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Students' Agentic Engagement Predicts Longitudinal Increases in Perceived Autonomy-Supportive Teaching: The Squeaky Wheel Gets the Grease

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ABSTRACT

Recognizing that teachers' motivating styles predict students' classroom engagement, we investigated whether students' classroom engagement might predict a change in teachers' motivating styles, though we investigated only students' perceptions of these changes. Using a self-determination theory framework and a classroom-based longitudinal research design, 336 Peruvian university students self-reported their teachers' perceived autonomy-supportive teaching and four aspects of their own engagement (behavioral, emotional, agentic, and cognitive) at the beginning (T1) and end (T2) of a semester. As expected, earlysemester perceived autonomy-supportive teaching predicted longitudinal increases in all four aspects of students' late-semester engagement. More importantly, students' early-semester agentic engagement predicted longitudinal increases in perceived autonomy-supportive teaching, which suggests that students' classroom engagement may recruit greater perceived autonomy support.

KEYWORDS

Agency; agentic engagement; autonomy support; engagement; motivating style; self-determination theory

MUCH PROGRESS HAS been made to understand how teachers' motivating styles predict students' classroom motivation and engagement (Assor, Kaplan, & Roth, 2002; Assor, Kaplan, Kanat-Maymon, & Roth, 2005; Cheon & Reeve, 2015; Cheon, Reeve, & Moon, 2012; Cheon, Reeve, & Song, 2016; Jang, Kim, & Reeve, 2016; Reeve, 2009), but it seems to be equally important to investigate how students' classroom engagement might in turn predict teachers' motivating styles. In the present study, we focused on both of these relations—how teachers' motivating style may predict longitudinal changes in students' engagement and how students' engagement may predict longitudinal changes in teachers' motivating style, though we focused mostly on the overlooked latter relation and only on perceived changes in teachers' motivating styles (rather than actual behavioral changes in teachers' motivating style).

Self-determination theory: How teachers' autonomy-supportive motivating style predicts students' classroom engagement

Self-determination theory (SDT) is a widely used theoretical framework to understand students' motivation and outcomes (Ryan & Deci, 2000, 2017). In this theory, students can be either active, curious, and engaged or passive, disaffected, and disengaged, according to whether the social context is supportive or controlling. Hence, it is important to understand how the teacher can create the conditions that

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foster rather than undermine students' positive classroom functioning (Van den Berghe, Cardon, Tallir, Kirk, & Haerens, 2016).

According to SDT, a teacher's motivating style represents the characteristic way he or she attempts to motivate students to engage in and benefit from learning activities (Deci, Schwartz, Sheinman, & Ryan, 1981; Reeve, 2009). The most widely studied motivating style within the SDT framework is autonomy support, which is the delivery of instruction through an interpersonal tone of support and understanding that students generally find to be need satisfying (Reeve, 2016). This tone is communicated to students through acts of instruction such as taking their perspective, creating opportunities for student input, encouraging initiative, offering learning activities in need-satisfying ways, and teaching in students' preferred ways (De Meyer et al., 2014; Jang, Reeve, & Halusic, 2016; Patall, Dent, Oyer, & Wynn, 2013; Reeve, 2009). When teachers become more autonomy supportive, their students benefit in terms of greater need satisfaction, autonomous motivation, engagement, learning, and performance, as evidenced by studies using experimental manipulations of teachers' autonomy-supportive motivating style (Jang et al., 2016; Vansteenkiste, Simons, Soenens, & Lens, 2004), teacher-focused interventions using randomized control designs to increase teachers' autonomy-supportive motivating style (Cheon & Reeve, 2015; Cheon et al., 2012; Cheon et al., 2016) and by longitudinal classroom-based research showing the benefits of naturally occurring increases in teachers' autonomy-supportive motivating style (Jang, Kim, & Reeve, 2012; Jang et al., 2016).

How students' classroom engagement might predict teachers' autonomy-supportive motivating style

Engagement refers to the extent of a student's active involvement in a learning activity (Skinner, Kindermann, Connell, & Wellborn, 2009). It is a multidimensional construct that features four distinct, though intercorrelated, aspects. *Behavioral engagement* refers to how involved the student is in learning activities in terms of on-task attention and effort (i.e., working hard); *emotional engagement* refers to the presence of positive emotions such as enjoyment during classroom learning activities (i.e., working enthusiastically); *agentic engagement* refers to the student's intentional, proactive, and constructive contribution into the flow of the instruction he or she receives such as making a suggestion or expressing a preference (i.e., working proactively); and *cognitive engagement* refers to how strategically the student attempts to learn in terms of employing sophisticated learning strategies such as elaboration and critical thinking (i.e., working smart) (Fredricks, Blumenfeld, & Paris, 2004; Reeve & Tseng, 2011).

Most of the research on student engagement has been undertaken with the goal of predicting and explaining students' positive educational outcomes, such as learning and achievement (Christenson, Reschly, & Wylie, 2012). We agree that the consistent finding is that higher levels of engagement are associated with higher levels of achievement (Ladd & Dinella, 2009; Reeve & Tseng, 2011). In the present study, however, we focused on how student engagement might predict changes in a teacher's autonomy-supportive motivating style or at least might predict changes in students' perceptions of a teacher's autonomy-supportive motivating style. One previous study has suggested that teachers do adjust their extent of autonomy-supportive teaching in reaction to displays of students' engagement. In this study, the more students reported showing initiative and offering input (i.e., agentic engagement), the more students perceived that their teachers became more autonomy-supportive throughout the semester (Reeve, 2013). This correlational-longitudinal study is important to the purposes of the present study because it suggests that teachers might at least sometimes adjust their provision of autonomy-supportive teaching in accommodation to students' displays of classroom engagement. This study also suggests that teachers do not alter their autonomy-supportive motivating style (or that students do not perceive that teachers alter their autonomy-supportive motivating style) in response to students' global engagement but, rather, in response to a specific aspect of engagement (i.e., agentic engagement only).

The reason we hypothesized that it was only agentic engagement (and not behavioral, emotional, or cognitive engagement) that might facilitate a longitudinal increase in perceived autonomy-supportive teaching was because agentic engagement is functionally a student-initiated pathway to recruit greater autonomy support from teachers. Unlike students who are behaviorally, emotionally, and cognitively engaged (i.e., working hard, working enthusiastically, and working smart), agentically engaged students explicitly ask for greater motivational support from their teachers, as these students offer suggestions to personalize the lesson, make recommendations on what to do and how to do it, offer input, ask questions, communicate what they want and need, tell the teacher what they are thinking, communicate their interests and preferences, and ask for resources, including greater understanding and support from their teacher (Reeve, 2013). For instance, when a student makes a suggestion (e.g., Can you provide an example of this?), the probability that the teacher will respond in an autonomy-supportive way increases, relative to when the same student does not make such a suggestion.

