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Student-Teacher Relationship and Classroom Goal Structure Profiles: Promoting Achievement and Preventing Externalizing and Internalizing Behaviors

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Abstract

This study investigates which profiles, defined based on students reports of student-teacher relationships (closeness; conflict) and classroom goal structure (mastery; performance), were optimal to support adjustment (externalizing and internalizing behaviors) and achievement in Math and Language. Elementary students (Grades 3-6, *N*=703) and their teachers (*N*=33) completed questionnaires in November 2011 and April 2012. Latent profile analysis identified four profiles, replicated across boys and girls: Average (44.46%), Mastery-Closeness (39.13%), Conflict (6.49%), and Approach-Closeness (9.92%). Students from the Conflict profile displayed more externalizing and internalizing behaviors than other students, whereas those from the Mastery-Closeness and Approach-Closeness profiles displayed the least difficulties. Students from the Approach-Closeness profile displayed the lowest achievement at the beginning of the year but the steepest increase over time.

Keywords: Student-teacher relationship; Mastery and Performance goal structures; Achievement; Externalizing behaviors; Internalizing behaviors

Highlights

- We identify profiles of student-teacher relationship and classroom goal structure
- The profiles were similar for boys and girls
- The profiles were linked with achievement and externalizing/internalizing behaviors
- Combining closeness and mastery with or without performance goals was optimal
- The *Conflict* profile was the least optimal

Authors' Bios

Angela Gallo, completed her undergraduate studies in the Department of Psychology of Concordia University, where she completed her honour's thesis in the Substantive- Methodological Synergy Research Laboratory, under the supervision of Alexandre J.S. Morin and Elizabeth Olivier.

Elizabeth Olivier, received her Ph.D. at University of Montreal in 2017. She is currently assistant professor in the Department of psycho-pedagogy and andragogy at the Faculty of Education of Université de Montréal. Her research focuses on teacher motivational practices associated with student mental health, externalizing and internalizing behaviors, and school motivation.

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Up to one-third of school-aged students display externalizing (i.e., attention difficulties, hyperactivity, opposition, defiance) or internalizing (i.e., depression, anxiety) behaviors (Olivier et al., 2018). Along with achievement, these behavior problems are key determinants of academic functioning and social development (Baker et al., 2008; Olivier et al., 2020). From an intervention perspective, it thus appears important to better understand how students' perceptions of their learning environment can contribute to their achievement and help prevent these behavior problems (Baker et al., 2008; Olivier et al., 2020). At school, teachers play a critical role in creating a supportive classroom environment through their relationships with their students (student-teacher relationship; Pianta, 1999) and their establishment of classroom goal structure (Midgley et al., 2000).

However, the combined effects student-teacher relationship and classroom goal structure on student achievement and externalizing and internalizing behaviors remain unknown, as studies tend to investigate student-teacher relationships and classroom goal structures independently. As a result, there is a need to develop a more integrative, or holistic, representation of the true diversity of student-teacher relationships and classroom goal structures to which students feel exposed in class. Such a representation can be achieved via a person-centered approach. In this study, we rely on this approach to identify the configurations, or profiles, of student-teacher relationships and classroom goal structures to which students report being exposed. We also investigate how these configurations help promote achievement and prevent externalizing and internalizing behaviors over a school year.

Achievement, Externalizing, and Internalizing Behaviors

Most students experience positive behavioral and emotional development and have adequate achievement (Olivier et al., 2018). Still, a significant proportion of students display some behavioral or achievement difficulties, which can impact their longer-term educational trajectories (Olivier et al., 2018, 2020). Achievement is an indicator of how students learn and master scholastic content and contributes to their success in various life domains (Wilson & Trainin, 2007). Externalizing behaviors refer to a group of noticeable, disruptive, and problematic behaviors directed by a child toward the external world (Achenbach & Edelbrock, 1978). Their manifestations include aggression, impulsivity, attention problems, hyperactivity, and conduct problems such as opposition and defiance (APA, 2013; Bierman & Sasser, 2014; Campbell et al., 2014). More introspective in nature, internalizing behaviors refer to behavioral problems that are harder to detect as they predominantly involve negative thoughts and emotions directed internally. These problems encompass symptoms of depression, including sadness, lack of interest and moodiness, and anxiety, including excessive worries, fears, and nervousness (Achenbach & Edelbrock, 1978; APA, 2013).

Moreover, students' levels of achievement, externalizing behaviors, and internalizing behaviors are likely to fluctuate over time. For instance, grades three to six encompass a key developmental transition between childhood and early adolescence, known to impact their long-term schooling and behavioral trajectories (Longobardi et al., 2019; Masten et al., 2005). Developmental trends show that externalizing behaviors tend to remain stable or to increase over time (Campbell et al., 2014), that internalizing behaviors tend to increase over time, especially from adolescence to adulthood and for girls (Garber & Rao, 2014; Vasey et al., 2014), and that achievement tends to decrease slightly over time (Gottfried et al., 2007; Moilanen et al., 2010). However, over shorter periods (e.g., a single year), achievement, externalizing, and internalizing behaviors generally remain stable (DeBolle et al., 2015; Rimfeld et al., 2018).

The school environment in which students manifest these behaviors is likely to play a role in their development over time. In particular, students struggling with externalizing or internalizing behaviors seem to be sensitive to their classroom environment, particularly to its relational classroom climate, indicating that unsupportive environments could possibly worsen pre-existing behavior problems (Caldarella et al., 2021; Lee & Bierman, 2018). Similarly, low-achieving students might be especially dependent on how they perceive their teachers' practices to ensure that they learn and master the various school subjects (Baker et al., 2002), with Math and first language (French in this study) being the core subjects in primary school. More generally, student perceptions of their learning environment are key in determining their motivation and well-being in school (Ryan & Deci, 2017), just like their own characteristics can also influence these perceptions (Tapola & Niemivirta, 2008).

The Role of Teachers from Two Theoretical Perspectives

Based on Attachment Theory (Ainsworth & Bowlby, 1991), Pianta (1999) proposed to differentiate the closeness and conflict dimensions of student-teacher relationships in a way that

matches the typical representation of parent-child relationships. Closeness entails warmth, support, and harmony within a student-teacher dyad (Pianta, 1999), and involves the sharing of positive emotions, open communication, and responsivity. In contrast, conflict entails frustration, anger, and negativity, and involves a lack of trust, poor dyadic rapport, and struggles (Pianta, 1999). Thus, student-teacher relationships result from the emotionally supportive or unsupportive aspects of teachers' interactions with their students, just as they can also be influenced by students' behaviors.

In parallel, Achievement Goal Theory describes practices that more directly seek to nurture and support motivation and achievement. According to this theory, teachers establish different classroom goal structures in which approach or avoidance goals are emphasized (Midgley et al., 2000). The present study focuses on teachers' reliance on classroom approach goal structures, which seek to push students toward positive learning outcomes, considered to be more adaptive than avoidance goals, which push students away from negative learning outcomes (Federici et al., 2015; Méndez-Giménez et al., 2018). Moreover, students more rarely perceive that their teacher promotes avoidance goal structures (Peng et al., 2018), which leads to little variability between classrooms (Kaplan et al., 2002). First, classroom mastery-approach goal structures emphasize learning, effort, competence, and progression (Midgley et al., 2000). In classrooms characterized by mastery-approach goal structures, students perceive that their teacher values individual improvement over social comparison, provides autonomy by offering choice in classroom activities, allows them to learn at their own pace, and expects mistakes from them even when asked to try their best, which offers them learning opportunities (Boden et al., 2020; Midgley et al., 2000). Second, classroom performance-approach goal structures define personal success as demonstrating one's competence relative to that of others (Midgley et al., 2000). In grouping students by ability, rewarding correct responses, and offering privileges to high-achievers, students feel that their teacher communicates that good grades and demonstrating competence are most important.

Whereas student-teacher relationships have been studied in relation to a wide range of student outcomes, including achievement, externalizing, and internalizing behaviors, studies investigating classroom goal structures have mainly focused on student motivation and achievement. Focusing first on student-teacher relationship, studies indicate that students who perceive their relationship with their teacher as characterized by a high level of closeness tend to display fewer externalizing and internalizing behavior problems and higher levels of achievement in elementary school and into adolescence (Hughes et al., 2012; O'Connor et al., 2011; Skalická et al., 2015). In comparison, students perceiving their student-teacher relationship as characterized by higher levels of conflict tend to display greater behavior problems and poorer achievement (Hughes et al., 2012; O'Connor et al., 2011; Skalická et al., 2015). Among secondary students, although Longobardi et al. (2019) found that low and stable levels of student-teacher relationship conflict may protect youth against internalizing behaviors, others found no such association (Morin et al., 2009; Roorda & Koomen, 2020). This inconsistency may be explained by sex differences. Morin et al. (2009) showed that conflict places girls at greater risk of internalizing problems than boys, suggesting that they might be more sensitive to student-teacher relationship. Finally, when close and conflictual student-teacher relationship are considered together, conflict seems to be more robustly related to maladaptive behaviors than closeness is related to adaptive behaviors (Baker et al., 2008; Rushton et al., 2019; Skalická et al., 2015). In particular, the positive association between conflict and behavior problems is especially marked for boys, who tend to experience greater conflict and to display fewer positive behaviors than girls even when sharing close relationship with their teacher (Hamre et al., 2008). These results suggest that considering sex differences and the combined role of closeness and conflict is important.

Turning our attention to students' perceptions of classroom goal structure, mastery- and performance-approach classroom goal structures have both been found to support achievement (Federici et al., 2015). Although research is still too scarce to draw definite conclusions on the implication of classroom goal structures for externalizing and internalizing behaviors, a few studies suggest that promoting performance goals could have undesirable repercussions for these behaviors (Kaplan et al., 2002). However, studies focusing the mastery and performance goals students hold for themselves (rather than those present at the classroom level) suggest that their combination might yield different outcomes (Huang, 2012; Senko, 2019). For instance, Heyman and Dweck (1992) argued that it might be problematic for students to display a pure desire to learn (mastery) not accompanied by a desire to perform, as the aspiration to master a skill without ever truly demonstrating it tends to jeopardize learning opportunities. This hypothesis was supported by Méndez-Giménez et al. (2018)

who demonstrated that adolescents' achievement was best nurtured by the joint pursuit of mastery- and performance-approach goals. As students' perceptions of their classroom learning environment are key in determining their adjustment (Ryan & Deci, 2017), these results should similarly apply to students' perceptions of classroom goal structure, suggesting that fostering achievement might require an optimal combination of mastery and performance classroom goal structures. These findings raise questions regarding the potential contribution of studying the combined role of students' perceptions of the mastery and performance goal structures of their classrooms as possible drivers of their achievement and behavior problems, but also about whether and how their perceptions of the classroom goal structure combine with that of their student-teacher relationships to create a more or less supportive classroom environment.

Whereas research has rarely examined sex differences in how girls and boys perceive their classroom goal structure, several studies focusing on personal achievement goals reflect a tendency for girls to be more mastery oriented and less performance oriented than boys, who tend to be more concerned with outperforming their classmates than learning course material (Kenney-Benson et al., 2006; Meece & Holt, 1993; Roeser et al., 1996). It remains uncertain whether these sex differences will also be reflected in students' perceptions of their classroom goal structure.

Adopting a Comprehensive View of the Role of Teachers

Practitioners recognize that teachers adopt a wide variety of teaching behaviors and practices, known as teaching styles (Rasku-Puttonen et al., 2011). Unfortunately, most research focuses on student-teacher relationships as something that is independent from teaching practices, including classroom goal structures. Yet, recent studies suggest that a mastery classroom goal structure comprises several components (i.e., Task, Autonomy, Recognition, Grouping, Evaluation, Time – forming the acronym TARGET), including the presence of emotional support (Bardach et al., 2018; Fokkens-Bruinsma et al., 2020). In addition, even research relying on the more traditional definition of a mastery classroom goal structure (i.e., Pattern of Adaptive Leading Scale; Midgely et al., 2000) shows that students feeling exposed to such an environment also tend to feel more emotionally connected to their teacher (Anderman, 1999; Patrick et al., 2011; Kaplan & Midgley, 1999).

