

**Universidades Lusíada**

Moreira, Paulo  
Dias, Adelaide  
Oliveira, Joana Serra de  
Castro, Jorge  
Gaspar, Tânia  
Matias, Carla

**School effects on students' engagement with school: academic performance moderates the effect of school support for learning on students' engagement**

<http://hdl.handle.net/11067/4533>

**Metadados**

**Data de Publicação**

2018

**Resumo**

**Abstract** The aim of the present cross-sectional study was to investigate how school support-for-learning, from peers and teachers, influences the relationship between prior academic performance and an indicator of cognitive engagement (students' future aspirations and perceptions of schoolwork). A sample of 4406 adolescent students from 68 schools in Portugal completed the self-report Student Engagement Instrument as a measure of future aspirations and perceptions of schoolwork, and perceived s...

**Sumário:** O objetivo do presente estudo transversal foi investigar como o apoio à aprendizagem na escola, de colegas e professores, influencia a relação entre o desempenho académico anterior e um indicador de engajamento cognitivo (aspirações futuras dos estudantes e percepções de trabalho escolar). Uma amostra de 4406 estudantes adolescentes de 68 escolas em Portugal completou o Instrumento de Engajamento do Estudante de autoavaliação como uma medida de futuras aspirações e percepções do trabal...

**Editor**

Elsevier - Science Direct

**Palavras Chave**

Engagement AchievementTeacher supportPeer supportSupport for learning, Suporte para o conhecimento do HLM multinível, Atendimento académico, Engajamento, Aquisição, Apoio ao suporte, Apoio ao professor

**Tipo**

article

**Revisão de Pares**

yes

**Coleções**

[ILID-CIPD] Artigos

<http://repositorio.ulusiada.pt>

Esta página foi gerada automaticamente em 2024-11-13T08:26:31Z com  
informação proveniente do Repositório

# School effects on students' engagement with school: academic performance moderates the effect of school support for learning on students' engagement

Paulo Moreira<sup>a,b,c</sup>

Adelaide Dias<sup>b</sup>

Joana Oliveira<sup>a,b,c</sup>

Jorge Castro<sup>a,b,c</sup>

Tânia Gaspa<sup>c,d,e</sup>

Carla Matias<sup>c</sup>

<sup>a</sup>*Instituto de Psicologia e de Ciências da Educação, Universidade Lusíada - Norte (Porto), Portugal.*

<sup>b</sup>*Observatório da Melhoria e da Eficácia da Escola, Porto, Portugal.*

<sup>c</sup>*Centro de Investigação em Psicologia para o Desenvolvimento (CIPD), Porto, Portugal.*

<sup>d</sup>*Faculty of Social Sciences, Universidade Lusíada de Lisboa, Lisbon, Porto.*

<sup>e</sup>*Centro Lusíada de Investigação em Serviço Social e Intervenção Social (CLISSIS), Portugal.*

**Note.** This document is the authors' version of the final accepted manuscript, published in 2018 by *Learning and Individual Differences*.

**doi:** 10.1016/j.lindif.2018.07.007

<https://www.sciencedirect.com/science/article/pii/S1041608018301237>

**Funding:** This research was supported by a grant from the Portuguese Foundation for Science and Technology (FCT) (PTDC/CPE-CED/122257/2010; PTDC/MHC-CED/224/2014) and by the Minerva Foundation – Ensino, Cultura e Investigação Científica (the founding organization of the Lusíada Universities).

### **Abstract**

The aim of the present cross-sectional study was to investigate how school support-for-learning, from peers and teachers, influences the relationship between prior academic performance and an indicator of cognitive engagement (students' future aspirations and perceptions of schoolwork). A sample of 4,406 adolescent students from 68 schools in Portugal completed the self-report Student Engagement Instrument as a measure of future aspirations and perceptions of schoolwork, and perceived support for learning. We obtained students' previous year exam grades in Maths and Portuguese from school records to form a composite measure of academic performance. We used Hierarchical Linear Modelling (HLM) to assess whether school-level support-for-learning moderates the student-level effect of performance on engagement. Higher achieving students reported higher scores for our indicator of cognitive engagement than lower achieving students. This association was weaker in schools with high support-for-learning than those with low support-for-learning. Altogether, our results demonstrate the importance of supportive school environments in buffering the negative effect of poor performance on engagement and promoting educational equity.

**Keywords:** engagement; academic performance; achievement; teacher support; peer support; support for learning; multilevel; HLM.

## **Introduction**

While a substantial amount of evidence demonstrates that student engagement with school, measured in a variety of ways, predicts academic performance (Borman & Overman, 2004; Carbonaro, 2005; Lee, 2014; Sirin & Rogers-Sirin, 2004; Willms, 2003), less attention has been given to the reciprocal relationship; academic performance also predicts student engagement (see Archambault, Janosz, Morizot, & Pagani, 2009; Chase, Hilliard, John Geldhof, Warren, & Lerner, 2014; Kindermann, 2007; Wang & Eccles, 2012; Wang & Holcombe, 2010). As students receive feedback about their performance and as work becomes more challenging over time (Lee, Bryk, & Smith, 1993), this causal link between performance and engagement means that students with a history of poor academic performance are at risk of becoming increasingly disengaged with school and moving on deteriorating academic trajectories.

Of the many identified student background predictors of engagement such as age, gender, and socioeconomic status, academic performance is the most likely to be influenced by school policies and practices (Lee & Burkam, 2003). An identification of the school characteristics that significantly weaken the association between academic performance and student engagement is therefore critically important because it has the potential to help schools minimize the effect of poor performance on engagement. This is of particular importance in Portugal, the context of the present study, where the rate of secondary-school dropout (ultimate disengagement) is one of the highest in the EU - 37.1% compared to an average of 12.7% (OECD, 2012).

One school characteristic known to have a significant positive impact on student outcomes and processes is the support for learning offered by teachers and peers (Rumberger & Rotermund, 2012). The overall objective of this study was to investigate

whether this school-level characteristic might serve to protect students with poor academic performance from detrimental changes in engagement.

### **Student Engagement with School**

Engagement with school typically refers to students' subjective experiences and perceptions concerning school (Appleton, Christenson, Kim, & Reschly, 2006). These experiences and perceptions are commonly shown to be predictive of a wide range of academic trajectories and outcomes, including school dropout (Wang & Fredricks, 2014). Engagement is generally considered as a multifaceted construct with three dimensions: *Behavioral* engagement, with indicators including class attendance, absence of disruptive behavior, effort and persistence with schoolwork, and participation in extracurricular activities; *Emotional* engagement, with indicators including feelings about learning, positive attitude, interest, and intrinsic motivation (Finn, 1989; Marks, 2000); and *Cognitive* engagement, which refers collectively to students' motivations, self-concepts, future aspirations, expectancies, and perceptions and beliefs regarding school (Fredricks, Blumenfeld, & Paris, 2004; Jimerson, Campos, & Greif, 2003). Although this tri-dimensional perspective is currently the most prevalent, the number and nature of these underlying dimensions remains under debate, and this is reflected in the fact that the operationalization of student engagement is far from well established.

There is also no clear consensus about whether contextual antecedents (or facilitators) of engagement, such as support for learning, should be conceptualised as part of engagement alongside its indicators (cognitive, emotional, and behavioral). On the one hand, some researchers such as Appleton et al. (2006) have included contextual factors in their conceptualization and operationalization of engagement (see the Student Engagement Instrument, which captures indicators of cognitive engagement as well as

perceived support from teachers, peers, and family). On the other hand, other authors such as Lam et al. (2014) have been explicit about the need to keep the contextual elements of engagement distinct from its indicators. Specifically, if contextual factors are included in the conceptualization of student engagement they claimed it is “not possible for researchers to study how contextual factors may affect the development of student engagement” (p. 215).

### **Link between Perceptions of School Support for Learning and School Engagement**

From the perspective of interactionist frameworks (e.g. Bronfenbrenner, 2005), which describe the dynamic processes that result from the interaction between different levels of influence, school is an important developmental context that exerts a significant impact on student development. One particular theory based on such interactionist frameworks, Self-Determination Theory (Deci & Ryan, 1985, 2008), posits that to achieve healthy psychological development individuals need to fulfil three basic psychological needs: *relatedness* (support from others and warm interactions), *autonomy* (sense of agency and control over decisions) and *competence* (self-perceived competence and self-efficacy). Individuals tend to be motivated and actively engaged in activities and contexts that provide the conditions for the fulfilment of their psychological needs (Jang, Reeve, & Deci, 2010), and the more students perceive that their needs are being met, the more activities become intrinsically rewarding (Csikszentmihalyi, 2013; Higgins, 2006). In short, contextual factors play an important role in the fulfilment of *relatedness*, *autonomy*, and *competence*. Moreover, schools are able to directly manage many of these contextual factors and are thus, dependent on the policies and practices they adopt, responsible for providing environments that are favourable for students’ needs.

One such contextual factor, the perceived support for learning available from teachers and peers, exerts a substantial influence on a range of student processes and outcomes. According to Thoits (2011), teacher and peer interactions with student functioning happen via the same processes involved in adaptive behaviour organization, including emotional support and instrumental coping. These refer to emotional sustenance (emotionally sustaining behaviours and empathy) and active coping assistance (instrumental aid, support in facing situations, and role modelling), which can be offered by two broad categories of supporters: significant others (such as teachers) and experientially similar others (peers). Teachers and peers are, thus, two important sources of two different types of support for students. Teachers play an important role in providing emotional sustenance while peers play a crucial role in providing coping assistance. In this manner, the support for learning offered by schools corresponds closely to the basic psychological needs for *relatedness* and *competence* described by Self Determination Theory (Deci & Ryan, 1985). The more students are emotionally supported and provided opportunities to feel competent, the greater the perceived support for learning experienced at school and the greater fulfilment of *competence* and *relatedness* needs. This leads to a larger positive influence of healthy social, emotional and intellectual functioning and feelings of self-worth and self-esteem on motivation and engagement (Connell & Wellborn, 1991; Martin & Dowson, 2009). In support of this, there is an overall agreement within engagement literature, and across perspectives, that support for learning is of vital importance for promoting student engagement. This has been shown to be the case by cross-sectional (Lee, Dedrick, & Smith, 1991), longitudinal (Lee & Burkam, 2003; Lee & Smith, 1999; Wang & Eccles, 2013), metaanalytic (Cornelius-White, 2007; Roorda, Koomen, Spilt, & Oort, 2011), and review studies (Rumberger & Rotermund, 2012).



