identify us?
[ST] 120. *Est-ce qu'on pourra nous identifier si facilement ?*
- [TT] 169. How do they make each advertisement unique?
[ST] 169. *Comment font-ils pour que chaque publicité soit propre à chacun ?*

Low level: explicit content + implicit content + no issue (n=14)

- [TT] 17. Wouldn't it be simpler if the technologies looked less complicated?
[ST] 17. *Ne serait-ce pas plus simple si les technologies avaient l'air moins compliquées ?*
- [TT] 22. Is there a danger that we will no longer be able to control what cars do?
[ST] 22. *Est-ce un danger que nous ne contrôlions plus ce que les voitures font ?*
- [TT] 223. Is it common for equipment to be defective?
[ST] 223. *Est-il fréquent que les appareils soient défectueux ?*
- [TT] 2. Could human beings still be autonomous, even with so much assistance?
[ST] 2. *L'être humain pourrait-il encore être autonome, même avec autant d'assistance ?*

High level: explicit content + implicit content + issue (n=93)

- [TT] 40. Will the price of these technologies have an impact on our purchasing power and the current economy?
[ST] 40. *Le prix de ces technologies aura-t-il un impact sur notre pouvoir d'achat et l'économie actuelle ?*
- [TT] 144. Is it good for children to use a screen at such an early age?
[ST] 144. *Est-ce bon pour les enfants d'utiliser un écran aussi jeune ?*

High level: implicit content + issue (n=36)

- [TT] 15. Will technology lead us to lose sight of the essentials?
[ST] 15. *Ne perdrons-nous pas l'essentiel de vue avec des technologies ?*
- [TT] 69. Won't technology lead to more pollution?
[ST] 69. *La technologie n'entraînera-telle pas plus de pollution ?*
- [TT] 105. What will happen to the craftspeople?
[ST] 105. *Comment vont devenir les artisans ?*

Different types of issues

Coding has highlighted different types of issues.

- 1) *Societal issues*: those I have defined in my rubric and which I measure by their presence or absence.
- 2) *Semiotics issues*: I have not defined them in my rubric, but I code them in the same way.
- 3) *Technical issues*: they refer to the technological implications (sub-dimension of the design of the explicit content).

- a. I can probably delete this dimension and categorise these questions as “undesirable effects”. (*)
 - b. But then I have to indicate that the question has an issue and that it is of a technical nature. At the moment, questions are not necessarily classified in this category.
- (*) It's not entirely possible to do this because there are questions about the positive effects of technologies that I have classified in this sub-dimension: 228 and 275. Issues in terms of improving everyday life and well-being.
- 4) *Ethical issues*: question 321 highlights ethical issues, namely those of disseminating such a media text.

C) The perspective

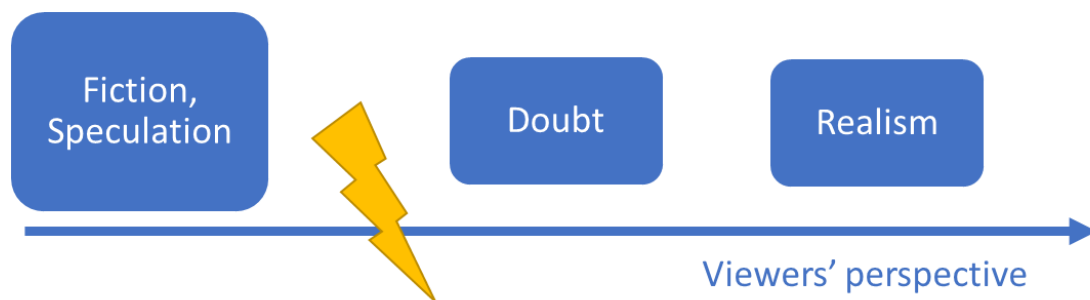
The perspective: refers to the point of view from which the student experiences the events of the story (fiction attitude vs. reality).