Longitudinal research design and hypotheses

The purpose of the paper was to test the extent to which (a) students' perceptions of teachers' autonomy-supportive motivating style would predict longitudinal changes in all four aspects of students' classroom engagement and (b) one specific aspect of students' engagement (i.e., agentic engagement) would predict longitudinal changes in perceived autonomy-supportive teaching. These predictions are shown in the hypothesized model depicted in Figure 1. More specifically, the four downwardly sloped lines show the four-fold hypothesis that perceived autonomy-supportive teaching enhances all four aspects of students' self-reported classroom engagement (behavioral, emotional, agentic, and cognitive). The single upwardly sloped line shows the reciprocal hypothesis that students' self-reported agentic engagement uniquely longitudinally enhances perceived autonomy-supportive teaching (while

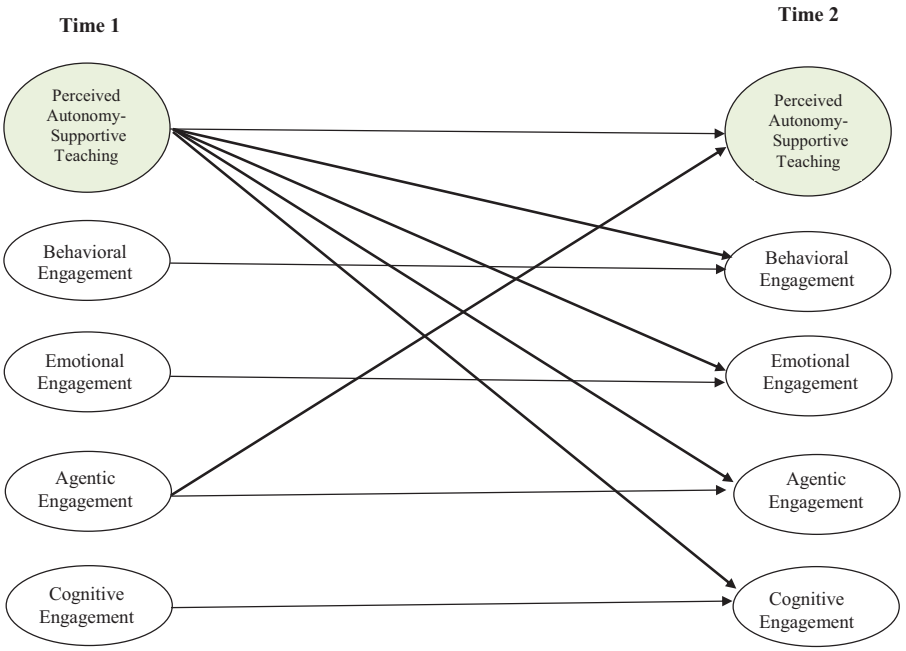

Figure 1. Hypothesized model. The four downwardly sloped lines show teacher-to-student hypothesized paths (i.e., perceived autonomy-supportive teaching predicts longitudinal changes in all four aspects of engagement), while the single upwardly sloped line shows the hypothesized student-to-teacher path (i.e., agentic engagement predicts longitudinal changes in perceived autonomy-supportive teaching). The five thin horizontal lines show stability effects of how each variable predicts itself at T2 (i.e., statistical controls for the repeated measures).

behavioral, emotional, and cognitive engagement do not). Figure 1 also shows the T1-to-T2 stability effects of each variable (five horizontal lines) to represent the repeated measures or longitudinal research design. These stability effects were not hypothesized paths per se but, rather, functioned as statistical controls.

Method

Participants

Participants were 336 university students (203 females, 133 males) taking classes either in the sciences ($n = 74$) or liberal arts ($n = 262$) at a large private university in Lima, Peru, who consented to complete the study questionnaire at both the beginning and end of an 18-week semester. Students were on average 20.6 years of age (range, 16 to 39). Students were taking a class from one of 22 different university professors (11 females, 11 males) in classes that averaged 17.4 students/class (range, 6 to 28). These university professors were on average 48.9 years old and had, on average, 15.5 years of teaching experience (range, 2 to 45). We add a note on the characteristics of Peruvian education in Appendix A.

Procedure

Participants completed the same four-page questionnaire two times during the 18-week semester—during week 1 or 2 (T1) and again during week 14 or 15 (T2). The surveys were administered at the beginning of the class period. Students were asked to complete each questionnaire in response to their experiences associated only with that particular class and were assured that their responses would be confidential and used only for purposes of the research study. The time frame for the data collection was one semester; thus, we assessed the dependent measures using a 13-week interval between the two waves of data collection.

Measures

The 25-item questionnaire included a statement of consent, items to assess demographic characteristics, and measures to assess perceived autonomy support and the four aspects of classroom engagement—namely, behavioral, emotional, agentic, and cognitive. All 25 questionnaire items appear (in English) in Table 2. The Spanish-language items used in the study can be found in Appendix B. Throughout the questionnaire, we used the same 1–7 Likert response scale (1 = *strongly disagree*, 7 = *strongly agree*), and we mixed the order of presentation of the 25 items throughout the questionnaire. Each measure was originally written in English, so we translated (and back-translated) each measure into Spanish, following International Test Commission guidelines (Hambleton, 2001).

Perceived autonomy-supportive teaching

To assess perceived autonomy support, we used the six-item short version of the Learning Climate Questionnaire (LCQ; Williams & Deci, 1996). The LCQ has shown strong psychometric properties in previous studies (internal consistency, predictive validity; Cheon et al., 2012; Jang, Reeve, Ryan, & Kim, 2009), and scores on this measure were internally consistent ($\alpha = .82$ at T1; $\alpha = .87$ at T2) and varied from class to class ($ICC = 24.2\%$ at T1, $ICC = 25.8\%$ at T2) throughout both assessment periods.

Four aspects of engagement

We assessed self-reported engagement as a multidimensional construct that featured behavioral, emotional, agentic, and cognitive aspects (Jang et al., 2016; Reeve, 2013). To assess behavioral and emotional engagement, we used the five-item behavioral engagement (αs at T1 and T2 were .73 and .78;

*ICC*s at T1 and T2 were 15.8% and 12.8%) and five-item emotional engagement (αs = .86 and .86; *ICC*s at T1 and T2 were 25.5% and 20.5%) scales from the Engagement versus Disaffection with Learning measure (Skinner et al., 2009). Both scales have shown strong psychometric properties in previous studies (Skinner et al., 2009). To assess agentic engagement, we used the five-item Agentic Engagement Scale (AES; Reeve, 2013). The AES scale has shown strong psychometric properties (Reeve, 2013; Reeve & Tseng, 2011), and it showed high internal consistency (αs = .85 and .86) and low class-to-class variability (*ICC* = 3.2% at T1, *ICC* = 4.2% at T2) in the present study. To assess cognitive engagement, we used the four-item Deep Learning measure (Senko & Miles, 2008). This measure has shown strong psychometric properties (Pintrich & De Groot, 1990), and it showed high internal consistency (αs = .81 and .82) and moderate class-to-class variability (*ICC* = 7.7% at T1, *ICC* = 12.2% at T2) in the present study.