Teachers have a fundamental interpersonal influence on child and adolescent development (O'Connor & McCartney, 2007) and represent one of the most proximal influences on the development of adolescents in school (Pianta & Hamre, 2009). Positive and supportive teacher-student interactions have been shown to be protective against negative or challenging experiences (Baker, 1999). Good relationships between teachers and students also facilitate improvements in student average achievement, especially in schools with a clear emphasis on learning (Lee & Smith, 1999). Students are less likely to drop out of school (complete disengagement) when relationships between teachers and students are consistently positive (Lee & Burkam, 2003; Rumberger & Rotermund, 2012). Teacher-student interactions have been shown to be positively associated with several indicators of academic trajectories including learning, academic performance, and dimensions of student engagement with school such as student academic motivation, self-efficacy, interest in class, prosocial behaviours, academic goals, social-emotional/subjective wellbeing, and mental health (Baker, Grant, & Morlock, 2008; Cornelius-White, 2007; Kuperminc, Leadbeater, & Blatt, 2001; Moreira, Dias, Vaz, & Vaz, 2013; Roorda et al., 2011). In regards to engagement, Kelly and Zhang (2016) used Hierarchical Linear Modelling (HLM) to examine the effects of teacher support on student engagement in a sample of over 25,000 students. Their analyses indicated that variance in student engagement (operationalised as interest, enjoyment, identification, and beliefs about the future utility of school subjects) was significantly associated with differences in teacher support. To complement this finding, a meta-analysis of 99 studies has shown that there is a medium to large effect size for the associations between the teacher-student relationships and engagement. There was also a small to medium effect size for the observed relationships between teacher-student relationships and academic achievement (Roorda et al., 2011).

Peers are another integral part of school and an important interpersonal context for the development of student engagement (Li, Lynch, Kalvin, Liu, & Lerner, 2011). As evidence of this, an analysis of 1,718 American 5<sup>th</sup>-graders using HLM showed that self-reported friendship quality was positively related to behavioral engagement the following year (Lynch, Lerner, & Leventhal, 2013). Similarly, students with larger social groups and with more stable friendships have been shown to have more behavioural and emotional engagement with school (Kindermann, 2007). Moreover, students who perceive they are valued and respected by classmates, and who have good quality friendships, tend to present more adaptive achievement motivation. Students with poor quality friendships, on the other hand, tend to be resistant to school norms and to present more maladaptive achievement motivation (Nelson & Debacker, 2008).

### **Moderation Effects of Academic Performance, Support for Learning, and Engagement**

In a relatively recent study, Wang and Eccles (2012) highlighted that few studies have investigated the moderating effects between school environment, engagement, and academic ability, and that a greater understanding of these relationships would allow teachers and school policy makers to enhance student development by promoting specific beneficial characteristics. Their study then demonstrated that school characteristics (including teacher and peer support) had a direct effect on student engagement and, more crucially, that the relation between school characteristics and motivational beliefs was stronger for students with worse academic performance. In other words, support for learning encourages engagement with school, but students with poor academic performances are the most likely to benefit from a supportive school environment.

Considering that academic performance and engagement are mutually predictive (e.g. Chase et al., 2014) we argue that an important and unexamined moderating effect to consider is that of support for learning on the relationship between performance and engagement. Students regularly receive feedback on their academic performances at school. Poor performance is expected to influence future performance negatively, via a decrease in engagement, because of the increased risk of students perceiving that school does not fulfil their basic psychological needs for *competence* (Eccles & Wigfield, 2002; Higgins, 2006; Jang et al., 2010). Since schools have considerable influence over the policies and practices that they implement, it is important to understand which aspects of the school context might serve to weaken the association between poor performance and low engagement. As support for learning contributes to the fulfilment of students' needs, including *competence* and *relatedness* (Connell & Wellborn, 1991; Thoits, 2011), we hypothesized that it would be likely that poorly performing students might be protected, to some degree, from lower engagement if they attend schools offering a large amount of support for learning. In other words, support for learning should moderate the effect of prior academic performance on student engagement with school. While we have highlighted several studies that indicate supportive contexts facilitate engagement, as far as we are aware few studies have examined this hypothesis considering the school-level context. Indeed, relatively recently, Wang and Eccles stated that, "no studies have looked at whether social support can protect against the normative declines in school engagement" (2012, p.879), although it is important to acknowledge that moderating effects of contextual variables have been identified in classroom level research (e.g. Murayama & Elliot, 2009). Within the small collection of studies that have investigated the moderating effect of support for learning, including Wang & Eccles (2012), most found significant effects for

emotional and behavioural aspects of engagement, but not for cognitive engagement. This finding is interesting, and thus requires further investigation given the importance of social contexts in shaping students representations of school and, therefore, student cognitive engagement with school.

Based on this rationale, our research interest was to examine whether school support for learning influences the relationship between prior academic performance and indicators of cognitive engagement such as student motivations, self-concepts, future aspirations, expectancies, and perceptions and beliefs regarding school. Because peers and teachers were considered to represent two important sources of two different, although related, forms of support (Thoits, 2011) we chose to consider the teacher and peer support separately, as well as a composite indicator of a supportive school environment.

## **Methodology**

### **Participants**

The current study uses participants who completed questionnaires for the first phase of a six-year longitudinal study into school effects on student engagement that started in 2013. We were initially able to recruit 5013 students from 101 schools, although students from schools returning fewer than 30 respondents ( $n = 33$ ) were excluded from the study because of sample-size requirements for HLM (Kreft, 1996; Hox, 1997). Means difference tests between included and excluded schools indicated that they did not differ in terms of SES ( $p = .670$ ), school-type (middle, secondary, or mixed;  $p = .500$ ), school-size ( $p = .235$ ), status as private or public ( $p = .153$ ), mean student cognitive engagement ( $p = .176$ ), mean student academic performance ( $p = .364$ ), or mean support for learning ( $p = .407$ ).

The final sample, after exclusions, comprised 4,406 Portuguese students (representing 68 schools) from two cohorts of approximately equal size. The first cohort consisted of students enrolled in the first year of Middle School (7<sup>th</sup> grade). The other cohort included students enrolled in the 10<sup>th</sup> grade (first year of Secondary School). The characteristics of these students are summarised in the upper rows of Table 1. Briefly, the sample comprised slightly more females (53.7%) than males (45.9%), had an age range of 11-19 years old, were predominantly Caucasian Portuguese, and most had parents with a low level of education (59.5% had parents with lower than Secondary School education), as is typical in Portugal.

#### TABLE 1 ABOUT HERE

The upper panels of Table 2 show the characteristics of the 68 schools. For schools from which we obtained data for both 7<sup>th</sup> and 10<sup>th</sup> grade students we recruited more students ( $M = 75$ ,  $SD = 29$ ) than from schools from which we obtained data for just a single grade ( $M = 45$ ,  $SD = 12$ ). The majority of schools were from the public education system (79.4%), most schools were Mixed schools (7<sup>th</sup> – 12<sup>th</sup> Grades; 77.9%) while a smaller proportion were Middle schools (7<sup>th</sup> – 9<sup>th</sup> Grades; 11.8%) and Secondary Schools (10<sup>th</sup> – 12<sup>th</sup> Grades; 10.3%), most were located in more rural, less populated, regions of Portugal (54.4%), and the majority served students from low SES families (mean parent education level less than Secondary School; 88.2%).

#### TABLE 2 ABOUT HERE

### **Instruments**

**The Student Engagement Instrument (SEI).** The aim of the present study was to investigate the moderating effect of school-level support for learning (from peers and teachers) on the relationship between academic performance and indicators of cognitive engagement. The Student Engagement Instrument (Appleton et al., 2006) was

the ideal tool to adapt for this purpose because it includes validated self-report items for measuring students' perceptions of teacher-student relationships and peer support for learning, and the motivational and self-regulatory aspects of engagement.

Appleton et al (2006) reported that the items of the SEI were designed to capture related, yet distinct, indicators of cognitive and emotional engagement. We argue that when considered as a school-level variable, emotional engagement (as measured by the SEI) should be treated as being conceptually distinct from indicators of cognitive engagement at the individual-level: in other words, as an indicator of support for learning. At least one psychometric study of a version of the SEI has indicated that while the Future Aspirations and Goals and Control and Relevance of Schoolwork subscales load on a second-order factor, this factor was related to, yet distinct from, first-order factors reflecting teacher-student relationships, peer support for learning, and family support for learning (Virtanen et al., 2017). Additionally, the items of the SEI designed to capture emotional engagement closely match conceptualisations of support for learning reported in past studies. Kelly and Zhang (2016), for example, defined teacher-student relationships in terms of four dimensions: valuing student ideas, treating students with respect and fairness, expectations of success, and making efforts to aid comprehension. Similarly, Thoits (2011) has conceptualised support from primary social groups (friends and family) in terms of demonstrations of love, caring, respect, esteem and value, and sympathy. These conceptualisations correspond closely to the SEI items measuring teacher-student relationships (e.g. *“Overall, adults at my school treat students fairly”* – and indeed such items are worded similarly to those used by Kelly and Zhang, e.g. *“Math/Science teacher treats every student fairly”*) and peer support (e.g. *“Other students here like me the way I am”* and *“Other students at school care about me”*). Prior studies have also shown that student perceptions of teacher-

student relationships and peer support via the SEI are significantly correlated with reports of school success promotion strategies including personalized learning, active learning, and proximity (Dias, Oliveira, Moreira, & Rocha, 2015; Moreira et al., 2013).

As a result, for the purpose of this study, we considered the control and relevance of schoolwork and future aspirations and goals subscales of the SEI as student-level indicators of cognitive engagement, and the teacher-student relationships and peer support for learning subscales as school-level indicators of support for learning. Given the lack of clarity and significant “jingle/jangle” with engagement terminology (Reschly & Christenson, 2012), from here on we will refer to *students’ future aspirations and perceptions of schoolwork* when considering our indicator of cognitive engagement. We will also refer to *teacher-student relationships* and *peer support for learning*, when referring to the separate influences of support from teachers and peers, and *composite support for learning* when referring to our combined indicator.