Realism: the viewer is in the reality, the real world, and observes the events from this point of view.

Fiction: the viewer enters the fiction and accepts to play the game.

Doubt: the viewer doubts what he/she is observing, he/she is in a posture of hesitation or uncertainty.

Speculation: the viewer is fully immersed in the fictional experience and entered into the game of design fiction. He or she asks questions that extend the reflection on what he or she is observing.



D) New version for the rubric

Is the question more or less critical?	
Not critical (0)	One Media Literacy Concept (except the implicit content) - No societal issue
Low order (1)	One Media Literacy Concept (except the implicit content) + Societal issue
Low order (2)	Two Media Literacy Concepts – No societal issue
High order (3)	Two Media Literacy Concepts + Societal issue
High order (4)	Implicit Content + Societal issue

Appendix V: Pearson Chi-Square Pretest

Dimensions

Presence of Pretest Questions about Context of Media Text Production * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of Pretest Questions about Context of Media Text Production	Absence	19	21	40
	Presence	4	2	6
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	,767 ^a	1	,381		
Continuity Correction ^b	,192	1	,662		
Likelihood Ratio	,780	1	,377		
Fisher's Exact Test				,665	,333
Linear-by-Linear Association	,750	1	,386		
N of Valid Cases	46				

a. 2 cells (50,0%) have expected count less than 5. The minimum expected count is 3,00.

b. Computed only for a 2x2 table

Presence of Pretest Questions about Authorships and Economics of the Media Text * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of Pretest Questions about Authorships and Economics of the Media Text	Absence	22	22	44
	Presence	1	1	2
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	,000 ^a	1	1,000		
Continuity Correction ^b	,000	1	1,000		
Likelihood Ratio	,000	1	1,000		
Fisher's Exact Test				1,000	,756
Linear-by-Linear Association	,000	1	1,000		
N of Valid Cases	46				

a. 2 cells (50,0%) have expected count less than 5. The minimum expected count is 1,00.

b. Computed only for a 2x2 table

Presence of Pretest Questions about Media Text's Purpose * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of Pretest Questions about Media Text's Purpose	Absence	21	21	42
	Presence	2	2	4
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	,000 ^a	1	1,000		
Continuity Correction ^b	,000	1	1,000		
Likelihood Ratio	,000	1	1,000		
Fisher's Exact Test				1,000	,696
Linear-by-Linear Association	,000	1	1,000		
N of Valid Cases	46				

a. 2 cells (50,0%) have expected count less than 5. The minimum expected count is 2,00.

b. Computed only for a 2x2 table

Presence of Pretest Questions about Context of Creation and Dissemination of the Media Text * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of Pretest Questions about Context of Creation and Dissemination of the Media Text	Absence	21	23	44
	Presence	2	0	2
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2,091 ^a	1	,148		
Continuity Correction ^b	,523	1	,470		
Likelihood Ratio	2,864	1	,091		
Fisher's Exact Test				,489	,244
Linear-by-Linear Association	2,045	1	,153		
N of Valid Cases	46				

a. 2 cells (50,0%) have expected count less than 5. The minimum expected count is 1,00.

b. Computed only for a 2x2 table

Presence of Pretest Questions in the dimension "Others" of the Context of Media Text Production * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of Pretest Questions in the dimension "Others" of the Context of Media Text Production	Absence	23	22	45
	Presence	0	1	1
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1,022 ^a	1	,312		
Continuity Correction ^b	,000	1	1,000		
Likelihood Ratio	1,409	1	,235		
Fisher's Exact Test				1,000	,500
Linear-by-Linear Association	1,000	1	,317		
N of Valid Cases	46				

a. 2 cells (50,0%) have expected count less than 5. The minimum expected count is ,50.

