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EMPIRICAL RESEARCH

What Makes Students Engaged in Learning? A Time-Use Study of Within- and Between-Individual Predictors of Emotional Engagement in Low-Performing High Schools

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Abstract Adolescents' emotional engagement plays a critical role in promoting their academic performance as well as overall psychological wellbeing. As a part of a 3-year longitudinal study, this study drew upon self-determination theory to examine three psychological predictors of emotional engagement within specific learning contexts. Ninety-four, low socioeconomic status (SES), ninth grade students (49% male; 32 Blacks, 30 Whites, and 32 Latinos) rated the perceived fulfillment of their autonomy, competence, and relatedness needs and their emotional engagement in learning settings at multiple time points over a 1-week period. Hierarchical linear modeling showed that the students' ratings of their psychological-need fulfillment and of their emotional engagement fluctuated over time and across contexts. After accounting for student gender, race/ethnicity, and prior achievement, we found that the fulfillment of each type of psychological need in a particular learning context was related to emotional engagement in that context (i.e., within-student level). The fulfillment of students' need for autonomy also was related to their emotional engagement at the aggregated level (i.e., between-student level). These findings illustrate how the psychological affordances of particular learning settings are associated with emotional engagement within and between students from low SES backgrounds.

Keywords Self-determination · Emotional engagement · Within- and between-individual predictors

Introduction

Educational researchers have identified academic engagement as one of the primary predictors of high achievement in school. In general, engagement is defined as active involvement in learning, in contrast to superficial participation, apathy, or lack of interest (Newmann 1992). Students who are highly engaged at school are more likely to learn more, earn higher grades, and pursue higher education (Johnson et al. 2001; Sciarra and Seirup 2008). However, many students experience decreasing levels of engagement as they move through the educational system (Fredricks et al. 2004; Shernoff et al. 2003), leading Newmann (1992) to assert that "the most immediate and persisting issue for students and teachers is not low achievement, but student disengagement" (p. 2).

In this study, we focus on emotional engagement, defined as students' affective response (e.g., happiness, anxiety, interest) to learning activities and to the people involved in those activities (Appleton et al. 2008). A growing body of evidence suggests that students who do not feel emotionally engaged in their academic life often begin to disengage behaviorally and cognitively as well, and ultimately are at risk for poor academic outcomes

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(Archambault et al. 2009; Green et al. 2008; Hirschfield and Gasper 2011). Additionally, given the salience of the school experience in adolescent life, students who are more emotionally engaged in learning settings are likely to experience greater psychological wellbeing than those who are anxious, bored or apathetic (Carter et al. 2007; Van Ryzin et al. 2009). This line of research suggests the importance of studying adolescents' emotional engagement in learning as an outcome and of investigating the factors responsible for promoting emotional engagement.

The question that then arises is what can be done to help students feel emotionally engaged in academic tasks. Self-determination theory offers a powerful framework for understanding how learning contexts facilitate engagement by meeting the psychological need of students to feel competent, emotionally connected, and autonomous (Niemiec and Ryan 2009). Indeed, several studies have demonstrated a relationship between student emotional engagement and global ratings of classroom opportunities for the fulfillment of their psychological needs (e.g., Connell et al. 1995; Skinner et al. 1990). However, little work has examined this association at the within-student level to pinpoint whether the specific opportunities for psychological need-fulfillment in a particular setting are related to emotional engagement in that setting (see Reis et al. 2000 for an exception). In the present study, we sought to address this gap in the research literature by examining situation-specific predictors of students' emotional engagement within a particular learning context.

Our research drew upon a sample of low socioeconomic status (SES) students attending ninth grade in two low-performing high schools. While it is easy to assume that students in such schools are generally unlikely to experience conditions that allow them to feel competent, emotionally connected, and autonomous, we argue that there is likely to be variability from one student to another, and from one context to another, in the extent to which such opportunities are available. By exploring the connection between students' perceived fulfillment of their psychological needs and the corresponding sense of emotional engagement in particular learning contexts, we hoped to learn whether these theoretically-derived concepts are a helpful tool for understanding this population of under-studied and under-served adolescents.

Students' Psychological Needs and Emotional Engagement

As noted, self-determination theory (SDT) offers a particularly powerful lens for understanding the conditions under which students are likely to become emotionally engaged in their work. One of a variety of approaches to the study of academic motivation and engagement (Martin and Dowson 2009), SDT views people as engaged in self-regulated and goal-directed actions that are motivated by a psychological need to feel autonomous, competent and emotionally connected to others (Niemiec and Ryan 2009). SDT-based researchers on students' engagement in schooling generally hypothesize that "the degree to which students perceive that the classroom context meets [their psychological] needs determines how engaged or disaffected they will be in school" (Fredricks et al. 2004, p. 80). Because SDT considers self-determined behaviors as a function of the interaction between individual agency and relevant social contexts (Ryan and Deci 2002), it is a particularly useful lens for researchers who seek to identify the ways in which educational settings can be constructed that best meet students' learning needs.