### **Measures describing students.**

***Students’ future aspirations and perceptions of schoolwork.*** To form our measure of students’ future aspirations and perceptions of schoolwork we used 9 items, each answered on a 4-point Likert scale, from the Portuguese version of the Student Engagement Instrument (Moreira, Vaz, Dias, & Petracchi, 2009; Moreira & Dias, 2018). These items corresponded to two subscales of the SEI referred to as the Control and Relevance of Schoolwork (CRSW) subscale, which has 6 items (e.g. “*Most of what is important to know you learn in school*”), and the Future Aspirations and Goals (FAG) subscale, which has 3 items (e.g. “*I plan to continue my education following high school*”). All items are answered on a 4-point Likert scale from 1 (*strongly disagree*) to 4 (*strongly agree*). Prior studies examining the psychometric properties of the

Portuguese SEI have shown that these items are a reliable indicator of CRSW ( $\alpha = .83$ ) and FAG ( $\alpha = .86$ ; Moreira & Dias, 2018). The reliability of our measure of students' future aspirations and perceptions of schoolwork was good with the present sample,  $\alpha = .84$ .

***Prior academic performance.*** We obtained student grades for national standardized end-of-year Maths and Portuguese exams from the year prior to the study. For all students these exams were taken prior to secondary school, and so were scored on a scale between 0 and 5, as is standard in Portugal. These grades were obtained from school records. For our analyses, we considered these two sets of exam grades as a composite *academic performance* score because academic results tend to be consistent over subject areas.

***Student sociodemographic characteristics.*** This information was measured using a student self-report questionnaire. These characteristics included age, gender, school level (10<sup>th</sup> vs. 7<sup>th</sup> grade), and median education-level across both parents (used as a proxy for student socio-economic status). Parent education was scored on an ordinal scale from 1 (4<sup>th</sup> Grade) to 9 (PhD).

### **Measures describing schools.**

***Teacher-student relationships and peer support for learning.*** We considered composite support for learning as a school-level aggregate of 15 items from two further subscales from the Portuguese version of the SEI: Teacher-Student Relationships (TSR), which has 8 items, and Peer Support for Learning (PSL), which has 6 items. All items are answered on a 4-point Likert scale from 1 (*strongly disagree*) to 4 (*strongly agree*). Considering TSR and PSL as a composite measure at the school level allows for an ecological approach since the influences from peers and teachers interact mutually in shaping the school interpersonal context. As a measure, the composite support for



learning scale was shown to have good reliability,  $\alpha = .85$ , in our sample. We also considered teacher-student relationships and peer support for learning as separate variables in order to examine the unique effects of each type of contextual influence on the relationship between prior academic performance and students' future aspirations and perceptions of schoolwork.

***School Characteristics.*** We considered school structure and composition for the purpose of statistical control. These measures included school sector (public vs. private), type of school (middle school vs. secondary school vs. mixed school), and school average composite (Maths and Portuguese) academic performance.

## **Procedures**

**Data collection.** Prior to collecting data, ethical approval was obtained from the ethics committee of Universidade de Lusíada, Portugal. We adopted the national territorial distribution of schools as strata for school sampling. Schools in Portugal are distributed over five regions: Northern, Central, Lisbon, Southern, and the Islands. We selected schools from the Northern, Central and Lisbon regions as these are the most populated regions of the country and where the majority of schools are located. We considered middle and mixed schools that included 7th to 9th grades, and all secondary schools in these regions.

To maximize the representativeness of our student sample in terms of academic performance, we requested that schools provide an average grade (based on previous year exam performance in Maths and Portuguese) for each of the classes in the 7th and/or 10th grades. We then recruited students from three classes from the each target grade in all schools (thus in schools with both grades we recruited students from six classes). These classes corresponded to those with a lower-than-average, average, and higher-than-average ability. To allow for a natural variance of classroom

characteristics and student demographics all students from the selected classes were asked to participate in the study (Lau & Nie, 2008).

**Data analyses.** Continuous measures (including students' future aspirations and perceptions of schoolwork, support for learning, and academic performance) were converted into Z-scores and categorical measures (e.g. gender) were converted into dummy variables. Because Little's MCAR test indicated data were not missing completely at random,  $\chi^2(10) = 75.71, p < .001$ , missing data (teacher-student relationships < 0.5%; peer support for learning < 0.5%; students' future aspirations and perceptions of schoolwork < 0.5%; mean academic performance = 8.3%, parent education = 2.4%) were imputed using a multiple imputation procedure in SPSS. This imputed data was used for Hierarchical Linear Modelling. Student- and school-level descriptive statistics were analysed using one-way ANOVAs.

***Hierarchical Linear Modelling.*** To examine the influences of school social organization on students' future aspirations and perceptions of schoolwork, including how school support for learning influences this relationship, we used Hierarchical Linear Modelling (HLM; Raudenbush & Bryk, 2002). Model 1, the fully unconditioned model, partitioned the variance in student engagement lying within and between schools. This allowed for the estimation of Intraclass Correlation Coefficients (ICC).

***Within-school HLM models (Level 1).*** Students' future aspirations and perceptions of schoolwork were modelled as a function of individual characteristics: gender (males vs. female), grade (7<sup>th</sup> vs. 10<sup>th</sup>), parent education, and academic performance. Gender, parent education, and grade slopes were estimated as fixed effects. These level-1 variables were group-mean centered. For Model 2 we considered academic performance as a composite of Maths and Portuguese grades. As a measure of effect size we calculated  $r^2$  using the equation  $(\sigma^2_{null} - \sigma^2_{random}) / \sigma^2_{null}$ . This indicates the

variance explained by the level-1 predictor variables on students' future aspirations and perceptions of schoolwork.

*Between-school HLM models (Level 2).* We explored how school-level support for learning (teacher student relationships, peer support for learning, and composite support for learning) was associated with the average future aspirations and perceptions of schoolwork in each school, and the relationship between academic performance and students' future aspirations and perceptions of schoolwork. These models were estimated using the level-1 control variables gender, parent education, and grade. We also included school type (two dummy variables representing *Middle school vs. Mixed* and *Secondary School vs. Mixed*, and a further dummy variable representing *Private vs. Public* school), school SES (mean parent education), school mean support for learning, and school mean academic performance (composite of Portuguese and Maths national exam grades). Based on the proposals of Enders and Tofighi (2007), level-2 variables were grand-mean centered. We analysed three level-2 models. In Model 3 we considered support for learning as a composite variable. In Models 4 and 5 we included teacher-student relationships and peer support for learning simultaneously in order to assess their unique effects on students' future aspirations and perceptions of schoolwork. Model 4 tested teacher-student relationships as a moderator of the relationship between academic performance and students' future aspirations and perceptions of schoolwork while Model 5 tested peer support for learning as a moderator. As a measure of effect size we calculated  $r^2$  using the equation  $(\tau_{null}^2 - \tau_{means}^2) / \tau_{means}^2$ . This indicates the variance explained by the level-2 predictor variables on students' future aspirations and perceptions of schoolwork.

## **Results**

### **Descriptive Statistics**

**Student-level variables.** The lower rows of Table 1 indicate that students scored the full range of marks available in their national exams and for measures of students' future aspirations, perceptions of schoolwork, and support for learning. A series of one-way ANOVAs were conducted to assess differences between students with low (25<sup>th</sup> percentile,  $n = 1293$ ), average (50<sup>th</sup> percentile,  $n = 1637$ ), and high (75<sup>th</sup> percentile,  $n = 1111$ ) academic performances. There were significant positive linear trends across these groups of students for the combined indicator of students' future aspirations and perceptions of schoolwork,  $F(2, 4029) = 179.61, p < .001$ , and parent education,  $F(2, 3948) = 552.31, p < .001$ . This indicated that students with better exam grades reported better future aspirations and perceptions of schoolwork and were from higher SES families. There were also significant gender differences between these groups,  $\chi^2(2) = 17.46, p < .001$ , with roughly equal gender distribution in the low academic performance group (Male = 636, Female = 650), but more females than males in the high academic performance group (Male = 454, Female = 655). Finally, there were significant differences in the distribution of 7<sup>th</sup> and 10<sup>th</sup> graders across the three groups,  $\chi^2(2) = 19.56, p < .001$ : There were more 10<sup>th</sup> grade students than 7<sup>th</sup> grade students in the low ability group (10<sup>th</sup> = 701, 7<sup>th</sup> = 592), but more 7<sup>th</sup> grade students than 10<sup>th</sup> grade students in the high ability group (10<sup>th</sup> = 506, 7<sup>th</sup> = 604). Correlations between all student-level variables are available in Appendix 1.

**School-level variables.** The lower rows of Table 2 show the mean and range of scores obtained across all schools for students' future aspirations and perceptions of schoolwork, support for learning, and academic performance. As with student-level variables, a series of ANOVAs were conducted to compare differences between schools with low (25<sup>th</sup> percentile,  $n = 17$ ), average (50<sup>th</sup> percentile;  $n = 33$ ), and high (75<sup>th</sup> percentile,  $n = 18$ ) average academic performance. There were significant positive

linear trends across these groups of schools for average composite support for learning,  $F(2, 65) = 5.49, p = .022$ , and average parent education,  $F(2, 65) = 45.54, p < .001$ . This indicates that schools with better average mean exam grades had more support for learning and student populations from higher SES families. There were significant differences in the composition of private and public schools across these groups,  $\chi^2(2) = 14.08, p = .001$ , with a similar number of both in the low ability group (Public = 9, Private = 8), but more Public schools in the high ability group (Public = 13, Private = 5). There were also significant differences in the composition of type of school across groups,  $\chi^2(4) = 28.61, p < .001$ . The high ability group comprised entirely of mixed schools ( $n = 18$ ), while the low ability group comprised of one middle school, nine mixed schools, and seven (100%) secondary schools.

## **HLM Analyses**

**Partitioning the variance in students' engagement with school.** The combined indicator of students' future aspirations and perceptions of schoolwork varied significantly between schools,  $\chi^2(67) = 507.26, p < .001$ . The ICC revealed that 10.8% of the total variation was accounted for at the school-level. The reliability for our combined indicator of students' future aspirations and perceptions of schoolwork estimated by HLM was good ( $\lambda = .87$ ). The value of AIC for this model was 12239.27.