b. Computed only for a 2x2 table

Presence of Pretest Questions about the Context of Media Text Reception * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of Pretest Questions about the Context of Media Text Reception	Absence	23	22	45
	Presence	0	1	1
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1,022 ^a	1	,312		
Continuity Correction ^b	,000	1	1,000		
Likelihood Ratio	1,409	1	,235		
Fisher's Exact Test				1,000	,500
Linear-by-Linear Association	1,000	1	,317		
N of Valid Cases	46				

a. 2 cells (50,0%) have expected count less than 5. The minimum expected count is ,50.

b. Computed only for a 2x2 table

Presence of Pretest Questions about Media Text Semiotics * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of Pretest Questions about Media Text Semiotics	Absence	22	21	43
	Presence	1	2	3
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	,357 ^a	1	,550		
Continuity Correction ^b	,000	1	1,000		
Likelihood Ratio	,363	1	,547		
Fisher's Exact Test				1,000	,500
Linear-by-Linear Association	,349	1	,555		
N of Valid Cases	46				

a. 2 cells (50,0%) have expected count less than 5. The minimum expected count is 1,50.

b. Computed only for a 2x2 table

Presence of Pretest Questions about Media Text Content * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of Pretest Questions about Media Text Content	Presence	23	23	46
Total		23	23	46

Chi-Square Tests	
	Value
Pearson Chi-Square	. ^a
N of Valid Cases	46

a. No statistics are computed because Presence of Pretest Questions about Media Text Content is a constant.

Presence of Pretest Questions about the Context of Production of the Diegetic Prototype * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of Pretest Questions about the Context of Production of the Diegetic Prototype	Absence	8	11	19
	Presence	15	12	27
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	,807 ^a	1	,369		
Continuity Correction ^b	,359	1	,549		
Likelihood Ratio	,810	1	,368		
Fisher's Exact Test				,550	,275
Linear-by-Linear Association	,789	1	,374		
N of Valid Cases	46				

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 9,50.

b. Computed only for a 2x2 table

Presence of Pretest Questions about the Designer of the Diegetic Prototype * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of Pretest Questions about the Designer of the Diegetic Prototype	Absence	20	23	43
	Presence	3	0	3
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3,209 ^a	1	,073		
Continuity Correction ^b	1,426	1	,232		
Likelihood Ratio	4,368	1	,037		
Fisher's Exact Test				,233	,117
Linear-by-Linear Association	3,140	1	,076		
N of Valid Cases	46				

a. 2 cells (50,0%) have expected count less than 5. The minimum expected count is 1,50.

b. Computed only for a 2x2 table

Presence of Pretest Questions about the Economics of the Diegetic Prototype * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of Pretest Questions about the Economics of the Diegetic Prototype	Absence	20	22	42
	Presence	3	1	4
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1,095 ^a	1	,295		
Continuity Correction ^b	,274	1	,601		
Likelihood Ratio	1,142	1	,285		
Fisher's Exact Test				,608	,304
Linear-by-Linear Association	1,071	1	,301		
N of Valid Cases	46				

a. 2 cells (50,0%) have expected count less than 5. The minimum expected count is 2,00.

b. Computed only for a 2x2 table

Presence of Pretest Questions about Purpose of the Diegetic Prototype * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of Pretest Questions about Purpose of the Diegetic Prototype	Absence	18	20	38
	Presence	5	3	8
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	,605 ^a	1	,437		
Continuity Correction ^b	,151	1	,697		
Likelihood Ratio	,611	1	,435		
Fisher's Exact Test				,699	,350
Linear-by-Linear Association	,592	1	,442		
N of Valid Cases	46				

a. 2 cells (50,0%) have expected count less than 5. The minimum expected count is 4,00.

b. Computed only for a 2x2 table

Presence of Pretest Questions about the context of Creation of the Diegetic Prototype
*** Group**

