

Transition from high school to university: a person-centered approach to academic achievement

Mikaël De Clercq¹ · Benoît Galand² · Mariane Frenay²

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Abstract Although a vast body of studies regarding the variables related to students' achievement exists, only a handful has investigated how these variables combine and interact together. Such an investigation might make it possible to more accurately illustrate the heterogeneity of students enrolling in university and assess the impact of this diversity on academic achievement. The current study focused on the person-centered approach and investigated the possibility of determining significant subgroups of freshmen in the very first week of the academic year in the Belgian educational context. Using k-mean clustering, 2178 freshmen were classified according to their past performance, socioeconomic status, study choice process, and academic self-efficacy beliefs at the beginning of the first year at university. Analyses of variance were also conducted to analyze the relationship between these student clusters and academic achievement outcomes. Six distinct profiles of students were identified representing different combinations of achievement predictors. Results revealed different odds of success among these profiles. The implications of our approach to the understanding of the heterogeneity of freshmen and the first-year achievement process are discussed.

Keywords Higher education · Academic achievement · College student · Entrance patterns · Self-efficacy

✉ Mikaël De Clercq
mikael.declercq@uclouvain.be; <http://www.uclouvain.be/mikael.declercq>

Benoît Galand
benoit.galand@uclouvain.be; <http://www.uclouvain.be/benoit.galand>

Mariane Frenay
mariane.frenay@uclouvain.be; <http://www.uclouvain.be/mariane.frenay>

¹ Research Institute of Psychological Sciences, Faculty of Psychology and Education, Université Catholique de Louvain, 10 Place Cardinal Mercier, 1348 Louvain-La-Neuve, Belgium

² Department of Psychology, Université Catholique de Louvain, 10 Place Cardinal Mercier, 1348 Louvain-La-Neuve, Belgium

Introduction

The freshman year is a challenging transition accompanied by major changes in students' educational environment such as unfamiliar academic tasks, new social networks, and heightened academic competition (Perry et al. 2001). In Belgium, 35 % of freshmen fail the freshman year and 25 % leave higher education (Droesbeke et al. 2008). The same pattern of results is reported across Europe, disclosing the global issue of success rates among first-year students at university (OECD 2013). Considering educational policies' imperatives of expanding the diversity and number of students enrolling and succeeding at university, academic achievement can be conceived as an on-going current concern (Gale and Parker 2012). An in-depth understanding of achievement is thus needed to cope with the increased numbers of freshmen from diverse backgrounds entering universities.

Over the years, many approaches to student achievement during the first year at university have been proposed in the literature (Pekrun et al. 2002; Robbins et al. 2006). To date, a large number of diverse variables, e.g., student's socioeconomic status (Arulampalam et al. 2004), attendance (Dollinger et al. 2008), study skills (Fenollar et al. 2007), self-regulated learning (Minnaert and Janssen 1999), self-efficacy beliefs (Phan 2009), and social support (Fass and Tubman 2002), have been depicted as having a direct impact on achievement. These findings lend credence to a conception of academic achievement as a complex multifactorial process. However, most of the studies have investigated the impact of these factors independently without taking their interrelationships into account. Recent surveys have shed light on the inadequacy of such single-factor analyses for understanding the complex process of academic achievement (Allen et al. 2010; Busato et al. 2000; De Clercq et al. 2013; Eccles and Wigfield 2002; Pintrich 2003). These surveys have pointed out a gap in the current literature which consists in testing the impact of a variable on academic achievement without considering that this impact resides within students' global functioning. According to these authors, a student's achievement is contingent on the way that individual characteristics combine. It can therefore be assumed that the impact of a variable on achievement will vary depending on how it combines with a student's other characteristics. This study therefore aimed at screening the possibility of developing an inclusive approach to freshman achievement that might deal with the interplay between some important achievement factors.

In such cases, a person-centered approach such as cluster analysis can provide a more detailed examination than a variable-centered approach (Dumais 2005; Phinney et al. 2005; Vansteenkiste et al. 2009; Hayenga and Corpus (2010, p. 372); "a person-centered approach focuses on particular combinations of variables as they exist within individuals rather than taking each variable itself as the focal point." The basic assumption of this framework is that human behavior is the result of dynamic interplay between several variables and can be accurately understood by investigating these complex patterns of factors (Bergman et al. 2003; Magnusson 1999). This framework also postulates that it is possible to identify distinct typical subgroups with specific patterns in the population (Roeser and Peck 2003).

Several authors have justified such assumptions in the context of higher education (Fenollar et al. 2007; Heikkilä et al. 2011, emphasizing the heterogeneity of students enrolling in the first year at university and underlining the challenge for educational literature to reflect this diversity in a more comprehensive way. Numerous higher education theories have also postulated that students bring to university a set of important characteristics that could constitute the shaping of forces and weaknesses to adapt to the new academic context (for a review, see Pascarella and Terenzini 2005). For example, Tinto's theory of student departure

(Tinto 1982, 1997) emphasized the impact of pre-entry attributes (e.g., parents' education, student's aspirations...) on students' persistence process. Astin's theory of involvement (Astin 1999) highlighted that inputs (family background, academic and social pre-college experience...) could intervene in the development of a student's involvement in the college experience. Pascarella's model of change hypothesized that a student's background characteristics and pre-college traits could have a direct impact on his/her environment perceptions and effort (Pascarella and Terenzini 2005). Weidman's model of undergraduate socialization postulated that students' socialization could differ depending on entrance socioeconomic status, past performance, aspiration, and motivation (Padgett et al. 2010). Finally, Price's 4P model of learning shed light on the impact of "presage" variables (initial motivation, ability...) on how students perceive learning contexts and initiate approaches to learning (Price 2013).