### **Within-school HLM analyses.**

*Academic performance and students' future aspirations and perceptions of schoolwork.* Model 2 (Table 3) presents significant relationships between gender, grade, parent education, and academic performance, and students' future aspirations and perceptions of schoolwork (see fixed effects). Tenth grade students had lower scores for the combined indicator of students' future aspirations and perceptions of schoolwork than 7<sup>th</sup> graders,  $\gamma = -.48, p < .001$ ; females had higher scores than males,  $\gamma = .22, p < .001$ .

.001; and students with more educated parents had higher scores than students with less educated parents,  $\gamma = .05$ ,  $p = .011$ . Student academic performance (composite score) was significantly and positively associated students' future aspirations and perceptions of schoolwork,  $\gamma = .14$ ,  $p < .001$ . In terms of random effects, Model 2 revealed significant variation between schools in terms of students' future aspirations and perceptions of school,  $\chi^2(67) = 557.60$ ,  $p < .001$ , confirming the influence of school features after controlling for the independent variables in our model. The composite academic performance-engagement slope (the relationship between composite prior academic performance and students' future aspirations and perceptions of schoolwork estimated in each school) varied systematically between schools,  $\chi^2(67) = 98.43$ ,  $p = .008$ . This is illustrated in Figure 1. The calculation of  $r^2$  indicated that the student-level variables in Model 2 explained 8.98% of the variance in our combined indicator of students' future aspirations and perceptions of schoolwork. Compared to the unconditional model (Model 1), Model 2 had better fit, as shown by a smaller values for AIC (11873.97).

FIGURE 1 ABOUT HERE

TABLE 3 ABOUT HERE

**Between-School HLM Analysis.** Models 3-5 (see Table 3) expanded on Model 2 by controlling for a number of school-level variables and by testing the moderating effect of school-level support for learning on the relationship between prior academic performance and our combined indicator of students' future aspirations and perceptions of schoolwork. Model 3 demonstrated that schools with higher levels of composite support for learning had students with higher scores for the combined indicator of students' future aspirations and perceptions of schoolwork,  $\gamma = .20$ ,  $p < .001$ . Secondary Schools had significantly lower scores than mixed and middle schools,  $\gamma = -.52$ ,  $p <$

.001, and schools with better average grades had students with higher scores,  $\gamma = .07$ ,  $p = .015$ . At level 1, Gender, Grade, and Parent Education were significant predictors of the combined indicator of students' future aspirations and perceptions of schoolwork. Moreover, school support for learning at level 2 accounted for a significant proportion of the variance in the relationship between student level academic performance and the combined indicator of students' future aspirations and perceptions of schoolwork across schools,  $\gamma = -.05$ ,  $p = .015$ . Figure 2, Panel A, illustrates this interaction with schools grouped into low (25<sup>th</sup> percentile), medium (50<sup>th</sup> percentile), and high (75<sup>th</sup> percentile) support for learning groups.

#### FIGURE 2 ABOUT HERE

Models 4 and 5 showed that when considered simultaneously, teacher student relationships had a significant positive effect on students' future aspirations and perceptions of schoolwork,  $\gamma = .18$ ,  $p < .001$ . Peer support, however, did not have a significant effect in either model,  $\gamma = .04$ ,  $p > .05$ . This indicates that peer support for learning does not have a unique effect on students' future aspirations and perceptions of schoolwork when considering the teacher student relationship. Model 4 showed that the peer support for learning accounted for a small but significant proportion of the variance in the relationship between student level academic performance and the combined indicator of students' future aspirations and perceptions of schoolwork across schools,  $\gamma = -.04$ ,  $p = .020$ . Similarly, Model 5 showed that teacher-student relationships also moderated the relation between academic performance and students' future aspirations and perceptions of schoolwork across schools,  $\gamma = -.04$ ,  $p = .044$ . The calculation of  $r^2$  indicated that the school-level variables accounted for 88.3%, 90.1%, and 90.1% of the between-group variance in the combined indicator of students' future aspirations and perceptions of schoolwork for Models 3, 4, and 5 respectively. Compared to the within-

school model (Model 2), Models 3, 4, and 5 all had fit indices indicative of a better model fit: AICs < 11795.55.

## **Discussion**

Students who perform poorly at school are at risk of becoming disengaged. This study examined whether the size of this effect is influenced by students' perceptions of the support for learning they receive at school from teachers and peers. Our results replicated some findings commonly reported in past research. Firstly, students who reported the highest levels of composite support for learning tended to report the highest levels of future aspirations and perceptions of schoolwork (our indicator of cognitive engagement). Secondly, students who had the best academic performances were those who tended to have highest future aspirations and perceptions of schoolwork. Besides replicating findings from a growing body of research, this study also offers a novel finding to the current literature: supportive school environments were associated with a reduced effect of prior academic performance on students' future aspirations and perceptions of schoolwork. The following discussion will consider each of these findings, and their implications, in turn.

### **Support for Learning and Students' Future Aspirations and Perceptions of Schoolwork**

The HLM models tested demonstrated a positive effect of composite support for learning on students' future aspirations and perceptions concerning school. As an indication of its robustness, this effect was significant despite controlling for the effects of student gender, grade, parent education, and a number of school-level variables. Our analyses also indicated that when teacher and peer sources of support were modelled simultaneously, teacher-student relationships were a significant predictor of students' future aspirations and perceptions of schoolwork. There was, however, no significant



effect of peer support for learning: Teacher-student relationships were able to account for a unique proportion of variance in students' future aspirations and perceptions of schoolwork while controlling for other variables while peer support for learning was not. This finding is somewhat consistent with results from past studies, such as Wang and Eccles (2012), which have shown the impact of teacher support on cognitive engagement is greater than peer support. Our findings therefore serve to support the converging finding that teachers have an important influence on adolescents' development despite the widely held belief that adolescents are most heavily influenced by peers (Wang & Eccles, 2012).

### **Academic Performance and Students' Future Aspirations and Perceptions of Schoolwork.**

A number of past studies have shown that student engagement is predictive of academic performance (Borman & Overman, 2004; Carbonaro, 2005; Lee, 2014; Sirin & Rogers-Sirin, 2004; Willms, 2003). Our results, and specifically the significant effects of academic performance on students' future aspirations and perceptions of schoolwork, build on the established understanding of the association between these two variables by demonstrating that academic performance also predicts student engagement. Put differently, when our findings are integrated with those of other studies, evidence suggests that students' experiences of school are influenced and shaped by the interrelation between performance and engagement (Lynch et al., 2013). One implication of this conclusion is that students at risk of performing poorly at school, such as those who come from socio-economically disadvantaged families, are at risk of becoming disengaged with school which, in turn, may have further negative effects on future performance. Although our study is not the first to highlight inequalities in groups of students, our findings offer one mechanism for why some students are

unfairly positioned to move on poor academic trajectories. While it goes beyond our data to indicate how this equity issue should be best addressed, schools should aim to implement policies that aim to break the cycle between poor achievement and engagement. Our study indicates that such policies could focus on improving support for learning, as this appears to moderate the negative effects of poor performance.

### **The Moderating Effect of Support for Learning.**

The principle novel finding from this study was that support for learning (as a composite measure) had a significant moderating influence on the relation between academic performance and students' future aspirations and perceptions of schoolwork. Specifically, in schools where students perceived a high level of support for learning, the relationship between prior academic performance and students' future aspirations and perceptions of schoolwork was weaker than in schools where students perceived a lower level of support for learning. Compared to poorly performing students from schools perceived to have high support for learning, poorly performing students from schools with a low perceived support for learning had lower future aspirations and perceptions of schoolwork. It is possible to interpret this finding from the perspective of Self-Determination Theory (Deci & Ryan, 1985, 2008). Students who receive support from peers and teachers (active coping assistance from peers and emotional sustenance from teachers; Thoits, 2011) are more likely to perceive that they have support from others and warm interactions (fulfilment of the need for *relatedness*), and more opportunities to feel competent (fulfilment of the need for *competence*). While poor exam performances are likely to increase students' perceptions that school does not fulfil their basic needs, particularly *competence*, our results imply that the increased fulfilment of needs provided by support for learning may compensate for and serve to protect students from the maladaptive effects of unfulfilled needs.

This result has important implications for educators and school policy makers. Primarily, it serves as a first indication that by implementing changes to improve the supportive nature of school environments, schools may be able to buffer the negative effects of poor academic performance on students' future aspirations and perceptions of schoolwork. That said, it is important to note that because this study measured student-perceptions of support for learning rather than an objective or teacher-report indicator of school support (e.g. use of personalised learning, career development activities etc.) it goes beyond the data to suggest which specific strategies schools should employ to offer support for learning. Nonetheless, any policy changes that lead to increases in perceived support for learning will be of particular relevance for groups of students who are at risk of poor performance (e.g. those from low SES families) and the effects this would have on engagement and subsequent academic performances.

#### **Additional Effects and Effect Sizes.**

In addition to the effects of support for learning and academic performance on students' future aspirations and perceptions of schoolwork, a number of other effects were evident. In terms of level-1 variables, the largest significant effects were for Grade (10<sup>th</sup> Grade students were significantly less engaged than 7<sup>th</sup> grade students) and Gender (females were more engaged than males). There was also a small positive effect of parent education. The variance accounted for by these level-1 predictors was shown to be small, at roughly 9%. The observed effects of gender and parent education (which we considered as a proxy for socioeconomic status) are consistent with that observed in the 2006 High School Survey of Student Engagement (HSSSE; Yazzie-Mintz, 2007). The negative effect of school Grade on students' future aspirations and perceptions of schoolwork was also consistent with past studies that have shown gradual disengagement as students progress through school (e.g. Marks, 2000).

In contrast to within-group variation, level-2 predictors accounted for a large proportion of between-group variance in students' future aspirations and perceptions of schoolwork with values ranging between 76% and 90%. A notable large school-effect was that students in secondary schools were significantly less engaged than students in mixed schools. Students in middle schools, on the other hand, did not differ in terms of engagement from those in mixed schools. While at first sight this effect may be intriguing, we noted that all secondary schools were classed as having a low average academic performance. Conversely, the majority of mixed schools were classified as having an average academic performance. We were therefore able to explain this difference in terms of the effect of academic performance on engagement.

