

Multilevel student-perceived teaching practices profiles: Associations with competence beliefs, task value, behavioral engagement, and academic achievement

Elizabeth Olivier^{a,*}, Benoit Galand^b, Jessica Bélanger^a, Alexandre J.S. Morin^{c,d}

^a Département de psychopédagogie et d'andragogie, Université de Montréal, Canada

^b Faculté de psychologie et des sciences de l'éducation, Université catholique de Louvain, Belgium

^c Substantive-Methodological Synergy Research Laboratory, Department of Psychology, Concordia University, Canada

^d Optentia Research Unit, North-West University, Vanderbijlpark, South Africa

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ABSTRACT

The study assesses student perceptions of their teachers' practices and their associations with motivational and academic achievement. Multilevel latent profile analyses (3710 grade 9 students, 245 classrooms) identified five profiles at the student level: *Average with focus on rules* (20.50 %), *Average with focus on need-support* (30.45 %), *Differential treatment* (18.86 %), *Need-support and differential treatment* (11.70 %), and *High-on-all* (18.50 %). Students corresponding to the *High-on-all* profile reported the most positive outcomes. We identified three profiles at the classroom level: *Mostly differential treatment* (20.75 %), which was associated with the worst outcomes, *Average and high-on-all* (41.20 %), and *Mostly need-supportive* (38.06 %).

Educational Relevance Statement: This study has implications for initial and continuing teacher training. By identifying profiles of teaching practices perceived by students and classrooms, the study informs what combinations of practices are positively associated with different aspects of student motivation and achievement, according to their perceptions. The findings also contribute to understanding that some practices (e.g., differential treatment), generally thought to deplete student motivation, might not need to be proscribed as long as they are counterbalanced with high levels of other positive practices (e.g., need supportive practices and rule enforcement).

1. Introduction

Student motivation is central to academic achievement, perseverance, and success (Gladstone et al., 2022). According to Expectancy-Value Theory (EVT), motivational processes encompass competence beliefs, task value, behavioral engagement, and achievement (Eccles & Wang, 2012; Gladstone et al., 2022; Wigfield & Eccles, 2000). Consistent with this theoretical perspective, Self-Determination Theory (SDT) postulates that teaching practices (e.g., autonomy, competence, and relatedness support) nurture student achievement motivation. In contrast, practices such as differential treatment should have the opposite effect (Guay, 2022; Ryan & Deci, 2017). Rule establishment and enforcement practices help support motivation and learning by creating a learning environment with clear expectations conducive to

concentration, active participation, and collaboration (Evertson & Weinstein, 2006). However, these three sets of practices are rarely studied together, even if they are all in the repertoire of practices frequently used by many teachers. This lack of joint consideration results in a fragmented understanding of the practices used by teachers and of how these practices combine to support or hamper student motivation and achievement. Moreover, students attending the same classroom typically share somewhat similar perceptions of their teachers' practices (Hornstra et al., 2021), although their individual perceptions can also differ from those of their classmates (Parrisius et al., 2022). It is important to understand how individual student perceptions of teaching practices contribute to their motivational processes and whether the collective classroom perceptions of these practices bring similar benefits for all students forming the same classroom. Developing

* Corresponding author at: Département de psychopédagogie et d'andragogie, Université de Montréal, Canada, 90, avenue Vincent-d'Indy, Montréal H2V 2S9, (Canada).

E-mail address: elizabeth.olivier@umontreal.ca (E. Olivier).

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such knowledge can help teachers adopt combinations of practices strongly associated with the motivation and achievement of most students in their classroom. Yet, studies rarely contrast student individual perceptions with aggregated classroom perceptions of teaching practices. The present study aims to address these limitations.

1.1. Competence beliefs, task value, behavioral engagement, and achievement

SDT (Ryan & Deci, 2017) and EVT (Wigfield & Eccles, 2000) place students' satisfaction of psychological needs at the base of a motivational cascade leading to engagement and achievement. More specifically, EVT (Wigfield & Eccles, 2000) expects that students will be engaged and have satisfactory achievement in school if they believe in their competence and value school tasks and assignments. SDT (Ryan & Deci, 2017) further contributes to this understanding by defining need-supportive teaching practices that support aspects of student achievement motivation described in EVT. Natural connections between these two theoretical frameworks are multiple, as shown by the logical and theoretical links between constructs typically associated with both theories (e.g., EVT competence beliefs are intimately related to SDT basic need for competence, just like EVT task value is closely related to autonomous forms of motivation in SDT). This dual theoretical perspective is also congruent with recent recommendations highlighting that multiple theoretical backgrounds need to be combined to fully understand interconnections and to properly represent authentic learning contexts (Urdan & Kaplan, 2020). Empirical studies have supported this recommendation, revealing that combining concepts from different theories makes it possible to attain new insights in our understanding of how environments shape student achievement motivation (e.g., Olivier et al., 2020; Wang & Eccles, 2013).

Within EVT, four concepts are key to understanding student achievement motivation. *Competence beliefs* represent students' perceptions of their ability to succeed in school based on past experiences (Wigfield & Eccles, 2000). *Task value* encompasses three key elements: students' perception of learning and tasks as *useful* to their current or future plans, of tasks as *interesting* and intrinsically enjoyable, and of the *importance* of doing well on these tasks (Eccles & Roeser, 2009). *Behavioral engagement* is students' active investment in their schoolwork and learning, as reflected by their participation in class and compliance with teachers' instructions and expectations (Fredricks et al., 2004). Although some have highlighted non-behavioral components of engagement (emotional, cognitive, and agentic; Connell & Wellborn, 1991; Skinner et al., 2008; Reeve, 2013), all agree on the central role of behavioral engagement (for reviews, see Eccles & Wang, 2012; Gladstone et al., 2022). *Achievement* in core subjects such as mathematics and main language indicates how well students know and master the content of their curriculum (Wilson & Trainin, 2007). These four concepts are key ingredients to ensure that students have a positive learning experience and they should be promoted by schools and teachers. In line with EVT (Eccles & Midgley, 1989), SDT (Ryan & Deci, 2017) also argues that teaching practices, specifically need-supportive practices, should help foster these aspects of student achievement motivation.

1.2. Teaching practices

1.2.1. Need-supportive practices

SDT (Ahmadi et al., 2023; Guay et al., 2020; Howard et al., 2024; Ryan & Deci, 2017) identifies three sets of teacher behaviors, qualified as need-supportive practices, most likely to support motivation. First, teachers who implement *autonomy support* consider students' point of view, acknowledge their feelings, offer them choices and decision-making opportunities, and rely on instructional rather than controlling language. These behaviors support students' need for autonomy, which refers to feelings of having choice over their learning and willingness to endorse learning-oriented behaviors. Second, teachers who implement

competence support (or structure) set clear expectations and offer students optimal challenges, accompanied by help, support, and constructive feedback. These behaviors support students' need for competence, which refers to their sense of mastery and effectiveness. Third, teachers who implement *relatedness support* (or involvement) care about their students and use positive attention, appreciation, and perspective taking (i.e., considering students' perspectives). These behaviors support students' need for relatedness, which refers to their feeling of being connected and their sense of belonging. Students and classrooms exposed to need-supportive teaching report better competence beliefs and task value (Ahn et al., 2021; Olivier et al., 2020; Parisius et al., 2022), as well as higher behavioral engagement (Archambault et al., 2020; Olivier et al., 2021; Opdenakker, 2021) and academic achievement (Amoura et al., 2015; Haw & King, 2022; Mendoza et al., 2023).

1.2.2. Rule enforcement

An additional core component of teaching practices entails establishing and enforcing clear *rules* (e.g., Brophy, 1999; Evertson & Weinstein, 2006; Korpershoek et al., 2016; Sabronie & Espelage, 2023). Teachers who set clear rules state explicit and specific behavioral expectations and consistently ensure that students follow these expectations (Evertson & Weinstein, 2006; Scott & Nakaruma, 2023). An important distinction between rule enforcement and competence support (or structure) as defined in SDT is that competence support focuses on instructional strategies seeking to support and guide the learning process, whereas rule enforcement focuses on guiding student behavior (Aelterman et al., 2019; Ahmadi et al., 2023). Setting clear rules and behavioral expectations contributes positively to competence beliefs, task value, active engagement, and achievement (Alter & Haydon, 2017; Gable et al., 2009; Korpershoek et al., 2016) by ensuring that they benefit from a predictable concentration-inducing learning environment (Evertson & Weinstein, 2006).