Based on the work of these authors and their theories, our study focused on cluster analysis and investigated the possibility of determining significant subgroups of freshmen in the very first week of the academic year in the Belgian tertiary educational system. This procedure was based on the assumption that each student enters university with a specific and complex profile which entails specific adaptation to the academic world. This perspective has been overlooked in the current literature where distinctions between entrance characteristics and process variables are often blurred (Pascarella and Terenzini 2005). The theories mentioned above have insisted on the utility of such a distinction for understanding the differences between freshmen relative to their responses to the same academic settings and experiences. Authors have also stressed the necessity of promoting achievement as soon as possible, because the first months are crucial to adaptation to the academic world (Neuville et al. 2013; Sauvé et al. 2007).

Following this line of thought, a more systematic conception of these profiles was endorsed by focusing on four factors in particular (past performance, socioeconomic status, self-efficacy beliefs, and study choice) documented as important achievement predictors and identified as particularly relevant for an "open access"¹ system. The four selected factors also meet several entrance categories endorsed by the above-mentioned theories. Recent studies have argued that both background and psychosocial factors need to be collected in order to offer a more comprehensive approach to students' entrance characteristics (Dollinger et al. 2008; Allen et al. 2010; Richardson et al. 2012).

Past performance

International findings claim that past academic performances—represented by high school grade point average or a standardized achievement test score—are the most powerful predictors of achievement at university level (Díaz et al. 2001; Hackett et al. 1992; Perry et al. 2001; Vandamme et al. 2005). Much energy has been devoted to examining past performance, and research and theories attempting to accurately grasp the impact of this performance on academic achievement have emerged in educational literature (Richardson et al. 2012). Dollinger et al. (2008) concluded that past performance and abilities could explain about 37 % of the academic achievement of college students. Allen et al. (2008) found that high school grades typically explained about 28 % of freshmen's grade point average. This factor is

¹ The Belgian tertiary educational system is qualified as an "open access" system because there is no standardized testing of students or admission criteria and the successful completion of comprehensive secondary school allows any student to enter any university program without passing an entrance test (except in engineering).

of utmost importance in open access systems which have no standardized testing of students (De Clercq et al. 2013).

Several studies have concluded that the impact of past academic performance on freshmen's academic achievement reflects the academic preparation of students for the academic world (Allen et al. 2008; Robbins et al. 2006). Past achievement allows easier adaptation to the new complex environment (Díaz et al. 2001) and promotes the establishment of a stable belief in one's ability to succeed (Elias and MacDonald 2007). Other authors have highlighted that past performance is an indicator of students' cognitive abilities (Willingham et al. 2002). Past performance is therefore considered by each aforementioned theory as an important entrance characteristic. It is, for instance, included in *pre-entry attributes* of Tinto's theory of departure and in *pre-college traits* of Pascarella's model of change.

Socioeconomic status

Socioeconomic status (SES)—reflected by the social, cultural, and economic resources available to students (e.g., parents' education and income)—has also been widely studied. Many studies found that students from lower socioeconomic backgrounds had lower achievement (Battle and Pastrana 2007; Caldas and Bankston 1997; Robbins et al. 2004). A meta-analysis by Sirin (2005a, b) reviewed the literature on academic achievement from 1990 to 2000 and highlighted a moderate-to-strong relationship between SES and academic achievement.

Three main explanations for this have emerged from the literature. According to Willingham et al. (2002, p.18), “the social advantages implied by higher SES...would presumably act over a lifetime on the development of general cognitive skill in and out of school.” Other authors have claimed that the impact of SES on academic achievement could reflect a school effect (Sackett et al. 2009; Zwick and Green 2007). Freshmen from underprivileged backgrounds have to cope with limited school resources and have no access to an adequate education. They are therefore ill-prepared to undertake academic studies. Finally, sociological theories have argued that the impact of SES on academic achievement may indicate that educational institutions reproduce the social order through sorting mechanisms. These authors suggest that underprivileged students have few opportunities to build social and cultural capital and are therefore ill prepared to adapt to the academic world (Linnehan et al. 2011; Mills 2008). Other authors have highlighted that students from underprivileged backgrounds often have lower confidence in their abilities to succeed (Phinney et al. 2005) and underachieve in high school (Zwick and Green 2007). Like past performance, SES is an integral part of background variables depicted in the above theories. It can be related to *family background* in Astin's model of involvement and to *parents' education* in Tinto's theory of departure.

Self-efficacy beliefs

Another line of research on psychosocial factors argues that academic self-efficacy beliefs are of the utmost importance for student achievement in higher education. This concept was originally developed by Bandura (1997) in the social cognitive theory. Several authors claim that confidence in one's abilities and chances of success is strongly correlated to performance and fosters many other variables such as mastery goal orientation, intrinsic motivation, self-regulated learning, effort ratings, emotional competences, social integration, intention to persist, and deep-processing study strategies (Adeyemo 2007; Bong and Skaalvik 2003;

Fenollar et al. 2007; Torres and Solberg 2001). Elias and Macdonald (2007) highlighted that academic self-efficacy accounted for about 22 % of variance in college achievement and went beyond the variance accounted for by past performance. These results were corroborated by Chemers et al. (2001) who undertook a study on first-year university students and found both a direct and indirect powerful predictive effect of academic self-efficacy beliefs on academic achievement, above and beyond the impact of past academic performance.

According to several authors, self-efficacy is paramount because it favors a positive motivational, cognitive, affective and behavioral process that good adaptation to academic requirements entails (Brown et al. 2008; Elias and MacDonald 2007; Kennett et al. 2009; Pintrich 2003; Robbins et al. 2004; Zimmerman 2000). However, as mentioned by Zimmerman (2000), self-efficacy beliefs are not an omnibus trait but rather a multidimensional construct differing on the basis of the domain of functioning. Therefore, global self-efficacy beliefs may be less predictive in explaining differences in academic achievement than domain-specific self-efficacy beliefs. From a theoretical point of view, academic self-efficacy beliefs are not traditionally included as entrance characteristics even though they could be related to pre-college experience in Astin's theory of involvement. However, considering the major impact of this variable on the achievement process, the variable was embedded in the analyses.