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of Pretest Questions about the context of Creation of the Diegetic Prototype	Absence	13	18	31
	Presence	10	5	15
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2,473 ^a	1	,116		
Continuity Correction ^b	1,583	1	,208		
Likelihood Ratio	2,509	1	,113		
Fisher's Exact Test				,208	,104
Linear-by-Linear Association	2,419	1	,120		
N of Valid Cases	46				

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 7,50.

b. Computed only for a 2x2 table

Presence of Pretest Questions about the context of Dissemination of the Diegetic Prototype * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of Pretest Questions about the context of Dissemination of the Diegetic Prototype	Absence	14	16	30
	Presence	9	7	16
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	,383 ^a	1	,536		
Continuity Correction ^b	,096	1	,757		
Likelihood Ratio	,384	1	,535		
Fisher's Exact Test				,758	,379
Linear-by-Linear Association	,375	1	,540		
N of Valid Cases	46				

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 8,00.

b. Computed only for a 2x2 table

Presence of Pretest Questions in the dimension "Others" of the Context of Production of the Diegetic Prototype * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of Pretest Questions in the dimension "Others" of the Context of Production of the Diegetic Prototype	Absence	23	23	46
Total		23	23	46

Chi-Square Tests	
	Value
Pearson Chi-Square	. ^a
N of Valid Cases	46

a. No statistics are computed because Presence of Pretest Questions in the dimension "Others" of the Context of Production of the Diegetic Prototype is a constant.

Presence of Pretest Questions about the Context of Use of the Diegetic Prototype * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of Pretest Questions about the Context of Use of the Diegetic Prototype	Absence	5	4	9
	Presence	18	19	37
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	,138 ^a	1	,710		
Continuity Correction ^b	,000	1	1,000		
Likelihood Ratio	,138	1	,710		
Fisher's Exact Test				1,000	,500
Linear-by-Linear Association	,135	1	,713		
N of Valid Cases	46				

a. 2 cells (50,0%) have expected count less than 5. The minimum expected count is 4,50.

b. Computed only for a 2x2 table

Presence of Pretest Questions about the Users of the Diegetic Prototype * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of Pretest Questions about the Users of the Diegetic Prototype	Absence	9	6	15
	Presence	14	17	31
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	,890 ^a	1	,345		
Continuity Correction ^b	,396	1	,529		
Likelihood Ratio	,895	1	,344		
Fisher's Exact Test				,530	,265
Linear-by-Linear Association	,871	1	,351		
N of Valid Cases	46				

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 7,50.

b. Computed only for a 2x2 table

Presence of Pretest Questions about the Uses and the Practices of the Diegetic Prototype * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of Pretest Questions about the Uses and the Practices of the Diegetic Prototype	Absence	8	11	19
	Presence	15	12	27
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	,807 ^a	1	,369		
Continuity Correction ^b	,359	1	,549		
Likelihood Ratio	,810	1	,368		
Fisher's Exact Test				,550	,275
Linear-by-Linear Association	,789	1	,374		
N of Valid Cases	46				

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 9,50.

b. Computed only for a 2x2 table

Presence of Pretest Questions in the dimension "Others" of the Context of Use of the Diegetic Prototype * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of Pretest Questions in the dimension "Others" of the Context of Use of the Diegetic Prototype	Absence	23	23	46
Total		23	23	46

Chi-Square Tests	
	Value
Pearson Chi-Square	. ^a
N of Valid Cases	46

a. No statistics are computed because Presence of Pretest Questions in the dimension "Others" of the Context of Use of the Diegetic Prototype is a constant.