Data analysis

We analyzed the five variables in the hypothesized model (see Figure 1) as latent variables. For each latent variable, we used participants' scores on the individual items from the construct's corresponding scale as individual indicators (e.g., we used the six LCQ items to serve as six indicators for the perceived-autonomy-support latent variable, and so forth for all five latent variables). In the test of the hypothesized model, we allowed the within-wave correlations among the T1 variables to intercorrelate and we allowed the within-wave correlations among the T2 variables to intercorrelate. We also included four covariates (gender, age, type of program, and class size) as T1 statistical control variables in the prediction of the T2 variables.

These data had a hierarchical structure in that students' scores (Level 1) were nested within classrooms (Level 2). The *ICC*s calculated for each of the 10 measured variables (five variables *x* two waves) from unconditional models averaged 15.2%. Given these notable ICC statistics and given the nested structure of the data (students' scores were nested within classrooms), we conducted multilevel (i.e., hierarchical) structural equation modeling (LISREL 8.80; Joreskog & Sorbom, 2006). Our model was a latent-manifest model (latent at Level 1, manifest at Level 2; Marsh et al., 2009) in that we assessed each student Level 1 variable with multiple indicators and then used these aggregated scores to create the class-level Level 2 scores.

Results

Preliminary analyses

Missing data were rare in the report of the four demographic variables, the 25 T1 questionnaire items, and the 25 T2 questionnaire items (146 out of 18,144 responses, or 0.8%), so we used the expectation–maximization (EM) algorithm for imputing missing values (generating 200 iterations). We also explored whether the distribution of scores for the 10 scale scores deviated from normality and found that all values for skewness and kurtosis were less than |0.66|, indicating little deviation from normality.

Wave invariance test

To examine whether participants' scores at T1 were invariant with their same-item scores at T2, we conducted a LISREL-based invariance test for wave (or time) of assessment. The results from this series of CFAs appear in Table 1. The two-wave baseline model with no constraints fit the data reasonably well. The tests for configural (factor loadings constrained to be equal), metric (factor variances constrained to be equal), and scalar (item means constrained to be equal) invariance all fit the data about as well as did the no-constraints baseline model, based on the Δ *CFI* < .01 statistical criterion recommended by Cheung and Rensvold (2002). This analysis suggests that participants' scores were wave invariant.

Table 1. Fit indices for the invariance tests for wave (or time) of assessment.

Model	X^2	*df*	*p*	*RMSEA*	*SRMR*	*CFI*	Δ *CFI* (from Baseline)	*NNFI*
Wave 1 model	712.08	265	.001	.071	.075	.950		.943
Wave 2 model	898.79	265	.001	.086	.070	.949		.943
Baseline 2—wave model, no constraints	1,610.87	530	.001	.079	.070	.950		.943
Configural invariance, factor loadings constrained to be equal	1,658.48	555	.001	.078	.087	.948	.002	.944
Metric invariance, factor variances constrained to be equal	1,713.03	570	.001	.078	.071	.949	.001	.946
Scalar invariance, means constrained to be equal	1,736.41	575	.001	.079	.072	.946	.004	.943

Demographic statistical controls

We explored for associations between the four demographic variables and each scale used in the analysis. Gender was associated (using $p < .05$) with two of the 10 measures (females scored higher on T1 behavioral engagement and T1 emotional engagement); age was associated with one of the 10 measures (older students scored higher on T1 agentic engagement); type of program (i.e., science versus liberal arts) was associated with one of the 10 measures (science students scored higher on T2 autonomy support); and class size was associated with six of the 10 measures (students in larger classes reported higher T1 and T2 emotional engagement and T1 and T2 cognitive engagement but lower T1 and T2 agentic engagement). Given these significant associations (all of which appear in Table 3), we entered gender, age, type of program, and class size as statistical control variables in each analysis.

Table 2. Descriptive statistics, unstandardized, and standardized beta weights associated with all 50 indicators within the measurement model.

	Time 1					Time 2				
Observed Variable	*M*	(*SD*)	*B*	*SE*	*beta*	*M*	(*SD*)	*B*	*SE*	*beta*
Autonomy-Supportive Teaching Indicators										
1. My teacher provides me with choices and options.	5.42	(1.33)	.93	.08	.67	5.54	(1.35)	.93	.08	.69
2. I feel understood by my teacher.	5.10	(1.34)	1.00	—	.72	5.08	(1.42)	1.00	—	.74
3. My teacher conveys confidence in my ability to do well in this course.	5.29	(1.13)	.81	.08	.58	5.22	(1.29)	.96	.07	.71
4. My teacher encourages me to ask questions.	5.72	(1.34	.75	.08	.54	5.41	(1.39)	.98	.07	.72
5. My teacher listens to how I would like to do things.	4.88	(1.38)	.92	.08	.66	5.05	(1.35)	1.01	.08	.75
6. My teacher tries to understand how I see things before suggesting a new way to do things.	5.10	(1.39)	1.02	.08	.73	5.12	(1.28)	.99	.08	.73
Behavioral Engagement Indicators										
1. When I'm in this class, I listen very carefully.	5.66	(1.08)	.94	.07	.74	5.33	(1.35)	.94	.06	.76
2. I pay attention in this class.	5.76	(1.06)	1.00	—	.78	5.42	(1.31)	1.00	—	.81
3. I try hard to do well in this class.	5.14	(1.53)	.68	.07	.53	5.07	(1.44)	.76	.07	.61
4. In this class, I work as hard as I can.	4.99	(1.41)	.75	.07	.59	4.88	(1.41)	.79	.06	.64
5. When I'm in this class, I participate in class discussions.	4.36	(1.62)	.49	.07	.38	4.40	(1.57)	.49	.07	.39
Emotional Engagement Indicators										
1. When we work on something in this class, I feel interested.	5.47	(1.22)	1.00	—	.79	5.16	(1.38)	1.00	—	.81
2. This class is fun.	5.08	(1.53)	.99	.06	.79	4.85	(1.59)	.92	.06	.75
3. I enjoy learning new things in this class.	5.60	(1.33)	.98	.06	.78	5.24	(1.55)	.94	.06	.77
4. When I'm in this class, I feel good.	5.19	(1.42)	.99	.06	.78	5.02	(1.39)	.94	.06	.76
5. When we work on something in this class, I get involved.	5.38	(1.22)	.70	.07	.55	5.04	(1.42)	.73	.06	.60
Agentic Engagement Indicators										
1. I let my teacher know what I need and want.	4.23	(1.58)	.87	.07	.68	4.34	(1.61)	.95	.07	.75
2. I let my teacher know what I am interested in.	4.30	(1.48)	1.00	—	.79	4.47	(1.46)	1.00	—	.79
3. During this class, I express my preferences and opinions.	4.23	(1.50)	.91	.07	.72	4.35	(1.46)	.93	.07	.73
4. During class, I ask questions to help me learn.	4.46	(1.57)	.87	.07	.69	4.51	(1.51)	.88	.07	.68
5. When I need something in this class, I'll ask the teacher for it.	5.09	(1.46)	.77	.07	.61	4.87	(1.39)	.84	.07	.66
Cognitive Engagement Indicators										
1. I try to explain the key concepts in my own words.	5.43	(1.18)	1.01	.07	.81	5.19	(1.31)	1.00	.07	.77
2. I usually try to summarize it in my own words.	5.43	(1.22)	1.00	—	.80	5.27	(1.28)	1.00	—	.77
3. I try to connect the ideas I am reading about with what I already know.	5.63	(1.14)	.85	.07	.68	5.31	(1.22)	.88	.07	.67
4. I try to generate examples to help me understand them better.	5.46	(1.26)	.59	.07	.47	5.31	(1.31)	.85	.07	.65

The possible range for each observed variable was 1 to 7.
M = mean; *(SD)* = standard deviation; *B* = unstandardized beta weight; *SE* = standard error of *B*; *beta* = standardized beta weight.

