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When students show some initiative: Two experiments on the benefits of greater agentic engagement

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ABSTRACT

Correlational and longitudinal research suggests that agentically-engaged students experience multiple educational benefits. Recognizing this, two experiments tested the causal capacity of manipulated agentic engagement to create three categories of benefits: a supportive learning environment; motivational satisfactions; and effective functioning (e.g., engagement, performance). Study 1 used the teacher–student laboratory paradigm to place 121 same-sex pairs of preservice teachers into the roles of teacher and student during a videotaped 12-min instructional episode. Teachers were randomly assigned to be autonomy supportive or not, while students were randomly assigned to be agentically engaged or not. MANOVAs on 10 self-reported and rater-scored dependent measures showed that manipulated agentic engagement enhanced both a supportive learning environment and greater motivational satisfaction but not more effective functioning. Study 2 used the same teacher-student paradigm to randomly assign 74 same-sex pairs into one of three conditions: agentic engagement to change the environment (as in Study 1); agentic engagement to change one's functioning (a new Study 2 manipulation); and a neutral control. The first manipulation again enhanced the supportive learning environment and motivational satisfaction but not effective functioning, while the second manipulation produced no benefits. Collectively, these findings confirm some limited causal benefits from agentic engagement and therefore provide guidance for future research, including the design and implementation of student-focused agentic engagement interventions.

1. Introduction

An agent is someone who acts to improve his or her life circumstances and surroundings (Bandura, 2006, 2018). Improving one's life circumstances means taking the initiative to enhance the environmental conditions and interpersonal relationships under which one strives, develops, and performs. Through their agency, students go beyond being passive and simply accepting whatever instruction comes their way—to instead being active contributors into the quality and personal relevance of the instruction they receive. That is, through their agency, students enrich their learning environment and, thus, their learning experience. For students in the classroom, such agency has been studied as agentic engagement (Reeve, 2013).

1.1. Agentic engagement

Agentic engagement refers to how proactively and constructively students attempt to influence their instruction so that it better supports their own motivation and learning, as by rendering learning activities more interesting, personal, and need-satisfying (Patall et al., 2019; Reeve, 2013). Engagement is a multidimensional concept that refers to how actively involved the student is in a learning activity (Christenson et al., 2012), and the concepts of behavioral, emotional, and cognitive engagement nicely capture the extent to which students become actively involved (or not) in teacher-provided learning opportunities. But students not only react to learning activities with more or less effort, interest, and strategic thinking, they further proactively (agentically) try

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to enhance the conditions under which they learn, as by making suggestions, offering input, and communicating preferences.

Students' agentic engagement generally enables three categories of educational benefits (Patall et al., 2019; Patall & Zambrano, 2021; Reeve, 2013; Reeve, Cheon, & Yu, 2020). First, student agency enables a *supportive learning environment*. The more agentically-engaged students are, the greater longitudinal gains they report in perceived autonomy-supportive teaching (e.g., greater perspective-taking, more interesting and personally relevant learning activities; (Matos, Reeve, Herrera, & Claux, 2018; Patall et al., 2018; Patall et al., 2019; Reeve, 2013). When students speak up to express their interests and preferences, they potentially change how the teacher interacts with them. When students offer constructive input (e.g., "Could we practice this language in a real setting, and not just memorize note cards?"), then teachers become increasingly aware of what students want, need, and are interested in doing. With this awareness, teachers become better positioned to bend (i.e., adjust, calibrate) their lessons in directions that are increasingly relevant to and supportive of their students' expressed interests, preferences, and goals. In this way, agentically engaged students become architects of their own learning environments (Matos et al., 2018).

Second, student agency enables *motivational satisfactions*. The more agentically-engaged students are, the greater longitudinal gains they report in their course-related interest, need satisfactions (e.g., autonomy), and self-efficacy (Patall et al., 2019; Patall & Zambrano, 2021; Reeve, Cheon, & Jang, 2020; Reeve & Lee, 2014). Agentically-engaged students are more likely than their non-agentically-engaged counterparts to take the action necessary to satisfy their curiosity (e.g., ask the teacher a question, search on the computer), develop their interests (e.g., volunteer for the school play, explore school resources), build their sense of competence and efficacy (e.g., search for an online video of a skilled performance), and attain their personal goals (e.g., spend their free time pursuing that personal goal; Jang, Kim, & Reeve, 2016). In this way, agentically-engaged students contribute to their own motivational satisfaction.