Presence of Pretest Questions about the Design of the Diegetic Prototype * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of Pretest Questions about the Design of the Diegetic Prototype	Absence	10	5	15
	Presence	13	18	31
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2,473 ^a	1	,116		
Continuity Correction ^b	1,583	1	,208		
Likelihood Ratio	2,509	1	,113		
Fisher's Exact Test				,208	,104
Linear-by-Linear Association	2,419	1	,120		
N of Valid Cases	46				

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 7,50.

b. Computed only for a 2x2 table

Presence of Pretest Questions about the Technical Working of the Diegetic Prototype * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of Pretest Questions about the Technical Working of the Diegetic Prototype	Absence	10	6	16
	Presence	13	17	30
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1,533 ^a	1	,216		
Continuity Correction ^b	,862	1	,353		
Likelihood Ratio	1,546	1	,214		
Fisher's Exact Test				,353	,177
Linear-by-Linear Association	1,500	1	,221		
N of Valid Cases	46				

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 8,00.

b. Computed only for a 2x2 table

Presence of Pretest Questions in the dimension "Others" of the Design of the Diegetic Prototype * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of Pretest Questions in the dimension "Others" of the Design of the Diegetic Prototype	Absence	22	21	43
	Presence	1	2	3
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	,357 ^a	1	,550		
Continuity Correction ^b	,000	1	1,000		
Likelihood Ratio	,363	1	,547		
Fisher's Exact Test				1,000	,500
Linear-by-Linear Association	,349	1	,555		
N of Valid Cases	46				

a. 2 cells (50,0%) have expected count less than 5. The minimum expected count is 1,50.

b. Computed only for a 2x2 table

Presence of Pretest Questions about the Storyworld * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of Pretest Questions about the Storyworld	Absence	5	6	11
	Presence	18	17	35
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	,119 ^a	1	,730		
Continuity Correction ^b	,000	1	1,000		
Likelihood Ratio	,120	1	,729		
Fisher's Exact Test				1,000	,500
Linear-by-Linear Association	,117	1	,732		
N of Valid Cases	46				

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 5,50.

b. Computed only for a 2x2 table

Presence of Pretest Questions about the Self-Existence of the Diegetic Prototype * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of Pretest Questions about the Self-Existence of the Diegetic Prototype	Absence	14	17	31
	Presence	9	6	15
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	,890 ^a	1	,345		
Continuity Correction ^b	,396	1	,529		
Likelihood Ratio	,895	1	,344		
Fisher's Exact Test				,530	,265
Linear-by-Linear Association	,871	1	,351		
N of Valid Cases	46				

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 7,50.

b. Computed only for a 2x2 table

Presence of Pretest Questions in the dimension "Others" of the Media Text Content * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of Pretest Questions in the dimension "Others" of the Media Text Content	Absence	23	22	45
	Presence	0	1	1
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1,022 ^a	1	,312		
Continuity Correction ^b	,000	1	1,000		
Likelihood Ratio	1,409	1	,235		
Fisher's Exact Test				1,000	,500
Linear-by-Linear Association	1,000	1	,317		
N of Valid Cases	46				

a. 2 cells (50,0%) have expected count less than 5. The minimum expected count is ,50.

b. Computed only for a 2x2 table

Presence of Pretest Questions about Media Text Representations * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of Pretest Questions about Media Text Representations	Absence	23	22	45
	Presence	0	1	1
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1,022 ^a	1	,312		
Continuity Correction ^b	,000	1	1,000		
Likelihood Ratio	1,409	1	,235		
Fisher's Exact Test				1,000	,500
Linear-by-Linear Association	1,000	1	,317		
N of Valid Cases	46				

a. 2 cells (50,0%) have expected count less than 5. The minimum expected count is ,50.

b. Computed only for a 2x2 table

Presence of Pretest Questions in the dimension "Others" * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of Pretest Questions in the dimension "Others"	Absence	22	21	43
	Presence	1	2	3
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	,357 ^a	1	,550		
Continuity Correction ^b	,000	1	1,000		
Likelihood Ratio	,363	1	,547		
Fisher's Exact Test				1,000	,500
Linear-by-Linear Association	,349	1	,555		
N of Valid Cases	46				

a. 2 cells (50,0%) have expected count less than 5. The minimum expected count is 1,50.

b. Computed only for a 2x2 table

Diversity of Pretest Core Dimensions * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Diversity of Pretest Core Dimensions	One Dimension	18	18	36
	Two Dimensions	4	3	7
	Three Dimensions	1	1	2
	Four Dimensions	0	1	1
Total		23	23	46

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	1,143 ^a	3	,767
Likelihood Ratio	1,530	3	,675
Linear-by-Linear Association	,198	1	,656
N of Valid Cases	46		

a. 6 cells (75,0%) have expected count less than 5. The minimum expected count is ,50.