The complexity of teaching encompasses a wide variety of behaviors and practices that is best captured by the adoption of a multidimensional holistic perspective (Gaias et al., 2019; Kikas et al., 2016; Rasku-Puttonen et al., 2011; Tang et al., 2017). Person-centered analyses, such as Latent Profile Analysis, are explicitly designed to achieve this purpose (Morin & Litalien, 2019). Indeed, rather than trying to summarize students' perception of their classroom environment by way of distinctive dimensions, latent profile analyses seek to identify subpopulations of students who feel exposed to qualitatively distinct types of classrooms defined by considering both their relationships with their teachers, and their perceptions of the classroom goal structures implemented by their teachers. In other words, not all combinations of high-moderate-low levels on the four indicators (i.e., mastery and performance classroom goal structures, and student-teacher closeness and conflict) are likely to occur based on students' perceptions. Indeed, some of those combinations are likely to be more prevalent, and relevant, to students' reality, and latent profile analyses are designed to identify them.

A few studies have relied on this approach and revealed insightful results. For instance, Bae et al. (2020) found that different teachers might promote mastery, performance, none, or both types of goals in their grade six science classrooms. They also found that students whose teachers valued mastery goals were more motivated than those whose teachers valued both mastery and performance goals, although these differences were not reflected in student levels of achievement in science. Relatedly, Patrick et al. (2011) found that classroom mastery goal structures were negatively associated with classroom performance goal structures, suggesting that even if some teachers might promote both mastery and performance goals, it is not generalized across all teachers. Their result also suggests that students who perceive a strong classroom mastery goal structure are also likely to find their interactions with their teacher as emotionally supportive. Others found that student perceptions of closeness were associated with their endorsement of mastery-approach goals for themselves, whereas their perceptions of conflict were related to their adoption of performance-approach goals (Thijs & Fleischmann, 2015). These associations are likely to apply to their perceptions of classroom mastery and performance goal structures, although this still has to be investigated. Finally, variable-centered studies also argue that various teaching practices should be studied in combination, as students who perceive multiple and diverse sources of support from their teacher display adaptive behaviors and positive school

development (Olivier et al., 2021).

The Present Study

To properly capture the complex multidimensional nature of student perceptions of the role played by their primary school teacher, the present study assesses the various combinations of classroom goal structures and student-teacher relationships to which boys and girls report being exposed. It also investigates whether and how these configurations are related to internalizing behaviors, externalizing behaviors, and achievement. Our first objective is to identify profiles of students reporting being exposed to qualitatively distinct configurations of student-teacher relationship closeness and conflict, mastery-approach and performance-approach classroom goal structures. Based on studies assessing the associations between student-teacher relationships and classroom goal structures (Bae et al., 2020; Patrick et al., 2011), we expect to identify at least one profile characterized by high perceptions of mastery goals and closeness, one profile characterized by a combination of perceived mastery and performance goal structures, and one profile mainly driven by perceptions of conflict, possibly in combination with a performance goal structure. Our second objective is to assesses whether these profiles vary across samples of boys and girls. Although girls tend to perceive slightly closer relationships with their teachers and mastery goal for themselves (Hamre et al., 2008; Kenney-Benson et al., 2006), we do not anticipate that the nature of the profiles will differ as a function of student's sex. Our third objective is to verify whether and how these profiles relate to student achievement, externalizing behaviors, and internalizing behaviors at the beginning of the school year, and to changes in these outcomes occurring over the school year. In doing so, we also investigate whether these associations differ across subsamples of boys and girls. We expect that profiles mainly characterized by classroom mastery goal structures or closeness will lead to more positive outcomes, whereas those characterized by conflict will be associated with poorer outcomes. We leave as an open question the role of profiles characterized by performance goal structures in combination with other aspects of the classroom. Finally, for descriptive purposes, we test whether or not the likelihood of profile membership differs as a function of students' grade level.

Methods

Participants

This study relies on a sample of 703 3rd to 6th grade students (M_{age}=9.93; SD_{age}=1.28; 48.10% girls) recruited in seven elementary schools from the same school board located in the Canadian province of Quebec. The majority of students were White Caucasians and came from middle-class families, which is representative of the Quebec student population outside of the Montreal area (MEES, 2019). Their 33 teachers (90.9% females) also participated in the study. Teachers were aged between 20-35 years (48.5%), 36-50 (33.3%), 51 or more (18.2%), and had between 1-3 (54.6%), 4-10 (9.1%), 11-20 (30.3%), and 20 or more (6.0%) years of tenure.

Procedure

This project was first approved by the University of Montreal's research ethics committee, and participation required active parental, student, and teacher consent. In November 2011 (T1) and April 2012 (T2), whole classrooms of students were taken to a computer lab in their school. Students simultaneously answered a 45-minute computerized questionnaire on their school experiences. During data collection, each classroom was supervised by two trained research assistants. If needed, the research assistants read the question out loud to help the students. Teachers used this time to complete a paper questionnaire on the behaviors and performance of each of their students.

Measures

Student-teacher Relationship. At T1, students completed the closeness (4 items; α_{T1}=.819; e.g., "I sometimes share my feelings with my teacher" and "I feel close to my teacher and trust him/her") and conflict (4 items; α_{T1}=.873; e.g., "I easily get angry with my teacher" and "I sometimes feel that my teacher is unfair with me") student-teacher relationship subscales from Pianta's (1999) questionnaire, using a five-point response scale (1- *not at all* to 5- *very much*).

Classroom Goal Structure. At T1, students completed the mastery-approach (3 items; α_{T1}=.738; e.g., "My teacher notices when we are trying hard") and performance-approach (3 items; α_{T1}=.822; e.g., "My teacher tells us which students have the highest scores on an exam") classroom goal structure subscales from Midgley et al.'s (2000) Patterns of Adaptive Learning Scales questionnaire, using a five-point response scale (1- *not true at all* to 5- *very true*).

Externalizing Behaviors. At T1 and T2, teachers rated students' externalizing behaviors using

ten items referring to hyperactivity-inattention and opposition-defiance (α_{T1}=.801, α_{T2}=.765; e.g., "Since the start of the school year, this child has been restless, hyperactive, cannot keep still") (Capron et al., 2007; Goodman, 2001), using a three-point response scale (1- *not true* to 3-*very true*).

Internalizing Behaviors. Students rated their own levels of internalizing behaviors using seven items reflecting anxiety and depression (α_{T1}=.827, α_{T2}= .841; e.g., "In the past month, you weren't as happy as other kids your age") (Hoge et al., 1985; Tremblay et al., 1987), using a three-point response scale (1- *not true* to 3-*very true*).

French and Math Achievement. Teachers compared each of their students' achievement in French (first language) and Math to the rest of the classroom at T1 and T2. They rated students for each subject using a five-point response scale (1- *clearly below average* to 5- *clearly above average*). This measure has been shown to provide a reliable evaluation of student achievement in primary school (Archambault et al., 2013; Duncan et al., 2007).

Covariates. Students self-reported their sex (0=male; 1=female).

Analyses

Preliminary analyses

Preliminary analyses were conducted to assess the factor structure of all scales, and their measurement invariance as a function of students' sex (student-teacher relationships and classroom goal structures), and as a function of time and students' sex (internalizing and externalizing behaviors, and achievement in Math and French). The profile indicators (student-teacher relationships and classroom goal structures) are invariant factor scores extracted from these models in standardized units (*M*=0; *SD*=1). For the outcomes (internalizing and externalizing behaviors) the most invariant measurement model was converted to a latent change model from which the factor scores were extracted. These factors scores were estimated in standardized units at T1 (*M*=0; *SD*=1), whereas the T1-T2 latent change factor was estimated in units reflecting deviations from T1 in SD units (a similar parameterization was use for achievement). These preliminary analyses and correlations are reported in the online supplements (Appendix A and Tables S1 to S4). Missing data were also handled as part of these preliminary analyses and are described in Appendix A of the online supplements.

Latent Profile Analysis

Estimation

Latent Profile Analyses (LPA) models were performed to identify the optimal set of profiles best representing students' perceptions of their student-teacher relationship (closeness and conflict) and classroom goal structure (mastery and performance). These models were estimated using Mplus 8.4's (Muthén, & Muthén, 2020) robust maximum likelihood (MLR) estimator separately in each subsample (boys versus girls) while relying on Mplus design-based correction procedures (TYPE=COMPLEX; Asparouhov, 2005) to control for the nesting of students within classrooms. Models were estimated using 3000 random sets of start values, 500 iterations, and 200 final stage optimizations to avoid converging on a suboptimal local solution (Morin & Litalien, 2019). These models were estimated while allowing the indicators' means, but not their variances, to be freely estimated across profiles. Although there are advantages to the estimation of LPA models defined while also allowing the variance of the indicators to vary across profiles (Peugh & Fan, 2013), these more complex models resulted in severe convergence difficulties and improper parameter estimates, suggesting overparameterization (Chen et al., 2001) and supporting the superiority of our simpler models (Morin & Litalien, 2019).

Model Selection

The optimal solution was selected based on three criteria: Statistical adequacy, meaningfulness, and theoretical adequacy (Morin et al., 2016). Several statistical indicators were also examined to guide this decision: Akaïke 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)[1]. Lower values on AIC, CAIC, BIC, and ABIC suggest a better solution. However, these indicators often keep improving with the addition of profiles. A graphical examination of "elbow plots" is recommended to facilitate decision-making (e.g., Petras & Masyn, 2010). In these plots, the inflection point in the curve representing the decrease in the value of these indicators associated with the addition of profiles suggests the optimal number of profiles. The

[1] One additional indicator, the bootstrap likelihood ratio test (BLRT), is not available when relying on the TYPE= COMPLEX correction for nesting.

aLMR compares the estimated model to the model with one less profile. Non-significant aLMR ($p > .05$) indicate that the model with one less profile should be retained. We also report the model entropy as an indicator of classification accuracy. Entropy values range from 0 to 1, with values closer to 1 indicating higher levels of classification accuracy. The entropy is only reported for descriptive purposes as it should not be used to guide the selection of the optimal solution.

Profile Similarity

Following the selection of the optimal LPA solution within each sex-specific subsample, tests of profile similarity were conducted to assess the extent to which this solution could be replicated across subsamples of boys and girls. These tests were performed following the sequence proposed by Morin et al. (2016), which involves the estimation of a series of nested models in which parameters are progressively constrained to equality across groups: (a) same number of profiles (configural similarity), (b) same within-profile means on the indicators (i.e., same profile shape: structural similarity), (c) same within-profile variances on the indicators (dispersion similarity); (d) same proportion of students in each profile (distributional similarity). The similarity is considered supported when two indicators out of the CAIC, BIC, and ABIC decrease relative to the previous step (Morin et al., 2016). Failure to uphold similarity at any stage was followed by tests of partial similarity limited to a subset of profiles or indicators (Morin et al., 2016).

Predictors

The associations between students' grade level (3^{rd} to 6^{th}) and their likelihood of profile membership were assessed starting from the most similar LPA solution identified in the previous stages. These associations were assessed following the direct inclusion of the predictor in the model via multinomial logistic regression link function (Morin & Litalien, 2019). To assess predictive similarity (Morin et al., 2016) between the boys and girls, a first model was tested in which all paths were freely estimated between samples. A second model was then assessed in which the paths between the predictors and profile membership were constrained to equality between samples.

Outcomes

Outcomes were added to the most similar LPA solution (Morin et al., 2016). Outcome levels were first freely estimated across profiles and between boys and girls. In a second model of explanatory similarity, outcome levels were constrained to be equal across sexes within each of the profiles. The similarity is supported when two indicators out of the CAIC, BIC, and ABIC show a decrease in the second model, and failure to uphold similarity was followed by tests of partial similarity. Tests of statistical significance for outcomes comparisons relied on the multivariate delta method (Raykov & Marcoulides, 2004) implemented using the MODEL CONSTRAINT function.