As conceptualized within SDT, *autonomy* in learning is fostered in situations where students have choices about how and what to learn, when they share in decision-making about the conditions of learning, and when their learning efforts are relatively free from external controls (Connell and Wellborn 1991; Deci et al. 1991). Adolescence is a period in which autonomy-seeking is foregrounded, as individuals actively construct a new sense of identity and explore a variety of adult social roles (Nota et al. 2011; Smetana 2011). A growing body of empirical evidence has demonstrated a significant link between academic autonomy and adolescents' emotional engagement in learning.

The need for *relatedness* involves feeling that one is connected to significant others (Reis et al. 2000). Even though adolescents are increasingly likely to seek autonomy, their need to connect with others through mutually supportive relationships also reaches its peak during this time (Midgley et al. 1989). Research suggests that students who report a higher sense of relatedness to parents, peers, and teachers experience greater emotional engagement in school (Furrer and Skinner 2003). Compared to other theories of motivation and engagement, SDT is particularly explicit about the role of support from others in bolstering students' engagement in schooling.

And finally, according to SDT, when a student's *need to feel competent* is met, that individual believes he or she can identify and adopt appropriate strategies to understand what is required to do well (Connell and Wellborn 1991). Thus, this perception of competence ultimately leads to behavioral, cognitive, and emotional engagement in the task at hand (Ryan and Deci 2002). For instance, Caraway et al. (2003) found that high school students' self-efficacy beliefs related positively to engagement. In summary, there is clear evidence for the theoretical contention that students' engagement in learning is related to their perception that the learning context adequately addresses their needs for autonomy, competence, and relatedness.

However, while the above-mentioned studies present compelling cross-sectional evidence, they do not fully address the situation-sensitive nature of emotional engagement or of students' perceptions of the learning context. In most work conducted to date, emotional engagement tends to be defined and measured as a general tendency without considering how it fluctuates over time, and in connection with specific tasks and situations (Appleton et al. 2008). In contrast to this approach, several recent studies have elicited moment-by-moment ratings of engagement as well as features of the learning context using the Experience Sampling Method (ESM). Within the ESM approach, each student reports his or her emotional engagement along with perceptions of the current learning context over a given number of days or weeks. These ratings yield a portrait of individual-level fluctuations over time, and also can be aggregated to examine average scores for the total time period. The ESM, in conjunction with Hierarchical Linear Modeling (HLM) techniques, allows researchers to examine within-person fluctuation across situations in terms of their ratings of the context and their own engagement (Schmidt et al. 2007). In our study, we utilized the ESM to gather data on students' activities, thoughts, and feelings throughout the entire day for a period of 1 week, thus providing a systematic documentation of engagement levels across a range of academic activities. We used HLM to explore both situation-specific and person-level measures of the same construct in one model.

Influences of Personal Factors on Students' Emotional Engagement

A substantial number of studies have been conducted to examine the influence of student characteristics such as gender, prior achievement, and race/ethnicity on engagement (Tsai et al. 2008). While it is important to identify whether groups of students are more or less susceptible to experiencing less emotional engagement, we argue that it is crucial to identify the psychological mediators that link such identifiers as gender and race/ethnicity to engagement. This approach increasingly has been adopted in recent years; for instance, a study of elementary school students found that the relationship between prior achievement and engagement was mediated by a variety of task and social support variables (Marks 2000). In our study, we controlled for indicators of student gender, race/ethnicity, and general achievement in our models, but expected that any effects of these individual characteristics would be less powerful than the more proximal effect of the perceived context in terms of predicting emotional engagement.

Perhaps the most compelling construct in these studies of personal status variables is that pertaining to race and ethnicity. Studies of racial/ethnic differences have come up with conflicting findings with respect to the amount of engagement reported students from different groups. For example, Ainsworth-Darnell and Downey's (1998) analysis of students in the NELS dataset found that Black students reported spending less time on homework compared to students in other racial/ethnic groups, but reported the highest level of effort. In contrast, Johnson et al. (2001) have shown that Black students reported higher engagement than White and Latino students on all indicators of engagement, including going to class, paying attention and doing homework. Shernoff and Schmidt (2008) also found that Black students rated themselves as having a greater degree of engagement and more positive affect in the classroom than did White students. To complicate the picture even further, it appears as though the self-perceptions of Black students are less likely to be consistent with teachers' ratings of their engagement. For example, Yair (2000) found that teachers rated Black students as the least likely among a variety of ethnic/racial groups to be engaged with instruction and the least responsive to their lessons. These inconclusive findings regarding racial/ethnic differences in engagement seem to depend on the particular indicator of engagement being considered as well as the reporter—teachers or students themselves—of behaviors indicative of engagement. The reason for this instability in the data on Black students is not clear, but we included race/ethnicity as a control variable in recognition of its strong relationship to engagement.

In addition to race/ethnicity, we also included students' sex and previous achievement as control variables. At all grade levels, girls are more likely than boys to be more engaged in learning (Johnson et al. 2001; Marks 2000). With regard to prior achievement level, many studies find that students with less knowledge and fewer academic skills tend to experience less engagement in the classroom (Kelly 2008; Lee and Smith 1995; Schmidt et al. 2007). However, in an ESM study (Larson and Richards 1991), academically proficient students reported higher rates of boredom in the classroom than did those who typically achieved at a lower level. These findings suggest that the effect of students' level of preparation may hinge on whether the specific learning context is adequately challenging and autonomy-supporting.