1.2.3. Differential treatment

To manage classroom heterogeneity and account for the diverse characteristics of their students, some teachers behave differentially toward distinct students (Badad, 1993). When applying differential treatment, teachers systematically provide students with different learning opportunities, frequency and types of interactions, positive reinforcements, etc. (Rubie-Davies, 2006). This practice might come from differential expectations based on stereotypical beliefs about the ability or background of specific types of students (achievement, sex, ethnicity; e.g., Eccles & Roeser, 2009; Hornstra et al., 2015; Rubie-Davies, 2006). Differential treatment shares similarities with controlling practices (e.g., showing approval only to performant students, pressuring students to meet teachers' goals) defined in SDT, thus interfering with their motivation and achievement (Amoura et al., 2015; Ryan & Deci, 2017; Sarrazin et al., 2005). *Differential treatment* should not be confused with *pedagogical differentiation*, which seeks to maximize students' learning by recognizing their individuality and diversity, such as by providing them with a variety of tasks that can be completed at different paces and in various settings (e.g., individual/group; Tomlinson et al., 2003). In practice, however, these two practices imply treating students differentially, and students' perceptions could also differ from teachers' intentions (Beaulieu et al., 2022).

The contribution of differential treatment to students' competence beliefs, task value, behavioral engagement, and academic achievement is controversial. Practices such as grouping students based on their abilities, are preferred by higher-ability students than lower-ability ones (Prast et al., 2023). Differential expectations may favor high-achievers who benefit from more learning opportunities than lower-ability students who find themselves in a more controlling and less autonomy-supportive relationship with teachers (Rubie-Davies, 2006). This process generalizes to differential treatment based on ethnicity, as students from minority groups may be stereotypically perceived as low achievers

(McKown & Weinstein, 2008; Rubie-Davies, 2006). Likewise, students reporting differential treatment based on sex, anchored in gender-differentiated performance expectations, reported lower competence beliefs and task value compared to other students (McKellar et al., 2018). These results reinforce the need to rely on a multidimensional (i.e., jointly considering multiple practices) and multilevel (i.e., jointly considering effects at the individual and classroom level) operationalization of teaching practices.

1.3. A multidimensional person-centered view of teaching practices

The need to jointly consider multiple teaching practices comes with a caveat, as variable-centered analyses (i.e., relations between predictors and outcomes assumed to generalize to the whole sample) assess the role of each practice net of what it shares with the others (e.g., Morin et al., 2018). In real-life classroom settings, teachers typically rely on a combination of practices. For instance, rule enforcement is more effective when applied in a need-supportive fashion (Aelterman et al., 2019; Booker, 2021). Providing competence support in an autonomy-supportive manner seems optimal to foster students' competence beliefs (Eckes et al., 2018). When teachers have high expectations toward specific students, which they sometimes end up communicating through differential treatment, these students may still perceive their teachers as need-supportive (Hornstra et al., 2018). Yet, variable-centered analyses typically ignore the arguably more critical role teaching practices play in combination. For this reason, many (e.g., Gallo et al., 2022; Hoang et al., 2019; Hornstra et al., 2021; Olivier et al., 2024) have highlighted the importance of studying combinations of teaching practices. This consideration requires a person-centered approach, which is designed to identify subpopulations – or profiles – of students who feel exposed to quantitatively and qualitatively distinct teaching practices (Morin et al., 2018; Morin & Litalien, 2019).

Studies assessing profiles of need-supportive practices often identify low-all, moderate-all, and/or high-all teaching practices (Hoang et al., 2019; Holzberger et al., 2019; Hornstra et al., 2021; Salminen et al., 2012). These results do not support the existence of distinct profiles, but rather that classrooms primarily differ along a single continuum of global teaching quality (Olivier et al., 2021). Morin and Marsh (2015) suggest that this inability to detect qualitatively distinct profiles may stem from the high correlations found between some components used to identify these profiles, such as those typically observed between need-supportive practices (Aelterman et al., 2019; Lietaert et al., 2015; Mouratidis et al., 2018; Olivier et al., 2021). Morin et al. (2016, 2017) proposed disentangling the global component common to several teaching practices from the unique nature of each specific teaching practice (S-factor) unexplained by this global component (G-factor). This approach, which we adopted in this study, helped identify uniquely distinct and more meaningful profiles.

The few studies that have investigated combinations of teaching practices concluded that some students primarily perceive negative practices similar to differential treatment (Amoura et al., 2015; Burgueño et al., 2023; Gallo et al., 2022; Jaakkola et al., 2015; Olivier et al., 2024; Schenke et al., 2017; see Table S1 in the online supplements for a summary of these results). Those who found a profile marked by positive teaching practices reported positive outcomes related to student motivation and achievement (Burgueño et al., 2023; Gallo et al., 2022; Olivier et al., 2024). These studies all found that some students (10 % to 40 %) perceive that their teachers combine positive and negative practices (e.g., high-on-all practices), a finding that is theoretically supported by SDT (Haerens et al., 2018). These high-on-all practices profiles are positively associated with competence beliefs, behavioral engagement, and academic achievement, although not as highly as those only dominated by positive practices (Burgueño et al., 2023; Olivier et al., 2024). Evidence suggests that need-supportive practices, such as teacher autonomy support, might trump the effects of less desirable practices (similar to differential treatment), in relation to students' competence

beliefs (Gallo et al., 2022; Ommundsen & Kvalø, 2007). Finally, some studies identified profiles where students perceived their teachers as not implementing any practice regularly (i.e., a low-on-all profile), which were associated with negative outcomes (Amoura et al., 2015; Olivier et al., 2024). More studies are warranted to confirm these results and expand them to several aspects of student motivation (i.e., task value and competence beliefs), behavioral engagement, and achievement, especially considering that individual students might have different perceptions from the entire classroom.

1.4. A multilevel person-centered view of teaching practices

Student perceptions of teaching practices partially reflect individual differences and idiosyncratic experiences in addition to objective teaching behaviors (Lüdtke et al., 2009; Marsh et al., 2012; Morin et al., 2014; Morin et al., 2022). Student perceptions, even combining objective and subjective elements, are critical to understanding motivation (i.e., competence beliefs, task value, and behavioral engagement) and achievement (Eccles & Wang, 2012; Wigfield & Eccles, 2000). Aggregating student perceptions at the classroom level (through multilevel analyses) allows focusing on their shared components, providing a closer representation of what truly happens in the classroom once corrected for inter-student differences (or inter-rater unreliability; Kunter & Baumert, 2006; Lüdtke et al., 2009; Marsh et al., 2012; Morin et al., 2014; Morin et al., 2022). This approach is often preferable to relying on teachers' reports of their own practices because of social desirability and self-consistency tendencies (Feldon, 2007).

When separating the variance in student perceptions of teaching practices across the student (i.e., within classroom) and classroom (i.e., between classrooms) levels, studies generally find that 5 % to 30 % of the variance is located at the classroom level (Bieg et al., 2011; Hornstra et al., 2021; Hospel & Galand, 2016; Olivier et al., 2020, 2021). This separation pulls together everything that the perception of all students from the same classroom have in common to obtain a reliable classroom-level aggregate likely to reflect students' shared reality, while providing a similarly reliable estimate of inter-individual differences in the perception of these practices at the student level (Morin et al., 2014). Student-level variance indirectly suggests that (Morin et al., 2014) teachers may treat students differentially (e.g., Domen et al., 2020) and that students may perceive their teachers differently (Schenke et al., 2018). Conclusions drawn from this level of analysis are necessary to fully grasp the role of inter-individual differences in the effects of teaching practices and to highlight the importance of consistency. Classroom-level variance suggests that there is a common core that is jointly perceived by all students forming a classroom, reflecting their inter-rater agreement on practices implemented by their teachers (Morin et al., 2014; Parrisi et al., 2022; Schenke et al., 2017). Conclusions drawn from this level are useful for formulating recommendations for teachers, as they rely on perceptions of the whole classroom, exempt from idiosyncratic bias (Lüdtke et al., 2009). Very few studies combine profiles and multilevel analyses, making it difficult to compare results from teaching practices assessed at different levels (i.e., different samples, different settings, etc.). As such, a question that remains is whether combinations of teaching practices (profiles) perceived individually by students and collectively by all members of the classroom share similar benefits for student competence beliefs, task value, behavioral engagement, and achievement.

A few rare studies have assessed multilevel teaching practices profiles (e.g., Santana-Monagas et al., 2022). The practices included in these studies are too distinct (and anchored in different theoretical frameworks) from those considered in the present study to allow us to use their results to generate clear hypotheses. Still, Schenke et al. (2017) demonstrated that higher levels of heterogeneity in student perceptions of autonomy support, relatedness support, and performance focus (bearing similarities with differential treatment) at the classroom level were associated with lower levels of achievement. Linking these results

with studies showing that differential treatment might benefit higher-ability students, [Prast et al. \(2023\)](#) suggest that this practice may be more strongly, or uniquely, associated with motivational processes at the individual level relative to the classroom level.