Table 3. Intercorrelation matrix among the 20 latent variables included in the test of the hypothesized model.

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
Time (Wave) 1														
1. Autonomy-Supportive Teaching	—													
2. Behavioral Engagement	.44	—												
3. Emotional Engagement	.46	.78	—											
4. Agentic Engagement	.42	.47	.45	—										
5. Cognitive Engagement	.17	.43	.50	.18	—									
Time (Wave) 2														
6. Autonomy-Supportive Teaching	.60	.38	.33	.41	.21	—								
7. Behavioral Engagement	.38	.64	.36	.35	.19	.46	—							
8. Emotional Engagement	.39	.49	.43	.31	.16	.46	.80	—						
9. Agentic Engagement	.34	.34	.20	.55	.08	.45	.57	.66	—					
10. Cognitive Engagement	.27	.34	.31	.18	.39	.39	.58	.63	.43	—				
Statistical Controls														
11. Gender (males = 0, females = 1)	−.05	−.14	−.13	.00	−.03	.03	−.09	−.07	.03	−.05	—			
12. Age	−.07	−.03	−.02	.13	.00	−.07	−.03	−.03	.06	.02	−.01	—		
13. Type Program (science = 0, liberal arts = 1)	−.08	.02	.03	.06	−.02	−.18	−.04	−.07	−.02	−.03	−.29	.36	—	
14. Class Size	.08	.10	.16	−.13	.18	.02	.03	.12	−.16	.11	.08	−.20	−.50	—
Mean	5.25	5.18	5.34	4.46	5.49	5.24	5.02	5.06	4.51	5.27	0.40	20.6	0.78	17.4
Standard Deviation	0.96	0.94	1.08	1.19	0.95	1.06	1.03	1.18	1.19	1.03	0.49	2.8	0.42	5.7
Range	1–7	1–7	1–7	1–7	1–7	1–7	1–7	1–7	1–7	1–7	0–1	16–39	0–1	6–28

$N = 336$. If $r = .11$, then $p \leq .05$; if $r = .15$, $p \leq .01$; if $r = .18$, $p \leq .001$.

Test of the measurement model

The measurement model featured six indicators for perceived autonomy support (i.e., the six LCQ items); five indicators for behavioral engagement, emotional engagement, and agentic engagement; and four indicators for cognitive engagement, all assessed across two waves of data collection for a total of 25 indicators for five latent constructs over two waves. To represent the longitudinal character of the data set, we allowed the between-wave error terms of each of the 25 observed indicators to correlate with itself from T1 to T2. Overall, the measurement model fit the data reasonably well [X^2 (2,380) = 3,130.75, $p < .001$, *RMSEA* (90% *CI*) = .060 (.056, .063), *SRMR* = .065, *CFI* = .98, *NNFI* = .98], with most of the variance occurring at the student level (X^2 = 2,455.49; 78.4%) rather than at the classroom (X^2 = 675.26, 21.6%) level. The descriptive statistics, unstandardized coefficients, and standardized coefficients for each of the 50 items included in the measurement model appear in Table 2.

Hypothesized model

The intercorrelations among the 10 latent variables included in the structural model appear in Table 3. The hypothesized (i.e., structural) model fit the data reasonable well [X^2 (2,770) = 3,848.85, $p < .001$, *RMSEA* (90% *CI*) = .067 (.064, .070), *SRMR* = .087, *CFI* = .97, *NNFI* = .96]. The path diagram showing the standardized estimates for each significant path in the hypothesized model appears in Figure 2. For clarity, we do not show the paths associated with the four statistical controls (gender, age, type of program, and class size), but we do report all of these additional statistical results in the text below, in Table 4 and in Table 5. We also do not show the within-wave intercorrelations among the five latent variables in Figure 2, but we do show the full set of statistics included in the test of the hypothesized model—hypothesized paths, reciprocal paths, stability effects, covariates, and within-wave intercorrelations—in a comprehensive figure included in Appendix C.

Students' agentic engagement predicts longitudinal changes in perceived autonomy-supportive teaching

In the prediction of *T2 autonomy-supportive teaching* (see Table 4), after controlling for T1 autonomy-supportive teaching (*beta* = .55, $p < .001$); gender (*beta* = .02, $p = .753$); age (*beta* = -.01, $p = .903$); type of program (*beta* = -.15, $p = .004$); and class size (*beta* = -.03, $p = .503$), T1 agentic engagement

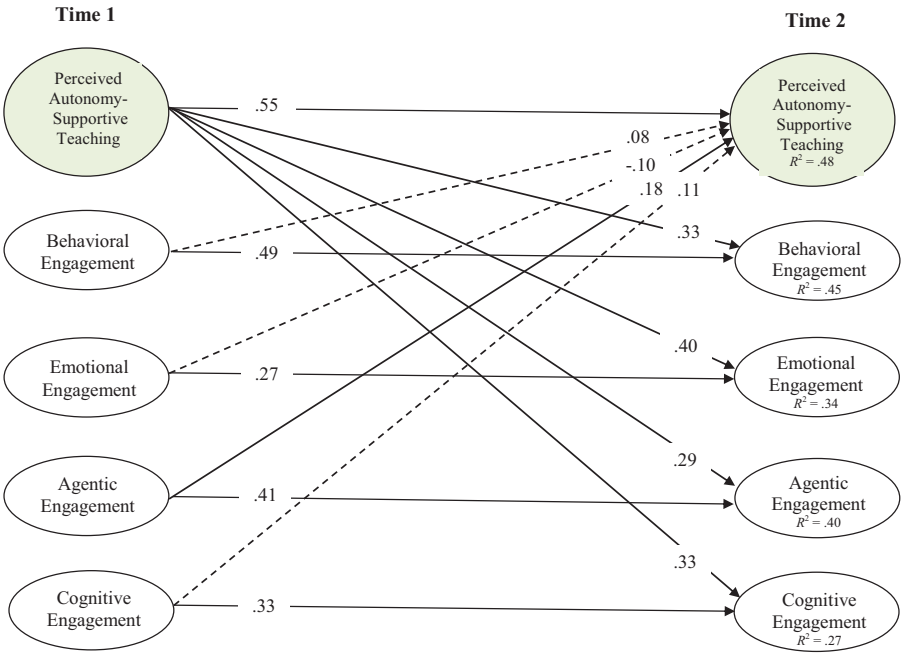

Figure 2. Standardized parameter estimates (beta coefficients) for the hypothesized structural model. Solid lines represent significant paths ($p < .05$), while dashed lines represent nonsignificant paths. For purposes of clarity, within-wave correlations among the five T1 exogenous variables are not shown (but are reported in Table 3).