Results

Latent Profile Analyses

The results from the alternative LPA solutions estimated separately in the boys and girls subsamples are reported in Table 1, and the corresponding elbow plots are reported in Figure S1 and S2 of the online supplements. For boys and girls, all information criteria (BIC, ABIC, and CAIC) continued to decrease without reaching a minimum. However, the elbow plot tentatively suggested a plateauing in the decrease in the value of these indicators between three and five profiles, which suggested a three-profile solution for boys and a four-profile solution for girls. Given these results, we more carefully examined solutions including 3, 4, and 5 profiles for their theoretical and heuristic meaningfulness and added value. Across all solutions, the identified profiles were visually relatively similar for boys and girls, providing early evidence of profile similarity. In both subsamples, the three-profile solution resulted in three qualitatively distinct profiles (corresponding to an average, a mastery and closeness, and a conflict profile). The four-profile solution resulted in the addition of a meaningful profile characterized by high levels of closeness, mastery, and performance goal structure, which was qualitatively distinct from the three profiles identified in the previous solution. In contrast, the five-profile solution only resulted in the addition of a relatively small (4%) profile presenting a shape similar to the third profile described previously (differing only in the level of some indicators). For these reasons, the four-profile solution was retained for tests of profile similarity.

The results from these tests (Table 1) failed to support the structural (shape) similarity of the profiles between boys and girls, resulting in a higher value on the BIC and ABIC compared to the model of configural similarity. Examination of the parameter estimates from the model of configural similarity suggested that this lack of structural similarity could be limited to the within-profile mean of a single

indicator (student-teacher closeness) in a single profile (Profile 1, presenting an *Average* configuration). Thus, equality constraints were relaxed between boys and girls on the Profile 1 mean of this specific indicator, leading to a model of partial structural similarity that was supported by the data (lower BIC and CAIC value relative to the model of configural similarity). From this model of partial structural similarity, the next models of dispersion and distributional similarity were both supported by the data, indicating that the within-profile variability and size of the profiles was similar between boys and girls. This solution was thus retained for interpretation, and is graphically illustrated in Figure 1 (parameter estimates are reported in in Table S5 of the online supplements).

These results first revealed an *Average* profile (Profile 1, or P1) in which students reported levels of student-teacher relationships and classroom goal structures close to the sample average. In this profile, the mean of one indicator differed between boys and girls, revealing slightly higher levels of closeness among girls than among boys. This profile corresponded to 44.46% of the sample. In the second *Mastery-Closeness* profile (P2, corresponding to 39.13% of the sample), students reported higher than average levels of mastery goal structure and closeness, around average levels of performance goal structure and lower than average levels of conflict. In the third *Conflict* profile (P3, corresponding to 6.49% of the sample), students reported higher than average levels of conflict, around average levels of performance goal structure, and lower than average levels of mastery goals and closeness. Finally, in the fourth *Approach-Closeness* profile (P4, corresponding to 9.92% of the sample), students reported higher than average levels of closeness, mastery and performance goal structures, and around average levels of conflict. For P2, P3, and P4, no differences were observed between boys and girls.

Predictors

Starting from the final solution of dispersion similarity, we assessed the association between students' school grade and likelihood of profile membership. As shown in Table 1, our results supported the equivalence of these associations across boys and girls (the model of predictive similarity resulted in lower BIC, ABIC, and CAIC values relative to the model in which these associations were allowed to differ between boys and girls). Results from these analyses are reported in Table 2 and show that students corresponding to the *Average*, *Mastery-Closeness*, and *Conflict* profiles were more likely to be in higher grades (i.e., older) than those corresponding to the *Approach-Closeness* profile. No other association was statistically significant.

Outcomes[2]

We finally incorporated the factor scores reflecting students' externalizing behaviors, internalizing behaviors, French grades, and Math grades at the beginning of the school year, and the change in the levels of these variables occurring between the beginning and the end of the school year. As shown in Table 1, our results revealed that these associations were similar for boys and girls (the model of explanatory similarity resulted in lower BIC and CAIC values relative to the model in which these associations were allowed to differ between boys and girls). The results from these outcome comparisons are illustrated in Figure 2, and detailed parameter estimates are reported in Table S6 of the online supplements.

Students corresponding to the *Conflict* profile displayed the highest initial levels of externalizing behaviors, followed by students corresponding to *Average* profile, and in turn by students corresponding to the *Mastery-Closeness* profile (P3>P1>P2). Students corresponding to the *Approach-Closeness* profile also displayed higher initial levels of externalizing behaviors than those corresponding to the *Mastery-Closeness* profile (P4>P2), but not significantly different from the level found among students corresponding to the *Average* profile. Students corresponding to the *Mastery-Closeness* profile experienced a slight increase in their levels of externalizing behaviors which was significantly different from the slight decrease observed in the *Average* profile (P2>P1). However, this last result should be interpreted with caution because both change scores (as well as those observed in the other profiles) were not significantly different from 0, suggesting that, on the average, externalizing

[2] In an additional set of analyses, we assessed whether the outcomes measured at T1 (externalizing behaviors, internalizing behaviors, and achievement in Math and French) predicted profile membership at T1 to test for possible reciprocal effects. The additional results, available from the corresponding author, clearly supported the lack of associations between these variables measured and T1 and the profiles measured at the same time point, thus supporting the role ascribed to the profiles as predictors, rather than outcomes.

behaviors remained stable across the school year.

Students corresponding to the *Average* and *Conflict* profiles displayed the highest initial levels of internalizing behaviors, and these levels were significantly higher than those observed among students corresponding to the *Mastery-Closeness* profile. No other statistically significant differences were found in relation to internalizing behaviors. In addition, the change scores observed in all profiles did not significantly differ from 0, indicating that, on the average, internalizing behaviors remained stable across the school year.

Students corresponding to the *Mastery-Closeness* profile reported the highest levels of achievement in French, followed by those corresponding to the *Average* and *Conflict* profiles, and finally by those corresponding to the *Approach-Closeness* profile (P2>P1=P3>P4). Students corresponding to the *Average* and *Approach-Closeness* profiles displayed a slight, but not significant, increase in French achievement, which was larger than the significant decrease in French achievement observed in the *Mastery-Closeness* profile (P1=P4>P2).

Students corresponding to the *Mastery-Closeness* profile had the highest initial levels of Math achievement, followed by those corresponding to the *Average* profile, and in turn by those corresponding to the *Conflict* and *Approach-Closeness* profiles (P2>P1>P3=P4). Students corresponding to the *Approach-Closeness* profile displayed a significant increase in Math achievement relative to those corresponding to the *Average* profile whose Math achievement levels remained stable over time, and to those corresponding to the *Mastery-Closeness* profile whose Math achievement levels decreased over time (P4>P1>P2). Also, the increase in Math achievement levels observed among students corresponding to the *Conflict* profile was significantly different from the decrease observed in students corresponding to the *Mastery-Closeness* profile (P3>P2).

Discussion

Combining Attachment Theory (Ainsworth & Bowlby, 1991; Pianta, 1999) and Achievement Goal Theory (Midgley et al., 2000), this study sought to identify potentially optimal and suboptimal configurations of student perceptions of their student-teacher relationships (closeness and conflict) and classroom goal structures (mastery- and performance-approach) with the goal of informing school-based efforts seeking to prevent externalizing and internalizing behavior problems and promote French and Math achievement in grades three to six. The study also assessed whether boys and girls would report being exposed to distinct student-teacher relationship and classroom goal structure configurations. Our results indicated that student perceptions matched four distinct profiles characterized by an *Average*, a *Mastery-Closeness*, a *Conflict*, and an *Approach-Closeness* configuration. Although these profiles were globally found to be similar across subsamples of boys and girls, girls corresponding to the *Average* profile reported slightly higher levels of closeness with their teacher relative to boys corresponding to the same profile. In terms of behavior problems and achievement, our results suggested that the *Mastery-Closeness* profile provided an optimal configuration, whereas the *Conflict* profile appeared to represent the least optimal configuration. Surprisingly, students corresponding to the *Approach-Closeness* profile (characterized by high levels of classroom mastery and performance goal structures, and closeness) did not seem to present a risk of experiencing of increases in externalizing and internalizing behavior problems over time, but were considered by their teachers to be low-achieving students.

Profiles of Student-teacher Relationships and Classroom Goal Structures

Consistent with studies advocating the use of Latent Profile Analyses to achieve a better understanding of the various configurations of teaching styles (Bae et al., 2020; Gaias et al., 2019; Kikas et al., 2016; Rasku-Puttonen et al., 2011; Tang et al., 2017), our results show that students described their classrooms as multidimensional combinations of student-teacher relationship and classroom goal structure dimensions. In the present study, we identified four profiles characterized either by high levels of closeness and classroom mastery goal structure (*Mastery-Closeness*; *Approach-Closeness*), or by moderate to high levels of conflict (*Average*; *Conflict*). The identification of a *Mastery-Closeness* profile is consistent with prior studies reporting that students who feel close to their teachers also tend to hold mastery goals for themselves (Thijs & Fleischmann, 2015), a conclusion that seems to also extend to their perception of their classroom goal structure. Fortunately, this profile was also one of the largest identified in this study (close to 40%). The identification of a *Conflict* profile is also consistent with previous research suggesting that students exposed to conflict with their teachers rarely report being simultaneously close to their teachers (e.g., Olivier et al., 2018). It was, however, encouraging to

note that this profile was the rarest identified in this study (6.49%).

Although not explicitly expected, the identification of an *Average* profile is also consistent with previous person-centered observations suggesting that a subset of roughly 25% of university teachers seemed to be perceived by their students as being relatively passive toward their teaching role and as not really relying on a clear set of dominant practices, while also not being completely disengaged from their role (Morin & Marsh, 2015). A similar configuration seems to be reported by primary school students who feel that their teachers' practices corresponded to the *Average* classroom profile identified in the present study, although more frequently (close to 50%). Importantly, we have not identified a profile simultaneously characterized by the dual presence of conflict and of a performance goal structure, which suggests that performance goal structures are not, in the eyes of most students, necessarily associated with a problematic learning climate (i.e., conflict), as previously suggested in studies assessing students' own goals (e.g., Thijs & Fleischmann, 2015). However, we identified a profile characterized by a combination of mastery- and performance-approach goal structures, coupled with closeness (*Approach-Closeness*), consistent with studies reporting that mastery and performance goal structures might sometimes be used in combination by some teachers (Bae et al., 2020), just as some students pursue these two types of goals for themselves (Méndez-Giménez et al., 2018). This profile, however, did not seem to be very frequent, corresponding only to roughly 10% of the sample. Interestingly, this profile also corresponded to slightly younger students than the other profiles, which suggests that older students might perceive slightly more cognitively activating practices, consistent with their teachers focusing on mastery but not performance goal structures (Schiefele & Schaffner, 2015) or that younger students might feel that their teacher needs to enforce achievement as a sign of mastery. An alternative explanation for younger students corresponding to this *Approach-Closeness* profile stem from studies examining students' personal goal orientations (e.g., Nicholls, 1984; Wigfield & Cambria, 2010). Younger students might not differentiate well between the concepts of 'ability' and 'effort' compared to older students. Applied to their perceptions of classroom goal structures, this conclusion suggests that younger students may perceive that performance (i.e., ability) and mastery (i.e., effort) go hand in hand, whereas older students may more clearly distinguish these concepts.

Given that the present study was the first to assess student profiles based on a combination of student-teacher relationships and classroom goal structures, it would be important for future studies to try and replicate our results, particularly among diversified samples of students from different cultures and countries, and across a wider range of educational levels. Indeed, person-centered evidence is cumulative in nature, leading to the identification of a central set of profiles that systematically emerge across studies, of more peripheral profiles emerging only in some conditions, and of rarer set of occasional profiles that might simply reflect random sampling variations (Solinger et al., 2013).

Sex Differences

Our results showed that the four profiles were virtually identical across subsamples of boys and girls, with a single exception suggesting that girls corresponding to the *Average* profile tended to report slightly higher levels of closeness than boys corresponding to the same profile. This result is consistent with previous research showing that girls tend to be more sensitive to the positive aspects of teachers' relational behaviors than boys, due to their tendency to be more attuned and attentive to the affective aspects of their social interactions in general (Koepke & Harkins, 2008; Morin et al., 2009). Research relying on teacher reports of student-teacher relationships also supports these findings, as teachers generally report closer relationships with girls than with boys (Koepke & Harkins, 2008). However, this difference was limited to a single profile. Although this profile corresponded to almost half of the sample (44.46%), this result suggests that these differences might not be as widespread as previously thought and limited to students with generally "average" perceptions of their teachers.