Study choice

Finally, in certain countries such as Belgium or the Netherlands where access to university is much more open, the study choice process seems to play a key role in achievement. In such a context, this process is often initiated much later than in more restrictive systems. It is therefore essential to analyze the impact of the study choice process on achievement among first-year students at university. Informed choice can be defined as the complexity of a student's study choice process (Biémar et al. 2003). Several research studies and theories such as the future time perspective theory (Husman and Lens 1999) and educational choice implementation (Germeijs and Verschueren 2007) have highlighted the importance of the information process. Findings led to the conclusion that students who make an informed and thoughtful study choice attain higher academic achievement, are more satisfied with their courses, apply more adaptive study strategies, and are more confident in their ability to succeed (Biémar et al. 2003; Husman and Lens 1999; Lens et al. 2002). However, this field of research remains underdeveloped in the higher education context and needs further investigation to support these initial findings. The notion of study choice is quite close to the *aspiration* highlighted in the models developed by Tinto, Pascarella, and Weidman. These models justified the consideration of aspiration as a significant entrance characteristic.

Research questions addressed

The studies reviewed above have highlighted important predictors of academic success. However, although they have revealed some insights into the relationship between these predictors, none of them has investigated their complex combinations within students and the way these relate to academic achievement. As mentioned above, the present study was aimed at developing a person-oriented conception of entrance factors that affect students' achievement during their first year of university in the Belgian educational system. Consequently, the outline of our study was determined by considering the limitations of extant literature and addressing the following two research questions:

RQ1. Can meaningful subgroups of freshmen with specific combinations of entrance variables be identified?

RQ2. Do these subgroups differ regarding achievement?

We might hypothesize that several complex profiles could emerge from the broad panel of students entering the university, each profile related to specific odds of success. Several hypotheses could be drawn on the manner in which factors might combine in pattern-centered analyses.

First, according to the empirical studies highlighting that SES, past performance, self-efficacy beliefs, and informed choice are connected (Husman and Lens 1999; Phinney et al. 2005; Zwick and Green 2007), we could adopt a global perspective and postulate that these variables will evolve together. As a result, one factor's score will have an impact on the scores of the other factors. Three subgroups might therefore be expected, respectively characterized by low, average, and high scores on the four factors. A subgroup with low scores on all the factors is expected to be the least successful. Conversely, a subgroup with high scores is assumed to be the most successful.

Second, we could move toward a specific point of view. Four subgroups of students respectively characterized by a specific weakness in one of the four factors under investigation are expected. These four subgroups could allow us to consider the impact of each entrance weaknesses when it is offset by other forces. According to the core impact of these factors in extant literature (Allen et al. 2008; Elias and Macdonald 2007), it is expected that a subgroup with particularly low past-performance or academic self-efficacy beliefs will demonstrate significantly lower performance than the two other subgroups. We postulated that these two weaknesses would scarcely be compensated by other entrance forces.

Method

Sample and procedure

Two thousand one hundred seventy-eight first-year university students from 29 different study programs (psychology, law, economics, medicine, physical education, chemistry, computer science, engineering...) in a Belgian university participated in a survey on a voluntary basis (48.5 % of the population of first-year students with a mean age of 18.3 years). Of the study participants, 52.9 % were women. The questionnaire was administered during a lecture session at the beginning of the year, and the student grade point average was collected, with students' consent, at the end of the academic year. One thousand nine hundred thirty-three students consented to the collection of their grade point average. Independent *t* test analyses were performed to compare initial scores on entrance variables of students who gave their consent with those who did not. No significant difference was found, which strengthens the assumption that our sample is representative.

Measures

Socioeconomic status In order to develop an accurate measure of SES, multiple indicators were collected and combined in an overall SES measure. Three indicators of SES were gathered, namely parental education (mother's and father's highest educational level), home

possessions (i.e., number of cars, computers, art objects, musical instruments, literature books, poetry books, etc.), and the student's sociocultural activities (i.e., traveling abroad, going to the theater, visiting museums, skiing during the winter holidays, etc.; $\alpha = 0.67$). Recent studies have supported such a composite measure (Sackett et al. 2009; Sirin 2005a, b). Exploratory factor analysis revealed one single factor (eigenvalue higher than 1) explaining more than 40 % of the variance, with factor loadings ranging from 0.57 to 0.72. The factor score was extracted to create an overall SES indicator.

High school grade Participants were asked to report their overall average percentage in their final year of high school on a four-point scale (1, 60–70 %; 2, 70–80 %; 3, 80–90 %; 4, more than 90 %).

Academic self-efficacy beliefs Academic self-efficacy beliefs were assessed through seven items adapted from Galand (2004) (e.g., “As long as I do my work, I’m sure I can succeed this year”; $\alpha = 0.72$). Items were answered on a five-point scale from 1 = “totally disagree” to 5 = “totally agree.” Exploratory factor analysis revealed one single factor (eigenvalue higher than 1) explaining more than 50 % of the variance. Factor loadings ranged from 0.55 to 0.77.

Informed choice This variable was operationalized as the number of actions of information undertaken by students in their study choice process. Participants were invited to consider six actions of information (discussions with teachers, appointments with guidance counselors, meeting professionals of the field, spontaneously gathering information about one's possible education and future career, reflecting upon one's professional choice and job prospects, thinking about the different possible higher education programs after secondary education) and were then asked which ones they undertook in their choice-making process. The reliability coefficient for this scale was good ($\alpha = 0.74$).