was an individually significant predictor ($B = .17$, $SE = .06$, $beta = .18$, $t = 2.82$, $p = .005$) while the other three aspects of engagement were not: T1 behavioral engagement ($B = .07$, $SE = .09$, $beta = .08$, $t = 0.77$, $p = .442$); T1 emotional engagement ($B = -.09$, $SE = .09$, $beta = -.10$, $t = 1.03$, $p = .304$); and T1 cognitive engagement ($B = .10$, $SE = .06$, $beta = .11$, $t = 1.82$, $p = .070$).

Perceived autonomy-supportive teaching predicts longitudinal changes in all four aspects of students' engagement

In the prediction of *T2 behavioral engagement* (see Table 5), T1 perceived autonomy-supportive teaching was a significant predictor ($B = .33$, $SE = .08$, $beta = .28$, $t = 4.26$, $p < .001$), even after controlling for T1 behavioral engagement ($beta = .49$, $p < .001$); gender ($beta = -.03$, $p = .582$); age ($beta = .06$, $p = .246$); type of program ($beta = -.13$, $p = .042$); and class size ($beta = -.08$, $p = .167$). In the prediction of *T2 emotional engagement*, perceived autonomy-supportive teaching was a

Table 4. LISREL-generated statistics for each individual predictor included in the hypothesized model to predict T2 perceived autonomy-supportive teaching.

	T2 Perceived Autonomy-Supportive Teaching				
Predictor Variable	*B*	*SE B*	*β*	*t*	*p*
T1 Perceived Autonomy-Supportive Teaching	.59	.08	.55	7.39	.001
Student Demographics (Statistical Controls)					
Gender (males = 0, females = 1)	.01	.04	.02	0.31	.753
Age	−.01	.04	−.01	0.12	.903
Type of Program (science = 0, liberal arts = 1)	−.12	.04	−.15	2.88	.004
Class Size	−.02	.04	−.03	0.55	.583
Hypothesized Predictors					
Behavioral Engagement	.07	.09	.08	0.77	.422
Emotional Engagement	−.09	.09	−.10	1.03	.304
Agentic Engagement	.17	.06	.18	2.82	.005
Cognitive Engagement	.10	.06	.11	1.82	.070

Table 5. LISREL-generated statistics for each individual predictor included in the hypothesized model to predict each of the four aspects of T2 engagement.

	T2 Behavioral Engagement					T2 Emotional Engagement					T2 Agentic Engagement					T2 Cognitive Engagement				
Predictor Variable	*B*	*SE B*	β	*t*	*p*	*B*	*SE B*	β	*t*	*p*	*B*	*SE B*	β	*t*	*p*	*B*	*SE B*	β	*t*	*p*
T1 Behavioral Engagement	.49	.07	.49	6.80	.001															
T1 Emotional Engagement						.27	.07	.27	4.09	.001										
T1 Agentic Engagement											.41	.07	.41	6.16	.001					
T1 Cognitive Engagement																.33	.06	.33	5.22	.001
Student Demographics (Statistical Controls)																				
Gender (males = 0, females = 1)	−.02	.04	−.03	0.55	.582	−.02	.04	−.03	0.47	.640	.01	.04	.01	0.11	.913	−.03	.05	.04	0.75	.457
Age	.05	.04	.06	1.16	.246	.04	.04	.05	1.00	.317	.04	.04	.05	0.96	.336	.06	.05	.08	1.32	.188
Type of Program (science = 0, liberal arts = 1)	−.11	.05	−.13	2.04	.042	−.07	.05	−.09	1.36	.175	−.12	.05	−.14	2.33	.020	−.01	.06	−.02	0.25	.802
Class Size	−.07	.05	−.08	1.38	.167	.00	.05	.00	0.05	.963	−.17	.05	−.20	3.57	.001	.02	.05	.03	0.41	.683
Hypothesized Predictor																				
T1 Perceived Autonomy-Supportive Teaching	.33	.08	.28	4.26	.001	.47	.08	.40	5.85	.001	.33	.08	.29	4.40	.001	.38	.07	.33	5.24	.001

significant predictor ($B = .47$, $SE = .08$, $beta = .40$, $t = 5.85$, $p < .001$), even after controlling for T1 emotional engagement ($beta = .27$, $p < .001$); gender ($beta = -.03$, $p = .640$); age ($beta = .05$, $p = .317$); type of program ($beta = -.09$, $p = .175$); and class size ($beta = .00$, $p = .963$). In the prediction of *T2 agentic engagement*, T1 perceived autonomy-supportive teaching was again a significant predictor ($B = .33$, $SE = .08$, $beta = .29$, $t = 4.40$, $p < .001$), even after controlling for T1 agentic engagement ($beta = .41$, $p < .001$); gender ($beta = .01$, $p = .913$); age ($beta = .05$, $p = .336$); type of program ($beta = -.14$, $p = .020$); and class size ($beta = -.20$, $p < .001$). In the prediction of *T2 cognitive engagement*, T1 perceived autonomy-supportive teaching was once again a significant predictor ($B = .38$, $SE = .07$, $beta = .33$, $t = 5.24$, $p < .001$), even after controlling for T1 cognitive engagement ($beta = .33$, $p < .001$); gender ($beta = -.04$, $p = .457$); age ($beta = .08$, $p = .188$); type of program ($beta = -.02$, $p = .802$); and class size ($beta = .03$, $p = .683$).

Supplemental analyses

In the test of the hypothesized model to predict changes in T2 perceived autonomy-supportive teaching, we entered all four aspects of T1 engagement together or simultaneously. The only individually significant predictor (other than T1 autonomy-supportive teaching) was T1 agentic engagement. We recognize, however, that the four aspects of engagement were all positively intercorrelated (see Table 3), so we conducted a pair of supplemental analyses to shed light on the interpretation as to whether T1 agentic engagement was the only predictor of T2 perceived autonomy-supportive teaching or was only one among many predictors of T2 perceived autonomy-supportive teaching.

In the first set of supplemental analyses, we tested whether or not each aspect of engagement might be able to predict changes in T2 perceived autonomy-supportive teaching (controlling for T1 perceived autonomy-supportive teaching) if it were included as the only aspect of engagement in the model. For instance, in the "behavioral engagement only" predictive model, the six-term model included the six predictors of T1 perceived autonomy-supportive teaching, T1 behavioral engagement, gender, age, type of program, and class size while excluding the three predictors (in the hypothesized model) of T1 emotional engagement, T1 agentic engagement, and T1 cognitive engagement.