The Current Study

In summary, it is clear that many studies have pointed to the importance of students' perceptions concerning their opportunity to experience autonomy, competence, and relatedness in learning settings. However, few studies have considered the situation-sensitive nature of these factors in

terms of their immediate connection to emotional engagement. In addition, previous studies have neglected the population of students attending under-resourced, low-performing schools even though these students are most at risk for emotional disengagement and low achievement.

To address the above gaps in the literature, we addressed the following research questions. First, to what extent are students from low-performing high schools emotionally engaged in academic activities and does this engagement differ according to students' gender, race/ethnicity, and prior achievement? Second, to what extent do the three psychological-need variables (i.e., perceived opportunity for autonomy, competence and relatedness) assessed at the within-student level account for variance in students' emotional engagement? Third, at the between-student level, to what extent do the psychological need and personal characteristic variables (i.e., average level of perceived autonomy, competence, and relatedness; student gender, race/ethnicity and general achievement) account for variance of students' emotional engagement? Lastly, does the relationship between emotional engagement and three psychological-need variables differ across student gender, race/ethnicity, and achievement level?

Methods

Participants

The data in this report is drawn from a three-year, multi-method longitudinal study of academic engagement. The sample was recruited from two northern California high schools serving a socioeconomically and ethnically diverse student body. Student performance on a state-wide test of academic achievement was substantially below the state mean in both schools, placing them in the second lowest decile of high schools in California.

To recruit ninth graders for the study, we made presentations in classes and circulated flyers around campus. We conducted an initial screening of applicants to identify those who were from lower-SES families as indicated by parental occupation (unskilled or low-skilled workers) or parental education (high school graduate or less), and/or eligible for free or reduced price lunch; were proficient in English; were a self-identified member of one of three target racial/ethnic groups; had resided in the US since at least seventh grade; and had demonstrated adequate attendance during the prior school year. Biracial students were not included in the sample, nor were students whose school programs indicated they had significant special needs.

The sample was comprised of 94 ninth grade students, 46 males and 48 females, evenly split between the two schools. The sample included 32 Blacks, 30 Whites, and 32 Latinos. Approximately 73% of the students' mothers and 62% of fathers had a high school education or less. The majority of parents were employed in low-wage jobs, such as cook, waiter, dish washer, custodian, administrative assistant and the like. Students were given monetary compensation for their participation in the study.

Experience Sampling Method

The current study used the Experience Sampling Method (ESM) to track students' emotional engagement and perceptions of learning situations. This method allows researchers to access the subjective experiences of participants interacting in specific real life settings (Csikszentmihalyi 1990). Evidence from previous studies has shown that the ESM represents individual experience with a high level of ecological, internal, and situational validity, as well as good reliability (e.g., Csikszentmihalyi and Larson 1987; Hektner et al. 2007). In our study, each participant was given a watch that was randomly pre-programmed to beep between the hours of 8:00 am and 10:00 pm. The average number of signals was seven times per day for 7 days, resulting in a potential total of 49 signals per student. Participants were instructed to complete a questionnaire immediately upon receiving a signal. The questionnaire elicited information concerning the participant's location and activity, the presence of other individuals in the setting, and various self-ratings of cognitive and affective experience at the time of being signaled.

In total, 4,388 responses were obtained, with an average of 46 questionnaires per student. Consistent with prior ESM research, surveys completed more than thirty minutes after the signal and those containing a substantial amount of missing data were excluded from subsequent analyses (249 responses). In order to limit the analysis to academic activities, we drew upon an open-ended item that elicited a description of the participant's activity at the time of being signaled: "What was the main thing you were doing [when signaled]?" We retained responses concerning activities that pertained to academic work (e.g., doing homework, taking a test, listening to the teacher) and excluded all other responses (e.g., congregating with friends in the hallways at school, watching television with family). Thus the final data set consisted of 789 responses completed in the context of an academic activity. The mean number of academic responses per student was 12 with a range of 4–24.

Measures

Emotional Engagement

The simultaneous experience of concentration, interest, and enjoyment is a central phenomenological feature of the engagement experience. Consistent with prior ESM

research (e.g., Shernoff et al. 2003), we constructed a composite measure of emotional engagement by averaging students' ratings on the following three ESM items (each of which was rated using a five-point Likert scale): *interest* ("Was the activity interesting?"); *concentration* ("How hard were you concentrating?"); and *enjoyment* ("Did you enjoy what you were doing?"). This composite achieved a moderately high level of reliability ($\alpha = .67$), which is consistent with, or higher than, reliability estimates in other work using this a similar measure (e.g., Schmidt et al. 2007).