1.5. Objectives and hypotheses

First, this study aims to identify profiles of perceived teaching practices at the student level (see [Fig. 1](#)). From a theoretical perspective, SDT suggests that need-supportive practices should cluster together, although this does not exclude the possibility that they can sometimes co-occur with controlling practices (i.e., differential treatment; [Haerens et al., 2018](#); [Howard et al., 2024](#)). This co-occurrence would imply the identification of at least two profiles: a need-supportive one (i.e., high autonomy, competence, and relatedness support, and rule enforcement, combined with low differential treatment), one marked by differential treatment (i.e., low autonomy, competence, and relatedness support, and rule setting, combined with high differential treatment), and a third high-on-all profiles (with high scores on all dimensions). From an empirical standpoint, studies also suggest the presence of individual profiles displaying low levels on all practices (see Table S1 of the online supplements). Based on these theoretical and empirical considerations, we expect that:

Hypothesis 1. Four profiles will be identified, matching the following configurations: need-supportive, differential treatment, high-on-all, and low-on-all.

Second, SDT generally anticipates that need satisfaction stems from individual perceptions of need-supportive environments ([Ryan & Deci, 2017](#)), making it critical to assess what happens at the classroom level. To address this question, the study aims to determine how individual-level profiles will combine at the classroom level. As no existing empirical study has assessed similar multilevel profiles, we cautiously propose that:

Hypothesis 2. Most classroom-level profiles will match profiles identified at the individual level (e.g., high-on-all).

Third, the study assesses which student- and classroom-level profiles

will be associated with the most positive motivational and achievement outcomes. From a theoretical standpoint, SDT and EVT suggest that profiles dominated by need-supportive practices should result in higher competence beliefs, task value, behavioral engagement, and academic achievement, implicitly assuming similar mechanisms of actions (or rather without proposing differences) at the student and classroom levels. Empirical results are generally consistent with these theoretical expectations ([Burgueño et al., 2023](#); [Gallo et al., 2022](#); [Olivier et al., 2024](#)). At the student level, a few empirical studies also found that profiles combining practices akin to differential treatment with need-supportive ones might yield outcomes comparable to those associated with profiles solely dominated by need-supportive practices ([Burgueño et al., 2023](#); [Gallo et al., 2022](#); [Olivier et al., 2024](#)). However, some rare studies suggest that these associations might be limited to the student level (e.g., [Prast et al., 2023](#)). These studies lead us to expect that:

Hypothesis 3. Student-level profiles dominated by need-supportive practices, even combined with some differential treatment, will be associated with positive outcomes.

Hypothesis 4. We tentatively expect a similar pattern of results at the classroom level.

2. Method

2.1. Participants

This study relies on a sample of 3710 students (49.7 % girls), aged between 13 and 20 ($M = 15.40$, $SD = 1.114$), recruited in 66 schools from the Brussels region, Belgium. Students were nested in 245 grade 9 classrooms (3rd year of secondary school in the Belgian school system), each including 3 to 29 participating students ($M = 15.143$). Classroom composition remained the same across school subjects, although school subjects were taught by different teachers. This means that students from the same classroom were all exposed to the same set of teachers. Among participants, 61.6 % were in the general education track, and 38.4 % were in the vocational track. Most students came from Belgian families (father: 51.5 %, mother: 54.5 %) or not Belgian but from European Union (EU) countries (father: 20.0 %, mother: 20.0 %). The

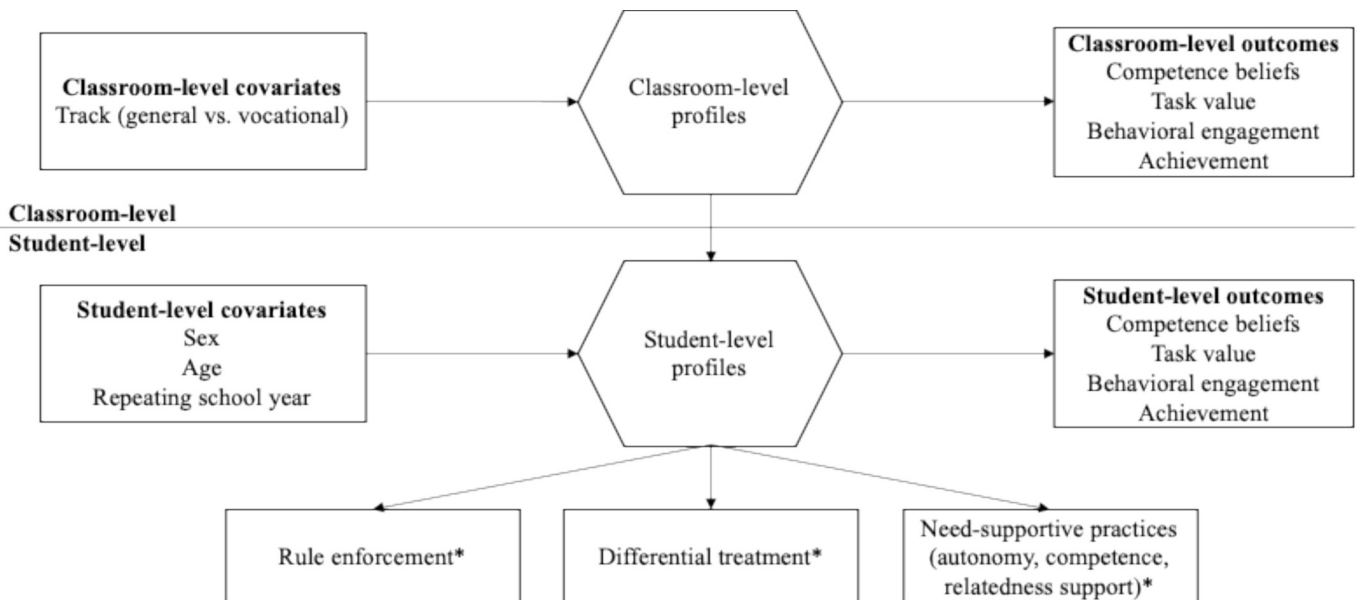


Fig. 1. Hypothesized model.

Note. *Depending on results from the preliminary analyses, the profile indicators might be better represented by a global factor accompanied by three (rule enforcement, differential treatment, and need-supportive practices) or five (rule enforcement, differential treatment, autonomy, competence, and relatedness support) specific factors representing the variance in each dimension beyond the global factor.

remaining students came from non-EU families (father: 25.4 %, mother: 23.4 %) or did not provide the information (father: 3.1 %, mother: 2.1 %). Regarding language spoken at home, 35.4 % of participants reported using exclusive French (schooling language), 50.8 % using French and another language, and 13.8 % using mainly another language. The parents of 17.3 % of participants were unemployed, one parent of 35.9 % of participants had a job, and both parents of 46.8 % of participants had a job. According to the information provided by the Ministry of Education, the sample of participants was representative of the student population in the Brussels area in terms of gender, age, grade retention, and school track.

2.2. Procedure

This study was conducted following the ethical principles of the Declaration of Helsinki. The study protocol was assessed and approved by the research ethics committee of the second author's Institution. A student paper-and-pen questionnaire and the study protocol were designed by the research team in collaboration with social workers from municipal services in charge of drop-out prevention. Members of these municipal services managed data collection during classroom hours in selected schools of their municipality. A passive consent procedure was used for parents, while students actively consented to participate. Social workers explained the objectives of the study to students, the voluntary nature of participation, and students' right to withdraw from the study. They answered students' questions and collected their active consent. A member of the school personnel was present in class during data collection but had no access to students' responses. The study was not preregistered, and data is available upon request to the first author. All analyses conducted as part of the study are reported in the main manuscript and the online supplements.

2.3. Measures

2.3.1. Perceived teaching practices

Students reported on the practices used by all of their teachers (as a whole) using scales adapted and validated in French by Galand and Philippot (2005) and Galand et al. (2014). The rule enforcement scale comprised six items (e.g., "Teachers intervene as soon as they realize that a student is not following rules."; $\alpha = 0.736$). The differential treatment subscale comprised six items reflecting differential treatment based on performance, ethnicity, and gender (e.g., "Teachers mainly pay attention to good students."; "Teachers treat students from Belgian and foreign origin differently."; "Teachers treat girls and boys differently"; $\alpha = 0.741$). The global need-supportive practices teaching practices scale had a satisfactory level of scale score reliability ($\alpha = 0.768$) and encompassed items related to autonomy support (three items; e.g., "Teachers offer us to choose between several activities."), competence support (three items; e.g., "Teachers agree to re-explain something if students ask."), and relatedness support (three items; e.g., "Teachers are willing to help students who have a personal problem."). All items were rated on a response scale ranging from 1 (never) to 5 (very often).

2.3.2. Competence beliefs

Students rated their competence beliefs on a six-item scale (e.g., "I know I can do well in school if I really want to."; $\alpha = 0.686$), validated in French (Galand & Philippot, 2002). Items were rated from 1 (completely false) to 5 (completely true).