When entered as a single predictor, T1 behavioral engagement did predict T2 autonomy-supportive teaching ($B = .12$, $SE = .06$, $beta = .13$, $t = 2.79$, $p = .006$), even after controlling for T1 autonomy-supportive teaching ($beta = .59$, $p < .001$); gender ($beta = .04$, $p = .391$); age ($beta = .03$, $p = .548$); type of program ($beta = -.15$, $p = .003$); and class size ($beta = -.03$, $p = .484$).

When entered as a single predictor, T1 emotional engagement was not able to predict T2 autonomy-supportive teaching ($B = .08$, $SE = .05$, $beta = .08$, $t = 1.44$, $p = .151$), at least not after controlling for T1 autonomy-supportive teaching ($beta = .61$, $p < .001$); gender ($beta = .04$, $p = .467$); age ($beta = -.02$, $p = .632$); type of program ($beta = -.15$, $p = .005$); and class size ($beta = -.03$, $p = .562$).

When entered as a single predictor, T1 agentic engagement did predict T2 autonomy-supportive teaching ($B = .18$, $SE = .06$, $beta = .20$, $t = 3.26$, $p = .001$) even after controlling for T1 autonomy-supportive teaching ($beta = .55$, $p < .001$); gender ($beta = .02$, $p = .721$); age ($beta = -.01$, $p = .816$); type of program ($beta = -.16$, $p = .002$); and class size ($beta = -.03$, $p = .579$).

When entered as a single predictor, T1 cognitive engagement did predict T2 autonomy-supportive teaching ($B = .11$, $SE = .04$, $beta = .11$, $t = 2.22$, $p = .027$) even after controlling for T1 autonomy-supportive teaching ($beta = .63$, $p < .001$); gender ($beta = .03$, $p = .587$); age ($beta = -.02$, $p = .647$); type of program ($beta = -.14$, $p = .008$); and class size ($beta = -.03$, $p = .532$).

In the second set of supplemental analyses, we imposed equality constraints on the four predictors of T2 perceived autonomy-supportive teaching—namely, T1 behavioral engagement, T1 emotional engagement, T1 agentic engagement, and T1 cognitive engagement—to test the goodness-of-fit statistics of this equality-constrained model versus the unconstrained (i.e., hypothesized) model. If the hypothesized model fits the data better than does the equality constrained model, then the magnitude of the T1 agentic engagement predictor can be said to be greater than the magnitude of the other three T1 engagement predictors. But if the hypothesized model does not fit the data significantly better than does the equality constrained model, then the magnitude of the four T1 engagement predictors can be

consider to be of roughly equal or comparable magnitude. For the logic of this statistical test and its interpretation, see Marsh, Dowson, Pietsch, and Walker (2004).

In the equality-constrained model, each unstandardized beta weight for the four T1 predictors was set to $B = .07$ (the average of the four B weights of .07, -.09, .17, and .10 taken from the test of the hypothesized model). This equality-constrained model fit the data reasonable well, X^2 (2,773) = 3,856.12, $p < .001$, *RMSEA* (90% *CI*) = .067 (.064, .070), *SRMR* = .088, *CFI* = .97, *NNFI* = .96. Most importantly, the hypothesized (unconstrained) model did not fit the data significantly better than did the equality-constrained model, ΔX^2 ($\Delta df = 3$) = 7.27, $p = .064$. This means that the magnitude of the effects from the four T1 predictor variables are of roughly equal value—that is, the magnitude of the T1 agentic engagement predictor, while individually significant, is not notably greater in size than the magnitude of the other three T1 engagement predictors (especially behavioral engagement and cognitive engagement).

Discussion

From past investigations, we already knew that the motivating styles teachers bring into the classroom would predict longitudinal changes in their students' classroom engagement over the course of the semester. The findings in the present study reinforced this expectation, as T1 perceived autonomy-supportive teaching did significantly (and rather substantially) predict the T2 change in all four aspects of students' engagement (see Figure 2 and Table 5). We also suspected that the reciprocal relation would emerge—namely, that the level of students' engagement would predict a longitudinal change in their perceptions of teacher-provided autonomy support. What was new in the present study was the hypothesis that it would be students' beginning-of-semester agentic engagement in particular that would specifically and uniquely predict and explain longitudinal increases in perceived autonomy-supportive teaching. This hypothesized effect did emerge in the present study (see Figure 2 and Table 4).

Why it is important that students' agentic engagement predicts changes in perceived autonomy-supportive teaching?

An autonomy-supportive motivating style is an interpersonal tone of support and understanding that teachers provide to students during instruction, as through taking the students' perspective and encouraging students' initiative. It is quite clear that autonomy-supportive teaching, when it occurs, predicts a wide range of positive and educationally important student outcomes (Assor et al., 2002; Cheon et al., 2016; Jang et al., 2016; Vansteenkiste, Simons, Lens, Soenens, & Matos, 2005). But it is a separate issue whether teachers can learn how to become more autonomy supportive toward students during instruction. Several variables correlate positively with an autonomy-supportive style, including autonomous motivation to teach, an autonomy-causality orientation, and relativistic (rather than absolutist) epistemological beliefs about students' learning processes (Reeve, 1998; Roth & Weinstock, 2013; Roth, Assor, Kaplan, & Kanat-Maymon, 2007), but surprisingly little is known in terms of how to causally enhance or develop an autonomy-supportive style. We know of only one such identified antecedent—namely, teacher participation in a theory-based, carefully designed, teacher-focused, semester-long, autonomy-supportive intervention program (ASIP; Aelterman, Vansteenkiste, Van den Berghe, De Meyer, & Haerens, 2014; Chatzisarantis & Hagger, 2009; Cheon & Reeve, 2015).

Carefully designed and theory-based ASIPs that are rich in guidance, modeling, practice, and group discussion have been shown to help teachers work through a professional developmental process to learn a more autonomy-supportive classroom motivating style, as teachers who are randomly assigned to participate in the ASIP—compared with teachers in a control group, who continue to teach in their "practice as usual" way—become significantly more autonomy-supportive toward students, as judged by their students (Cheon et al., 2016); by trained raters who score teachers' actual classroom instructional behaviors (Cheon et al., 2012); and by the teachers themselves (Reeve & Cheon, 2016). The drawbacks with using an ASIP are that such programs require considerable expertise from the research team (to design and implement the intervention), a rather substantial time commitment from the

teachers (to complete the multipart, semester-long ASIP), and a good measure of institutional support from the school. So, what is so important about the findings in the present study is that we identified one possible naturally occurring classroom opportunity to help teachers become significantly more autonomy supportive—namely, high levels of student-initiated agentic engagement.

We believe this to be an important new finding for two reasons. First, the finding that agentic engagement predicts changes in perceived autonomy-supportive teaching identifies a second pathway to help teachers learn how to adopt a more autonomy-supportive motivating style, as discussed above. Second, the finding suggests that students have the proactive and intentional means to change their educational environments for the better (e.g., This is what I'm interested in, can we talk about that?), which is why we say "the squeaky wheel gets the grease" (i.e., students get what they ask for).