Outcome variables *Continuous variables:* Academic achievement was represented by the average percentage scores in all courses at the end of the academic year. This measure was collected from department records and used as an overall indicator of achievement. To be successful in the tertiary education system of the Belgian-French community, an overall final percentage of 60 is required. *Categorical variable:* A second measure was created through categorical variables in order to provide another appraisal of academic achievement. Achievement scores were divided into four dimensions representing the four typical student outcomes at the end of the year. The first dimension, entitled “attrition,” depicted students who obtained between 0 and 30 % as their final percentage: these students were considered to have dropped out of the academic year. The second dimension, entitled “failure,” brought together students with a final percentage ranging from 30 to 60 %: these students actually committed to their academic year but did not succeed. The third dimension, entitled “success,” represented students with a final percentage ranging from 60 to 70 %: these students completed the academic year satisfactorily but did not gain honors. The final group was made up of students whose final percentage was over 70 % and was called the “honor roll.” Of students, 16.4 % were classified in the attrition group, 29.5 % in the failure group, 37.1 % in the success group, and 17 % in the honor roll group.

Analyses

In line with the assertions made by several authors (Daniels et al. 2008; Peck and Roeser 2003; Phinney et al. 2005; Valle et al. 2008), k-means cluster analyses were run with regard to entrance achievement factors in order to identify the most highly similar groups of students within groups and the most highly dissimilar students between groups. According to Daniels and colleagues (Daniels et al. 2008), such methods can enable an unbiased investigation of natural occurring patterns among college students and a better understanding of the combined effects of the variables of interest. Furthermore, Neuville and Bourgeois (2007) have argued that the k-means method is suitable for handling a large data set (>150 subjects) and can compensate for a low initial partition of data. However, it is important to understand that the selection and interpretation of clusters are essentially guided by researchers rather than by analytical results. Nonetheless, to carry out our selection, we considered the distribution of students in each cluster and the adjustment of the final cluster solution to the entrance factor variability using multivariate analysis of variance (MANOVA). Once the final cluster solution was set up, analyses of variance (ANOVA) and descriptive analyses were used to compare clusters in terms of grade point average. Finally, categorical measures of achievement were analyzed through cross-tabulation and chi-square tests.

Results

Preliminary analysis

Table 1 displays the zero-order correlations and summary statistics of each study's variables. The scores corresponding to skewness and kurtosis were found to be within the normal values. As expected, high school grade, SES, academic self-efficacy beliefs, and informed choice were positively correlated ($p < .001$) with academic achievement. Although correlations were smaller than expected, these results lend credence to the predictive value of these entrance variables for final academic achievement.

Table 1 Means, standard deviations, skewness, kurtosis, and correlations of the study variables

	Min	Max	<i>M</i>	<i>SD</i>	Skew.	Kurt.	1	2	3	4	5
1. High school grade	1	4	1.77	0.75	0.64	−0.24	—				
2. Socioeconomic status	Factor score	0.00	1.00	−0.52	0.24	0.14***	—				
3. Academic self-efficacy beliefs	1	5	3.52	0.55	−0.21	0.09	0.13***	0.12***	—		
4. Informed choice	0	6	4.54	1.34	−0.83	0.26	0.07**	0.16***	0.02	—	
5. Academic achievement	0	100	59.1	13.9	−0.80	0.32	0.37***	0.12***	0.11***	0.10***	—

* $p < .05$; ** $p < .01$; *** $p < .001$

Cluster analysis

As entrance factor scales have different metrics, each one was standardized through Z-transformations before being entered into the cluster analysis. Five k-means cluster analyses were run separately specifying two-, three-, four-, five-, and six-cluster solutions. Based on several indices such as the number of iterations, sample sizes in each cluster, and interpretability, the six-cluster solution was eventually selected as the most meaningful distinction. The reliability of this solution was also investigated through the cross-validation procedure described below. The final cluster centroids are described in Table 2 and illustrated in Fig. 1.

Centroids can be defined as students' means in high school grade, SES, academic self-efficacy beliefs, and informed choice in each cluster. A cautionary note is nevertheless required in the interpretation of these scores. As each scale was standardized, a positive centroid does not reflect a high score per se but rather, a higher score than the overall sample mean. Centroids must thus be understood as a normative assessment and not as a criterion-referenced assessment. For instance, a cluster with a positive centroid on informed choice was composed of students who made more thoughtful study choices than average students from the sample. Finally, MANOVA was computed with cluster-membership as the between-subjects factor and the four cluster variables as dependent variables. This analysis revealed whether clusters differed across entrance variables. The overall MANOVA was significant, and Roy's largest root = 2.06, $F(5, 2122) = 873.29$, $p < .001$. As shown in Table 2, the univariate test for each cluster variable was significant and showed that cluster membership explained more than 50 % of the variance of the four variables used to create the clusters. These results lend credence to the cluster solution as a meaningful depiction of entrance students' distribution and support the fact that each selected entrance variable contributes to the cluster solution.

Validation of the cluster solution A cross-validation procedure was set up to assess the replication of the six-cluster solution (Breckenridge 2000; Phinney et al. 2005). To this end, the data set was randomly divided into two samples (sample 1, $n = 1069$ and sample 2, $n = 1109$). Subsequently, k-means clusters—specifying a six-cluster solution—were performed separately on samples 1 and 2 using the cluster centroid derived from the global sample. Based on the work of Cohen (1960), the agreement between the cluster solutions for the whole sample and for the two subsamples was average to high ($\kappa = 0.62$ for Sample 1; $\kappa = 0.58$ for sample 2). This procedure thus proved that the six-cluster solution had good reliability in the data set.

Characteristics of the clusters As mentioned earlier, statistical and theoretical criteria led to our choice of a six-cluster solution which revealed meaningful profiles highlighting specific patterns of factors. The description and interpretation of these clusters are presented below.