2.3.3. Task value

Students reported task value on a scale encompassing their perceptions of task utility, interest, and importance (Galand & Hospel, 2015). The scale included 15 items (e.g., "What we learn in school is useful to me in everyday life."; $\alpha = 0.870$) rated on a 1 (completely false) to 5 (completely true) response scale.

2.3.4. Behavioral engagement

Student reported their behavioral engagement on a scale validated in French by Hospel et al. (2016). The scale included 19 items encompassing compliance with teacher instructions and rules, participation, and disengagement (reverse coded) (e.g., "When I don't understand, I ask for explanations."; $\alpha = 0.872$) rated on a 1 (never) to 5 (very often) response scale.

2.3.5. Academic achievement

Students self-reported their achievement level in mathematics and French (i.e., main language) by responding to two questions (i.e., "What were your math/French grades on your last reported card?") with the six following response options: 1 = "less than 10/20"; 2 = "11–12/20"; 3 = "13–14/20"; 4 = "15–16/20"; 5 = "17–18/20"; and 6 = "19–20/20". We then averaged these two items ($r = 0.342$, $p < .001$).

2.3.6. Covariates

Students reported their sex (0 = girl; 1 = boy), age (13 to 20 years old), and academic track (0 = general education track; 1 = vocational track). Students also reported whether they had repeated a school year (0 = never; 1 = at least once).

3. Analyses

3.1. Preliminary analyses

We conducted preliminary factor analyses to confirm the factor structure of the study variables. These analyses and missing data procedures are reported in Appendix A and Tables S2–S4 in the online supplements. Factor scores were estimated in standardized units ($M = 0$; $SD = 1$) and used as profile indicators (i.e., teaching practices global factor, rule enforcement specific factor, differential treatment specific factor, and need-supportive practices specific factor¹) and outcomes (competence beliefs, task value, and behavioral engagement) in the main analyses. Variable correlations are reported in Table S5.

3.2. Single-level LPA

Single-level latent profile analyses (LPA) were first estimated in Mplus 8.5 (Muthén & Muthén, 2022) to identify profiles that best represent student perceptions of teachers' practices. Models including 1 to 8 profiles were estimated, allowing the means and variances of the indicators to differ across profiles (Peugh & Fan, 2013). These models relied on Mplus' maximum likelihood robust (MLR) estimator along with design-based correction procedures (type = complex) to control for the nesting of students within classrooms. The models were estimated using 3000 random starts, 500 iterations, and 50 final optimizations. The best loglikelihood values were replicated for all solutions.

To select the optimal solution, we relied on statistical adequacy, profile meaningfulness, and theoretical conformity (Morin et al., 2016). The following statistical indicators also guided this decision: Akaike Information Criterion (AIC), Constant AIC (CAIC), Bayesian Information Criterion (BIC), Sample-Size-Adjusted BIC (ABIC), and adjusted Lo-Mendell-Rubin (aLMR) likelihood ratio test (e.g., Peugh & Fan, 2013).² Lower values on AIC, CAIC, BIC, and ABIC suggest a better solution, whereas a significant ($p > .05$) p -value on the aLMR supports a solution relative to one including fewer profiles. Due to their sample-size

¹ The global and specific factors were obtained using a bifactor model, which identifies a global factor representing the variance shared among all items along with specific orthogonal (i.e., uncorrelated) factors representing the variance uniquely attributable to each subscale beyond that explained by the global factor (details are reported in Appendix A of the online supplements).

² The bootstrap likelihood ratio test is not available when relying on Mplus design-based correction procedures.

dependency, the AIC, CAIC, BIC, and ABIC often improve when adding profiles (Marsh et al., 2009). Thus, we relied on an “elbow plot” in which the inflection point (a flattening of the decrease in the value of these indicators associated with adding profiles) is a rough estimate of the optimal number of profiles (Morin & Litalien, 2019; Petras & Masyn, 2010). We also report the entropy, indicating classification accuracy (ranging from 0 to 1, with higher values suggesting greater accuracy) for descriptive purposes.

Outcomes (i.e., competence beliefs, task value, and behavioral engagement) were directly incorporated into the retained solution (i.e., the solution was fixed, and outcomes were incorporated as additional indicators allowed to differ across profiles; for a more detailed presentation, see Morin & Litalien, 2019), allowing for tests of mean differences on these outcomes across profiles. Tests of statistical significance of outcome differences across profiles were conducted using the multivariate delta method (Raykov & Marcoulides, 2004), implemented in Mplus via MODEL CONSTRAINT. Covariates (i.e., student sex, age, and study program) were added to the retained solution via a multinomial logistic regression link.

3.3. Multilevel LPA

After retaining the optimal single-level latent profile solution reflecting student perceptions of their teachers' practices, the second set of analyses sought to identify classroom-level profiles characterized by distinct proportions of the student-level profiles defined based on the optimal solution retained in the previous step (mathematically corresponding to a latent class analysis at the classroom level). The single-level LPA estimated solutions included one to eight profiles using the same parametrization (i.e., 3000 random starts, 500 iterations, and 50 final optimizations). Once again, the best loglikelihood values were replicated for all solutions. Model selection relied on the same criteria as the single-level LPA, except the aLMR, which is not available in multilevel LPA. Finally, relying on latent aggregation procedures (allowing us to obtain classroom-level estimates corrected for sampling error/inter-rater unreliability; Morin et al., 2014; Morin et al., 2022), we incorporated the outcomes at the classroom level to our final solution, and assessed significant differences between profiles using the same procedure as in the single-level LPA.

4. Results

4.1. Single-level LPA

4.1.1. Profile estimation

The results from the alternative single-level LPA solutions are reported in Table S6 of the online supplements and graphically illustrated (elbow plot) in Fig. S1. The BIC and CAIC reached their lowest point at the 4-profile solution, whereas the AIC and ABIC kept on decreasing but started to plateau at four profiles. Finally, the last significant aLMR was at the 4-profile solution. Given these results, we more carefully examined solutions with 4 and 5 profiles for their theoretical conformity and heuristic meaning and value. The 4-profile solution converged on four qualitatively distinct profiles. Moving from the 4- to 5-profile solutions, we notice that two profiles remain similar between the two solutions, whereas the two others were reorganized to create three qualitatively distinct profiles, thus supporting the unique relevance of each additional profile. However, adding one additional profile resulted in the arbitrary division of existing profiles into smaller ones with a similar configuration. We thus retained the 5-profile solution.

This solution is graphically represented in Fig. 2. Detailed parameter estimates are reported in Table S7 of the online supplements. Profile 1 (*Average with focus on rules*) corresponds to 20.50 % of the sample reporting slightly above average global levels of teaching practices and specific levels of rule enforcement, accompanied by low specific levels of differential treatment and need-supportive practices. Profile 2 (*Average*

with focus on need-support) corresponds to 30.45 % reporting close to average global levels of teaching practices and specific levels of differential treatment, below average specific levels of rule enforcement S-factor, and higher than average specific levels of need-supportive practices. Profile 3 (*Differential treatment*) corresponds to 18.86 % of the sample reporting very low global levels of teaching practices, low levels of need-supportive practices, average levels of rule enforcement, and above-average levels of differential treatment. Profile 4 (*Need-support and differential treatment*) corresponds to 11.70 % of the sample reporting average global levels of teaching practices, below-average specific levels of rule enforcement, above-average specific levels of differential treatment, and very high specific levels of need-supportive practices. Profile 5 (*High-on-all*) corresponds to 18.50 % of the sample reporting the highest global levels of teaching practices, accompanied by high specific levels of rule enforcement and close to average specific levels of differential treatment and need-supportive practices.

4.1.2. Outcomes

Outcomes were directly added to the retained 5-profile solution. The results of the mean comparisons across profiles for these outcomes are reported in the top section of Table 1. First, the lowest competence beliefs were equally observed in the *Average with focus on need-support* (P2) and the *Differential treatment* (P3) profiles. All other profiles presented higher competence beliefs than these two profiles and differed significantly from one another on this outcome. Progressively higher levels of competence beliefs were thus observed, in increasing order, in the *Average with focus on rules* profile (P1), then in the *Need-support and differential treatment* (P4) profile, and finally in the *High-on-all* (P5) profile.

The *Differential treatment* (P3) profile displayed the lowest levels of task value, followed by the *Average with focus on need-support* (P2) profile, then by the *Average with focus on rules* (P1) profile. The highest task value levels were observed equally in *Need-support and differential treatment* (P4) and *High-on-all* (P5) profiles.

The *Differential treatment* (P3) profile reported the lowest levels of behavioral engagement, followed by the *Average with focus on need-support* (P2) profile, and then equally by the *Average with focus on rules* (P1) and *Need-support and differential treatment* (P4) profiles. The highest levels of behavioral engagement were reported in the *High-on-all* (P5) profile.