### **Limitations**

It is important to acknowledge and discuss the limitations of this study. Firstly, by using data from one time point from a longitudinal study we limited ourselves to cross-sectional analyses. Because of this, some caution should be held when making inferences about causal relationships (although it seems obvious that current engagement cannot influence past performance). Future research should aim to describe the longitudinal impact of school characteristics on changes of students' engagement with school.

Secondly, we used a single self-report instrument to assess engagement and school-level support for learning. This may present several issues. For one, student-reports may not be an accurate measure of school-level characteristics. Although individuals' perceptions are not equivalent to the objective characteristics of reality, perceptions are the strongest mediators of the relationships between the objective characteristics and individuals' experiences as they mediate agency mechanisms. Moreover, theories (including self-determination or bioecological theories) emphasize

the importance of individuals' perceptions in describing transactional processes between the individual and his/her context. Thus, while the ideal would be to use multi-informant and multi-method assessments, student self-reports are considered to be an acceptable source of information in studies capturing motivational and personal agency mechanisms (Murayama & Elliot, 2009; Wang & Eccles, 2012). Indeed, perceptions as a "psychological environment" are more proximal to individual experiences than objective environments (Ames, 1992; Murayama & Elliot, 2009; Wang & Eccles, 2012), meaning that the individuals' perceptions have a more proximal influence on student experiences than the objective characteristics of reality. As a second issue, we acknowledge that there may be some concerns with our treatment of cognitive engagement and support for learning as distinct constructs considering that we measured these using items from a single instrument (the SEI; Appleton et al., 2006), which is designed to assess just one higher-order construct: engagement. Our basic rationale for considering support for learning as being distinct from cognitive engagement was that we treated support for learning as a level-2 variable in the model and that several studies have indicated that the two constructs are separate (e.g. Wang & Eccles, 2013). Nonetheless, future studies may wish to consider using different and more specialized measures of cognitive engagement and support for learning in order to provide a clearer conceptual distinction. As a third issue, having the same individuals inform about individual and contextual indicators may have resulted in response biases (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Future studies should control for this by randomly dividing the sample into two separate groups, one which informs about student level characteristics, and another which informs about school level characteristics. Although we used appropriate multi-level techniques to consider between-school differences, our study design did not allow us to consider that students

are also nested within classes. Future studies should consider using HLM with 3-levels to fully account for the effect of class-level predictors (e.g. class size, class-level peer support) on student engagement.

For this study, we used an indicator of cognitive engagement as the dependent measure. While our rationale for doing so was to build on the findings of Wang and Eccles (2013), the result of this approach is that we are unable to draw any conclusions concerning any differences among the various types of engagement. Studies that allow for such comparisons will be necessary in the future, as the influence of teacher and peer support on engagement has been shown to differ depending on the indicators of engagement studied (Wang & Eccles, 2013). Peer support, for example, has been shown to be positively associated with participation in extracurricular activities (behavioral engagement), while teacher support had no association. Both peer and teacher support, on the other hand, are positively associated with subjective valuing of learning at school (cognitive engagement). The implication of this is that while our study is a first indication that school interventions to improve support for learning may protect poorly performing students from declines in future aspirations and perceptions of schoolwork, such interventions may not be effective in terms of behavioral or emotional engagement.

Fourth, while the large sample size (in terms of students and schools) is a strength of this study, one concern may be that the relatively small number of respondents per school (between 30 and 145 students) indicates that data, particularly for school-level variables, is not representative of the objective school culture at large. However, it is important to note that our interest was in the support for learning available to two particular grades within schools (7<sup>th</sup> and 10<sup>th</sup> grades), and thus the number of respondents per school should not be considered as a proportion of an entire

school population, but instead as a proportion of one (middle or secondary schools) or two grades (mixed schools). Moreover, in an attempt to obtain representative samples we recruited students from three different classes, which had been identified as representing high, medium, and low ability students.

Finally, we chose to interpret our principle finding in terms of basic psychological needs. Poor academic performance compromises the fulfilment of competence and leads to worse psychological development including reduced engagement. Supportive school environments, however, are able to compensate for this through the fulfilment of competence and, more directly, relatedness. It is important to note that while our measure of support for learning corresponds closely to relatedness, we did not directly measure perceived competence. Thus, future studies are required to test these underlying processes in more detail in order to extend our understanding of how school characteristics protect students from the negative effects.

## **Conclusion**

This study represents one of the first demonstrations, using multilevel analyses, of the significant moderating effect of support for learning on the association between academic performance and indicators of cognitive engagement. Students who reported higher levels of support for learning were least affected by overall poor performance in terms of engagement.

## **References**

- Ames, C. (1992). Classrooms: Goals, structures, and student motivation. *Journal of Educational Psychology*, 84(3), 261–271.
- Appleton, J. J., Christenson, S. L., Kim, D., & Reschly, A. L. (2006). Measuring cognitive and psychological engagement: Validation of the Student Engagement

Instrument. *Journal of School Psychology*, 44(5), 427–445.

<https://doi.org/10.1016/j.jsp.2006.04.002>

Archambault, I., Janosz, M., Morizot, J., & Pagani, L. (2009). Adolescent behavioral, affective, and cognitive engagement in school: Relationship to dropout. *Journal of School Health*, 79(9), 408–415. <https://doi.org/10.1111/j.1746-1561.2009.00428.x>.

Baker, J. A. (1999). Teacher-student interaction in urban at-risk classrooms: Differential behavior, relationship quality, and student satisfaction with school. *The Elementary School Journal*, 100(1), 57–70.

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(1), 3–15.

Borman, G. D., & Overman, L. T. (2004). Academic resilience in Maths among poor and minority students. *The Elementary School Journal*, 104(3), 177–195.

Bronfenbrenner, U. (2005). *Making human beings human: Bioecological perspectives on human development*. Sage.

Carbonaro, W. (2005). Tracking, students' effort, and academic achievement. *Sociology of Education*, 78(1), 27–49.

Chase, P. A., Hilliard, L. J., John Geldhof, G., Warren, D. J. A., & Lerner, R. M. (2014). Academic Achievement in the High School Years: The Changing Role of School Engagement. *Journal of Youth and Adolescence*, 43(6), 884–896. <https://doi.org/10.1007/s10964-013-0085-4>

Connell, J. P., & Wellborn, J. G. (1991). Competence, autonomy and relatedness: A motivational analysis of self-system processes. In M. Gunnar & L. A. Sroufe



(Eds.), *Minnesota Symposium on Child Psychology: Vol. 23. Self processes in development* (pp. 43–77). Chicago: University of Chicago Press.

Cornelius-White, J. (2007). Learner-centered teacher-student relationships are effective:

A meta-analysis. *Review of Educational Research*, 77(1), 113–143.

Csikszentmihalyi, M. (2013). *Flow: The psychology of happiness*. London: Random House.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behaviour*. New York, NY: Plenum.

Deci, E. L., & Ryan, R. M. (2008). Facilitating optimal motivation and psychological well-being across life's domains. *Canadian Psychology*, 49(1), 14–23.

<https://doi.org/10.1037/0708-5591.49.1.14>

Dias, A., Oliveira, J. T., Moreira, P. A. S., & Rocha, L. (2015). Percepção dos alunos acerca das estratégias de promoção do sucesso educativo e envolvimento com a escola. *Estudos de Psicologia (Campinas)*, 32(2), 187–199.

<https://doi.org/10.1590/0103-166X2015000200004>

Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology*, 53, 109–132.

<https://doi.org/10.1146/annurev.psych.53.100901.135153>

Enders, C. K., & Tofighi, D. (2007). Centering predictor variables in cross-sectional multilevel models: A new look at an old issue. *Psychological Methods*, 12, 121–138.

Finn, J. D. (1989). Withdrawing from School. *Review of Educational Research*, 59(2), 117. <https://doi.org/10.2307/1170412>

- Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School Engagement: Potential of the Concept, State of the Evidence. *Review of Educational Research*, 74(1), 59–109. <https://doi.org/10.3102/00346543074001059>
- Higgins, E. T. (2006). Value from hedonic experience and engagement. *Psychological Review*, 113(3), 439–460. <https://doi.org/10.1037/0033-295X.113.3.439>
- Hox, J. (1997). Multilevel modelling: When and Why? In I. Balderjahn, R., Mathar, & M Schader (Eds), *Classification, data analysis, and data highways: Proceedings of the 21<sup>st</sup> annual conference of the Gesellschaft für Klassifikation EV, University of Potsdam*. (pp. 147-154). New York: Springer.
- Jang, H., Reeve, J., & Deci, E. L. (2010). Engaging students in learning activities: It is not autonomy support or structure but autonomy support and structure. *Journal of Educational Psychology*, 102(3), 588–600.
- Jimerson, S. R., Campos, E., & Greif, J. L. (2003). Toward an Understanding of Definitions and Measures of School Engagement and Related Terms. *The California School Psychologist*, 8, 7–27.
- Kelly, S., & Zhang, Y. (2016). Teacher Support and Engagement in Math and Science: Evidence from the High School Longitudinal Study. *The High School Journal*, 99(2), 141–165. <https://doi.org/10.1353/hsj.2016.0005>
- Kindermann, T. A. (2007). Effects of naturally existing peer groups on changes in academic engagement in a cohort of sixth graders. *Child Development*, 78(4), 1186–1203. <https://doi.org/10.1111/j.1467-8624.2007.01060.x>
- Kreft, ITA, G.G. (1996). Are multilevel techniques necessary? An overview, including simulation studies. California State University, Los Angeles.