Self-Determination Variables

The self-determination variables were derived from students' responses to the prompt, "Indicate how you felt about what you were doing." At the moment of each signal, students rated their perceived autonomy, competence, and relatedness on a five-point Likert scale (1 = not at all, 5 = very much). According to self-determination theory, the individual's need for autonomy is most likely to be met in contexts where students have choice, shared decision-making, and relative freedom from external controls (Martin and Dowson 2009). In our study, students' perception of their opportunity for *autonomy* was derived from the question, "How much choice did you have about this activity?" Our emphasis on choice as an indicator of perceived autonomy is consistent with the approach taken by Schmidt et al. (2007). Second, the indicator of *perceived competence* was derived from the question "How much did you understand what was going on?" This construct has been assessed in a variety of ways in previous work, but we felt that one's understanding of a learning activity is a crucial indicator of academic competence. Third, we used the question, "How satisfied were you with the support others were giving you?" to measure *relatedness*, under the assumption that students feel relatedness in situations where teachers, parents, or peers create a caring and supportive environment.

In order to address the issue of reliability, ESM researchers typically average each individual's scores from the first and second half of the data collection period and compute the correlation between the two halves (Hektner et al. 2007; Larson et al. 2002). We employed this split-half technique on each of the psychological need variables, and found moderately strong associations. The correlation between students' mean autonomy score for the first half of the week and their mean autonomy score for the second half was .51; for competence, this correlation was .59 and for relatedness it was .40.

Individual Variables

Gender was dummy coded (male = 0, females = 1). Race/ethnicity categories include White, Black and Latino and were dummy coded, with adolescents from White students serving as the reference group. Student GPA during the first semester of the ninth grade was obtained from school records and used as a measure of prior achievement.

Analytical Model

The repeated measurement design that we employed resulted in a two-level hierarchical structure with time-varying data points nested within each individual student. In nested data such as this, the error terms of responses may be correlated within individuals, leading to potentially biased ordinary square estimates and standard errors (Rabe-Hesketh and Skrondal 2008). We used Hierarchical Linear Modeling (HLM) to account for this dependence among responses within individuals. Time-varying estimates of autonomy, competence and relatedness were included at the within-student level (level-1 model). Students' personal characteristics, including gender, race/ethnicity and GPA, were modeled in the between-student level (level-2 model).

We began with a one-way random effects analysis of variance to partition the total variance in emotional engagement into within- and between-individual components. The variance estimates were obtained by fitting an HLM in which the emotional engagement experience of the *i*th ESM response of the *j*th student ($Engagement_{ij}$) is given by the grand mean (β_{00}), random effect of student (u_j), and within-student residual (r_{ij})

$$Engagement_{ij} = \beta_{00} + u_j + r_{ij}$$

The within-student level model investigated how student engagement was associated with the three time-varying psychological-need variables using the following regression equation:

$$\begin{aligned} Engagement_{ij} = {} & \beta_{0j} + \beta_{1j}(Autonomy_{ij}) \\ & + \beta_{2j}(Competence_{ij}) + \beta_{3j}(Relatedness_{ij}) \\ & + u_{0j} + r_{ij} \end{aligned}$$

Students' engagement on a particular occasion (i) for a particular individual (j) was modeled as a function of a person-specific intercept (β_{0j}), the coefficients of autonomy (β_{1j}), competence (β_{2j}), and relatedness (β_{3j}), random intercept (u_{0j}), and within-student error term (r_{ij}). The intercept represents each individual's average level of emotional engagement, while the coefficients test whether within-student changes in psychological variables promote momentary changes in emotional engagement.

Turning to the between-student level model, the personal characteristic variables were included to explain between-student variability in emotional engagement at level 2:

$$Level\,1: Engagement_{ij} = \beta_{0j} + \beta_{1j}\left(Autonomy_{ij} - \overline{Autonomy_j}\right) + \beta_{2j}\left(Competence_{ij} - \overline{Competence_j}\right) + \beta_{3j}\left(Relatedness_{ij} - \overline{Relatedness_j}\right) + r_{ij}$$

$$Level\,2: \beta_{0j} = \gamma_{00} + \gamma_{01}Male_j + \gamma_{02}Latino_j + \gamma_{03}Black_j + \gamma_{04}GPA_j + \gamma_{05}\overline{Autonomy_j} + \gamma_{06}\overline{Competence_j} + \gamma_{07}\overline{Relatedness_j} + u_{0j}$$

$$\beta_{1j} = \gamma_{10},\ \beta_{2j} = \gamma_{20},\ \beta_{3j} = \gamma_{30}$$

The coefficient estimators for the three time-varying variables in previous model can be expressed by within- and between-individual effects. That is, the estimates represent either a comparison of emotional engagement between students with different levels of self-determination or a comparison of emotional engagement between different learning contexts within a student. Two notable advantages of using HLM in repeated measurement data are to differentiate the within- from the between-individual effects of time-varying variables on the outcomes and to eliminate the bias due to unobserved heterogeneity or unmeasured factors by including the individual means of the time-varying covariates (Rabe-Hesketh and Skrondal 2008). While it is almost impossible to control all the potential confounding variables that vary across individuals and are related with time-varying variables, by a using within-individual analysis, we were able to address the issue by essentially using individual students as their own control.