In contrast, whereas previous research suggested that boys might experience higher levels of conflict than girls (e.g., Hamre et al., 2008), this observation was not supported by our results. One possible explanation is that teachers and students have different perceptions of their relationship, with teachers typically perceiving more conflicts with boys than with girls, as well as with students displaying behavior problems (Koepke & Harkins, 2008). Students usually have plenty of time to properly process and analyze the absolute nature of their relationship with their teacher, especially in primary schools where they typically have a single teacher. In contrast, teachers must ponder their relationships involving every student in their class(es), possibly relying on social comparisons to differentially weigh their relationships with every individual student. This process may lead teachers to

develop inflated negative perceptions of their relationships with the most agitated students, which are often boys (Hamre et al., 2008), even though these students might remain unaware of this perception (Koepke & Harkins, 2008).

Student Behavior Problems and Achievement

Our results indicated that some profiles seemed to be more optimal than others for nurturing student adjustment and achievement, in addition to revealing some interesting observations related to the evolution of behavior problems and achievement over the course of a school year. First, across all profiles, students' levels of internalizing and externalizing behaviors did not seem to change over the course of one school year, consistent with the previous observation that these difficulties were relatively stable over short periods of time (DeBolle et al., 2015). Behavioral difficulties might, however, evolve differently in response to yearly fluctuations in the classroom environment. For instance, students consistently exposed to supportive interactions with their teachers might be able to reduce their problematic behaviors over the years (Lee & Berman, 2018). In contrast, achievement levels were found to evolve over the course of the school year, but in a way that seemed to be influenced by profile membership, as discussed in the following paragraphs.

Second, the *Conflict* profile was the least optimal, being associated with the highest levels of internalizing and externalizing behaviors. Teachers also reported lower levels of achievement for members of the *Conflict* profile relative to the *Average* and *Mastery-Closeness* profiles. These results reinforce previous reports showing that student-teacher conflict tends to be associated with higher levels of behavior problems and lower achievement (Baker et al., 2008; O'Connor et al., 2011; Skalická et al., 2015). These behavioral problems, themselves associated lower achievement (Jerome et al., 2009), are likely to result in a downward spiral, leading to increased teachers' frustration which in turn may reinforce students' behavioral problems (Longobardi et al., 2019; Roorda & Koomen, 2020). Moreover, the fact that levels of externalizing behaviors remained higher and achievement levels lower but stable in the *Conflict* profile relative to the *Average* one suggests that average levels of the other more desirable characteristics (student-teacher closeness and mastery goal structure) might have contributed to protect *Average* students against the negative effects of student-teacher conflict on externalizing behaviors and achievement, as suggested by O'Connor et al. (2011). However, this protective effect did not extend to internalizing behaviors, which did not differ between the *Conflict* and *Average* profiles. This last result suggests that students at risk for internalizing problems might be more sensitive to negative interactions with their teachers than to other aspects of their interactions with their teachers. Indeed, students at risk for internalizing problems have been reported to be more likely than their peers to withdraw from negative social interactions (O'Connor et al., 2011), making them less likely to benefit from other aspects of their interactions with their teachers.

Third, no profile was characterized by high levels of conflict coupled with high levels on any of the other indicators (closeness, mastery, performance), which made it impossible to verify whether student-teacher conflict might reduce the benefits associated with other components of teachers' relational behaviors and motivational practices, as previously suggested (Longobardi et al., 2019; O'Connor et al., 2011; Skalická et al., 2015). In fact, only one study (McGrath & Van Bergen, 2019) focusing specifically on student-teacher relationships identified such a paradoxical profile (high closeness and conflict) among a small number of highly disruptive students. Other studies identified students feeling neglected (i.e., sharing neither close nor conflictual relationships), but failed to identify students reporting the dual presence of high levels of closeness and conflict in relation to the same teacher (Olivier et al., 2018). Similarly, our results seem to suggest that incompatible relationships, although they might occur for a relatively small proportion of students with very specific characteristics, are not commonly perceived by typically developing students attending regular classrooms. These students rather seem to report conflict as occurring on its own, or possibly as overshadowing their perceptions of other teacher's behaviors.

Fourth, the *Mastery-Closeness* profile seemed to provide an optimal configuration relative to the other profiles. Indeed, students corresponding to this profile presented lower levels of externalizing and internalizing behaviors, and higher initial levels of achievement in French and Math than those corresponding to the other profiles. This result adds to the literature by suggesting that, at least from the students' perspective, the combination of closeness and mastery goal structure might help to establish an optimally supportive classroom context and learning environment that may prevent the emergence of behavior problems and promote achievement. This result is consistent with previous

studies independently supporting the positive effects of closeness (Baker et al., 2008; Hughes et al., 2012; O'Connor et al., 2011), classroom mastery goal structure (Federici et al., 2015) and students' mastery goals (Theis et al., 2019).

Fifth, although the achievement levels of students corresponding to the *Mastery-Closeness* profile decreased slightly during the year, it remained higher than that of students corresponding to other profiles over the course of the study. This decline could potentially reflect a *regression-to-the-mean* effect, known to frequently happen in achievement research among high achievers (Lohman & Korb, 2006). Over the year, teachers may also come to dedicate more energy to improve the learning and achievement of the lower-achieving students (Baker et al., 2002). As a result, the teaching rhythm may become less challenging for high-achieving students, in turn decreasing their learning motivation (e.g., Litvack et al., 2011). Nonetheless, the *Mastery-Closeness* profile remains the most optimal combination of student-teacher relationships and classroom goal structures observed in this study, as students corresponding to this profile displayed fewer behavior problems and higher achievement levels than any other students.

Sixth, students corresponding to the *Approach-Closeness* profile reported high levels of closeness and mastery-approach classroom goal structures coupled with similarly high levels of performance-approach classroom goal structures. Existing studies are scarce on how this combination might impact students. Our results indicate that, contrary to what others thought (e.g., Butler & Shibaz, 2008), students corresponding to the *Approach-Closeness* profile were not more likely to feel anxious and depressed relative to all other students, nor to be reported as inattentive, hyperactive, or disruptive by their teacher relative to *Average* students. Arguably, this result is likely due to the fact that high levels of performance goal structures were only observed in this single profile in which they did not occur on their own, suggesting that the similarly high levels of student-teacher closeness and mastery goal structure might have contributed to reduce the possible negative effects of performance goal structures for these students. This observation is very interesting as many studies anchored in Achievement Goal Theory have only considered the additive role played by mastery and performance goal structures, without also considering their combined impact, and without jointly considering the role of student-teacher relationships. Indeed, one core assumption of person-centered analyses is that the meaning of each profile indicators is likely to be impacted and modified based on the context created by the other indicators (e.g., Meyer & Morin, 2016). In this regard, our results suggest that performance goals may be seen in a more positive light when occurring within classroom characterized by close relationships with their teachers and in which mastery is also value. These results support similar conclusions reported by Pintrich (2000; also see Litalien et al., 2017a, 2017b), who found that when coupled with mastery goals, adolescents' performance goals led them to experience increases in positive affect and decreases in self-handicapping behaviors, results that also seem to apply to classroom goal structure. Still, as students exposed to performance goals have been previously shown to be more likely to share conflictual relationships with teachers and to perceive them as controlling (Olivier et al., 2018), they might be especially attuned to having a chance to share positive and supportive interactions such as those found in the *Approach-Closeness* profile.

Seventh, it was most surprising to notice that, in this *Approach-Closeness* profile, French and Math achievement levels were at their lowest at the beginning of the school year. As some studies suggested that closeness, as well as mastery and performance classroom goal structures, all tend to be positively associated with student achievement (Federici et al., 2015; Hughes et al., 2012), this result might seem surprising. Yet, and matching these previous results, students corresponding to this profile also showed the most improvement throughout the year. These students might feel that their teachers have opted to rely on this specific combination of practices to maximally push low achievers to improve over the course of the school year. Furthermore, our results tentatively suggest that this approach succeeded, without simultaneously increasing students' risk of externalizing and internalizing behaviors. Although replications are necessary, this suggests that a performance goal structure, when combined with a mastery goal structure and closeness, might be well-adapted to the needs of low-achieving students. These findings also echo Heyman and Dweck's (1992) suggestion that actually learning occurs best when individuals pursue performance goals along with their desire to master academic skills. As students corresponding to this profile were slightly younger than those corresponding to the other profiles, it would seem particularly important for future research to verify whether the efficacy of this combination changes as a function of students' developmental stage.

Lastly, all profiles were found to share similar associations with the outcomes for boys and girls. Considering that previous research has often suggested that girls might be more sensitive to the relational aspects of their interactions with their teachers (e.g., Morin et al., 2009), this result was unexpected. Moreover, whereas boys tend to be seen by their teachers as displaying higher levels of externalizing behaviors, girls tend to report higher levels of internalizing behaviors (Hamre et al., 2008; Morin et al., 2009). Beyond these differences also found in our study, our results failed to support that boys and girls might react differently to their perceptions of their classroom environment. These results contribute to a growing body of research showing that only a few and specific aspects of the classroom context might differently impact boys and girls, and that both ultimately seem to benefit from the same classroom features (Lietaert et al., 2015; Madill et al., 2014).

Limitations and Future Research

This study assessed only some aspects of the classroom environment and is thus not without limitations. First, the simultaneous consideration of other influential aspects of the classroom environment, such as need-supportive practices (Ryan & Deci, 2017) and classroom social climate (Patrick et al., 2011), would complement the complex portrait of teaching styles drawn in the present study. Similarly, students' perceptions of classroom avoidance goal structures were not considered in the present study. Given that previous studies have reported that avoidance goals tend to lead to poor student outcomes (Federici et al., 2015), it would be informative for future studies to consider their role in combination with other facets of the classroom environment (Peng et al., 2018). Moreover, although our results supported the importance of all facets of the classroom environment in the definition of the profiles, it would be interesting for future studies to see whether a reduced set of "high-quality" indicators could be used to reliably identify the same set of profiles in a cost-effective manner. Second, we relied on theory to position behavior problems and achievement as outcomes of the classroom profiles. However, teachers may struggle to establish positive relationships and to encourage mastery goals with students presenting behavior problems (e.g., internalizing individuals become socially aversive, whereas externalizing students tend to disrupt the classroom), entailing bidirectional associations were behavior problems lead to worse relationships, which in turn lead to a worsening of the problems (Skalická et al., 2015). It would be interesting for future research to investigate whether specific combinations of practices can break this cycle, and which specific aspects of the classroom environment are the most potent drivers of behaviors. Similarly, student motivation, abilities, and temperament are also likely influence their perceptions of the classroom context, a question that should be addressed in future studies. Finally, this study relied on a teacher and student perceptions of the main concept under investigation. Relying on observational data would provide a complementary and a more neutral evaluation teachers' actual practices in their classroom. This is especially important in order to provide recommendations not solely based on student perceptions of their teachers, but also on observable and quantifiable teacher behaviors.

Implications and Conclusion

Our results have practical implications for educators and researchers. At a theoretical level, studies rarely integrate multiple facets of teachers' relational behaviors and motivational practices, thus failing to consider the complex multidimensional reality of the classroom environment to which students feel being exposed. Most investigators simply examine isolated aspects of the classroom, or school context, rooted in a single theoretical framework, resulting in microscopic analysis of the isolated role played by a single characteristic. The true classroom environment is far more complex and would benefit from analyses considering the whole multidimensional reality to which students are exposed. Research should thus increasingly focus on the forest, rather than (or in addition to) each of the trees. In this regard, our study demonstrates that student-teacher relationships, typically rooted in attachment or need satisfaction models, are complementary to teachers' use of different classroom goal structures, typically stemming from motivational models. Both models suggest that a supportive environment, whether in terms of positive social relationships or motivational context, contributes to students' adaptive behavioral and educational functioning. As such, our results advocate for a more integrated and comprehensive investigation of the learning context, encompassing several theoretical frameworks. Such studies will help researchers to make more nuanced and realistic recommendations to educators, while acknowledging the complexity of teachers' roles.