Agentic engagement is students' constructive contribution to influencing the flow of instruction they receive. It therefore is an excellent complement to a teacher's autonomy-supportive motivating style, as illustrated in Table 6. The left side of Table 6 list several agentic acts of engagement students' might display (taken from Reeve, 2013), while the right side of Table 6 lists several acts of autonomy-supportive instruction a teacher might display (taken from Reeve, 2016). What is important to notice is how each act of agentic engagement can be considered an intentional and proactive effort to bring out in teachers a corresponding act of autonomy support. That is, the more that students let the teacher know what they want and need (Item 1 in Table 6), the more likely it becomes that the teacher will consider and respond to students' wants and needs.

Of course, just because students ask for a say in what to do (Item 6 in Table 6) does not mean that teachers will actually accept and act on those recommendations and adapt their instruction accordingly. Some teachers will instead argue against such student input (e.g., No, I am the teacher; I know how to teach; just get with the program and do what I tell you to do). In such cases, student-initiated agentic engagement might even, paradoxically, bring out an episode of teacher control. So, student-initiated agentic engagement is only a potential catalyst to greater autonomy-supportive instruction. For agentic engagement to translate into greater autonomy support, the teacher would need to listen to students, welcome their suggestions, and have the skill and experience to know how to translate that student input into productive instruction. That said, the present findings did show that naturally occurring levels of students' classroom agentic engagement were a potent enough classroom catalyst to bring out greater perceived autonomy-supportive teaching.

Cautions, open questions, limitations, and conclusion

We conducted the pair of supplemental analyses to help in the interpretation of the findings from the hypothesized model. While it was true that agentic engagement was the only individually significant

Table 6. Illustrative examples of how students' acts of agentic engagement might bring out greater teacher-provided autonomy support.

What Agentically Engaged Students Say and Do During Instruction	What Autonomy-Supportive Teachers Say and Do During Instruction
1. Let the teacher know what you want and need.	1.Take the student's perspective.
2. Tell the teacher what you are most interested in.	2. Vitalize students' inner motivational resources (e.g., their psychological needs for autonomy, competence, and relatedness).
3. Make suggestions, recommendations, or a contribution.	3. Use invitational language.
4. Express your preferences; recommend a goal or objective you would like to pursue.	4. Offer choices and options (i.e., display flexibility).
5. Communicate likes and dislikes.	5. Acknowledge and accept expressions of positive and negative affect (i.e., expressions of dislike).
6. Ask for a say in what to do and how to do it.	6. Allow students the time and space they need to work in their own way and at their own pace (i.e., display patience).
7. Ask "why?" or "why not?" questions.	7. Provide explanatory rationales.
8. Ask the teacher for help and needed resources.	8. Listen and be responsive.

predictor of changes in perceived autonomy-supportive teaching when all four aspects of engagement were entered simultaneously, it needs to be acknowledged that the four aspects of engagement are all positively intercorrelated. When behavioral engagement and cognitive engagement were entered as individual predictors (in the absence of the other three aspects of engagement), they were able to predict a longitudinal increase in perceived autonomy-supportive teaching. This suggests that working hard and thinking strategically about the lesson might also be possible antecedents to greater perceived autonomy-supportive teaching. The supplemental analyses in which the hypothesized model was compared to an equally constrained model showed that the magnitude of the four aspects of engagement as individual predictors of changes in perceived autonomy-supportive teaching was of roughly equal magnitude. What these supplemental analyses add to the main analysis is the caution that it makes as much sense to say that students' T1 engagement generally predicts changes in perceived autonomy-supportive teaching as it does to conclude that students' T1 agentic engagement uniquely predicts changes in perceived autonomy-supportive teaching.

One question not addressed in the present study is to ask what might be an optimal level of classroom agentic engagement. While asking questions and expressing one's preferences can be a motivating experience (e.g., Reeve, 2013), there might be conditions under which students' input could be "too much of a good thing." While we do not endorse this position, future research might test possible moderating factors, especially contextual factors such as time limitations or performance pressures; for instance, class size correlated modestly (negatively) with agentic engagement, so agentic engagement may be less common, less constructive, less appropriate, or less accepted by teachers in larger classes.

A second open question is to what extent might agentic engagement also recruit a more-structured motivating style from teachers. That is, if students proactively request clearer expectations, goals to strive for, more guidance, helpful strategies, and more in-depth feedback (i.e., request more structure), then it is an interesting to ask in future research whether such student input (i.e., expressions of agency) might encourage teachers to respond in kind with more structured teaching.

The study suffers from one major limitation—namely, that all of our measures relied only on students' self-reports. A stronger and more rigorous methodology would include classroom observational data. For instance, trained raters could visit the classroom to make objective ratings of how autonomy-supportive teachers actually were during instruction (e.g., Reeve, Jang, Carrell, Jeon, & Barch, 2004). We recognize this limitation, and we therefore conclude that we showed only that students' self-reported agentic engagement predicted a longitudinal change in perceived autonomy-supportive teaching. In our defense, however, this is a new and potentially important classroom observation. Now that the self-report data have suggested the viability of this hypothesis, a more methodologically rigorous study can be carried out to confirm that agentic engagement predicts not just changes in *perceived* autonomy-supportive teaching but, perhaps, *actual* (objective) changes in autonomy-supportive teaching. In such a future study, we would also recommend that data be collected from multiple informants—from students, teachers, and objective raters. Data from these three sources can sometimes diverge from one another (i.e., low intercorrelations among scores generated by students, teachers, and raters; Haerens, Aelterman, Vansteenkiste, Soenens, & Van Petegem, 2015; Samyn, Roeyers, Bijttebier, Rosseel, & Wiersema, 2015), probably because different aspects of the measured constructs are captured by the different informants.

In conclusion, we investigated how students' perceptions of autonomy-supportive teaching predicted a change in their self-reported classroom engagement and how students' self-reported engagement in turn predicted a change in perceived autonomy-supportive teaching. The most important finding was that the more students reported high agentic engagement in the early part of the course, the more they perceived that their teachers became increasing autonomy-supportive toward the students as the semester progressed. This is a rather striking finding because it means that students may be able to recruit greater autonomy support from their teachers—perhaps specifically through their agentic engagement or perhaps through their classroom engagement more generally. It also means that a teacher's autonomy-supportive motivating style may be less of a trait-like quality of teachers and more like something that develops during professional development opportunities and unfolds during high-quality–teacher-student interactions.

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Appendix A

Peruvian education

Peru is a relatively open, collectivistic culture. Peru is also a "we" culture in which students are rarely left alone and in which students do not mind (and even could appreciate and welcome) close teacher supervision. Peru as a culture places a high value and personal utility on education, especially higher

education. However, only about one-third of Peruvian young adults graduate from college, so our study included an academically advanced sample of Peruvians. To enter university, high school graduates might need very good grades or to pass a wide-ranging college entrance examination. This particular research project was undertaken within the context of a private Peruvian university. The most common majors for our student-participants in the liberal arts program were sociology, psychology, philosophy, history, and linguistics, while the most common majors for our student-participants in the sciences program were engineering, physics, chemistry, and mathematics.