Thus, an HLM model can be built to consider the within- and between-student associations between the three self-determination variables and emotional engagement by including group-mean centered forms of the psychological-need variables (e.g., $Autonomy_{ij} - \overline{Autonomy_j}$) at level 1 and mean scores of those variables (e.g., $\overline{Autonomy_j}$) at level 2. In the level-1 equation, the coefficients of mean-centered autonomy (β_{1j}), competence (β_{2j}), and relatedness (β_{3j}) represent whether within-student changes in autonomy, competence and relatedness are associated with emotional engagement. And at level 2, the student-specific intercept (β_{0j})—the average engagement score of jth student—derived from the level-1 equation was used as an outcome in the level-2 equation. The intercept is a function of the grand mean engagement score of the sample (γ_{00}), and the coefficients of being a male (γ_{01}), being Latino (γ_{02}), being Black (γ_{03}), 9th grade GPA (γ_{04}), person mean autonomy(γ_{05}), person mean competence (γ_{06}), and person mean relatedness(γ_{07}). The subsequent three equations indicate that the slopes in the level-1 model—β_{1j}, β_{2j}, β_{3j}—are treated as fixed effects. The coefficients for these slopes—γ_{10}, γ_{20}, γ_{30}—represent the extent to which students with higher levels of autonomy, competence and relatedness tend to display higher levels of emotional engagement.

To answer questions as to whether the effect of contextual variables on engagement applied equally across all students, we allowed the slopes for the level-1 variables to vary randomly in the final series of models. When statistically significant slope variance was found, the equation for that slope parameter was modeled with level-2 predictors to identify significant explanatory variables. One slope coefficient was modeled at a time.

To assess effect sizes for the variables of interest, we divided the standardized version of the coefficient by the level-specific standard deviation of the outcome. For instance, the effect size of the relation between students' momentary perceptions of autonomy (a level-1 variable) and emotional engagement was estimated by dividing the standardized version of autonomy coefficient by the level-1 standard deviation of the unconditional model (i.e., a model with covariates). Similarly, we estimated the effect size for level-2 variables (i.e., students' characteristics) by dividing the corresponding standardized coefficient by the level-2 intercept standard deviation. These standardized estimates are equivalent to effect sizes (Galindo and Fuller 2010).

Results

Question 1: To What Extent Are Students Emotionally Engaged?

Examination of students' mean score on the engagement composite revealed that emotional engagement varied according to student gender and race/ethnicity (see Table 1). Girls ($M = 2.81$, SD = .99) reported significantly higher mean scores on emotional engagement than boys ($M = 2.67$, SD = .97; $F(1, 95) = 8.46$, $p < .01$).

Table 1 Emotional engagement in academics by individual student characteristics

	Mean	SD	F
Gender			
Male	2.67	0.97	8.46**
Female	2.81	0.99	
Ethnicity			
White	2.58	0.89	11.77***
Latino	2.73	0.99	
Black	2.87	1.03	
Achievement			
High	2.68	0.59	2.63
Medium	2.72	0.83	
Low	2.81	0.67	

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

Black and Latino students ($M = 2.87$, SD = 1.03, and $M = 2.73$, SD = .99, respectively) students reported higher levels of engagement than White students ($M = 2.58$, SD = .89; $F(2, 95) = 11.77$, $p < .001$). Pairwise (Bonferroni) tests indicated that Black students reported significantly higher emotional engagement in learning than did White students and Latino students. There was no significant difference in emotional engagement across the three achievement groups, but there was a tendency for the higher achieving students to report less engagement than the lower achievers.

Question 2: To What Extent Do the Psychological-Need Variables Predict Within-Student Emotional Engagement?

Table 2 presents descriptive statistics on how emotional engagement and the psychological-need variables varied within and between-student level. Engagement, competence, and relatedness varied more within-individual than between-individual, while autonomy demonstrated the reverse pattern.

The unconditional model indicated that emotional engagement varied significantly between students, $\chi^2 = 254.61$, $p < .001$, which justified the use of HLM for subsequent analyses. The variance component estimates showed that both within- and between-student variation occurred, but that the between-student variation was relatively small (see Table 3). The intraclass correlation indicated that 44 percent of the total variation in emotional engagement was between students. Thus, we concluded that each student not only experienced changing levels of engagement from situation to situation, but also displayed a distinctive trajectory of engagement compared with other students.

Table 4 presents the hierarchical linear models of emotional engagement. As shown at the bottom of the table, model 2, 3, 4, and 5 represent significant improvements in fit over previous models (i.e., the deviance statistic significantly decreased). As shown in model 2, the hypothesized associations between the psychological-need variables and students' engagement were all supported. Students were more engaged when they perceived that the context was supportive of their psychological need for autonomy, competence and relatedness. The coefficients for these variables changed slightly across the models. In standard deviation units, which are equivalent to effect sizes, we observed that the magnitude of the association to emotional engagement was moderate (0.24 SD for autonomy, 0.28 SD for competence, and 0.31 SD for relatedness).