At a practical level, this study sought to help educational psychologists make fewer, but more optimal recommendations sharing a stronger connection to teachers' complex reality, at least according

to student perceptions of their teachers' practices. In this regard, we found that students who perceive a combination of closeness and approach goal structures in their classroom, with or without a performance goal structure, were likely to display more desirable behaviors. They also perceived this combination as incompatible with the development of high levels of conflict with their teacher. Students, especially younger low-achieving students, who reported being exposed to a combination of performance with mastery goal structures and closeness might find the necessary resources in this combination to progress throughout the school year. This suggests students can thrive even when their perceive that their teacher implements a performance goal structure as long as an emotionally and motivationally supportive environment also backs up this practice. In contrast, we also found that conflict seems to be incompatible with any of the other desirable dimensions, thus reinforcing that conflictual relationships should be avoided at all costs. We hope that this study serves as an impetus for future intertheoretical investigations of classroom configurations likely to help teachers identify those practices and behaviors most conducive to positive student functioning.

References

Achenbach, T. M., & Edelbrock, C. S. (1978). The classification of child psychopathology: A review and analysis of empirical efforts. *Psychological Bulletin, 85*, 1275-1301.

Ainsworth, M. D. S., & Bowlby, J. (1991). An ethological approach to personality development. *American Psychologist, 46*, 331-34.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). American Psychiatric Association.

Archambault, I., Pagani, L., & Fitzpatrick, C. (2013). Transactional associations between classroom engagement and relations with teachers from first through fourth grade. *Learning and Instruction, 23*, 1-9.

Asparouhov, T. (2005). Sampling weights in latent variable modeling. *Structural Equation Modeling, 12*, 411-434.

Bae, C.L., Hayes, K.N., & DeBusk-Lane, M. (2020). Profiles of middle school science teachers: Accounting for cognitive and motivational characteristics. *Journal of Research in Science Teaching, 57*, 911-942.

Baker, S., Gersten, R., & Lee, D.-S. (2002). A synthesis of empirical research on teaching mathematics to low-achieving students. *Elementary School Journal, 103*, 51-73.

Baker, J.A., Grant, S., & Morlock, L. (2008). The teacher-student relationship as a developmental context for children with internalizing or externalizing behavior problems. *School Psychology Quarterly, 23*, 3-15.

Bierman, K.L., & Sasser, T.R. (2014). *Conduct disorder*. In M. Lewis & K. D. Rudolph (Eds.), *Handbook of developmental psychopathology* (p. 467–485). Springer.

Boden, K.K., Zepeda, C.D. & Nokes-Malach, T.J. (2020). Achievement goals and conceptual learning: An examination of teacher talk. *Journal of Educational Psychology, 112*, 1221-1242.

Butler, R., & Shibaz, L. (2008). Achievement goals for teaching as predictors of students' perceptions of instructional practices and students' help seeking and cheating. *Learning and Instruction, 18*, 453-467.

Caldarella, P., Larsen, R.A.A., Williams, L., Wills, H.P., & Wehby, J.H. (2021). "Stop doing that!": Effect of teacher reprimands on student disruptive behavior and engagement. *Journal of Positive Behavior Interventions, 23*, 163-173.

Campbell, S.B., Halperin, J.M., & Sonuga-Barke, E.J.S. (2014). *A developmental perspective on attention-deficit/hyperactivity disorder (ADHD)*. In M. Lewis & K. D. Rudolph (Eds.), *Handbook of developmental psychopathology* (p. 427-448). Springer.

Capron, C., Thérond, C., & Duyme, M. (2007). Psychometric properties of the French version of the self-report and teacher Strengths and Difficulties Questionnaire (SDQ). *European Journal of Psychological Assessment, 23*, 79-88.

Chen, F., Bollen, K.A., Paxton, P., Curran, P.J., & Kirby, J.B. (2001). Improper solutions in structural models: Causes, consequences, and strategies. *Sociological Methods & Research, 29*, 468-508.

DeBolle, M., De Clercq, B., De Caluwé, E., & Verbeke, L. (2015). Exploring the complexity of the childhood trait–psychopathology association: Continuity, pathoplasty, and complication effects. *Development & Psychopathology, 28*, 139-148.

Duncan, G.J., Dowsett, C.J., Claessens, A., Magnuson, K., Huston, A.C., Klebanov, P., Pagani, L.S.,

Feinstein, L., Engel, M., Brooks-Gunn, J., Sexton, H., Duckworth, K., & Japel, C. (2007). School readiness and later achievement. *Developmental Psychology, 43,* 1428-1446.

Federici, R.A., Skaalvik, E.M., & Tangen, T.N. (2015). Students' perceptions of the goal structure in mathematics classrooms: Relations with goal orientations, mathematics anxiety, and help-seeking behavior. *International Education Studies, 8,* 146-158.

Gaias, L.M., Lindstorm Johnson, S., Bottiani, J.H., Debnam, K.J., & Bradshaw, C.P. (2019). Examining teachers' classroom management profiles: Incorporating a focus on culturally responsive practice. *Journal of School Psychology, 76,* 124-139.

Garber, J., & Rao, U. (2014). *Depression in children and adolescents.* In M. Lewis & K. D. Rudolph (Eds.), *Handbook of developmental psychopathology* (p. 489–520). Springer.

Goodman, R. (2001). Psychometric Properties of the Strengths and Difficulties Questionnaire. *Journal of the American Academy of Child & Adolescent Psychiatry, 40,* 1337-1345.

Gottfried, A.E., Marcoulides, G.A., Gottfried, A.W., Oliver, P.H., & Guerin, D.W. (2007). Multivariate latent change modeling of developmental decline in academic intrinsic math motivation and achievement: Childhood through adolescence. *International Journal of Behavioral Development, 31,* 317-327.

Hamre, B.K., Pianta, R.C., Downer, J.T., & Mashburn, A.J. (2008). Teachers' perceptions of conflict with students: Looking beyond problem behaviors. *Social Development, 17,* 115-136.

Heyman, G.D., & Dweck, C.S. (1992). Achievement goals and intrinsic motivation: Their relation and their role in adaptive motivation. *Motivation and Emotion, 16,* 231-247.

Hoge, R.D., Meginbir, L., Khan, Y., & Weatherall, D. (1985). A multitrait-multimethod analysis of the Preschool Behavior Questionnaire. *Journal of Abnormal Child Psychology, 13,* 119-127.

Huang, C. (2012). Discriminant and criterion-related validity of achievement goals in predicting academic achievement: A meta-analysis. *Journal of Educational Psychology, 104,* 48-73.

Hughes, J.N., Wu, J.-Y., Kwok, O.-M., Villarreal, V., & Johnson, A.Y. (2012). Indirect effects of child reports of teacher–student relationship on achievement. *Journal of Educational Psychology, 104,* 350-365.

Jerome, E.M., Hamre, B.K., & Pianta, R.C. (2009). Teacher-child relationships from kindergarten to sixth grade: Early childhood predictors of teacher-perceived conflict and closeness. *Social Development, 18,* 915-945.

Kaplan, A., Gheen, M., & Midgley, C. (2002). Classroom goal structure and student disruptive behaviour. *British Journal of Educational Psychology, 72,* 191-211.

Kenney-Benson, G.A., Pomerantz, E.M., Ryan, A.M., & Patrick, H. (2006). Sex differences in math performance: The role of children's approach to schoolwork. *Developmental Psychology, 42,* 11-26.

Kikas, E., Silinskas, G., Jõgi, A. L., & Soodla, P. (2016). Effects of teacher's individualized support on children's reading skills and interest in classrooms with different teaching styles. *Learning and Individual Differences, 49,* 270-277.

Koepke, M.F., & Harkins, D.A. (2008). Conflict in the classroom: Gender differences in the teacher–child relationship. *Early Education & Development, 19,* 843-864.

Lee, P. & Bierman, K.L. (2018). Longitudinal trends and year-to-year fluctuations in student-teacher conflict and closeness: Associations with aggressive behavior problems. *Journal of School Psychology, 70,* 1-15.

Lietaert, S., Roorda, D., Laevers, F., Verschueren, K., & De Fraine, B. (2015). The gender gap in student engagement: The role of teachers' autonomy support, structure, and involvement. *British Journal of Educational Psychology, 85,* 498-518.

Litalien, D., Morin, A.J.S., & McInerney, D.M. (2017a). Achievement goal profiles among adolescent males and females. *Developmental Psychology, 53,* 731-751.

Litalien, D., Morin, A.J.S., & McInerney, D.M. (2017b). Generalizability of achievement goal profiles across five cultural groups: More similarities than differences. *Contemporary Educational Psychology, 51,* 267-283.

Litvack, M.S., Ritchie, K.C., & Shore, B.M. (2011). High-and average-achieving students' perceptions of disabilities and of students with disabilities in inclusive classrooms. *Exceptional Children, 77,* 474-487.

Lohman, D.F., & Korb, K.A. (2006). Gifted today but not tomorrow? Longitudinal changes in ability and

achievement during elementary school. *Journal for the Education of the Gifted, 29,* 451-484.
Longobardi, C., Settanni, M., Prino, L. E., Fabris, M. A., & Marengo, D. (2019). Students' psychological adjustment in normative school transitions from kindergarten to high school: Investigating the role of teacher-student relationship quality. *Frontiers in Psychology, 10,* 1238.
Madill, R.A., Gest, S.D., & Rodkin, P.C. (2014). Students' perceptions of relatedness in the classroom: The roles of emotionally supportive teacher–child interactions, children's aggressive–disruptive behaviors, and peer social preference. *School Psychology Review, 43,* 86-105.
Masten, A.S., Roisman, G.I., Long, J.D., Burt, K.B., Obradović, J., Riley, J.R., Boelcke-Stennes, K., & Tellegen, A. (2005). Developmental cascades: Linking academic achievement and externalizing and internalizing symptoms over 20 years. *Developmental Psychology, 41,* 733-746.
McGrath, K.F., & Van Bergen, P. (2019). Attributions and emotional competence: Why some teachers experience close relationships with disruptive students (and others don't). *Teachers and Teaching, 25,* 334-357.
Meece, J.L., & Holt, K. (1993). A pattern analysis of students' achievement goals. *Journal of Educational Psychology, 85,* 582-590.
MEES. (2019). *Diplomation et qualification par commission scolaire au secondaire*. Ministère de l'Éducation et de l'Enseignement supérieur du Québec.
Méndez-Giménez, A., Cecchini-Estrada, A., & Fernández-Río, J. (2018). A multi-theoretical approach of the students' motivational profiles in physical education: Achievement and social goals. *Psicothema, 30,* 401-407.
Meyer, J.P., & Morin, A.J.S. (2016). A person-centered approach to commitment research: Theory, research, and methodology. *Journal of Organizational Behavior, 37,* 584-612.
Midgley, C., Maehr, M.L., Hruda, L.Z., Anderman, E., Anderman, L., Freeman, K.E., & Urdan, T. (2000). Manual for the Patterns of Adaptive Learning Scales. *Ann Arbor: University of Michigan.*
Moilanen, K.L., Shaw, D.S., & Maxwell, K.L. (2010). Developmental cascades: Externalizing, internalizing, and academic competence from middle childhood to early adolescence. *Development and Psychopathology, 22,* 635-653.
Morin, A.J.S., Janosz, M., & Larivée, S. (2009). The Montreal Adolescent Depression Development Project (MADDP): School life and depression following high school transition. *Psychiatry Research Journal, 1,* 1-50.
Morin, A.J.S., & Litalien, D. (2019). Mixture modelling for lifespan developmental research. In *Oxford Research Encyclopedia of Psychology*. Oxford University Press.
Morin, A.J.S., & Marsh, H.W. (2015). Disentangling shape from level effects in person-centered analyses: An illustration based on university teachers' multidimensional profiles of effectiveness. *Structural Equation Modeling, 22,* 39-59.
Morin, A.J.S., Meyer, J.P., Creusier, J., & Biétry, F. (2016). Multiple-group analysis of similarity in latent profile solutions. *Organizational Research Methods, 19,* 231-254.
Muthén, L.K., & Muthén, B. O. (2020). *Mplus User's Guide*. Muthén & Muthén.
Nicholls, J. G. (1984). Achievement motivation: Conceptions of ability, subjective experience, task choice, and performance. *Psychological Review, 91,* 328-346.
O'Connor, E.E., Dearing, E., & Collins, B.A. (2011). Teacher-child relationship and behavior problem trajectories in elementary school. *American Educational Research Journal, 48,* 120-162.
Olivier, E., Archambault, I., & Dupéré, V. (2018). Boys' and girls' latent profiles of behavior and social adjustment in school: Longitudinal links with later student behavioral engagement and academic achievement? *Journal of School Psychology, 69,* 28-44.
Olivier, E., Galand, B., Morin, A. J., & Hospel, V. (2021). Need-supportive teaching and student engagement in the classroom: Comparing the additive, synergistic, and global contributions. *Learning and Instruction, 71,* 101389.
Olivier E., Morin, A.J..S., Langlois, J. Tardif-Grenier, K., & Archambault, I. (2020). Internalizing and externalizing behavior problems and student engagement in elementary and secondary school. *Journal of Youth and Adolescence, 49,* 2327-2346.
Patrick, H., Kaplan, A., & Ryan, A.M. (2011). Positive classroom motivational environments: Convergence between mastery goal structure and classroom social climate. *Journal of Educational Psychology, 103,* 367-382.
Peng, S.-L., Cherng, B.-L., Lin, Y.-Y., & Kuo, C.-W. (2018). Four-dimensional classroom goal

structure model: Validation and investigation of its effect on students' adoption of personal achievement goals and approach/avoidance behaviors. *Learning and Individual Differences, 61*, 228-238.