Finally, students corresponding to the *Differential treatment* (P3) profile reported the lowest levels of achievement. Students corresponding to the *Average with focus on rules* (P1) profile and the *Average with focus on need-support* (P2) profile did not significantly differ from those of the *Need-support and differential treatment* (P4) profiles. Yet, the level of achievement reported by students corresponding to P1 was higher than that of students corresponding to P2. The highest achievement levels were found in the *High-on-all* (P5) profile.

4.1.3. Covariates

Associations between the profiles and the covariates (i.e., sex, age, and having repeated a school year) are reported in Table 2. Compared to boys, girls were less likely to correspond to the *Average with focus on rules* (P1) profile than any other profile. Compared to boys, girls were also more likely to correspond to the *Differential treatment* (P3) profile than to the *Average with focus on need-support* (P2) profile. Yet, boys were more likely to correspond to the *Differential treatment* (P3) profile than to the *Need-support and differential treatment* (P4) and *High-on-all* (P5) profiles. Compared to older students, younger students were less likely to correspond to the *Average with focus on rules* (P1) profile than to all other profiles. Younger students were also more likely to correspond to the *Need-support and differential treatment* (P4) profile than to the *Average with focus on need-support* (P2) and *Differential treatment* (P3) profiles. Finally, older students were more likely to correspond to the *Average with focus on need-support* (P2), *Differential treatment* (P3), and *Need-support and differential treatment* (P4) profiles than to the *High-on-all* (P5)

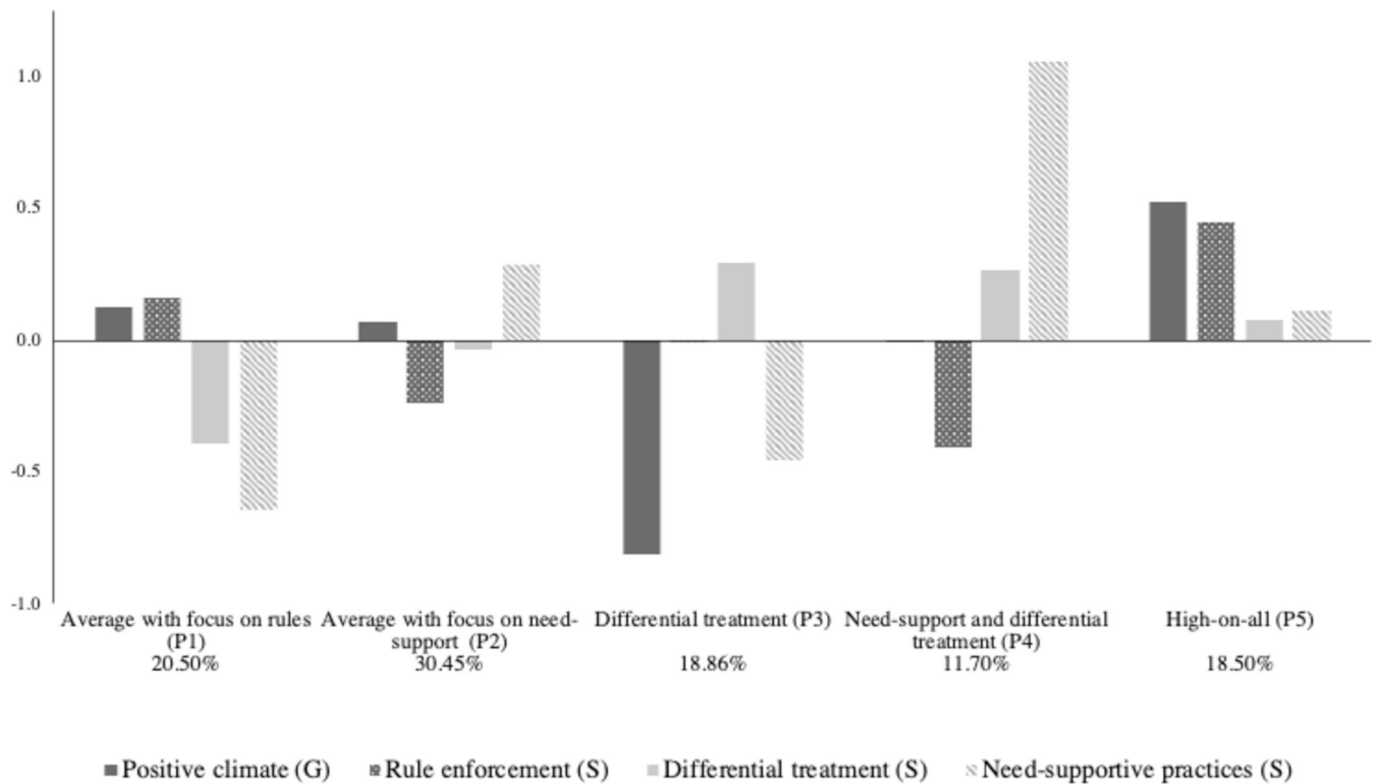


Fig. 2. Single level latent profile final solution.

Note. G: global factor, S: specific factors.

profile. Finally, the results revealed no significant associations with repeating a school year.

4.2. Multilevel LPA

4.2.1. Profile estimation

The results from the alternative multilevel LPA solutions (including 1 to 8 classroom-level profiles) are reported in Table S6 and graphically illustrated (elbow plot) in Fig. S2 of the online supplements. Although the AIC kept decreasing until seven profiles and the ABIC kept decreasing until five profiles, their decrease showed a clear inflection point at three profiles. Likewise, the BIC and CAIC reached their lowest point in the 3-profile solution. Thus, we examined the 3-profile solution more thoroughly, as well as the adjacent 2- and 4-profile solutions. The 2-profile solution identified two meaningful profiles. The first profile was characterized by two student-level profiles in which students perceived high levels of need-supportive practices (P2 and P4) and almost no student corresponding to P1. It was thus labeled as reflecting a combination of *Mostly need-supportive* profile. The second profile included relatively similar proportions of three student-level profiles (P1, P2, and P3). However, in the 3-profile solution, this profile was separated into two far more meaningful profiles. The first of those profiles (*Mostly differential treatment* profile) included over 50 % of students reporting a *Differential treatment* (P3) profile at the student level, and very few students corresponding to P4 and P5. The second of those profiles included similar proportions of students corresponding to the two *Average* profiles (P1 and P2) and the *High-on-all* profile (P5) at the student levels, and almost no students corresponding to P4. The 4-profile solution only added a smaller profile very similar to the *Average and high-on-all* profile already identified in the 3-profile solution, which was thus retained for interpretation. This final solution is graphically represented in Fig. 3 and includes the following three profiles: (1) *Mostly differential treatment* profile (ML-P1; 20.75 %); (2) *Average and high-on-all* profile (ML-P2; 41.20 %), and (3) *Mostly need-*

supportive profile (ML-P3; 38.06 %).

4.2.2. Outcomes

Outcomes comparisons are reported at the bottom of Table 1. All three profiles differed in terms of task value. Classrooms characterized by a *Mostly differential treatment* profile (ML-P1) reported the lowest level of task value, followed by the *Average and high-on-all* profile (ML-P2) classrooms, and then by the *Mostly need-supportive* profile (ML-P3) classrooms in which students reported the highest level of task value. Moreover, classrooms characterized by a *Mostly differential treatment* profile (ML-P1) reported the lowest levels of competence beliefs, behavioral engagement, and achievement. Those characterized by *Average and high-on-all* profile (ML-P2) or *Mostly need-supportive* profile (ML-P3) reported similarly higher levels of those three outcomes.

4.2.3. Covariates

Associations with student track enrolment revealed that vocational classrooms were 1.37 times more likely to correspond to the *Mostly need-supportive* profile (ML-P3) than the *Average and high-on-all* profile (ML-P2) profile. Track enrollment was not differentially associated with membership into the *Mostly differential treatment* profile (ML-P1) relative to the *Mostly need-supportive* (ML-P3) or *Average and high-on-all* (ML-P2) profiles.