In Fig. 1, to illustrate the way in which students' opportunity for self-determination and their emotional engagement fluctuated across contexts, we have displayed one student's rating of engagement and perceived competence across academic learning contexts. This high-achieving student evidenced a jagged pattern, with very low levels of engagement in some contexts balanced by higher ratings in other settings. The graph shows that students' emotional engagement is more accurately conceptualized and measured as a process that is sensitive to context rather than as a single, global score. The graph further illustrates how even minor changes in perceived competence can be associated with corresponding fluctuations in emotional engagement.

Question 3: To What Extent Do the Individual-level Variables Predict Between-Student Emotional Engagement?

As shown in Table 4, there was no significant effect of gender or school achievement on emotional engagement. Only being Black ($b_{black} = .31$, $p < .05$) compared with being White, was significantly associated with students' engagement; this effect size was moderate (0.37 SD).

With respect to the impact of the three psychological-need variables, perceived competence and relatedness showed significant within-person effects only. This result

Table 2 Mean and standard deviation of time-varying variables

Variable	Mean	SD
Engagement		
Overall	2.74	.99
Between		.70
Within		.76
Autonomy		
Overall	2.81	1.45
Between		1.03
Within		1.01
Competence		
Overall	3.81	1.17
Between		.81
Within		.89
Relatedness		
Overall	2.92	1.62
Between		.87
Within		.94

Table 3 Variance components for emotional engagement

	Variance component	*df*	χ^2	*P*
Within-student effect	0.54			
Between-student effect	0.43	94	254.61	.000
Intraclass correlation	0.44			

Table 4 Hierarchical linear models examining predictors of emotional engagement

	Model 1	Model 2	Model 3	Model 4	Model 5
Fixed effect					
Intercept	2.68 (0.08)***	0.94 (0.13)***	0.62 (0.23)*	0.83 (0.37)*	1.62 (0.28)***
Within-individual level[a]					
Autonomy		0.16 (0.02)***	0.15 (0.02)***	0.15 (0.02)***	0.14 (0.02)***
Competence		0.19 (0.04)***	0.17 (0.04)***	0.17 (0.03)***	0.19 (0.04)***
Relatedness		0.21 (0.02)***	0.23 (0.03)***	0.21 (0.03)***	0.19 (0.04)***
Between-individual level					
Female			0.07 (0.12)	0.08 (0.12)	0.12 (0.10)
Latino[b]			0.19 (0.15)	0.18 (0.15)	0.15 (0.13)
Black			0.31 (0.15)*	0.27 (0.15)	0.33 (0.16)*
9th GPA			−0.01 (0.07)	0.00 (0.07)	−0.18 (0.10)
MN_autonomy[c]				0.22 (0.06)***	0.27 (0.06)***
MN_competence				0.19 (0.08)	
MN_relatedness				0.11 (0.11)	
Cross-level interaction[d]					
GPA × relatedness					0.08 (0.02)***
Random effect (variance)					
Between-individual					
Intercept	0.66	0.53	0.52	0.51	0.50
Relatedness					−0.42
Within-individual	0.74	0.67	0.66	0.66	0.64
Model comparison[e]					
Chi-square	227.01***	162.02***	142.21***	120.65***	109.11**
Degrees of freedom		3	4	3	1

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

[a] In model 3, 4, and 5, three within-level variables were used in their mean-centered forms to address cluster-level confounding

[b] Reference group: White students

[c] MN = mean

[d] After testing all possible 12 cross-level interaction terms, we represented only significant interaction term in the table

[e] Model comparison (current vs. previous model)

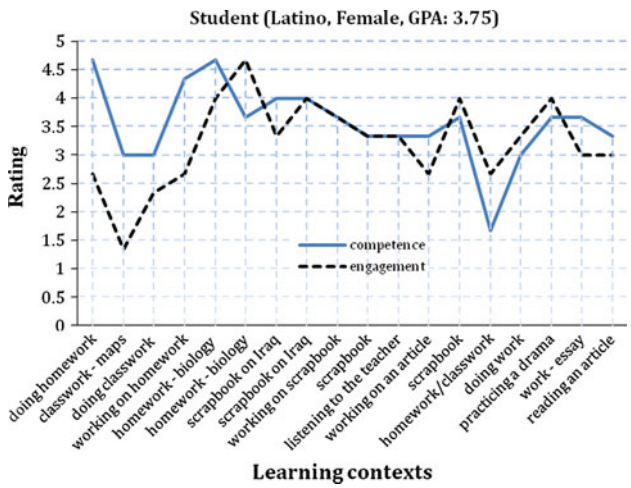

Fig. 1 A high achieving student's emotional engagement and perceived competence across learning contexts

demonstrated that situational changes in students' perception of competence and relatedness were associated with emotional engagement, while students' overall perception on these variables estimated by the aggregated score was not associated with engagement. With regard to the support for autonomy, both the within- and between-individual effects were significant. In standard deviation units, the between-individual effect of autonomy (0.33 SD) was larger than within-effects of autonomy (0.24 SD).

Question 4: Does the Relationship of Psychological Needs to Emotional Engagement Vary According to Students' Personal Characteristics?