Appendix B

Spanish-language items used in the study to assess the dependent measures

Each Spanish-language item used in the study appears below in italics (following its English-language equivalent).

Autonomy-Supportive Teaching Indicators

1. My teacher provides me with choices and options.

Mi profesor(a) me da opciones y posibilidades de hacer elecciones.

2. I feel understood by my teacher.

Siento que mi profesor(a) me comprende.

3. My teacher conveys confidence in my ability to do well in this course/subject.

Mi profesor(a) tiene confianza en mi habilidad para desempeñarme bien en este curso.

4. My teacher encourages me to ask questions.

Mi profesor(a) me alienta a hacer preguntas.

5. My teacher listens to how I would like to do things.

Mi profesor(a) escucha cómo me gustaría hacer las cosas.

6. My teacher tries to understand how I see things before suggesting a new way to do things.

Mi profesor(a) trata de entender cómo veo las cosas antes de sugerir una nueva manera de hacerlas.

Behavioral Engagement Indicators

1. When I'm in this class, I listen very carefully.

Cuando estoy en este curso, escucho cuidadosamente.

2. I pay attention in this class.

Presto atención en este curso.

3. I try hard to do well in this class.

Me esfuerzo mucho porque me vaya bien en este curso.

4. In this class, I work as hard as I can.

En este curso, trabajo lo más que puedo.

5. When I'm in this class, I participate in class discussions.

Cuando estoy en este curso, participo de las discusiones que se dan en clase.

Emotional Engagement Indicators

1. When we work on something in this class, I feel interested.

Cuando trabajamos algo en este curso, me siento interesado(a).

2. This class is fun.

Este curso es divertido.

3. I enjoy learning new things in this class.

Disfruto aprender cosas nuevas en este curso.

4. When I'm in this class, I feel good.

Cuando estoy en este curso, me siento bien.

5. When we work on something in this class, I get involved.

Cuando trabajamos en algo en este curso, me involucro en la tarea.

Agentic Engagement Indicators

1. I let my teacher know what I need and want.

Hago saber a mi profesor(a) lo que necesito y quiero.

2. I let my teacher know what I am interested in.

Hago saber a mi profesor(a) qué es lo que me interesa.

3. During this class, I express my preferences and opinions.

Durante este curso, expreso mis preferencias y opiniones.

4. During class, I ask questions to help me learn.

En este curso, hago preguntas que me ayudan a aprender.

5. When I need something in this class, I'll ask the teacher for it.

Cuando necesito algo en este curso, le pregunto al profesor(a) por ello.

Cognitive Engagement Indicators

1. When reading for this class, I try to explain the key concepts in my own words.

Cuando estudio para este curso, trato de explicar los conceptos clave en mis propias palabras.

(For different subjects, we sometimes adapted "When reading for this class …" into "When studying for this class …")

2. When learning about a new topic in this course, I usually try to summarize it in my own words.

Cuando aprendo sobre un nuevo tema de este curso, usualmente trato de resumirlo en mis propias palabras.

3. When reading for this class, I try to connect the ideas I am reading about with what I already know.

Cuando estudio para este curso, trato de conectar las ideas que estoy estudiando con lo que ya sé.

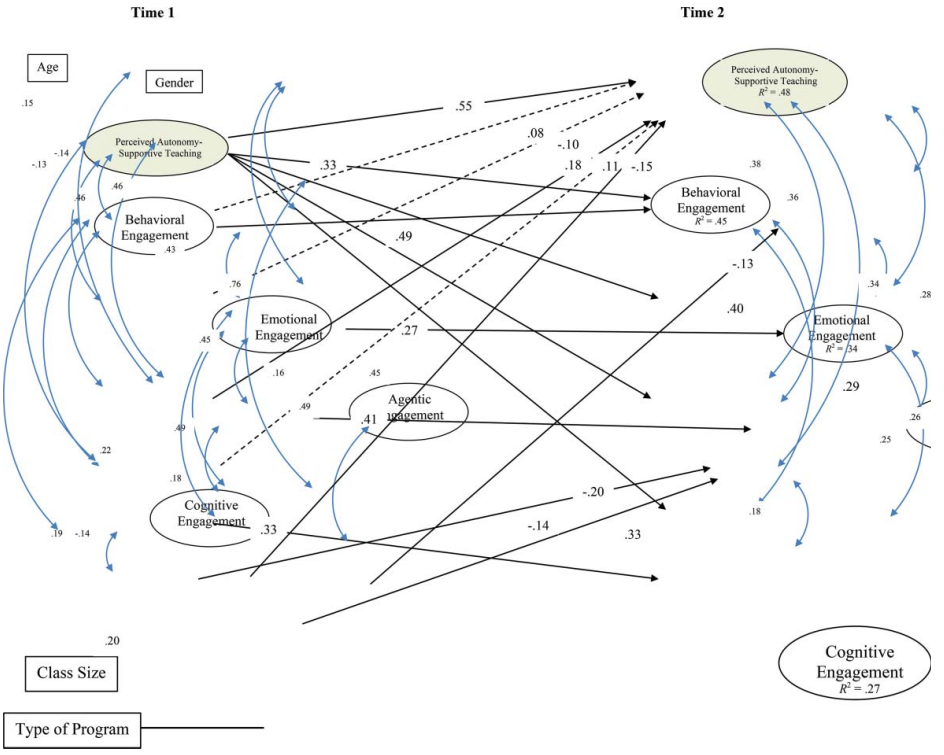
(For different subjects, we sometimes adapted "When reading for this class…" into "When studying for this class…")

4. When thinking about the concepts in this class, I try to generate examples to help me understand them better.

Cuando pienso acerca de los conceptos de este curso, trato de encontrar ejemplos que me ayuden a entenderlos mejor.

Appendix C

Full set of statistics included in the test of the hypothesized model—hypothesized paths, reciprocal paths, stability effects, covariates, and within-wave intercorrelations. The only statistics not reported in the figure (for clarity and space considerations) are the nonsignificant correlations among the four statistical controls and in their relation to the T1 and T2 latent variables. All statistics reported are standardized parameter estimates (beta coefficients). Solid lines represent significant paths ($p < .05$), while dashed lines represent nonsignificant paths.


Time 1
Time 2
Age
Gender
Perceived Autonomy-Supportive Teaching
Behavioral Engagement
Emotional Engagement
Agentic Engagement
Cognitive Engagement
Perceived Autonomy-Supportive Teaching R^2 = .48
Behavioral Engagement R^2 = .45
Emotional Engagement R^2 = .34
Cognitive Engagement R^2 = .27
Class Size
Type of Program
.55
.08
-.10
.33
.18
.11
-.15
.49
-.13
.40
.27
.41
.29
-.20
-.14
.33