5. Discussion

Grounded in the EVT (Eccles & Wang, 2012; Gladstone et al., 2022) and SDT (Ryan & Deci, 2017), this study identified profiles of student perceptions of their teachers' need-supportive practices (i.e., autonomy, competence, and relatedness support), rule enforcement, and differential treatment. Assuming that individual student perceptions differ from the classroom reality (Hornstra et al., 2021; Marsh et al., 2012), we also assessed how student profiles are combined at the classroom level via the estimation of classroom profiles defined by the relative frequency of

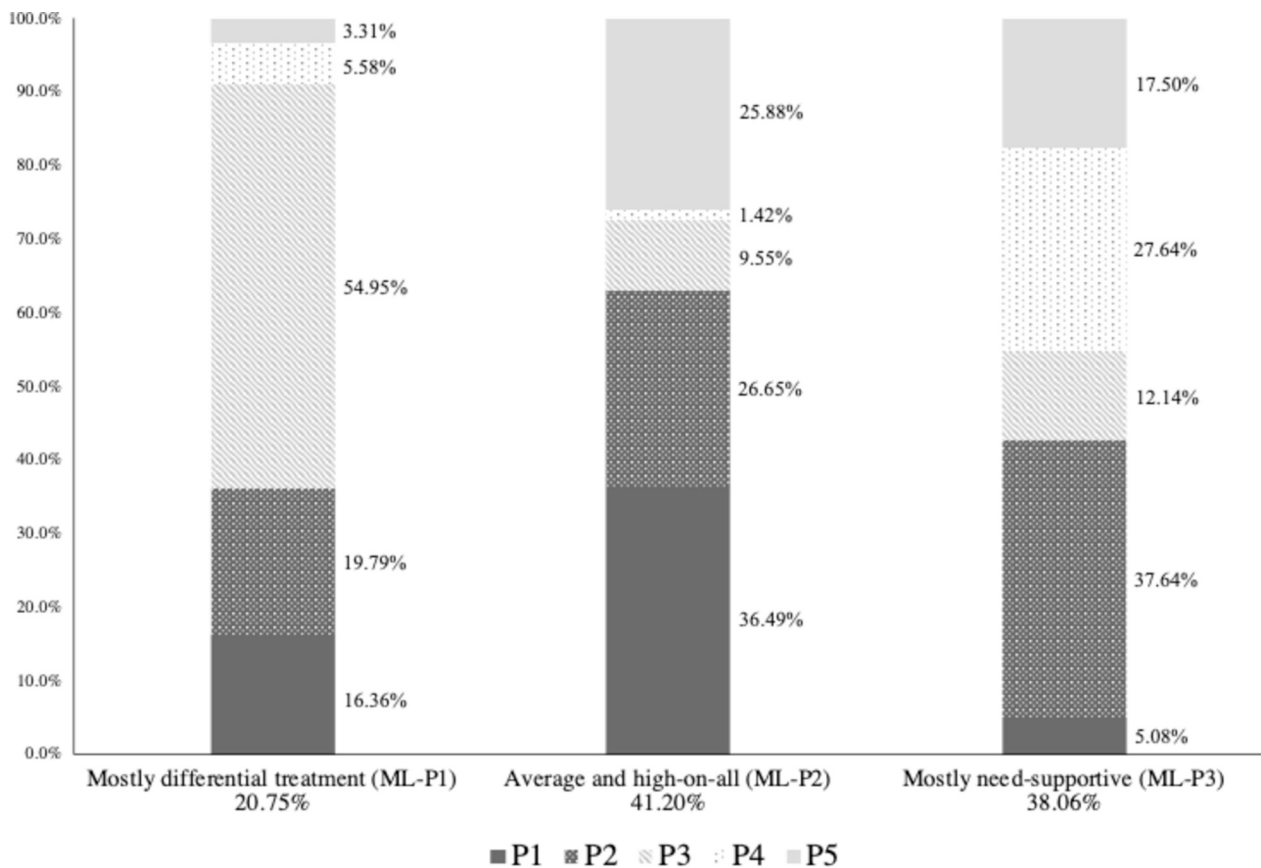


Fig. 3. Multilevel latent profile final solution.

Note. P1: Average with focus on rules; P2: Average with focus on need-support; P3: Differential treatment; P4: Need-support and differential treatment; P5: High-on-all.

occurrence of student profiles. Moreover, as these teaching practices primarily seek to support student motivation and achievement (Eccles & Wang, 2012; Guay, 2022), we tested associations between these profiles and three core components of student motivation: competence beliefs, task value, and behavioral engagement, as well as their achievement. Finally, we considered whether and how the frequency of occurrence of student-level profiles varied as a function of students' age, sex, and having repeated a school year and whether and how the frequency of occurrence of classroom-level profiles varied across educational tracks.

5.1. Student-perceived teaching practices

Relying on theory and empirical results, we anticipated at least four profiles (Hypothesis 1) based on individual student perceptions: a need-supportive profile (potentially also including rule enforcement), a differential treatment profile, a high-on-all practices profile, and a low-on-all practices profile. Disaggregating global perceptions of teaching practices from specific perceptions of each practice beyond that global level uncovered some profiles consistent with our expectations and some unexpected ones.

Students corresponding to the *Differential treatment* profile (P3) reported the lowest level of global teaching practices, along with an above-average specific level of differential treatment. This configuration shares clear similarities with profiles found in other studies in which students described their teachers as mostly adopting negative practices (Amoura et al., 2015; Burguño et al., 2024; Olivier et al., 2024; Schenke et al., 2017). Incidentally, and as expected based on SDT (Hypothesis 3) given that differential treatment shares similarities with controlling practices (Ryan & Deci, 2017; Sarrazin et al., 2006), this profile was associated with the lowest level of competence beliefs, task value, behavioral

engagement, and achievement. This clearly shows that perceptions of teaching practices marked by differential treatment not backed up by any other practice are associated with depleted student motivation and academic achievement.

We did not find the expected need-supportive profile (Hypothesis 1). Instead, we found that a global average level of teaching practices combined either with a moderate level of need-support (P2) or rule enforcement (P1). In the *Average with focus on need-support* profile (P2), even if students reported a higher than average level of specific need-supportive practices, an average level of specific differential treatment, and an average level of global teaching practices, their lower than average perception of specific levels of rule enforcement seemed to lead to generally negative outcomes. Apart from competence beliefs and achievement that were comparable to those observed in other profiles (respectively P2 and P4, discussed next), students' level of task value and behavioral engagement were lower in this profile than in all other profiles, with the sole exception of the *Differential treatment* profile (discussed previously). In other words, in this profile, the small benefits associated with the slightly higher-than-average specific level of need-supportive practices are not enough to counterbalance the suboptimal levels of other practices related to this profile. We did not directly expect a profile characterized by average levels of teaching practices. However, this profile does provide an interesting counterpart to the former profile, showing that both a lack of investment on the part of the teacher, as well as a lack of conviction on the part of the teacher applying these practices can both be harmful to student motivation. In other words, efficient teaching practices seem to require a high level of implementation to truly generate interest and engagement. What is worrisome, however, is the frequency of this profile, which reflected the perceptions of close to one-third of the students.

Table 1

Outcome mean comparisons between latent profiles in the single-level LPA and multilevel LPA.

	Outcomes			
	Competence Beliefs	Task Value	Behavioral Engagement	Achievement
<i>Single-level LPA</i>				
Average with focus on rules (P1)	0.009 [−0.069; 0.087]	0.105 [0.012; 0.199]	0.284 [0.205; 0.363]	3.078 [2.937; 3.220]
Average with focus on need-support (P2)	−0.192 [−0.287; −0.098]	−0.228 [−0.380; −0.113]	−0.252 [−0.399; −0.141]	2.753 [2.615; 2.890]
Differential treatment (P3)	−0.221 [−0.321; −0.121]	−0.900 [−0.985; −0.814]	−0.842 [−0.931; −0.754]	2.519 [2.385; 2.652]
Need-support and differential treatment (P4)	0.218 [0.024; 0.411]	0.647 [0.347; 0.947]	0.237 [−0.048; 0.522]	3.045 [2.774; 3.316]
High-on-all (P5)	0.449 [0.332; 0.567]	1.025 [0.862; 1.188]	0.983 [0.823; 1.144]	3.522 [3.352; 3.692]
Nonsignificant mean differences	2 = 3	4 = 5	1 = 4	1&2 = 4
<i>Multilevel LPA</i>				
Mostly differential treatment (ML-P1)	−0.176 [−0.246; −0.106]	−0.403 [−0.472; −0.335]	−0.397 [−0.483; −0.310]	2.540 [2.380; 2.700]
Average and high-on-all (ML-P2)	0.004 [−0.053; 0.061]	0.023 [−0.059; 0.105]	0.138 [0.052; 0.223]	3.018 [2.801; 3.236]
Mostly need-supportive (ML-P3)	0.093 [0.017; 0.168]	0.253 [0.150; 0.357]	0.074 [−0.052; 0.199]	3.080 [2.751; 3.409]
Nonsignificant mean differences	2 = 3	None	2 = 3	2 = 3

Note. The outcomes are factor scores estimated with a mean of 0 and a standard deviation of 1 across samples (the results can thus be interpreted in standardized units); 95 % confidence intervals are reported in brackets. Reported mean differences were significant at $p < .05$.

The *Average with focus on rules* profile (P1) was also not directly

expected. This profile was characterized by a global level of teaching practices, similar to the former profile. Yet, despite its lower specific levels of need-supportive practices, this profile appeared more advantageous for student task value, competence beliefs, behavioral engagement, and academic achievement, possibly due to its higher specific level of rule enforcement combined with its lower specific levels of differential treatment. Perceiving clear behavioral expectations (i.e., rule enforcement) that equally apply to all members of the classroom (i.e., lack of differential treatment) thus seems to help students see why tasks are important and useful (i.e., task value) and proactively participate in class (i.e., behavioral engagement).