Diversity of Pretest Sub-dimensions Context of Production * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Diversity of Pretest Sub-dimensions Context of Production	None	19	21	40
	One Dimension	3	1	4
	Two Dimensions	1	0	1
	Three Dimensions	0	1	1
Total		23	23	46

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3,100 ^a	3	,376
Likelihood Ratio	3,919	3	,270
Linear-by-Linear Association	,064	1	,800
N of Valid Cases	46		

a. 6 cells (75,0%) have expected count less than 5. The minimum expected count is ,50.

Diversity of Pretest Sub-dimensions Content * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Diversity of Pretest Sub-dimensions Content	One Dimension	2	3	5
	Two Dimensions	6	3	9
	Three Dimensions	5	9	14
	Four Dimensions	6	3	9
	Five Dimensions	4	5	9
Total		23	23	46

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3,454 ^a	4	,485
Likelihood Ratio	3,510	4	,476
Linear-by-Linear Association	,000	1	1,000
N of Valid Cases	46		

a. 8 cells (80,0%) have expected count less than 5. The minimum expected count is 2,50.

Attitudes

Presence of Pretest Questions asked in a Documentary Attitude * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of Pretest Questions asked in a Documentary Attitude	Absence	19	19	38
	Presence	4	4	8
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	,000 ^a	1	1,000		
Continuity Correction ^b	,000	1	1,000		
Likelihood Ratio	,000	1	1,000		
Fisher's Exact Test				1,000	,650
Linear-by-Linear Association	,000	1	1,000		
N of Valid Cases	46				

a. 2 cells (50,0%) have expected count less than 5. The minimum expected count is 4,00.

b. Computed only for a 2x2 table

Presence of Pretest Questions asked in a Fiction Attitude * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
PRE_attitude_fiction	Absence	1	1	2
	Presence	22	22	44
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	,000 ^a	1	1,000		
Continuity Correction ^b	,000	1	1,000		
Likelihood Ratio	,000	1	1,000		
Fisher's Exact Test				1,000	,756
Linear-by-Linear Association	,000	1	1,000		
N of Valid Cases	46				

a. 2 cells (50,0%) have expected count less than 5. The minimum expected count is 1,00.

b. Computed only for a 2x2 table

**Presence of Pretest Questions asked in a Speculation & Doubt Attitude * Group
Crosstabulation**

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
PRE_attitude_specdoute	Absence	6	13	19
	Presence	17	10	27
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4,394 ^a	1	,036		
Continuity Correction ^b	3,228	1	,072		
Likelihood Ratio	4,476	1	,034		
Fisher's Exact Test				,071	,036
Linear-by-Linear Association	4,298	1	,038		
N of Valid Cases	46				

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 9,50.

b. Computed only for a 2x2 table

Issue

Presence of Pretest Questions that do NOT raise an issue * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of Pretest Questions that do NOT raise an issue	Absence	4	3	7
	Presence	19	20	39
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	,168 ^a	1	,681		
Continuity Correction ^b	,000	1	1,000		
Likelihood Ratio	,169	1	,681		
Fisher's Exact Test				1,000	,500
Linear-by-Linear Association	,165	1	,685		
N of Valid Cases	46				

a. 2 cells (50,0%) have expected count less than 5. The minimum expected count is 3,50.