1. *Disadvantaged* ($n = 280$; 12.9 %). The first cluster depicted students with the most negative profiles. These were characterized by a negative centroid on the four entrance achievement factors. In addition to a score on academic self-efficacy beliefs that was more than one standard deviation below the mean score, low scores on SES, high school grades, and informed choice were also reported. A typical student from this cluster would thus originate from a lower socioeconomic background, report weaker high school grades, have substantially lower confidence in his/her ability to succeed, and operate a less informed study choice process.
2. *Poor performer* ($n = 429$; 19.7 %). The second cluster was labeled poor performer due to the extremely negative centroid (more than a standard deviation from the mean) on high

Table 2 Cluster centroids and multivariate analysis of variance

Entrance profiles	Cluster 1 : disadvantaged	Cluster 2: poor performer	Cluster 3: thoughtless	Cluster 4: underprivileged	Cluster 5: apprehensive	Cluster 6: advantaged	<i>F</i>	<i>D</i> ²
<i>n</i>	280(12.9 %)	429 (19.7 %)	276 (12.7 %)	291 (13.4 %)	417 (19.1 %)	435 (20.0 %)		
High school grade	-0.66 b	-1.04 a	-0.23 c	-0.06 d	0.71 e	0.87 f	509.49***	0.55
Socioeconomic status	-0.93 b	0.48 de	0.14 c	-1.33 a	0.38 d	0.61 e	451.29***	0.52
Academic self-efficacy beliefs	-1.26 a	0.08 c	0.20 c	0.54 d	-0.69 b	0.91 e	462.33***	0.52
Informed choice	-0.34 b	0.50 d	-1.71 a	0.02 c	0.45 d	0.38 d	458.17***	0.52

Letters indicate post hoc comparison grouping based on Tukey's HSD; cluster centroids with different letters differ significantly

* $p < .05$; ** $p < .01$; *** $p < .001$

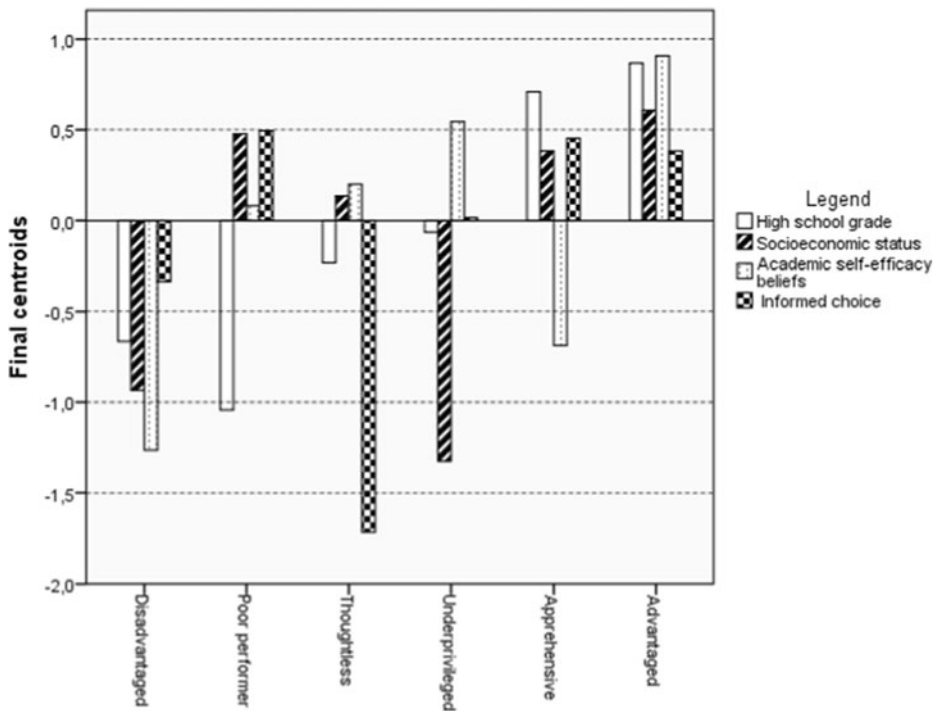


Fig. 1 Final centroids of entrance achievement factors for each profile

school grade. Indeed, these students reported lower high school grades than the average student. However, they had also made more thoughtful study choices and came from more privileged backgrounds than the average freshman.

3. *Thoughtless* ($n = 276$; 12.7 %). The third cluster was entitled the *thoughtless profile*. Students in this cluster showed a highly negative centroid on informed choice, a negative centroid on high school grade, but a positive centroid on SES and academic self-efficacy beliefs. This kind of student came from a more privileged background and entered university with a higher confidence in his/her ability to succeed compared to the average student, notwithstanding lower high school grades and a poor study choice process. Students in this profile had not initiated any real complex study choice process and were thus potentially vulnerable to attrition.
4. *Underprivileged* ($n = 291$; 13.4 %). The fourth cluster was particularly characterized by an extremely negative centroid on socioeconomic background and was labeled the *underprivileged profile*. Such students came from a more underprivileged background but had higher academic self-efficacy beliefs.
5. *Apprehensive* ($n = 417$; 19.1 %). The fifth cluster exhibited a favorable profile except for academic self-efficacy beliefs; it was labeled the *apprehensive profile*. Despite positive centroids on high school grades, SES, and informed choice, this profile had a negative centroid on academic self-efficacy beliefs.
6. *Advantaged* ($n = 435$; 20.0 %). The final cluster depicted students with the most positive profiles and was thus labeled the *advantaged profile*. In contrast to the disadvantaged profile, these students had initiated a complex study choice, possessed great confidence in their abilities to succeed, reported high grades in high school, and came from privileged backgrounds.

Clusters and academic outcomes Using a one-way ANOVA, we found significant differences between the clusters across the average percentage at the end of the year $F(5, 1928) = 37.64, p < .001, \eta^2 = 0.13$. The disadvantaged profile exhibited the lowest average final percentage of the six clusters. The poor performer, thoughtless, and underprivileged profiles also displayed an average final percentage below the minimum required to pass the academic year. Special attention should thus be paid to students in these clusters. By contrast, the apprehensive and advantageous profiles showed average performances above the minimum 60 % required to pass the year in the Belgian educational context.