The *Need-support and differential treatment* profile (P4) was also not specifically expected by [Hypothesis 1](#). This profile corresponded to students who, despite reporting a globally average level of positive teaching practices coupled with a low specific level of rule enforcement and a higher-than-average specific level of differential treatment, also reported a very high specific level of need-supportive practices. Possibly as a result of this last element ([Ryan & Deci, 2017](#)), students corresponding to this profile reported generally positive outcomes, with the second highest levels of competence beliefs and behavioral engagement, the latter akin to the level found in students corresponding to the former profile. These students also reported clearly above-average levels of task value, which were not statistically different from those reported in the profile associated with the best outcomes (discussed next). Globally, these results are consistent with SDT predictions regarding motivation ([Ryan & Deci, 2017](#)), showing that, when implemented at a high level, need-supportive practices can compensate for exposure to otherwise average teaching practices, lacking clear rule enforcement, and even involving differential treatment. These associations did not extend to academic achievement, as students corresponding to this profile did not differ from those of the two profiles marked by average levels of global teaching practices (P1 and P2).

However, these results also suggest that, for some students, differential treatment based on competence is not a problem as long as it is backed by high levels of need-supportive practices. Three potential hypotheses might explain this observation. First, students corresponding to profile P4 did not perform better than those of the two average profiles. Yet, by perceiving positive teacher attention above that provided to

Table 2

Results from the predictive model.

	P1 vs. P5		P2 vs. P5		P3 vs. P5		P4 vs. P5		P1 vs. P4	
<i>Single-level LPA</i>	Coef. (SE)	OR	Coef. (SE)	OR	Coef. (SE)	OR	Coef. (SE)	OR	Coef. (SE)	OR
Sex	−0.707(0.218)**	0.493	−0.256(0.189)	0.774	0.758(0.203)**	2.134	0.063(0.245)	1.065	−0.769(0.251)**	0.463
Age	−0.286(0.148) [†]	0.751	0.273(0.117)*	1.314	0.180(0.130)	1.197	0.858(0.118)**	2.359	−1.145(0.141)**	0.318
Repeating year	−0.112(0.250)	1.119	0.209(0.218)	1.232	0.351(0.252)	1.421	−0.077(0.269)	0.926	0.189(0.268)	1.208
	P2 vs. P4		P3 vs. P4		P1 vs. P3		P2 vs. P3		P1 vs. P2	
<i>Single-level LPA</i>	Coef. (SE)	OR	Coef. (SE)	OR	Coef. (SE)	OR	Coef. (SE)	OR	Coef. (SE)	OR
Sex	−0.319(0.237)	0.727	0.695(0.240)**	2.004	−1.465(0.230)**	0.637	−1.014(0.197)**	2.756	−0.451(0.198)*	1.570
Age	−0.585(0.097)**	0.557	−0.678(0.112)**	0.507	−0.466(0.153)**	0.572	0.093(0.117)	0.911	−0.559(0.126)**	1.750
Repeating year	0.285(0.268)	1.330	0.428(0.428)	1.534	−0.239(0.263)	0.908	−0.143(0.240)	1.153	−0.096(0.206)	1.101
	ML-P1 vs. ML-P3		ML-P2 vs. ML-P3		ML-P1 vs. ML-P2		-	-	-	-
<i>Multilevel LPA</i>	Coef. (SE)	OR	Coef. (SE)	OR	Coef. (SE)	OR				
Track	−0.216 (0.131)	0.806	−0.314 (0.103)**	0.731	0.098 (0.142)	1.103				

Note. Sex: 0 = girl, 1 = boy. Track: 0 = general, 1 = vocational; Repeating year: 0 = never, 1 = at least once. P1: Average with focus on rules; P2: Average with focus on need-support; P3: Differential treatment; P4: Need-support and differential treatment; P5: High-on-all; ML-P1: Mostly differential treatment; ML-P2: Average and high-on-all; ML-P3: Mostly need-supportive. Coef.: Logistic regression coefficient; SE: Standard error of the coefficient; OR odds ratio; the coefficients and OR reflect the effects of the predictors on the likelihood of membership into the first listed profile relative to the second listed profile.

* $p < .01$.

** $p < .01$.

other students (i.e., differential treatment), accompanied by a high level of autonomy, competence, and relatedness support, these students potentially find themselves in the best possible environment to nurture their feelings of competency and task value (Rubie-Davies, 2006). They may also interpret their teachers' behaviors as a mark of confidence in their ability to succeed and thus respond well to being pushed toward performance (Johnston et al., 2021). Second, as competence beliefs are partially formed based on social comparison (e.g., doing better than others), students who realize that teachers allocate more attention to the strongest students may see that as a motivation to develop their competencies (i.e., a challenge), especially when they are supported to do so (i.e., high need-supportive practices). Third, Baumrind's (1978) typology of parenting practices, as applied to the school context (Donker et al., 2021; Pellerin, 2005), characterizes teaching practices along the dimensions of responsiveness (i.e., warmth, open communication) and demandingness (i.e., high expectations for effort and compliance with rules). Pellerin (2005) argues that combining high responsiveness and demandingness should best help foster students' positive behaviors and adjustment. Supposing that students corresponding to the *Need-support and differential treatment* profile perceive teachers' differential treatment as high expectations, they would find themselves exposed to this optimal combination, at least from Baumrind's perspective. These results further reinforce those of existing studies (Burgueño et al., 2023; Gallo et al., 2022; Olivier et al., 2024), suggesting that differential treatment may not be damaging for some students as long as at least some level of need-supportive practices accompany them. What remains to be seen is whether these effects also expand to the entire classroom.

Finally, the *High-on-all* (P5) profile was also expected by Hypothesis 1 and characterized students reporting exposure to highly positive global teaching practices coupled with high specific levels of rule enforcement, but only average specific levels of differential treatment and need-supportive practices. Consistent with the high-all configuration reported in other studies (Amoura et al., 2015; Jaakkola et al., 2015; Olivier et al., 2024), this profile is associated with the most positive motivational and achievement outcomes, as expected by Hypothesis 3. This observation is consistent with the fact that the effectiveness of rule enforcement is widely documented in classroom management studies (e.g., Everson & Weinstein, 2006; Sabronie & Espelage, 2023) while highlighting the important role of globally positive teaching practices.

Looking at the five profiles all together brings some interesting observations. Without surprise, students reporting the lowest (P3) and highest (P5) perceived global teaching practices also reported the lowest and the highest levels of motivation, engagement, and achievement. However, the three other profiles had similar levels of perceived global teaching practices but different configurations on the specific factors. Interestingly, these profiles were associated with generally different levels of competence beliefs, task value, and behavioral engagement, not necessarily favoring one profile over the others. Yet, students corresponding to these three profiles had relatively similar levels of achievement. As such, students' perceptions of specific teaching practices contribute to motivational processes differently but all dimensions should be combined to foster motivation (i.e., rule enforcement for competence beliefs and need-supportive practices for task value). These findings support the claim that teaching practices are intertwined, and that each student feels exposed to different combinations of practices, with each of those combinations likely to have its own effect on achievement and motivation. Hence, a proper understanding of their role in student motivation and achievement requires their joint consideration.

Associations with student sex and age were interesting, as they provided some evidence for the criterion-related validity of our profiles. Indeed, other studies have shown that younger students and girls generally report more positive perceptions of teaching practices (e.g., Gallo et al., 2022; Holzberger et al., 2019; Lietaert et al., 2015). Similarly, in our study, girls and younger students were generally more likely to correspond to the *High-on-all* (P5) profile than any other profiles. Girls

and younger students were also more likely to correspond to the *Need-support and differential treatment* (P4) than to other profiles (except for P5). No association was found for having repeated a school year.

5.2. Classroom-perceived teaching practices

We then investigated how student-level perceived teaching practices profiles would translate into classroom-level profiles. As SDT and EVT do not have clear expectations regarding the differential role of teachers in relation to individual students versus whole classrooms, we had few specific hypotheses for these profiles, apart from potentially expecting the same profiles to emerge at both levels (Hypothesis 2). Interestingly, and consistent with our focus (at the individual level) on student perceptions, we identified classroom profiles corresponding to various combinations of student profiles. More precisely, we identified three profiles: (1) a *Mostly differential treatment* profile (ML-P1) represented 20.75 % of classrooms in which slightly over half of students reported exposure to a *Differential treatment* profile (P3); (2) an *Average and high-on-all* profile (ML-P2) represented 41.20 % of classrooms in which similar proportions of students (between one quarter and one third each) reported exposure to either of the two *Average* (P1 and P2) profiles or the *High-on-all* (P5) profile; and (3) a *Mostly need-supportive* profile (ML-P3) represented 38.06 % of the classrooms in which students reported exposure to one of the two profiles marked by higher-than-average levels of specific need-supportive practices (P2 close to 40 % and P4 close to 30 %). This last profile still presented a non-negligible proportion (17.50 %) of students perceiving a *High-on-all* (P5) profile.