b. Computed only for a 2x2 table

Presence of Pretest Questions that raise an issue in the video * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
PRE_issue_video	Absence	5	6	11
	Presence	18	17	35
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	,119 ^a	1	,730		
Continuity Correction ^b	,000	1	1,000		
Likelihood Ratio	,120	1	,729		
Fisher's Exact Test				1,000	,500
Linear-by-Linear Association	,117	1	,732		
N of Valid Cases	46				

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 5,50.

b. Computed only for a 2x2 table

Presence of Pretest Questions that raise a NEW issue * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of Pretest Questions that raise a NEW issue	Absence	5	5	10
	Presence	18	18	36
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	,000 ^a	1	1,000		
Continuity Correction ^b	,000	1	1,000		
Likelihood Ratio	,000	1	1,000		
Fisher's Exact Test				1,000	,639
Linear-by-Linear Association	,000	1	1,000		
N of Valid Cases	46				

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 5,00.

b. Computed only for a 2x2 table

Maximum Level of the Issue in the Pretest * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Maximum Level of the Issue in the Pretest	No Issue	1	1	2
	Issue represented in the video With an answer	3	2	5
	Issue represented in the video Without an answer	1	2	3
	New issue	18	18	36
Total		23	23	46

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	,533 ^a	3	,912
Likelihood Ratio	,541	3	,910
Linear-by-Linear Association	,030	1	,864
N of Valid Cases	46		

a. 6 cells (75,0%) have expected count less than 5. The minimum expected count is 1,00.

Criticality

Presence of pretest media text related questions with criticality level 0 * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of pretest media text related questions with criticality level 0	0	23	23	46
Total		23	23	46

Chi-Square Tests	
	Value
Pearson Chi-Square	. ^a
N of Valid Cases	46

a. No statistics are computed because Presence of pretest media text related questions with criticality level 0 is a constant.

Presence of pretest media text related questions with criticality level 1 * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of pretest media text related questions with criticality level 1	0	21	20	41
	1	2	3	5
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	,224 ^a	1	,636		
Continuity Correction ^b	,000	1	1,000		
Likelihood Ratio	,226	1	,635		
Fisher's Exact Test				1,000	,500
Linear-by-Linear Association	,220	1	,639		
N of Valid Cases	46				

a. 2 cells (50,0%) have expected count less than 5. The minimum expected count is 2,50.

b. Computed only for a 2x2 table

Presence of pretest media text related questions with criticality level 2 * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of pretest media text related questions with criticality level 2	0	22	22	44
	1	1	1	2
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	,000 ^a	1	1,000		
Continuity Correction ^b	,000	1	1,000		
Likelihood Ratio	,000	1	1,000		
Fisher's Exact Test				1,000	,756
Linear-by-Linear Association	,000	1	1,000		
N of Valid Cases	46				

a. 2 cells (50,0%) have expected count less than 5. The minimum expected count is 1,00.

b. Computed only for a 2x2 table

Presence of pretest media text related questions with criticality level 3 * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of pretest media text related questions with criticality level 3	0	22	22	44
	1	1	1	2
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	,000 ^a	1	1,000		
Continuity Correction ^b	,000	1	1,000		
Likelihood Ratio	,000	1	1,000		
Fisher's Exact Test				1,000	,756
Linear-by-Linear Association	,000	1	1,000		
N of Valid Cases	46				

a. 2 cells (50,0%) have expected count less than 5. The minimum expected count is 1,00.

b. Computed only for a 2x2 table

Presence of pretest media content related questions with criticality level 0 * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of pretest media content related questions with criticality level 0	0	6	4	10
	1	17	19	36
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	,511 ^a	1	,475		
Continuity Correction ^b	,128	1	,721		
Likelihood Ratio	,514	1	,473		
Fisher's Exact Test				,722	,361
Linear-by-Linear Association	,500	1	,480		
N of Valid Cases	46				

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 5,00.