- Kuperminc, G. P., Leadbeater, B. J., & Blatt, S. J. (2001). School social climate and individual differences in vulnerability to psychopathology among middle school students. *Journal of School Psychology, 39*(2), 141–159.
- Lam, S., Jimerson, S., Wong, B. P. H., Kikas, E., Shin, H., Veiga, F. H., ... Zollneritsch, J. (2014). Understanding and measuring student engagement in school: The results of an international study from 12 countries. *School Psychology Quarterly, 29*(2), 213–232. <https://doi.org/10.1037/spq0000057>
- Lau, S., & Nie, Y. (2008). Interplay between personal goals and classroom goal structures in predicting student outcomes: A multilevel analysis of person-context interactions. *Journal of Educational Psychology, 100*(1), 15–29. <https://doi.org/10.1037/0022-0663.100.1.15>
- Lee, J. S. (2014). The Relationship Between Student Engagement and Academic Performance: Is It a Myth or Reality? *The Journal of Educational Research, 107*(3), 177–185. <https://doi.org/10.1080/00220671.2013.807491>
- Lee, V. E., Bryk, A. S., & Smith, J. B. (1993). The organization of effective secondary schools. *Review of Research in Education, 19*, 171–267.
- Lee, V. E., & Burkam, D. T. (2003). Dropping out of high school: The role of school organization and structure. *American Educational Research Journal, 40*(2), 353–393. <https://doi.org/10.3102/00028312040002353>
- Lee, V. E., Dedrick, R. F., & Smith, J. B. (1991). The effect of the social organization of schools on teachers' efficacy and satisfaction. *Sociology of Education, 64*(3), 190–208.
- Lee, V. E., & Smith, J. B. (1999). Social support and achievement for young adolescents in Chicago: The role of school academic press. *American*

*Educational Research Journal*, 36(4), 907–945.

<https://doi.org/10.3102/00028312036004907>

Li, Y., Lynch, A. D., Kalvin, C., Liu, J., & Lerner, R. M. (2011). Peer relationships as a context for the development of school engagement during early adolescence.

*International Journal of Behavioral Development*, 35(329–342).

<https://doi.org/10.1177/0165025411402578>

Lynch, A. D., Lerner, R. M., & Leventhal, T. (2013). Adolescent Academic Achievement and School Engagement: An Examination of the Role of School Wide Peer Culture. *Journal of Youth and Adolescence*, 42(1), 6–19.

<https://doi.org/10.1007/s10964-012-9833-0>

Marks, H. M. (2000). Student engagement in instructional activity: Patterns in the elementary, middle, and high school years. *American Educational Research Journal*, 37(1), 153–184.

Martin, A. J., & Dowson, M. (2009). Interpersonal relationships, motivation, engagement, and achievement: Yields for theory, current issues, and educational practice. *Review of Educational Research*, 79(1), 327–365.

<https://doi.org/10.3102/0034654308325583>

Moreira, P. A. S., & Dias, M. A. (2018). Tests of factorial structure and measurement invariance for the Student Engagement Instrument: Evidence from middle and high school students in Portugal. *International Journal of School & Educational Psychology*. <https://doi.org/10.1080/21683603.2017.1414004>

Moreira, P. A. S., Dias, P., Vaz, F. M., & Vaz, J. M. (2013). Predictors of academic performance and school engagement - Integrating persistence, motivation. *Learning and Individual Differences*, 24, 117–125.

- Moreira, P. A. S., Vaz, F. M., Dias, P. C., & Petracchi, P. (2009). Psychometric Properties of the Portuguese Version of the Student Engagement Instrument. *Canadian Journal of School Psychology, 24*(4), 303–317.
- Murayama, K., & Elliot, A. J. (2009). The joint influence of personal achievement goals and classroom goal structures on achievement-relevant outcomes. *Journal of Educational Psychology, 101*(2), 432–447. <https://doi.org/10.1037/a0014221>
- Nelson, R. M., & Debacker, T. K. (2008). Achievement motivation in adolescents: The role of peer climate and best friends. *Journal of Experimental Education, 76*(2), 170–189. <https://doi.org/10.3200/JEXE.76.2.170-190>
- O'Connor, E., & McCartney, K. (2007). Examining Teacher-Child Relationships and Achievement as Part of an Ecological Model of Development. *American Educational Research Journal, 44*(2), 340–369. <https://doi.org/10.3102/0002831207302172>
- OECD. (2012). *Equity and Quality in Education: Supporting Disadvantaged Students and Schools*. Paris: OECD Publishing. <https://doi.org/10.1787/9789264130852-en>
- Pianta, R. C., & Hamre, B. K. (2009). Classroom processes and positive youth development: Conceptualizing, measuring, and improving the capacity of interactions between teachers and students. *New Directions for Youth Development, 121*, 33–46. <https://doi.org/10.1002/yd>
- Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*(5), 879–903. <https://doi.org/10.1037/0021-9010.88.5.879>

- Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical Linear Models: Applications and data analysis methods* (2nd ed.). London: Sage Publications.
- Reschly, C., & Christenson, A.L. (2012). Jingle, jangle, and conceptual haziness: Evolution and future directions of the engagement construct. In S. L. Christenson, A. L. Reschly, & C. Wylie (Eds.), *Handbook of research on student engagement* (pp. 3-20). New York: Springer.
- Roorda, D. L., Koomen, H. M. Y., Spilt, J. L., & Oort, F. J. (2011). Teacher-child relationships and interaction processes: Effects on students' learning behaviors and reciprocal influences between teacher and child. *Review of Educational Research, 81*, 493–529.
- Rumberger, R. W., & Rotermund, S. (2012). The Relationship Between Engagement and High School Dropout. In S. L. Christenson, A. L. Reschly, & C. Wylie (Eds.), *Handbook of Research on Student Engagement* (pp. 491–514). Springer.
- Sirin, S. R., & Rogers-Sirin, L. (2004). Exploring school engagement of middle-class African American adolescents. *Youth and Society, 35*(3), 323–340.  
<https://doi.org/10.1177/0044118X03255006>
- Thoits, P. A. (2011). Mechanisms linking social ties and support to physical and mental health. *Journal of Health and Social Behavior, 52*(2), 145–161.  
<https://doi.org/10.1177/0022146510395592>
- Virtanen, T.E., Moreira, P.A.S., Ulvseth, H., Andersson, H, Tetler, S., Kuorelahti, M. (2017). Analyzing measurement invariance of the students' engagement instrument brief version: The cases of Denmark, Finland, and Portugal. *Canadian Journal of School Psychology*. Advance online publication.  
<https://doi.org/10.1177/0829573517699333>

- Wang, M.-T., & Eccles, J. S. (2012). Social Support Matters: Longitudinal Effects of Social Support on Three Dimensions of School Engagement from Middle to High School. *Child Development*, 83(3), 877–895.  
<https://doi.org/10.1111/j.14678624.2012.01745.x>
- Wang, M.-T., & Holcombe, R. (2010). Adolescents' perceptions of school environment, engagement, and academic achievement in middle school. *American Educational Research Journal*, 47, 633–662. <https://doi.org/10.3102/0002831209361209>
- Wang, M.-T., & Eccles, J. S. (2013). School context, achievement motivation, and academic engagement: A longitudinal study of school engagement using a multidimensional perspective. *Learning and Instruction*, 28, 12–23.  
<https://doi.org/10.1016/j.learninstruc.2013.04.002>
- Wang, M.-T., & Fredricks, J. A. (2014). The Reciprocal Links Between School Engagement, Youth Problem Behaviors, and School Dropout During Adolescence. *Child Development*, 85(2), 722–737.  
<https://doi.org/10.1111/cdev.12138>
- Willms, J. D. (2003). *Student engagement at school: A sense of belonging and participation. Result from PISA 2000*. Paris.
- Yazzie-Mintz, E. (2007). Voices of students on engagement: A report on the 2006 High School Survey of Student Engagement. Bloomington: Center for Evaluation & Education Policy, Indiana University.

Table 1.

*Sample characteristics and descriptive statistics for level-1 variables (N = 4406)*

Panel A: Total Sample (Students)			
	n (%)		
7 <sup>th</sup> Grade	2168 (49.2)		
10 <sup>th</sup> Grade	2237 (50.8)		
Females	2373 (53.9)		
Caucasian	4198 (95.3)		
Parent Education < Secondary School	2560 (59.5)		
Parent Education = Secondary School	929 (21.0)		
Parent Education > Secondary School	811 (18.0)		
	Range	M (SD)	
Age	11-19	14.01 (1.73)	
Mean Academic Performance	1-5	3.22 (0.79)	
Perceptions of Schoolwork	1-4	3.26 (0.46)	
Future Aspirations	1-4	3.52 (0.54)	
Cognitive engagement <sup>a</sup>	1-4	3.39 (0.43)	
Panel B: Academic Performance Groups			
	Low Performance (n =1383)	Average Performance (n =1872)	High Performance (n =1151)
	n (%)	n (%)	n (%)
7 <sup>th</sup> Grade	634 (45.8)	906 (48.4)	628 (54.6)
10 <sup>th</sup> Grade	749 (54.2)	966 (51.6)	522 (54.4)
Females	686 (49.6)	1005 (53.7)	682 (59.3)
	Z-Score	Z-Score	Z-Score
Parent Education	-0.40	-0.07	0.53
Mean Academic Performance	-1.17	0.00	1.29
Perceptions of Schoolwork	-0.05	-0.02	0.10
Future Aspirations	-0.34	0.01	0.40
Cognitive engagement <sup>a</sup>	-0.24	-0.01	0.30

*Note.* <sup>a</sup>Corresponds to a composite score comprising the Control and Relevance of Schoolwork (CRSW) subscale and Future Aspirations and Goals (FAG) subscales of the Student Engagement Instrument.



Table 2.

*Sample characteristics and descriptive statistics for level-2 variables (N = 68)*

Panel A: Total Sample (Schools)			
	n (%)		
Public	54 (79.4)		
Private	14 (20.6)		
Middle School	8 (11.8)		
Mixed School	53 (77.9)		
Secondary School	7 (10.3)		
	Range	M (SD)	
Number of Participants	31-145	75 (29)	
Teacher Support for Learning	2.74 – 3.47	3.09 (0.13)	
Peer Support for Learning	2.88 – 3.54	3.22 (0.12)	
Composite: Support for Learning	2.85 – 3.42	3.16 (0.11)	
Panel B: Academic Ability Groups			
	Low Performance (n =17)	Average Performance (n = 33)	High Performance (n =18)
	n (%)	n (%)	n (%)
Public	9 (52.9)	32 (97.0)	13 (72.2)
Private	8 (47.1)	1 (3.0)	5 (27.8)
Middle School	1 (5.9)	7 (21.2)	0 (0.0)
Mixed School	9 (52.9)	26 (78.8)	18 (100.0)
Secondary School	7 (41.2)	0 (0)	0 (0.0)
	Z-Score	Z-Score	Z-Score
Mean Parent Education	-0.73	-0.18	1.02
Mean Academic Performance	-1.33	-0.22	1.13
Teacher Support for Learning	0.01	-0.13	0.22
Peer Support for Learning	-0.64	0.04	0.53
Composite: Support for Learning	-0.35	-0.05	0.42

Table 3.