Petras, H., & Masyn, K. (2010). *General growth mixture analysis with antecedents and consequences of change*. In A. Piquero & D. Weisburd (Eds.), *Handbook of Quantitative Criminology*, (p. 69-100). Springer.

Peugh, J., & Fan, X. (2013). Modeling unobserved heterogeneity using latent profile analysis. *Structural Equation Modeling, 20*, 616–639.

Pianta, R.C. (1999). *Enhancing relationships between children and teachers*. American Psychological Association.

Pintrich, P.R. (2000). Multiple goals, multiple pathways: The role of goal orientation in learning and achievement. *Journal of Educational Psychology, 92*, 544-555.

Rasku-Puttonen, H., Pakarinen, E., Trossmann, K., Lerkkanen, M.-K., Kikas, E., & Poikkeus, A.-M. (2011). Classroom practices in Finnish and Estonian preschools: Subgroups of observed teaching practices. In M. Veisson, E. Hujala, P.K. Smith, M. Waniganayake, & E. Kikas (Eds.). *Global Perspectives in Early Childhood Education: Diversity, Challenges and Possibilities* (pp. 313-331). Peter Lang.

Raykov, T., & Marcoulides, G.A. (2004). Using the delta method for approximate interval estimation of parameter functions in SEM. *Structural Equation Modeling, 11*, 621-637.

Rimfeld, K., Malanchini, M., Krapohl, E., Hannigan, L.J., Dale, P.S., & Plomin, R. (2018). The stability of educational achievement across school years is largely explained by genetic factors. *NPJ Science of Learning, 3*, 1-16.

Roeser, R.W., Midgley, C., & Urdan, T. C. (1996). Perceptions of the school psychological environment and early adolescents' psychological and behavioral functioning in school: The mediating role of goals and belonging. *Journal of Educational Psychology, 88*, 408-422.

Roorda, D.L., & Koomen, H.M. (2020). Student–teacher relationships and students' externalizing and internalizing behaviors: A cross-lagged study in secondary education. *Child Development, 92*, 174-188.

Rushton, S., Giallo, R., & Efron, D. (2019). ADHD and emotional engagement with school in the primary years: Investigating the role of student–teacher relationships. *British Journal of Educational Psychology, 90*, 193–209.

Ryan, R.M. & Deci, E.L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. Guilford.

Schiefele, U. & Schaffner, E. (2015). Teacher interests, mastery goals, and self-efficacy as predictors of instructional practices and student motivation. *Contemporary Educational Psychology, 45*, 159-171.

Senko, C. (2019). When do mastery and performance goals facilitate academic achievement? *Contemporary Educational Psychology, 59*, 101795.

Skalická, V., Belsky, J., Stenseng, F., & Wichstrøm, L. (2015). Reciprocal relations between student-teacher relationship and children's behavioral problems: Moderation by child-care group size. *Child Development, 86*, 1557-1570.

Solinger, O.N., Van Olffen, W., Roe, R.A., & Hofmans, J. (2013). On becoming (un)committed: A taxonomy and test of newcomer onboarding scenarios. *Organization Science, 24*, 1640-1661.

Tang, X., Kikas, E., Pakarinen, E., Lerkkanen, M.K., Muotka, J., & Nurmi, J.E. (2017). Profiles of teaching practices and reading skills at the first and third grade in Finland and Estonia. *Teaching and Teacher Education, 64*, 150-161.

Theis, D., Sauerwein, M., & Fischer, N. (2019). Perceived quality of instruction: The relationship among indicators of students' basic needs, mastery goals, and academic achievement. *British Journal of Educational Psychology, 90*, 176-192.

Thijs, J., & Fleischmann, F. (2015). Student–teacher relationships and achievement goal orientations: Examining student perceptions in an ethnically diverse sample. *Learning and Individual Differences, 42*, 53-63.

Tapola, A., & Niemivirta, M. (2008). The role of achievement goal orientations in students' perceptions of and preferences for classroom environment. *British Journal of Educational Psychology, 78*, 291-312.

Tremblay, R.E., Desmarais-Gervais, L., Gagnon, C., & Charlebois, P. (1987). The Preschool Behavior Questionnaire. *International Journal of Behavioral Development, 10,* 467–484.

Vasey, M.W., Bosmans, G., & Ollendick, T.H. (2014). *The developmental psychopathology of anxiety*. In M. Lewis & K.D. Rudolph (Eds.), *Handbook of developmental psychopathology*, (p. 543–560). Springer.

Wigfield, A., & Cambria, J. (2010). Students' achievement values, goal orientations, and interest: Definitions, development, and relations to achievement outcomes. *Developmental Review, 30,* 1-35.

Wilson, K.M. & Trainin, G. (2007). First-grade students' motivation and achievement for reading, writing, and spelling. *Reading Psychology, 28,* 257-282.

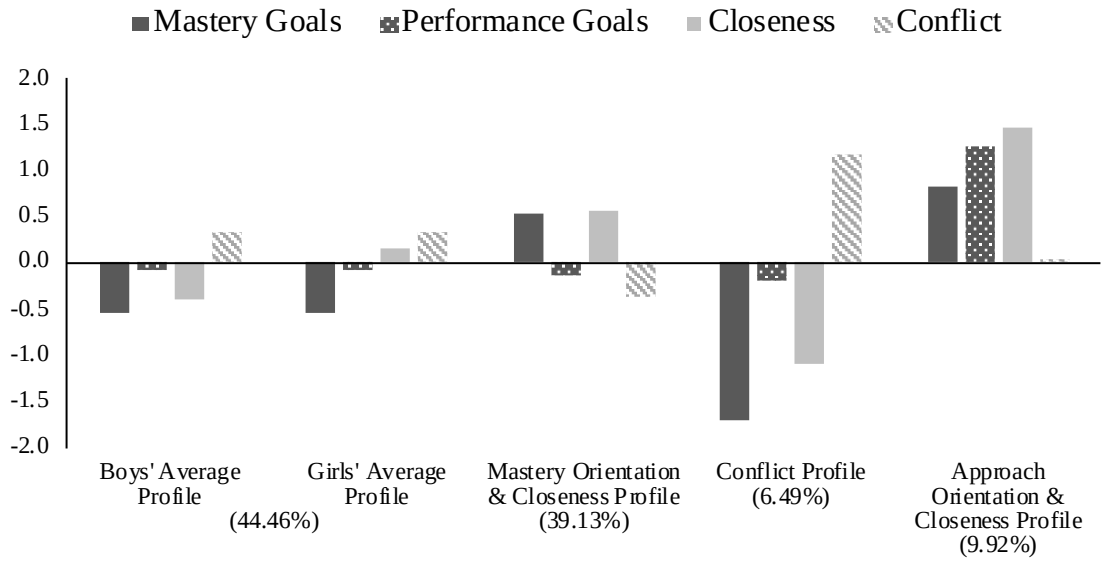

Figure 1. *Final Four-Profile Solution.*
Note. These profiles are based on factor scores estimated with a mean of 0 and a standard deviation of 1 for boys and girls (the results can be interpreted in standardized units); The means that are displayed in a lighter tone are not equal between genders.

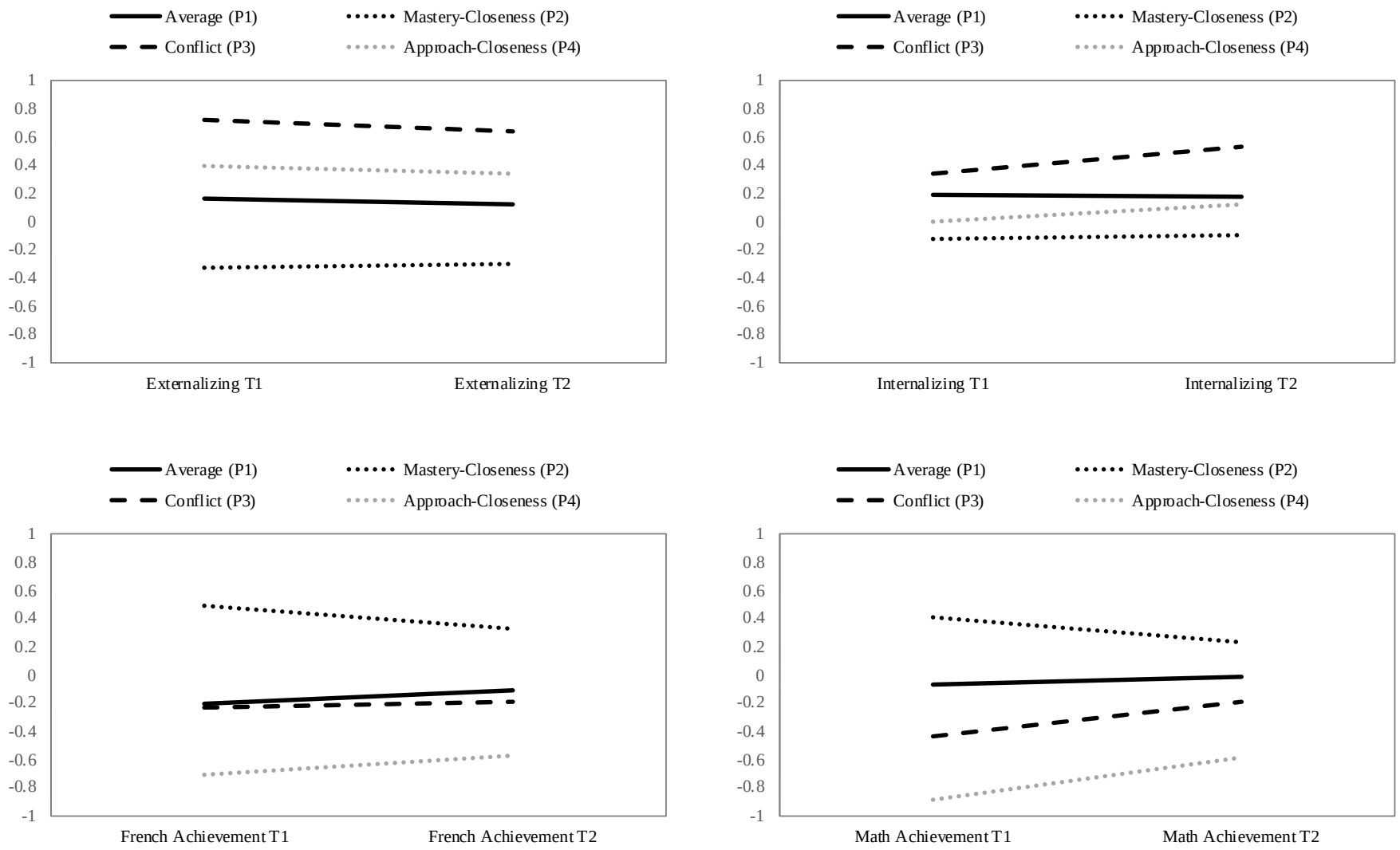

Figure 2. *Profile-Specific Latent Change in Outcomes Levels.*

Table 1

Fit Indices for the Alternative LPA Solutions and Tests of Profile, Predictive, and Explanatory Similarity.