The associations between classroom profiles and student outcomes largely reflect student-level results, as expected by Hypothesis 4. The first profile (ML-P1: *Mostly differential treatment*) was associated with the lowest levels of competence beliefs, task value, behavioral engagement, and achievement at the classroom level. The remaining classroom profiles were associated with similar levels of competence beliefs, behavioral engagement, and achievement at the classroom level. However, classrooms characterized by a *Mostly need-supportive* profile (ML-P3) had a slightly higher mean task value relative to those characterized by an *Average and high-on-all* profile (ML-P2), while including, at the same time, more heterogeneity in individual profiles. The similarity between the motivational processes and achievement associated with these two profiles might stem from the fact that they both include students reporting exposure to a *High-on-all* profile and an *Average with need-support* profile. Interestingly, the classroom *Mostly need-supportive* profile (ML-P3) included several students reporting a combined exposure to need-supportive practices and differential treatment. This does not seem to jeopardize their collective level of feeling of competence, task value, and behavioral engagement. This further reinforces the idea that differential treatment, at moderate levels, can be counterbalanced by a need-supportive and generally positive profile. In contrast, when differential treatment is not compensated by generally positive and need-supportive practices, as in the classroom *Mostly differential treatment* profile (ML-P1), students reported the lowest competence beliefs, task value, and behavioral engagement.

A few other interesting conclusions are worth mentioning. First, two student profiles were primarily represented in distinct profiles at the classroom level. The *Differential treatment* (P3) and the *Need-support and differential treatment* (P4) student profiles were respectively found in the *Mostly differential treatment* (ML-P1) and in the *Mostly need-supportive* (ML-P3) classroom profiles. In other words, no classroom profile had inconsistent perceptions of how differential treatment is conveyed to students. This supports the idea that students can agree with one another, at least in some situations, in assessing their teachers' practices. In the present context, findings show that teachers who are seen to rely on differential treatment are either perceived as doing so as a main teaching style (i.e., *Mostly differential treatment* profile) or in a need-supportive (i.e., *Mostly need-supportive* profile) manner. Second, the most optimal student-level profile (i.e., *High-on-all*) was almost not

represented in the *Mostly differential treatment* (ML-P1) profile, which was the least optimal classroom-level profile. This further reinforces some agreement between individual students rating their teachers' practices. Positive teaching practices seem irreconcilable with differential treatment in the eyes of students sharing a classroom. Still, all student-level profiles were somewhat represented within all classroom-level profiles. Only one classroom profile (*Mostly differential treatment* profile) included a majority of students from the same student-level profile. Individual students sharing a classroom can have different perceptions of their learning environment, reflecting both rater tendencies and dyadic teacher-student interactions (Göllner et al., 2018; Schenke et al., 2018). Third, classrooms enrolled in general and vocational education were similar in their perceptions of teaching practices, apart from one small difference (i.e., vocational classrooms were more likely to correspond to the *Mostly need-supportive* profile than to the *Average and high-on-all* profiles, which are the two classroom-level profiles similar in terms of associations with student motivation). Teachers of both tracks can probably adapt to their students' characteristics, which is particularly interesting as vocational tracks include more students with academic difficulties (Misra, 2011).

5.3. Limitations

The results should be interpreted in light of a few limitations. This study is cross-sectional and relies on student perceptions. First, assessing potential bidirectional associations between individual perceptions of teaching practices and student motivational outcomes was impossible, requiring longitudinal data and other analytical strategies (Ruzek & Schenke, 2019). Highly motivated or high-achieving students might perceive their teachers' practices more positively (Göllner et al., 2018; Kunter & Baumert, 2006). Teachers could also adjust their practices according to their perception of student motivation and achievement (Liu et al., 2020; Sarrazin et al., 2006). Also, students involved in the study were asked to report on the practices used by all of their teachers, considered jointly, rather than to report on the practices of any specific teacher. Each teacher creates a specific learning environment and shares unique interactions with the classroom (Alonso-Tapia & Ruiz, 2022; Evans et al., 2009). Thus, our study could not capture the learning climate established by each individual teacher, but rather a more general climate perceived by students sharing a set of teachers. Still, studies conducted at the student level that have formally compared the practices of different teachers (math and language arts) find that students perceiving a profile from one teacher are likely to perceive a similar profile from another teacher, although some variations remain possible (Olivier et al., 2024).

Second, when assessing teaching practices, teachers and students share varying levels of agreement depending on the nature of the practice evaluated (Donker et al., 2021; Kunter & Baumert, 2006). Recommendations addressed to teachers based on our results cannot assume that teachers perceive their practices in the same way as the students. For this reason, it will be important to replicate the results with teacher reports or observed practices. Besides, teaching is a complex task. It encompasses numerous practices and actions, most embedded within different theoretical frameworks (e.g., Achievement Goal Theory (Ames, 1992), Attachment Theory (Pianta et al., 2008), etc). Our study cannot pretend to portray all dimensions of teachers' practices. Considering several other practices simultaneously could shed light on the optimal environments to support student motivation and success.

Third, the outcomes considered in this study were grounded within EVT (Wigfield & Eccles, 2000) and SDT (Ryan & Deci, 2017). However, these may not be the only constructs relevant to student motivation. For instance, Goal theory proposes that student achievement motivation should be supported by mastery and performance goals, which in turn also influence students' intention to develop competence or demonstrate competence, two aspects that would have been highly relevant to consider in this study (Urdan & Kaplan, 2020). Moreover, we relied on a

global assessment of task value, even though the previous studies have demonstrated benefits in differentially considering task value components (interest, importance, and usefulness, as well as costs as an additional dimension; Gaspard et al., 2017; Muenks et al., 2023; Part et al., 2020, 2023). Unfortunately, it was not possible to rely on such a disaggregated measure in the present due to the very high correlations among subscales ($r > 0.800$). It would seem important for future studies to assess whether and how results generalize across task value components.

Finally, although we relied on a representative sample, the true generalizability of our results beyond this specific age group and Belgium remains unknown. It would thus seem important for future studies to systematically assess whether and how results generalize to younger or older students from different countries, particularly non-WEIRD (Western, Educated, Industrialized, Rich, and Democratic) countries. In addition, the large diversity of students in classrooms and the trend toward inclusion require teachers to diversify their practices to ensure fair learning opportunities. Future studies could also consider teaching practices through the lens of inclusive classroom management (Preast et al., 2020).

5.4. Theoretical and practical implications

According to Vansteenkiste et al. (2020), SDT “does not involve a one-size-fits-all perspective, as if there would be no variation in the way how individuals' needs get supported. [...] Thus, need-supportive socialization implies ongoing calibration of one's approach to others (Vansteenkiste et al., 2019).” This statement clearly shows that teaching practices might be better adapted to some students compared to others and that teachers might best support their students if they do not act with them all in the same way. This was captured in this study by analyses conducted at the student level. Conclusions from this level of analysis show that individual perceptions of need-supportive practices and clear rules setting by teachers were both associated with better student outcomes. Differential treatment based on performance, sex, or origin is most likely perceived as a controlling strategy (Ryan & Deci, 2017). Still, our results show that perceived differential treatment is either positive for some students and some classrooms if combined with other supportive practices, or that these supportive practices can counterbalance the presence of differential treatment for these students. Similarly, setting clear and explicit rules can also compensate for general teaching practices marked by only average levels of “desirable” teaching practices. These results raise the critical question of what teachers should do.

Based on results from the classroom-level analyses, a tentative recommendation for teachers is to establish a need-supportive environment combined with clear rules and behavioral expectations. Results suggest that avoiding differential treatment might not be a priority as it seems easily balanced by other, more positive, practices. Still, differential treatment might benefit only the strongest students (i.e., competence beliefs are related to actual performance; Olivier et al., 2019), further increasing the discrepancies between high and low achievers. Unfortunately, the current study cannot answer the matter clearly. Rather, it exposes disparities between individual students' and classrooms' collective perceptions of teaching practices, opening the door to several new questions. The first of those questions is how SDT and other motivational models, such as EVT, can differentiate between student and classroom levels of influence. Both theoretical perspectives seem to roughly anticipate that individual perceptions of need-supportive practices should translate into benefits at the classroom level and, conversely, that perception of differential treatment should result in negative outcomes across all levels. Our results, however, somewhat contradict this expectation and thus warrant empirical replication and further theoretical developments.

CRedit authorship contribution statement

Elizabeth Olivier: Writing – original draft, Formal analysis, Data curation, Conceptualization. **Benoît Galand:** Writing – original draft, Project administration, Methodology, Funding acquisition, Conceptualization. **Jessica Bélanger:** Writing – original draft, Conceptualization. **Alexandre J.S. Morin:** Writing – original draft, Formal analysis, Conceptualization.

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Appendix A. Supplementary data

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