More precisely, post hoc comparisons across groups based on Tukey's honestly significant difference (HSD) test showed that the disadvantaged profile ($M = 55.4$; $SD = 11.6$) had a significantly lower percentage than all other profiles except the poor-performer profile (see Table 3 for post hoc detailed results). Second, the poor performer ($M = 57.6$; $SD = 10.7$) had a significantly lower percentage than the apprehensive and advantaged profiles, but not the other three profiles. Third, the thoughtless ($M = 59.1$; $SD = 11.3$) and underprivileged profiles ($M = 59.9$; $SD = 10.5$) showed a significantly lower percentage than the apprehensive and advantaged profiles and a higher percentage than the disadvantaged profile. However, they did not differ from one another and from the poor performers. Fourth, the apprehensive ($M = 63.9$; $SD = 10.9$) and advantaged profiles ($M = 66.1$; $SD = 10.9$) both had a significantly higher percentage than the four other profiles but did not differ from one another. The underprivileged profile was therefore classified in the low achiever level.

Descriptive statistics allowed us to clarify these results. Frequencies were investigated on four levels of academic outcomes: attrition, failure, success, and the honor roll. Initial results revealed that failure and attrition rates were 16.4 and 29.5 %, respectively. These percentages are less significant than the national rates of 25 % for attrition and 35 % for failure (Droesbeke et al. 2008).

Using a chi-square test for independence and cross-tabulation (Greenwood and Nikulin 1996), the association between the six clusters and the four typical student outcomes at the end of the year was investigated. The results described in Table 4 highlight significant variations in the proportion of academic outcomes from one profile to another ($\chi^2(15) = 238.66; p < .001$). Cramer's V coefficient revealed a moderate association ($V = 0.35; p < .001$) between the clusters to which students belonged and final outcomes.

More precisely, the attrition rates were above average for disadvantaged, poor performer, thoughtless, and underprivileged profiles. Only the apprehensive and advantageous profiles

Table 3 Post hoc comparison among the six entrance profiles on final percentage

Entrance profiles	Mean on final percentage	Mean differences across clusters					
		1	2	3	4	5	6
1. Disadvantaged	55.45 a	–					
2. Poor performer	57.57 ab	–2.12	–				
3. Thoughtless	59.09 b	–3.64*	–1.52	–			
4. Underprivileged	59.95 b	–4.50**	–2.38	–0.86	–		
5. Apprehensive	63.94 c	–8.49***	–6.37***	–4.85***	–3.99**	–	
6. Advantaged	66.09 c	–10.64***	–8.52***	–7.00***	–6.14***	–2.15	–

Letters indicate post hoc comparison grouping based on Tukey's HSD; means with different letters differ significantly

* $p < .05$; ** $p < .01$; *** $p < .001$

Table 4 Crosstabs cluster membership $\times$ achievement outcomes

	Four-level academic outcomes				Total
	Attrition	Failure	Success	Honor roll	
1. Disadvantaged	61 25.1 %	105 43.2 %	61 25.1 %	16 6.6 %	243 100.0 %
2. Poor performer	76 19.5 %	138 35.4 %	153 39.2 %	23 5.9 %	390 100.0 %
3. Thoughtless	49 19.7 %	77 30.9 %	97 39.0 %	26 10.4 %	249 100.0 %
4. Underprivileged	57 21.3 %	84 31.5 %	99 37.1 %	27 10.1 %	267 100.0 %
5. Apprehensive	40 10.5 %	91 23.9 %	148 38.9 %	101 26.6 %	380 100.0 %
6. Advantaged	34 8.4 %	75 18.6 %	159 39.4 %	136 33.7 %	404 100.0 %
Total	317 16.4 %	570 29.5 %	717 37.1 %	329 17 %	1933 100 %

delivered percentages below average. Attrition was especially high for the disadvantaged profile in which 25.1 % of students dropped out before the end of the first year. Failure rates were also above average in the disadvantaged, poor performer, thoughtless, and underprivileged profiles. Once again, the failure rate for the disadvantaged profile was particularly high: more than 40 % of students failed. Conversely, the apprehensive and advantaged profiles presented failure rates below average. Considering attrition and failure together, more than 65 % of students classified in the disadvantaged profile were unable to cope with the academic requirements of their first year at university. More surprisingly, only the disadvantaged profile was found to have a success rate below average. All the other profiles showed a success rate of approximately 40 %. The main distinction relating to the success rate lay in the honor roll category where the success rate for the apprehensive and advantaged profiles was more than twice that of the other profiles. Moreover, the success rate for these two profiles was higher than 60 % when considering success and honor roll outcomes together.

Discussion

Our goal in this study was to further clarify the possibility of developing an inclusive approach to freshman achievement that might address the interplay between some important entrance achievement factors in the Belgian tertiary education context. More precisely, the study attempted to test the feasibility of identifying meaningful subgroups and analyzed the extent to which being a member of a specific subgroup impacted on student academic success.

University entrance based on a person-centered approach

The first research question was: “Can meaningful subgroups of freshmen with specific combinations of entrance variables be identified?” The results provided empirical evidence

that various profiles can be identified at the beginning of the year, each constituting a unique combination of predictors. This finding is in line with several higher education theories which postulate that students enter university with a set of specific characteristics (Pascarella and Terenzini 2005). More precisely, in addition to entirely favorable and adverse profiles, cluster analysis highlighted complex profiles including a combination of high and low scores on the four entrance variables. These results support two of our assumptions concerning the type of profile that might emerge from analyses.