To answer the question as to whether the effect of contextual variables on engagement applied equally across all students, we estimated an additional set of models in which

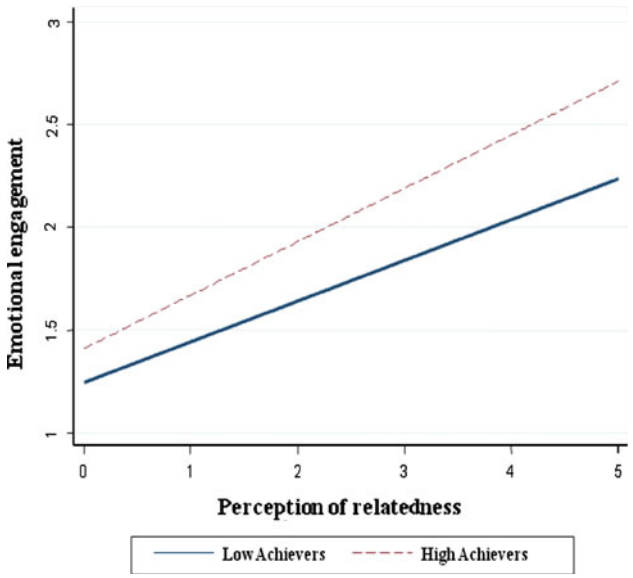

Fig. 2 Association of engagement to relatedness for higher and lower achieving students

we included cross-level interaction terms between level-1 and level-2 variables. In Model 5, we allowed the slopes of the level-1 variables to vary randomly in the final series of HLMs. When a statistically significant slope variance was found, the equation for that slope parameter was modeled with level-2 predictors to identify significant explanatory variables. Cross-level interactions were tested one at a time to determine whether the slope for the three contextual variables varied significantly across individuals. One interaction term (relatedness * ninth grade GPA) was significant but the effect size was small (0.10 SD). As indicated in Fig. 2, as the level of perceived relatedness increased, student engagement increased as well, and this increase was steeper for students with a higher prior GPA than students with a lower GPA.

Discussion

Students' disengagement from schooling has been characterized as one of the most persistent problems in educational settings, particularly during high school (Wigfield et al. 2006). Students who are bored, apathetic, or anxious in learning settings often disengage behaviorally, and ultimately are at-risk for underachievement and/or school dropout (Eccles 2004). Previous studies drawing upon self-determination theory have found that students' perceptions of the opportunity for fulfillment of their psychological needs for autonomy, competence, and relatedness in a learning setting were related to their emotional engagement in learning within a particular context. However, the majority of this work has been restricted to examining this relationship between students. Drawing upon a longitudinal data set that captured assessment of the context and emotional engagement at nearly 50 time points for each student, our study breaks new ground by examining not only between-student but also within-student associations between these psychological-need variables and emotional engagement. Our study was conducted with an ethnically-diverse sample of 94 students attending low-performing schools, thus contributing to a better understanding of the motivational dynamics of an under-studied yet academically vulnerable population.

We found that emotional engagement was fluid across time and context, and this within-student variation in emotional engagement across contexts was greater than the between-student variation in average engagement across contexts. We found that learning contexts appeared to spark students' engagement when they met students' psychological needs for autonomy, competence and relatedness. Consistent with prior research, the fulfillment of students' need for autonomy also was related to their emotional engagement at the aggregated level (i.e., between-student level). More importantly, by examining the fluctuation of scores within each student across nearly 50 data points, we found that context-based perceptions of autonomy, competence and relatedness all contributed to students' emotional engagement at the within-student level, and they did so over and above the effects of students' gender, race/ethnicity and achievement level. Lastly, we found that a combination of situational and individual factors was associated with students' emotional engagement. In particular, perceived opportunity for relatedness was more strongly associated with engagement for higher achieving students than for their lower achieving counterparts. Taken together, these results suggest that even students who are at-risk for emotional disengagement and underachievement are sensitive and responsive to opportunities for fulfillment of their need to be autonomous, emotionally connected, and competent learners.

The Influence of Learning Contexts on Emotional Engagement

Overall, our findings confirmed the results of other studies showing that students are more engaged when learning contexts offer students an opportunity for autonomy, competence and relatedness (Furrer and Skinner 2003; Marks 2000; Van Ryzin et al. 2009). In previous ESM research, signal-level responses often have been aggregated under the assumption that this approximates a person-level characteristic or trait (Hektner et al. 2007). However, we found that the aggregated scores of competence and relatedness measured by average scores over 1 week had no association with emotional engagement. In contrast, the

aggregated autonomy score, which exhibited relatively wide variance, was significantly associated with engagement. During the adolescent period, autonomy-related characteristics of the individual may be particularly powerful compared to situational affordance of autonomy.

The most significant finding in this study was that the psychological-need variables in a particular context were associated with emotional engagement in that context, within each individual student. In our study, instead of assessing participants only once, we adopted a repeated measurement design that allowed us to obtain not only aggregated assessment of these variables but also momentary responses to particular learning contexts. This design allowed us to pay special attention to the fluctuating, context-sensitive nature of the psychological-need variables as well as of emotional engagement.