Model	LL	#fp	SCF	AIC	BIC	ABIC	CAIC	Entropy	aLMR(*p*)
Boys Sample									
1 profile	-1820.244	8.000	1.584	3656.488	3687.687	3662.306	3695.687	NA	NA
2 profiles	-1706.982	13.000	1.709	3439.964	3490.663	3449.419	3503.663	0.718	0.004
3 profiles	-1665.586	18.000	1.444	3367.172	3437.370	3380.264	3455.370	0.833	0.018
4 profiles	-1642.875	23.000	1.481	3331.751	3421.448	3348.479	3444.448	0.785	0.249
5 profiles	-1622.931	28.000	1.705	3301.861	3411.058	3322.226	3439.058	0.740	0.694
6 profiles	-1600.613	33.000	1.706	3267.227	3395.923	3291.228	3428.923	0.796	0.557
7 profiles	-1578.819	38.000	1.405	3233.637	3381.833	3261.275	3419.833	0.821	0.185
8 profiles	-1561.278	43.000	1.399	3208.557	3376.252	3239.831	3419.252	0.821	0.501
Girls Sample									
1 profile	-1611.671	8.000	1.923	3239.342	3269.926	3244.549	3277.926	NA	NA
2 profiles	-1506.534	13.000	1.741	3039.069	3088.768	3047.530	3101.768	0.754	0.001
3 profiles	-1464.278	18.000	1.783	2964.557	3033.372	2976.273	3051.372	0.866	0.230
4 profiles	-1424.684	23.000	1.448	2895.368	2983.298	2910.338	3006.298	0.856	0.014
5 profiles	-1400.730	28.000	1.649	2857.459	2964.505	2875.684	2992.505	0.791	0.605
6 profiles	-1377.784	33.000	1.486	2821.569	2947.729	2843.048	2980.729	0.879	0.354
7 profiles	-1344.743	38.000	1.454	2765.486	2910.761	2790.219	2948.761	0.857	0.230
8 profiles	-1317.196	43.000	1.346	2720.391	2884.782	2748.380	2927.782	0.872	0.230
Profile Similarity (4 profiles)									
Configural	-3554.323	47	1.449	7202.646	7416.748	7267.513	7463.748	.879	NA
Structural	-3608.218	31	1.923	7278.437	7419.653	7321.221	7450.653	.864	NA
Partial structural	-3587.183	32	1.658	7238.365	7384.137	7282.53	7416.137	.876	NA
Dispersion	-3591.202	28	1.727	7238.404	7365.954	7277.048	7393.954	.874	NA
Distributional	-3595.354	25	1.645	7240.709	7354.593	7275.213	7379.593	.876	NA
Predictive Similarity									
Free	-4651.523	15	2.786	9333.046	9401.377	9353.749	9416.377	.880	NA
Fixed	-4654.895	12	3.148	9333.790	9388.454	9350.351	9400.454	.880	NA
Explanatory Similarity									
Free	-9291.680	76	1.577	18735.360	19081.567	18840.251	19157.567	.903	NA
Fixed	-9339.586	44	1.820	18767.172	18967.608	18827.898	19011.608	.898	NA

Note. LL = Model LogLikelihood; #fp = Number of free parameters; SCF = Scaling correction factor; AIC = Akaïke Information Criteria; CAIC = Constant AIC; BIC = Bayesian Information Criteria; ABIC = Sample-size adjusted BIC; NA = Not applicable.

Table 2

Results from the Four-Profile Model of Predictive Similarity among Boys and Girls

	School Grade			
	b	(SE)	*p*	OR
Average vs. Approach-Closeness	1.152	(.306)	<.001	3.166
Mastery-Closeness vs. Approach-Closeness	1.285	(.316)	<.001	3.615
Conflict vs. Approach-Closeness	1.410	(.326)	<.001	4.095
Average vs. Conflict	-.257	(.193)	.182	.773
Mastery-Closeness vs. Conflict	-.125	(.232)	.591	.883
Average vs. Mastery-Closeness	-.133	(.114)	.244	.876

Note. * $p < .05$; ** $p < .01$; SE: standard error of the coefficient; OR: odds ratio; the coefficients and OR reflects the effects of the predictor on the likelihood of membership into the first listed profile relative to the second listed profile.

Online Supplements for:

Student-Teacher Relationship and Classroom Goal Structure Profiles: Promoting Achievement and Preventing Externalizing and Internalizing Behaviors

Appendix A

Preliminary Analyses: Measurement Models

The indicators of teacher-student closeness and conflict, mastery and performance classroom goal orientation, student externalizing and internalizing behaviors used in the main analyses were created using factor scores extract from preliminary measurement models estimated to verify the psychometric properties of these measures. These confirmatory factor analyses (CFA) were estimated using Mplus 8.4 (Muthén, & Muthén, 2020) robust weight least square (WLSMV) estimator. This estimator outperforms Maximum Likelihood estimation with ordinal indicators rated using five or fewer response categories and/or asymmetric response thresholds (Finney & DiStefano, 2013), such as those used in the current study. These analyses were conducted while controlling for student's nesting into classroom using the TYPE=COMPLEX function (Asparouhov, 2005).

Given that teacher-student relationship and classroom goal structure were rated by students at T1 using computerized questionnaires in which it was not possible to skip a question, there was no missing data on these measures. The same applies to students' self-reports of internalizing behaviors at Time 1. At T2, 41 students were absent on the day of data collection, resulting in 5.83% of missing data on their ratings of internalizing behaviors. Teacher-reports of externalizing behaviors and achievement included between 7.68% and 10.81% of missing data at T1, and between 12.94% to 13.09% at T2. Missing data was accounted for as part of the measurement models using all available information through the missing data procedures implemented in Mplus for WLSMV estimation (Asparouhov & Muthén, 2010), without having to rely on deletion or imputation procedures.

The measurement invariance of these CFA solution was investigated as a function of students' sex for measures of teacher-student relationship and classroom goal structure, and as a function of sex and time for measures of externalizing and internalizing behaviors. These tests were performed in the following sequence (Morin et al., 2011, Millsap, 2011): (i) configural invariance (same model with no other constraint); (ii) equal factor loadings (weak invariance); (iii) equal factor loadings and response thresholds (strong invariance); (iv) equal factor loadings, response thresholds, and item uniquenesses (strict invariance); (v) equal factor loadings, response thresholds, item uniquenesses, and correlated uniquenesses (for the externalizing-internalizing model only), (vi) equal factor loadings, response thresholds, item uniquenesses, correlated uniquenesses, and latent variance-covariance matrix; (vii) equal factor loadings, response thresholds, item uniquenesses, latent variance-covariance matrix, and latent means. Model fit was assessed using the chi-square statistic (χ^2), the Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI), and the Tucker-Lewis Index (TLI) (Marsh et al., 2005). RMSEA values smaller than 0.08 and 0.06 respectively suggest acceptable and excellent model fit. Values above .90 and .95 for the CFI and TLI respectively indicate adequate and excellent model fit. In tests of measurement invariance, increases in RMSEA of more than .015 and decreases in CFI and TLI of more than .010 were considered to indicate non-invariance (Chen, 2007). Results from these tests of measurement invariance are reported in Table S1. These results supported the complete measurement invariance of the measures of internalizing and externalizing behaviors as a function of sex and time, as well as the configural, weak, strong, strict, latent variance-covariance, and partial latent mean invariance for the measures of teacher-student relationship and classroom goal structure. For this model, the final solution of partial latent mean invariance revealed latent mean differences limited to closeness perceptions (girls reported closeness levels that were on average 0.508 SD higher than boys' perception of closeness).

The most invariant model of teacher-student relationship and classroom goal structure was used to extract factor scores (estimated in standardized units with M = 0 and SD = 1) equivalent across the subsamples of boys and girls. The most invariant model of externalizing and internalizing behaviors

across time and sex was converted to a latent change parameterization prior to the extraction of factors scores, allowing us to obtain indicators of outcomes levels at T1 (estimated in standardized units with M = 0 and SD = 1) and of change occurring in outcome levels between T1 and T2 (estimated as deviation from T1 levels expressed in SD units). Latent change scores were also created for teacher-ratings of achievement in Math and French between T1 and T2.

Detailed parameter estimates from the final solutions are reported in Tables S2 and S3, and correlations among all variables used in the main study are reported in Table S4. These results support the factor structure of all measures. Measures of student perceptions of their interactions with teachers were associated with strong factor loadings (.707 to .955, *M* = .822) and indicators of composite reliability (ω: closeness = .883; conflict = .918; mastery goal = 0.810; performance goals = 0.889). Similarly, measures of behavior problems also had strong loadings (.659 to .950, *M* = .763) and indicators of composite reliability (externalizing behaviors = .922; internalizing behaviors = .917).

References

Asparouhov, T. (2005). Sampling weights in latent variable modeling. *Structural Equation Modeling, 12*, 411-434.

Asparouhov, T., & Muthén, B.O. (2010). Weighted least square estimation with missing data: www.statmodel.com/download/GstrucMissingRevision.pdf.

Chen, F.F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Structural Equation Modeling, 14*, 464–504.

DiStefano, C., Zhu, M., & Mindrila, D. (2009). Understanding and using factor scores: Considerations for the applied researcher. Practical Assessment, Research & Evaluation, 14(20), 1-11.

Millsap, R.E. (2011). *Statistical approaches to measurement invariance*. Routledge/Taylor & Francis Group.

Morin, A.J.S., Moullec, G., Maïano, C., Layet, L., Just, J.L., & Ninot, G. (2011). Psychometric properties of the Center for Epidemiologic Studies Depression Scale (CES-D) in French clinical and nonclinical adults. *Epidemiology and Public Health, 59*, 327-340.

Muthén, L.K., & Muthén, B. O. (2020). *Mplus User's Guide*. Muthén & Muthén.

Table S1

Goodness-of-fit Information for the Alternative Measurement Models and Tests of Measurement Invariance.

Model	χ^2	*df*	CFI	TLI	RMSEA	RMSEA 90% CI	$\Delta\chi^2$	Δdf	ΔCFI	ΔTLI	ΔRMSEA
Teacher-Student Relationship and Classroom Goal Structure Measurement Invariance (Sex)											
1. Configural invariance	526.022*	142	.931	.911	.088	.080-.096	–	–	–	–	–
2. Weak invariance	528.483*	152	.932	.919	.084	.076-.092	8.762	10	+.001	+.008	-.004
3. Strong invariance	563.023*	190	.933	.936	.075	.068-.082	54.700*	38	+.001	+.017	-.009
4. Strict invariance	560.569*	204	.936	.943	.071	.064-.078	17.251	14	+.003	+.007	-.004
5. Latent variance-covariance invariance	414.379*	214	.964	.969	.052	.044-.059	8.682	10	+.028	+.026	-.019
6. Latent mean invariance	476.809*	218	.953	.961	.058	.051-.065	31.716*	4	-.011	-.008	+.006
6. Latent mean invariance – partial	427.289*	217	.962	.968	.053	.045-.060	13.830*	3	-.002	-.001	+.001
Externalizing and Internalizing Measurement Invariance (Sex and Time)											
1. Configural invariance	1217.291*	891	.953	.948	.032	.028-.037	–	–	–	–	–
2. Weak invariance	1245.209*	933	.955	.952	.031	.026-.035	47.832	42	+.002	+.004	-.001
3. Strong invariance	1284.373*	972	.955	.954	.030	.026-.035	50.145	39	.000	+.002	-.001
4. Strict invariance	1330.666*	1004	.953	.954	.030	.026-.035	75.502*	32	-.002	.000	.000
5. Correlated uniquenesses invariance	1338.987*	1013	.953	.954	.030	.026-.035	10.808	9	.000	.000	.000
6. Latent variance-covariance invariance	1343.711*	1021	.954	.955	.030	.025-.034	18.187*	8	+.001	+.001	.000
7. Latent mean invariance	1395.466*	1025	.947	.949	.032	.028-.036	44.497*	4	-.007	-.006	+.002

Note. $^*p < .05$; χ^2: Chi square test of model fit and associated degrees of freedom (*df*); CFI: Comparative Fit Index; TLI: Tucker-Lewis Index; RMSEA: Root Mean Square Error of Approximation and 90% Confidence Interval (CI); Δ: Change according to the previous retained model; $\Delta\chi^2$: Chi square difference test calculated with the Mplus DIFFTEST option.