b. Computed only for a 2x2 table

Presence of pretest media content related questions with criticality level 1 * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of pretest media content related questions with criticality level 1	0	16	21	37
	1	7	2	9
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3,453 ^a	1	,063		
Continuity Correction ^b	2,210	1	,137		
Likelihood Ratio	3,620	1	,057		
Fisher's Exact Test				,135	,067
Linear-by-Linear Association	3,378	1	,066		
N of Valid Cases	46				

a. 2 cells (50,0%) have expected count less than 5. The minimum expected count is 4,50.

b. Computed only for a 2x2 table

Presence of pretest media content related questions with criticality level 2 * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of pretest media content related questions with criticality level 2	0	14	19	33
	1	9	4	13
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2,681 ^a	1	,102		
Continuity Correction ^b	1,716	1	,190		
Likelihood Ratio	2,734	1	,098		
Fisher's Exact Test				,189	,095
Linear-by-Linear Association	2,622	1	,105		
N of Valid Cases	46				

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 6,50.

b. Computed only for a 2x2 table

Presence of pretest media content related questions with criticality level 3 * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of pretest media content related questions with criticality level 3	0	8	8	16
	1	15	15	30
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	,000 ^a	1	1,000		
Continuity Correction ^b	,000	1	1,000		
Likelihood Ratio	,000	1	1,000		
Fisher's Exact Test				1,000	,621
Linear-by-Linear Association	,000	1	1,000		
N of Valid Cases	46				

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 8,00.

b. Computed only for a 2x2 table

Presence of pretest media content related questions with criticality level 4 * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of pretest media content related questions with criticality level 4	0	17	18	35
	1	6	5	11
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	,119 ^a	1	,730		
Continuity Correction ^b	,000	1	1,000		
Likelihood Ratio	,120	1	,729		
Fisher's Exact Test				1,000	,500
Linear-by-Linear Association	,117	1	,732		
N of Valid Cases	46				

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 5,50.

b. Computed only for a 2x2 table

Presence of pretest media content related questions with criticality level 5 * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of pretest media content related questions with criticality level 5	0	8	7	15
	1	15	16	31
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	,099 ^a	1	,753		
Continuity Correction ^b	,000	1	1,000		
Likelihood Ratio	,099	1	,753		
Fisher's Exact Test				1,000	,500
Linear-by-Linear Association	,097	1	,756		
N of Valid Cases	46				

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 7,50.

b. Computed only for a 2x2 table

Presence of pretest media content related questions with criticality level 6 * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Presence of pretest media content related questions with criticality level 6	0	14	16	30
	1	9	7	16
Total		23	23	46

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	,383 ^a	1	,536		
Continuity Correction ^b	,096	1	,757		
Likelihood Ratio	,384	1	,535		
Fisher's Exact Test				,758	,379
Linear-by-Linear Association	,375	1	,540		
N of Valid Cases	46				

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 8,00.

b. Computed only for a 2x2 table

Max level of criticality for pretest media text related questions * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Max level of criticality for pretest media text related questions	0	19	19	38
	1	2	2	4
	2	1	1	2
	3	1	1	2
Total		23	23	46

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	,000 ^a	3	1,000
Likelihood Ratio	,000	3	1,000
Linear-by-Linear Association	,000	1	1,000
N of Valid Cases	46		

a. 6 cells (75,0%) have expected count less than 5. The minimum expected count is 1,00.

Max level of criticality for pretest media content related questions * Group

Crosstab				
Count				
		Group		Total
		Control group	Treatment group	
Max level of criticality for pretest media content related questions	0	0	2	2
	2	1	0	1
	3	3	3	6
	4	1	1	2
	5	9	10	19
	6	9	7	16
Total		23	23	46

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3,303 ^a	5	,653
Likelihood Ratio	4,462	5	,485
Linear-by-Linear Association	,806	1	,369
N of Valid Cases	46		

a. 8 cells (66,7%) have expected count less than 5. The minimum expected count is ,50.