*Fixed effects, random effects, and variance components for hierarchical linear models of students' cognitive engagement (composite of future aspirations and perceptions of schoolwork).*

		Estimated Effects (robust SE)			
		Model 2 (Within-school model)	Model 3	Model 4	Model 5
<b>Fixed effects</b>					
Cognitive engagement					
	Intercept	-.02 (.04)	-.02 (.02)	-.02 (.02)	-.02 (.02)
	Private vs. Public		-.10 (.06)	-.13* (.06)	-.13* (.06)
	Middle School vs. Mixed		-.00 (.04)	.03 (.05)	.03 (.05)
	Secondary School vs. Mixed		-.52*** (.09)	-.60*** (.10)	-.60*** (.10)
	School Parent Education		-.00 (.02)	.00 (.02)	.00 (.02)
	School Average Support for Learning		.20*** (.02)		
	School Average Peer Support			.04 (.03)	.04 (.03)
	School Average Teacher Support			.18*** (.02)	.18*** (.02)
	School Average Academic Performance		.07* (.03)	.08** (.03)	.07** (.03)
Gender (♀ vs. ♂) Slope					
	Intercept	.22*** (.04)	.22*** (.04)	.22*** (.04)	.22*** (.04)
Grade (10 <sup>th</sup> vs. 7 <sup>th</sup> ) Slope					
	Intercept	-.48*** (.05)	-.48*** (.05)	-.48*** (.05)	-.48*** (.05)
Parent Education Slope					
	Intercept	.05* (.02)	.05* (.02)	.05* (.02)	.05* (.02)
Academic Performance Slope					
	Intercept	.14*** (.02)	.14*** (.02)	.14*** (.02)	.14*** (.02)
	School Average Support for Learning		-.05* (.02)		
	School Average Peer Support			-.04* (.02)	
	School Average Teacher Support				-.04* (.02)
<b>Random Effects</b>		Variance Component (SD)			

Level 2 Intercept	.11*** (.33)	.01*** (.11)	.01*** (.10)	.01*** (.10)
Academic Performance Slope	.01** (.08)	.01* (.08)	.01* (.08)	.01* (.08)
Level-1 effect	.83 (.91)	.83 (.91)	.83 (.91)	.83 (.91)

*Note:* \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$ . ♀ = female; ♂ = male: Please see Appendices 3-6 for the HLM equations corresponding to Models 2-5.

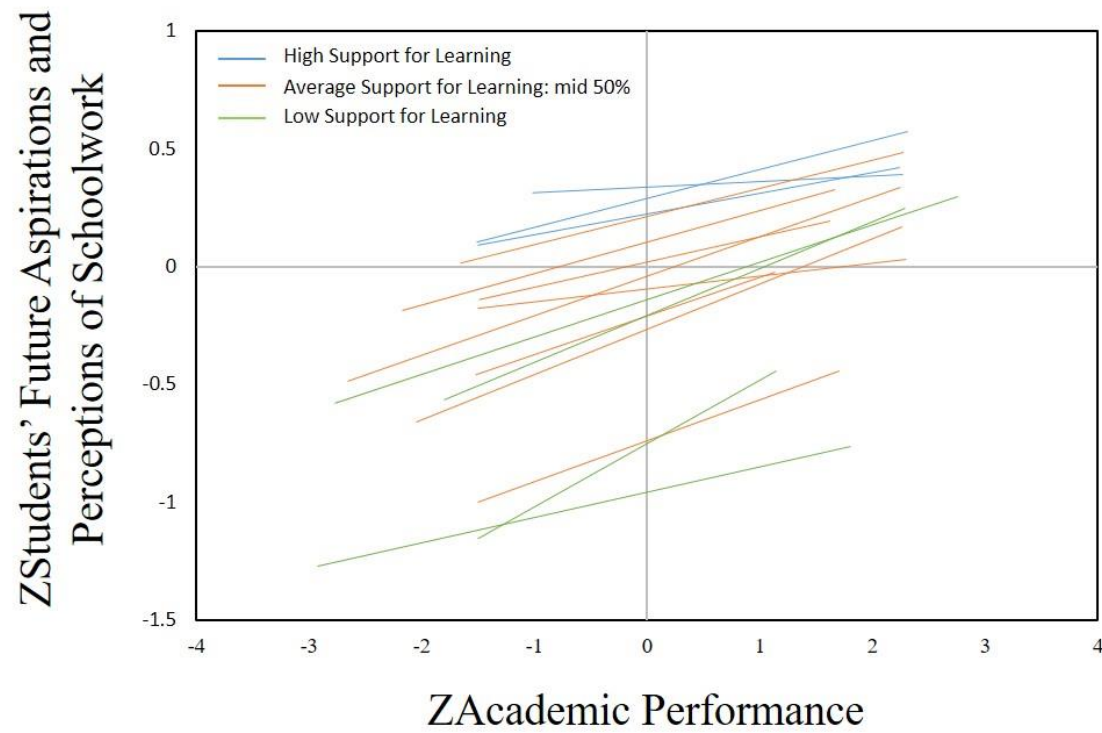
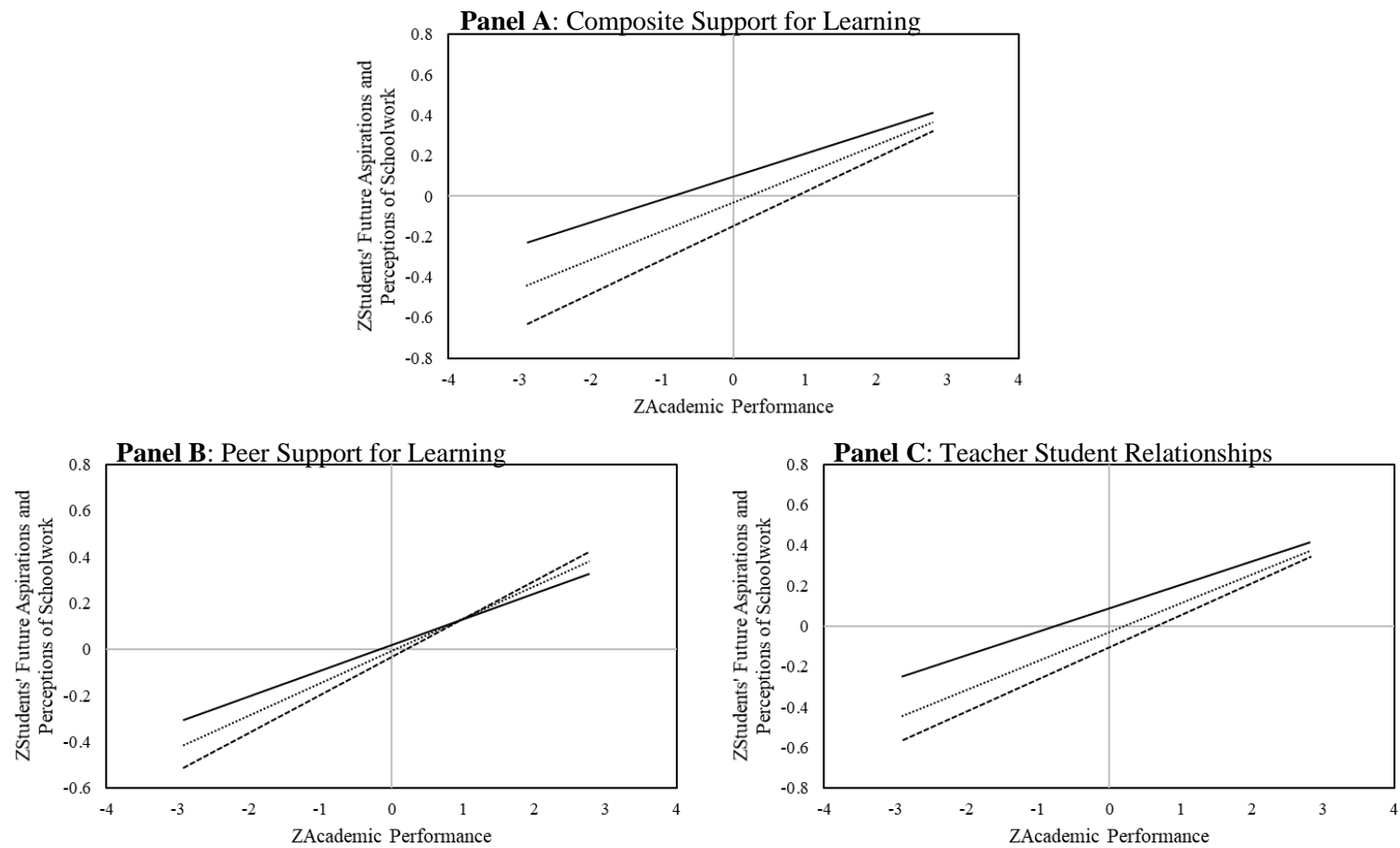


Figure 1. Variability in the Academic Performance slope across a randomly selected 25% of schools.