Table S2

Standardized Factor Loadings (λ) and Uniquenesses (δ) from the Most Invariant (Sex) Measurement Model of the Teacher-Student Relationship and Classroom Goal Structure.

Items	λ	δ	ω
Teacher-student closeness			.883
I share an affectionate, warm relationship with my teacher.	.855	.270	
I sometimes talk about myself to my teacher.	.757	.427	
I sometimes share my feelings with my teacher.	.765	.415	
I feel close to and I trust my teacher.	.855	.268	
Teacher-student conflict			.918
I often argue with my teacher.	.808	.347	
I often get angry at my teacher.	.955	.088	
Sometimes, my teacher is unfair with me.	.868	.246	
My teacher needs a lot of energy to argue and negotiate with me.	.794	.370	
Mastery goal structure (My teacher…)			.810
… thinks mistakes are okay as long as we are learning.	.740	.453	
… wants us to understand the work, not just memorize it.	.707	.501	
… recognizes us for trying hard.	.847	.283	
Performance goal structure (My teacher…)			.889
… points out those students who get good grades as an example to all of us.	.882	.223	
… lets us know which students get the highest score on a test.	.855	.270	
… tells us how we compare to other students.	.822	.324	

Note. ω: omega coefficient of composite reliability (McDonald, 1970).

Table S3

Standardized Factor Loadings (λ) and Uniquenesses (δ) from the Most Invariant (Time by Sex)

Measurement Model of Internalizing and Externalizing Behavior Problems.

Items	λ	δ	ω
Externalizing behaviours (This student…)			.922
… often looses temper.	.773	.403	
… is well behaved, usually does what adults request.	-.659	.565	
… often fights with other children or bullies them.	.668	.553	
… often lies or cheats.	.691	.523	
… is restless, overactive, cannot stay still for long.	.950	.098	
… is constantly fidgeting or squirming.	.935	.126	
… is easily distracted, concentration wanders	.733	.463	
… thinks things out before acting.	-.664	.559	
… has good attention span, sees chores or homework through to the end.	-.673	.547	
Internalizing behaviours			.917
I am unhappy or sad.	.822	.324	
I am not as happy as other kids my age.	.831	.310	
I have a hard time having fun.	.766	.414	
I am fearful or nervous.	.792	.373	
I worry a lot.	.797	.365	
I cry a lot.	.671	.549	
I feel nervous or tensed.	.786	.382	

Note. ω: omega coefficient of composite reliability (McDonald, 1970).

Table S4

Correlations.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. Sex (0=male)													
2. Grade level	.013												
3. Closeness T1	.279**	-.204**											
4. Conflict T1	-.184**	-.035	-.320**										
5. Mastery Goals T1	.097*	-.100**	.626**	-.515**									
6. Performance Goals T1	-.069	-.314**	.330**	.259**	.197**								
7. Externalizing T1	-.241**	-.029	-.164**	.298**	-.201**	.032							
8. Externalizing T1-T2 change	.017	-.110**	.056	-.045	.020	–.026	-.322**						
9. Internalizing T1	.098**	.035	-.026	.231**	-.171**	–.032	.186**	-.042					
10. Internalizing T1-T2 change	-.038	-.104**	-.007	.031	-.005	.036	.088	.166*	-.317**				
11. French Achievement T1	.064	-.017	-.015	.010	-.050	.024	-.380**	.034	-.100**	-.004			
12. French Achievement T1-T2 change	.038	.121**	-.062	.063	-.066	–.024	.066	-.120*	.042	.015	-.363		
13. Math Achievement T1	.063	-.017	-.016	.010	-.050	.024	-.300**	.005	-.063	-.049	.677**	-.082	
14. Math Achievement T1-T2 change	-.023	.085*	-.028	.085*	-.082*	.009	.094*	-.096*	.024	.087*	-.130**	.237**	-.382**

Note. *$p < .05$. **$p < .01$; T1 = Time 1; T2: Time 2.

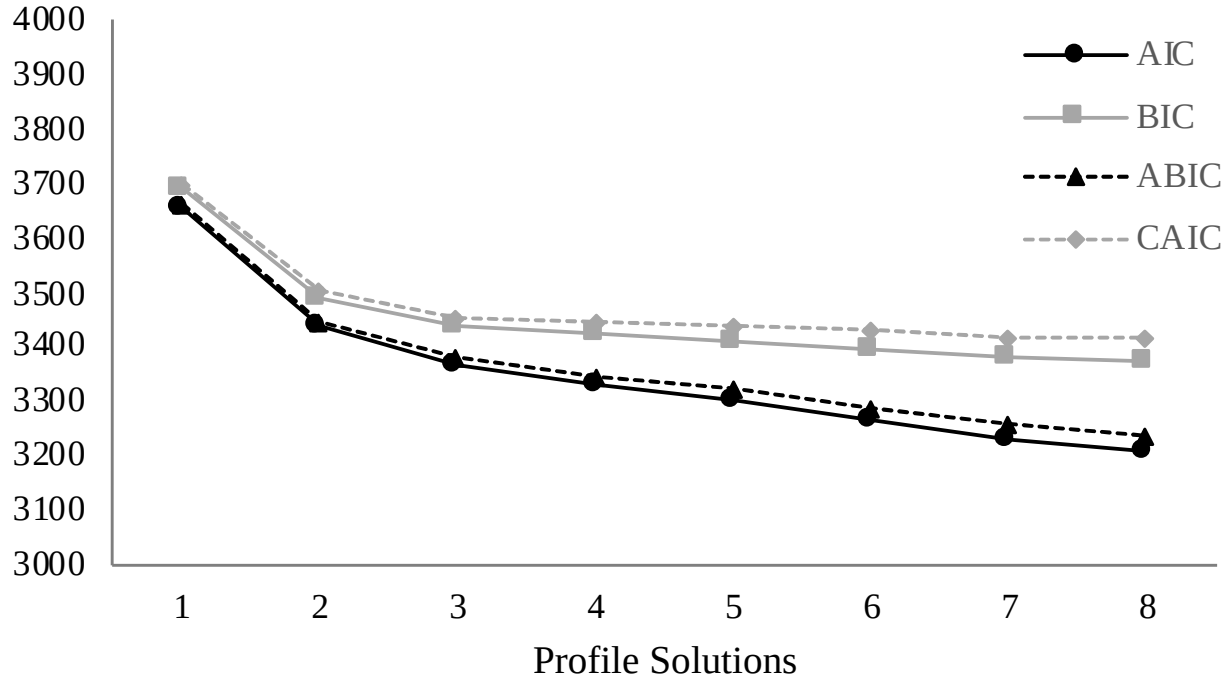

Figure 1

Elbow Plot of Alternative LPA solutions in the Boys Sample

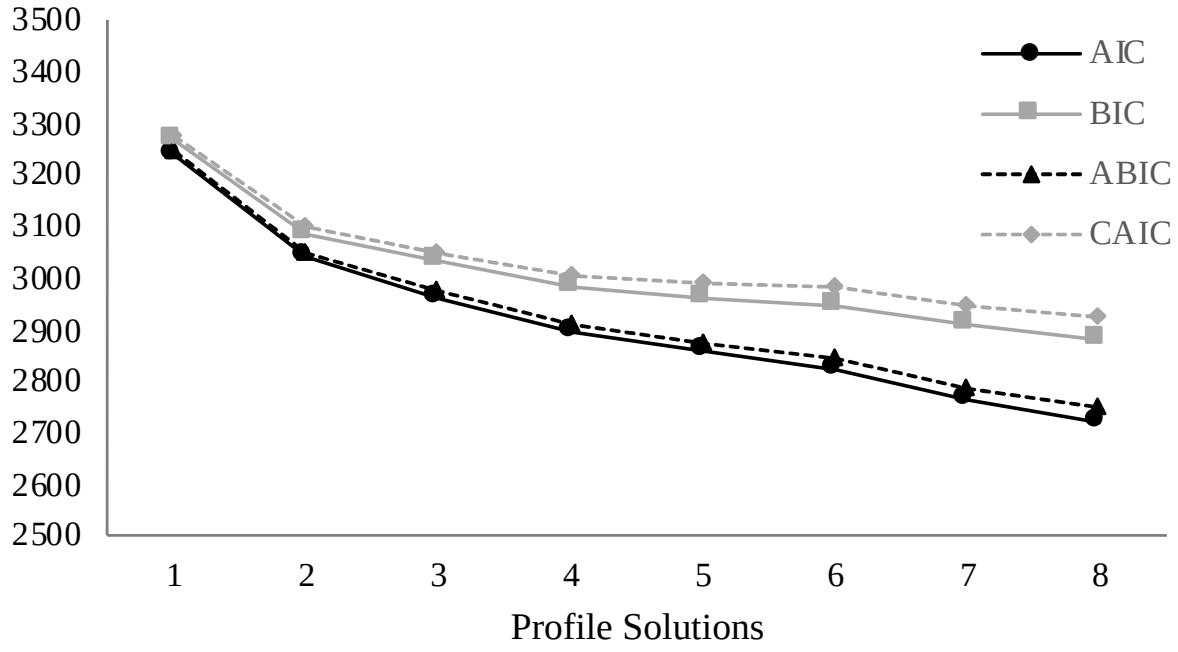

Figure 2

Elbow Plot of Alternative LPA solutions in the Girls Sample

Table S5.

Detailed Results from the Final Most Similar Four-Profile LPA Solution (Distributional Similarity)

	Average		Mastery Orientation & Closeness		Conflict		Approach Orientation & Closeness		All profiles	
	Mean	95% CI	Mean	95% CI	Mean	95% CI	Mean	95% CI	Var.	95% CI
Mastery	-.536	[-.643; -.430]	.524	[.432; .616]	-1.708	[-1.902; -1.515]	.829	[.670; .988]	.133	[.102; .164]
Perform.	-.095	[-.227; .036]	-.143	[-.381; .094]	-.194	[-.537; .148]	1.241	[.864; 1.617]	.571	[.490; .652]
Closeness	*boys*: -.408	[-.566; -.250]	.556	[.395; .717]	-1.085	[-1.382; -.789]	1.443	[1.071; 1.816]	.430	[.369; .492]
	girls: .142	[.009; .275]								
Conflict	.333	[.230; .435]	-.368	[-.516; -.219]	1.164	[.936; 1.392]	.035	[-.400; .469]	.432	[.363; .500]

Note. Var. = Variance. CI = 95% Confidence Interval. b: parameter estimate specific to boys; g: parameter estimate specific to girls.

Table S6

Mean Comparisons Between the Four Profiles Among Boys and Girls

	Average (P1)	Mast.-Clo. (P2)	Conflict (P3)	App.-Clo. (P4)	Significant differences between profiles
Externalizing T1	.161 [.010; .312]	-.325 [-.476; -.174]	.725 [.488; .962]	.402 [.048; .755]	2 < 1 < 3; 2 < 4
Externalizing T1-T2 change	-.039 [-.116; .039]	.033 [-.018; .083]	-.080 [-.252; .092]	-.058 [-.209; .092]	2 < 1
Internalizing T1	.198 [.088; .308]	-.115 [-.230; -.001]	.339 [.097; .580]	-.001 [-.247; .245]	2 < 1,3
Internalizing T1-T2 change	-.012 [-.085; .061]	.017 [-.047; .081]	.199 [-.033; .431]	.123 [-.071; .317]	None
French Achievement T1	-.202 [-.360; -.044]	.492 [.288; .695]	-.222 [-.534; .089]	-.711 [-1.284; -.470]	2 > 1,3 > 4
French Achievement T1-T2 change	.102 [-.008; .212]	-.158 [-.253; -.063]	.034 [-.149; .218]	.138 [-.081; .356]	1,4 > 2
Math Achievement T1	-.070 [-.235; .095]	.413 [.220; .605]	-.435 [-.714; -.156]	-.877 [-1.284; -.470]	2 > 1 > 3,4
Math Achievement T1-T2 change	.059 [-.031; .149]	-.178 [-.270; -.087]	.251 [-.075; .578]	.301 [.082; .520]	4 > 1 > 2; 3 > 2

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 $p < .05$.