First, the assumption that clusters with specific weaknesses could emerge from the analysis was corroborated by the identification of four subgroups of students with particularly low scores in one of the four variables investigated. This finding provides rationales to consider the contribution of each specific line of research in the academic achievement issue. In this line of thought, research and theories about specific achievement predictors might endorse complementary perspectives of achievement, each perspective being a good fit for a specific profile of freshmen. The vast body of knowledge that has attempted to explain the impact of past performance on achievement (Allen et al. 2008; Elias and MacDonald 2007; Robbins et al. 2006) could be particularly relevant in understanding the adaptation of the poor-performer profile. Authors who have undertaken in-depth investigations of the actual impact of SES on achievement (Linnehan et al. 2011; Mills 2008; Sackett et al. 2009; Zwick and Green 2007) have been able to clearly depict specific difficulties with which the underprivileged profile has to struggle. Bandura's social cognitive theory (Bandura 1997) could pinpoint specific proximal variables that could foster achievement in the apprehensive profile. Finally, future time perspective and educational choice implementation theories (Germeijs and Verschueren 2007; Husman and Lens 1999) may be of major interest for an understanding of the achievement process of the thoughtless profile. A substantial lens through which to understand the thoughtless profile might also be found in Berzonsky's identity process style which postulates that students in this profile are more diffuse-avoidant-oriented individuals (Berzonsky and Kuk 2000). However, further investigation is required to corroborate this assumption.

Second, the depiction of clusters with low and high scores on the four variables partially confirmed our expectation of clusters composed of variables evolving together. This finding substantiates the importance of the inclusive approach of achievement (Allen et al. 2010; De Clercq et al. 2013). We can postulate that students endorsing cumulative strengths or weaknesses show specific adaptation to the academic context that differs from students with a specific weakness. Consequently, an in-depth investigation of the combined impact of achievement predictors should be an on-going concern in attempts to understand achievement from disadvantaged and advantaged profiles.

From clusters to final outcomes

The second research question was as follows: "Do different subgroups differ regarding achievement?" To respond to this question, we highlighted significant differences between profiles with regard to overall percentages and the proportion of successful students. The analyses also demonstrated that students in the disadvantaged profile are particularly vulnerable to attrition and failure and that those in the advantaged profile are presumably better prepared to face the first year at university. Focusing on the categorical measure of achievement, results revealed that more than 65 % of students classified in the disadvantaged profile failed whereas more than 70 % in the advantaged profile passed the year.

The results also highlighted that the apprehensive profile emerged as a high achiever's profile. Thus—notwithstanding the literature that argues that academic self-efficacy beliefs are a key factor necessary for academic achievement—students with lower confidence in their abilities to succeed than the average freshman might be good achievers, as this weak point can be offset by other achievement factors. This finding illustrates the utility of evaluating the combination of factors to develop a precise conceptualization of academic achievement. The actual effect of a variable on achievement may depend on how it combines with other student characteristics. It also partially qualifies the plethora of studies on the strong impact of self-efficacy beliefs on achievement (Chemers et al. 2001).

It is also worth noting that preliminary results revealed a significant relationship between the four variables and academic achievement. While high school grades had a moderate relationship with achievement, SES, informed choice, and self-efficacy beliefs had a weak positive relationship with final performance. The relatively low impact of these variables was quite surprising, especially for academic self-efficacy beliefs which are often reported as strong predictors of achievement. Two main explanations are possible. First as mentioned above, self-efficacy beliefs differ according to the domain of functioning. Therefore, global confidence in one's ability to succeed must essentially be considered to be at the apex of academic self-hierarchy and to have an indirect impact on academic achievement by initiating the development of domain-specific academic self-efficacy beliefs (Zimmerman 2000). Elias and MacDonald (2007) provide the second explanation. They argue that self-efficacy beliefs are not good predictors of performance in new academic contexts such as the first year at university. According to them, when facing a new learning context, past performance is the main predictor of achievement and demonstrates students' global learning abilities. This line of thought concurs with our findings.

With regard to our results, achievement differs depending on different subgroups. More precisely, the combination of risk factors could have a severe negative impact on a student's achievement, whereas the impact of an isolated weakness could be offset by a student's strengths. Entrance characteristics could thus have a cumulative impact on academic achievement. However, a more detailed analysis of the results revealed that the scope of this finding requires further assessment. First, entrance profiles explained only about 13 % of final grade variance. Second, every cluster included both successful and unsuccessful students. It thus appears necessary to relativize the predictive value of a student's entrance characteristics and consider the impact of the achievement process during the academic year. Following this idea, students with cumulative entrance weaknesses (disadvantaged profiles) might therefore succeed if their adaptation during the year is particularly successful.

Practical implications

Taken together, these results can pinpoint—from the very beginning of the year—those students who are at risk of failure and thus need specific attention. From a pragmatic view, the early identification of profiles could be useful to prevent drop-out and failure. Such a person-centered approach could provide tools to capture and consider students' specific differences in achievement and retention interventions. This perspective could lead to a shift from the undifferentiated promotion of achievement to the establishment of tailor-made interventions to fit the specific needs of students according to their profiles. For example, students from the apprehensive profile might participate in psychosocial self-affirmation interventions that target their beliefs and feelings about the university in order to promote

their confidence in their ability to succeed (Cohen et al. 2009). Moreover, characterizing specific patterns from the very beginning of the year also provides some indications that make it possible to intervene in the early promotion of academic achievement, before students fall too far behind to reduce the gaps (Neuville et al. 2013).

To some extent, we might also question the relevance of the university entrance selection process. Our findings highlighted that, in each entrance profile, a significant proportion of students actually passed the first year. This assertion was also true for students with cumulative entrance weaknesses who—in more restrictive systems—would probably not gain entry to university. Consequently, this paper suggests that the open access system might be considered a viable perspective to democratize access to higher education, in line with the aspirational expansion of higher education set out in educational policies in many European countries (Gale and Parker 2012).