*Figure 2.* The relationships between students' future aspirations and perceptions of schoolwork and academic performance in schools with high (bold line), average (dotted line; mid 50%), and low (dashed line) support for learning, peer support, and teacher support for learning

## Appendices

### Appendix 1.

#### *Correlations between student-level variables.*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Portuguese Exam	-							
(2) Maths Exam	<b>.529</b>	-						
(3) Mean Academic Performance	<b>.831</b>	<b>.911</b>	-					
(4) Perceptions of Schoolwork <sup>a</sup>	.097	.014	.056	-				
(5) Future Aspirations <sup>b</sup>	.262	.254	.293	<b>.456</b>	-			
(6) Cognitive engagement <sup>c</sup>	.216	.166	.214	<b>.832</b>	<b>.874</b>	-		
(7) Teacher Support for Learning	.062	.049	.062	<b>.552</b>	<b>.322</b>	<b>.503</b>	-	
(8) Peer Support for Learning	.090	.071	.090	.297	.238	<b>.311</b>	<b>.403</b>	-
(9) Composite: Support for Learning	.090	.072	.090	<b>.511</b>	<b>.336</b>	<b>.489</b>	<b>.846</b>	<b>.829</b>

*Note.* <sup>a</sup>Perceptions of School corresponds to the Control and Relevance of Schoolwork (CRSW) subscale of the SEI. <sup>b</sup>Future Aspirations corresponds to the Future Aspirations and Goals (FAG) subscale of the SEI; <sup>c</sup>Composite of Control and Relevance of Schoolwork (CRSW) subscale of the SEI and of Future Aspirations and Goals (FAG) subscale of the SEI

**Appendix 2.** HLM equations for Model 1 (Unconditional Model).

**Level-1 Model**

$$COGNITIVE\_ENGAGEMENT_{ij} = \beta_{0j} + r_{ij}$$

**Level-2 Model**

$$\beta_{0j} = \gamma_{00} + u_{0j}$$

**Mixed Model**

$$COGNITIVE\_ENGAGEMENT_{ij} = \gamma_{00} + u_{0j} + r_{ij}$$

### **Appendix 3.** HLM equations for Model 2 (Within-Subjects Model).

#### **Level-1 Model**

$$COGNITIVE\_ENGAGEMENT_{ij} = \beta_{0j} + \beta_{1j}*(GENDER_{ij}) + \beta_{2j}*(GRADE_{ij}) + \beta_{3j}*(PARENT\_EDUCATION_{ij}) + \beta_{4j}*(ACADEMIC\_PERFORMANCE_{ij}) + r_{ij}$$

#### **Level-2 Model**

$$\beta_{0j} = \gamma_{00} + u_{0j}$$

$$\beta_{1j} = \gamma_{10}$$

$$\beta_{2j} = \gamma_{20}$$

$$\beta_{3j} = \gamma_{30}$$

$$\beta_{4j} = \gamma_{40} + u_{4j}$$

#### **Mixed Model**

$$COGNITIVE\_ENGAGEMENT_{ij} = \gamma_{00} + \gamma_{10}*GENDER_{ij} + \gamma_{20}*GRADE_{ij} + \gamma_{30}*PARENT\_EDUCATION_{ij} + \gamma_{40}*ACADEMIC\_PERFORMANCE_{ij} + u_{0j} + u_{4j}*ACADEMIC\_PERFORMANCE_{ij} + r_{ij}$$



#### Appendix 4. HLM equations for Model 3.

##### Level-1 Model

$$COGNITIVE\_ENGAGEMENT_{ij} = \beta_{0j} + \beta_{1j}*(GENDER_{ij}) + \beta_{2j}*(GRADE_{ij}) + \beta_{3j}*(PARENT\_EDUCATION_{ij}) + \beta_{4j}*(ACADEMIC\_PERFORMANCE_{ij}) + r_{ij}$$

##### Level-2 Model

$$\begin{aligned}\beta_{0j} &= \gamma_{00} + \gamma_{01}*(PRIVATE\_DUMMY_j) + \gamma_{02}*(MIDDLE_j) + \gamma_{03}*(SECONDARY_j) + \\ &\quad \gamma_{04}*(SCHOOL\_PARENT\_EDUCATION_j) \\ &\quad + \gamma_{05}*(SUPPORT\_LEARNING_j) + \\ &\quad \gamma_{06}*(SCHOOL\_ACADEMIC\_PERFORMANCE_j) + u_{0j} \\ \beta_{1j} &= \gamma_{10} \\ \beta_{2j} &= \gamma_{20} \\ \beta_{3j} &= \gamma_{30} \\ \beta_{4j} &= \gamma_{40} + \gamma_{41}*(SUPPORT\_LEARNING_j) + u_{4j}\end{aligned}$$

##### Mixed Model

$$\begin{aligned}COGNITIVE\_ENGAGEMENT_{ij} &= \gamma_{00} + \gamma_{01}*PRIVATE_j + \gamma_{02}*MIDDLE_j + \gamma_{03}*SECONDARY_j \\ &\quad + \gamma_{04}*SCHOOL\_PARENT\_EDUCATION_j + \gamma_{05}*SUPPORT\_LEARNING_j + \\ &\quad \gamma_{06}*SCHOOL\_ACADEMIC\_PERFORMANCE_j \\ &\quad + \gamma_{10}*GENDER_{ij} \\ &\quad + \gamma_{20}*GRADE_{ij} \\ &\quad + \gamma_{30}*PARENT\_EDUCATION_{ij} \\ &\quad + \gamma_{40}*ACADEMIC\_PERFORMANCE_{ij} + \\ &\quad \gamma_{41}*SUPPORT\_LEARNING_j*ACADEMIC\_PERFORMANCE_{ij} \\ &\quad + u_{0j} \\ &\quad + u_{4j}*ACADEMIC\_PERFORMANCE_{ij} + r_{ij}\end{aligned}$$

## Appendix 5. HLM equations for Model 4.

### Level-1 Model

$$COGNITIVE\_ENGAGEMENT_{ij} = \beta_{0j} + \beta_{1j}*(GENDER_{ij}) + \beta_{2j}*(GRADE_j) + \beta_{3j}*(PARENT\_EDUCATION_{ij}) + \beta_{4j}*(ACADEMIC\_PERFORMANCE_{ij}) + r_{ij}$$

### Level-2 Model

$$\begin{aligned} \beta_{0j} &= \gamma_{00} + \gamma_{01}*(PRIVATE_j) + \gamma_{02}*(MIDDLE_j) + \gamma_{03}*(SECONDARY_j) + \\ &\gamma_{04}*(SCHOOL\_PARENT\_EDUCATION_j) \\ &+ \gamma_{05}*(TEACHER\_STUDENT\_RELATION) + \gamma_{06}*(PEER\_SUPPORT_j) + \\ &\gamma_{07}*(SCHOOL\_ACADEMIC\_PERFORMANCE_j) + u_{0j} \end{aligned}$$

$$\beta_{1j} = \gamma_{10}$$

$$\beta_{2j} = \gamma_{20}$$

$$\beta_{3j} = \gamma_{30}$$

$$\beta_{4j} = \gamma_{40} + \gamma_{41}*(PEER\_SUPPORT_j) + u_{4j}$$

### Mixed Model

$$\begin{aligned} COGNITIVE\_ENGAGEMENT_{ij} &= \gamma_{00} + \gamma_{01}*PRIVATE_j + \gamma_{02}*MIDDLE_j + \gamma_{03}*SECONDARY_j \\ &+ \gamma_{04}*SCHOOL\_PARENT\_EDUCATION_j + \gamma_{05}*TEACHER\_STUDENT\_RELATION_j + \\ &\gamma_{06}*PEER\_SUPPORT_j + \gamma_{07}*SCHOOL\_ACADEMIC\_PERFORMANCE_j \\ &+ \gamma_{10}*GENDER_{ij} \\ &+ \gamma_{20}*GRADE_{ij} \\ &+ \gamma_{30}*PARENT\_EDUCATION_{ij} \\ &+ \gamma_{40}*ACADEMIC\_PERFORMANCE_{ij} + \\ &\gamma_{41}*PEER\_SUPPORT_j*ACADEMIC\_PERFORMANCE_{ij} \\ &+ u_{0j} \\ &+ u_{4j}*ACADEMIC\_PERFORMANCE_{ij} + r_{ij} \end{aligned}$$

## Appendix 6. HLM equations for Model 5.

### Level-1 Model

$$COGNITIVE\_ENGAGEMENT_{ij} = \beta_{0j} + \beta_{1j}*(GENDER_{ij}) + \beta_{2j}*(GRADE_{ij}) + \beta_{3j}*(PARENT\_EDUCATION_{ij}) + \beta_{4j}*(ACADEMIC\_PERFORMANCE_{ij}) + r_{ij}$$

### Level-2 Model

$$\begin{aligned} \beta_{0j} = & \gamma_{00} + \gamma_{01}*(PRIVATE_j) + \gamma_{02}*(MIDDLE_j) + \gamma_{03}*(SECONDARY_j) + \\ & \gamma_{04}*(SCHOOL\_PARENT\_EDUCATION_j) \\ & + \gamma_{05}*(TEACHER\_STUDENT\_RELATION_j) + \gamma_{06}*(PEER\_SUPPORT_j) + \\ & \gamma_{07}*(SCHOOL\_ACADEMIC\_PERFORMANCE_j) + u_{0j} \end{aligned}$$

$$\beta_{1j} = \gamma_{10}$$

$$\beta_{2j} = \gamma_{20}$$

$$\beta_{3j} = \gamma_{30}$$

$$\beta_{4j} = \gamma_{40} + \gamma_{41}*(TEACHER\_STUDENT\_RELATION_j) + u_{4j}$$

### Mixed Model

$$\begin{aligned} COGNITIVE\_ENGAGEMENT_{ij} = & \gamma_{00} + \gamma_{01}*PRIVATE_j + \gamma_{02}*MIDDLE_j + \\ & \gamma_{03}*SECONDARY_j \\ & + \gamma_{04}*SCHOOL\_PARENT\_EDUCATION_j + \gamma_{05}* \\ & TEACHER\_STUDENT\_RELATION_j + \gamma_{06}*PEER\_SUPPORT_j + \\ & \gamma_{07}*SCHOOL\_ACADEMIC\_PERFORMANCE_j \\ & + \gamma_{10}*GENDER_{ij} \\ & + \gamma_{20}*GRADE_{ij} \\ & + \gamma_{30}*PARENT\_EDUCATION_{ij} \\ & + \gamma_{40}*ACADEMIC\_PERFORMANCE_{ij} + \gamma_{41}* \\ & TEACHER\_STUDENT\_RELATION_j*ACADEMIC\_PERFORMANCE_{ij} \\ & + u_{0j} \\ & + u_{4j}*ACADEMIC\_PERFORMANCE_{ij} + r_{ii} \end{aligned}$$