The Relationship of Individual Characteristics to Emotional Engagement

Consistent with some previous research (Shernoff and Schmidt 2008; Johnson et al. 2001), the Black students in our sample reported higher engagement than the White students. They also reported higher perceived competence relative to White students. These indicators of engagement present somewhat of a paradox when considered in association with the finding that average achievement was lower for Black students. One explanation for our findings may be that, as Eccleston et al. (2010) has argued, Black students are more likely to discount negative feedback from the schools, and therefore maintain a sense of competence and high emotional engagement, but this strategy also may result in a gap between their level of engagement and the evidence regarding their achievement from standard performance indicators. In any case, we would point to the fact that the associations between the psychological-need variables and engagement were similar across the three racial/ethnic groups in our sample, indicating that the theory applies equally well to all groups.

Our analyses revealed no association between prior student achievement as measured by 9th grade GPA and emotional engagement at either the person-level or the response-level. However, we discovered that GPA moderated the relationship between perceived relatedness and emotional engagement. In particular, the opportunity for relatedness afforded in a setting was particularly strongly associated with engagement for higher achieving students. This finding is interesting given that the higher achieving students tended, in general, to rate themselves as less engaged than the lower achievers. Our sense is that this dynamic may be a function of the conditions in their low-resourced, under-performing schools. For higher achieving students, the expected connection between perceived relatedness and engagement held up because these students had the cognitive resources to respond contingently to contextual conditions. In contrast, the lower achievers may have been too overwhelmed by their personal challenges to respond to their teachers' attempts to relate to them. An alternative hypothesis has been suggested by Shernoff and Schmidt (2008), which is that students from difficult family situations may perceive school as a relatively safe and supportive environment, and there may be a disconnect between their perception of support and their actual approach to their schoolwork. In general, we believe that this finding sensitizes us to the fact that learning settings are indeed evaluated differently depending on a variety of psychological and ecological characteristics of the student and the setting, and highlights the need to include student perceptions rather than relying exclusively on more "objective" indicators of the learning environment.

Study Limitations

The results of this study should be interpreted with caution due to several design and measurement limitations. First, although we have argued that it is essential to understand how students understand and evaluate their learning settings, the students' self-report is vulnerable to errors, exaggeration, or even deliberate falsification. However, we went to great lengths to support and monitor students in order to increase the chances that they would approach this task in a conscientious manner. Second, the variables used to represent autonomy, competence, and relatedness were based on responses to a single item. Future work should make use of multi-dimensional measures. For instance, autonomy might be better represented by items which address not only students' perception of choice but also their perception of control over the conditions of learning and the extent to which the learning activity appears connected to "real life." With more comprehensive measurement of these opportunities for psychological fulfillment, researchers may be able to show even stronger associations between the context and student engagement. Additionally, the relatively small number of participants ($N = 94$) presented a limitation for the statistical inference of the between-student level model and limits the generalizability of the findings, even though we obtained a large number of within-student ratings ($N = 789$).

Although our study broke new ground by examining the relatively understudied construct of emotional engagement, we see a need for future research that considers behavioral and cognitive as well as emotional engagement, exploring the relationship among these components and investigating the predictors of each. Additionally, we are conscious of the fact that the relationship between student engagement and these contextual features is likely to be reciprocal in

the sense that students who appear to be more emotionally engaged may in turn elicit more support from others in the setting, and may be afforded a greater degree of autonomy. Further research is needed to test the reciprocal nature of the relationship between social interaction and student outcome.

Implications for Practice

The presence of intra-individual variation in emotional engagement suggests that one cannot simply label a student as "engaged" or "disengaged." Because emotional engagement is a dynamic, malleable construct, high-achieving students sometimes report boredom and frustration in the process of learning and low-achieving students experience moments of interest and curiousity. In contrast to this dynamic construal of engagement, teachers tend to focus more on between-student differences in engagement than on the effects of particular contextual conditions on a given student's engagement (Reeve and Halusic 2009). Our findings emphasize the need for pre- and in-service teacher education programs to help teachers evaluate whether the conditions in their classrooms fulfill students' basic need to feel competent, supported by others, and autonomous with respect to learning. For instance, in order to enhance students' engagement, teachers can support students' need for autonomy by minimizing evaluative pressure, giving them meaningful choices in the context of academic activities, and providing them with a meaningful rationale for why a learning activity is useful (Assor et al. 2002).

Conclusion

Overall, the results of our study suggest that student engagement is not a fixed, global entity; rather, a particular student experiences substantial variation in emotional engagement depending on the nature of the learning context. Undoubtedly, some students are truly disengaged from most learning contexts. But our study suggests that even low achieving students in under-resourced schools experience some circumstances in which they find that learning is engaging. This finding challenges the common notions that low-achieving adolescents are simply not interested in learning, and shifts the focus of research away from identifying "problem learners" and toward the ways in which educators can design activities that are supportive of students' psychological needs. Furthermore, our study underscores the importance of acknowledging that adolescents not only need to seeking autonomy—the goal that is most frequently associated with this developmental period—but also need to feel supported and competent as they approach learning tasks.

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