Limitations and future perspectives

Among the limitations of this study, three should be pointed out. First, our approach to achievement factors has not taken cognitive factors into account. However, cognitive variables such as learning strategies and self-regulation have been shown to have a significant impact on achievement (Fenollar et al. 2007; Minnaert and Janssen 1999; Nota et al. 2004; Pintrich and De Groot 1990; Shell and Husman 2008; Vermunt 2005; Ward and Walker 2008). An estimation of freshmen's cognitive strategies could thus enrich our approach to students' entrance profiles. Second, studies have depicted informed choice as a meaningful entrance factor in an open-access educational system such as in the Netherlands or Belgium. However, such a variable may be of minor concern in more restrictive systems such as the English educational system. Replicating this study in a country where access to higher education is highly contingent on school performance and/or SAT scores may thus be interesting. Finally, the past performance measure used in the study can be criticized. As no standardized test scores exist in the Belgian educational context, past performance was measured using a four-point item assessing high school final average percentages. This measure is quite global and self-reported, and it does not consider educational track, specialization in secondary education, and the characteristics of the high schools. Given the circumstances, the reliability of high school grades as a reliable indicator of students' actual past performance is questionable (Zwick and Green 2007).

The major contribution of these findings lies in the fact that they highlight the relevance of taking a person-centered approach into account and make it possible to depict different meaningful entrance profiles. However, many questions remain unanswered, and a complementary future issue would be to investigate the relation between these entrance profiles and more proximal achievement variables such as attendance, social integration, and teaching practice. We might presumably infer that freshmen within distinct profiles adapt differently to the academic world. In other words, students' entrance characteristics could entail a specific achievement process with specific variables. For instance, a poor-performer profile could involve other adaptation difficulties compared to a thoughtless profile. The impact of proximal predictors of achievement such as academic engagement, motivation, and social integration may therefore vary from one profile to another. Several theories support such an assumption. For example, Astin's theory of involvement (Astin 1999) postulates that students' pre-entry attributes will affect their engagement during the academic year. Future studies might therefore determine whether the pattern of relationships between academic achievement and proximal

variables is the same across entrance profiles. Further investigation of this question might be attempted through multigroup structural equation modeling. Based on the literature, an overall model of the achievement process at university could be tested while investigating the ways in which it varies depending on students' entrance characteristics.

Another future perspective could be to more deeply assess atypical students in the different profiles. On the one hand, it would be quite interesting to explore how successful students from the disadvantaged profile cope with first-year university difficulties to achieve academic success. On the other hand, scrutinizing students from the advantaged profile who fail or drop out of the first year of university could also provide a more in-depth understanding of the achievement issue. Perry et al. (2001) have emphasized the necessity of fully grasping this "paradox of failure," namely why bright high school students fail when they enter university. This assessment might be undertaken by combining a person-centered approach with qualitative procedures.

In conclusion, our approach has provided some clues to differentiate students who cope with the transition from high school to university from those who do not. However, in order to deepen our understanding of the former issue and address the latter, our findings need to be replicated. Moreover, they must be combined with more specific analytical approaches such as a qualitative approach or structural equation modeling. This would enable a dynamic and comprehensive conceptualization of academic achievement to be carried out.

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Mikaël De Clercq. Université Catholique de Louvain, Research Institute of Psychological Sciences, Faculty of Psychology and Education, 10 Place Cardinal Mercier, B-1348 Louvain-La-Neuve, Belgium. Phone: 00 32 (0)10 47 86 27; URL: mikael.declercq@uclouvain.be, Web site: www.uclouvain.be/mikael.declercq

Current themes of research:

Mikaël De Clercq is a Ph.D student at the Université catholique de Louvain.

His research interests focus on the predictors of academic achievement among first-year university students and on the impact of motivation on students' learning processes.

Most relevant publications in the field of Psychology of Education:

- De Clercq, M., Galand, B., Dupont, S., & Frenay, M. (2013). Achievement among first-year university students: an integrated and contextualised approach. *European Journal of Psychology of Education*, 28(3), 641–662. doi: 10.1007/s10212-012-0133-6

- De Clercq, M., Galand, B., & Frenay, M. (2013). Chicken or the egg: longitudinal analysis of the causal dilemma between goal orientation, self-regulation and cognitive processing strategies in higher education. *Studies in Educational Evaluation*, 39(1), 4–13. doi: <http://dx.doi.org/10.1016/j.stueduc.2012.10.003>
- De Clercq, M., Galand, B., & Frenay, M. (2013). Learning processes in higher education: providing new insights into the effects of motivation and cognition on specific and global measures of achievement. In D. Gijbels, V. Donche, J. T. E. Richardson & J. D. Vermunt (Eds.), *Learning Patterns in Higher Education: Dimensions and research perspectives*: Taylor & Francis.

Benoît Galand. Department of Psychology, Université Catholique de Louvain, 10 Place Cardinal Mercier, B-1348 Louvain-La-Neuve, Belgium. Phone: benoit.galand@uclouvain.be; Web site: www.uclouvain.be/benoit.galand

Current themes of research:

Benoît Galand obtained a Ph.D. degree in psychology from the University of Louvain in 2001. He is a professor in the department of Psychology of UCL. His research interests revolve around the effects of instructional practices on student motivation, learning, and psycho-social adaptation. He lectures in educational psychology, pedagogy, and research methodology to graduate and undergraduate students.

Mariane Frenay. Department of Psychology, université Catholique de Louvain, 10 Place Cardinal Mercier, B-1348 Louvain-La-Neuve, Belgium. Phone: mariane.frenay@uclouvain.be, Web site : <http://www.uclouvain.be/mariane.frenay>

Current themes of research:

Mariane Frenay is a professor at the Université catholique de Louvain, Belgium (Dean of the faculty of Psychology and Education) and received her PhD in Instructional Psychology in 1994. She is an active researcher in the field of higher education teaching and learning and faculty development. She has been a member of the UNESCO Chair of university teaching and learning at her university since 2001 and has been teaching for several years in Master's and Doctoral programs in Psychology and Education.