Third, student agency enables *effective functioning*. The more agentically-engaged students are, the greater longitudinal gains they report across a range of indicators of effective functioning. This is because agentically-engaged students take the personal initiative to catalyze their own learning—to engage themselves fully (i.e., behaviorally, emotionally, and cognitively), to develop greater skill, and to attain higher achievement (e.g., grades) (Patall et al., 2019; Reeve & Tseng, 2011, Reeve, 2013; Reeve, Cheon, & Jang, 2020).

1.2. Need for an experiment

Correlational and longitudinal research demonstrates that students' agentic engagement is positively associated with all three aforementioned categories of benefits. Correlational studies show that students who self-report high (vs. low) agentic engagement also report high levels of perceived autonomy support, autonomy need satisfaction, and objectively-scored grades (Reeve & Tseng, 2011, Reeve, 2013; Reeve, Cheon, & Jang, 2020). Longitudinal studies show that students who are agentically engaged at the beginning of the semester subsequently report increased end-of-semester perceived autonomy support (Matos et al., 2018; Reeve, 2013), motivational satisfactions (i.e., need satisfaction, self-efficacy beliefs; Patall et al., 2019; Reeve & Lee, 2014), classroom engagement (Patall et al., 2018, 2019), and course grades (Reeve, Cheon, & Jang, 2020).

Because all these findings are correlational, the direction of the effect of agentic engagement on these educational benefits can be questioned. That is, it is just as likely that supportive learning conditions, motivational satisfactions, and effective functioning have a positive directional effect on agentic engagement as the other way around. In addition, some unmeasured third variable might explain the observed association between agency and these educational benefits. What is needed to establish the causal link from agentic engagement to educational benefits is an experimental research design—one that manipulates agentic engagement as an independent variable to then measure subsequent changes in the dependent measures (i.e., educational benefits). The present investigation was initiated to provide such an experimental test.

Another need for an experimental test is to lay the foundation for future intervention research. An engagement intervention is a potentially fruitful undertaking because student engagement is (1) malleable, (2) responsive to contextual factors, and (3) linked to important educational outcomes (Fredricks, Reschly, & Christenson, 2019). Before designing and implementing such an intervention, however, it is first necessary to establish that manipulated agentic engagement can causally increase these desired educational benefits. Because an experiment is an ideal way to establish such a causal relation, we considered a successful experimental study to be a prerequisite to commencing such intervention research.

2. Study 1

Fig. 1 organizes the correlational and longitudinal research literature that links agentic engagement to three educationally-important phenomena. The figure is based on Skinner's (2016)"Context → Self → Action → Outcomes" self-system model, and it suggests that agentic engagement recruits a supportive learning environment (path "a") and enables both motivational satisfaction (path "b") and effective functioning (path "c").

The plan in Study 1 was to randomly assign participants into either an agentic engagement "high" or "low" condition to test whether participants in the former condition would report (1) a more supportive learning environment (i.e., higher student-reported and rater-scored autonomy-supportive teaching), (2) greater motivational satisfaction (i.e., higher autonomy satisfaction and task interest), and (3) more effective functioning (i.e., higher perceived skill development, self-reported and rater-scored engagement [behavioral, emotional, and cognitive], and task performance/achievement).

2.1. Agentic engagement and autonomy support

To produce these benefits, agentic engagement may require a teacher who supports these acts of agency. That is, even though students might offer their input and voice their preferences, that initiative may require teacher support before it can translate into educational benefits. If the student initiative were to fall on deaf or authoritarian ears, its effects may be inert.

One prototype of supportive, responsive teaching is autonomy-supportive teaching. Autonomy-supportive teaching is the delivery of instruction through an interpersonal tone of understanding and instructional behaviors such as perspective taking, providing choices, and communicating relevance (Assor et al., 2002; Reeve & Cheon, 2021; Vansteenkiste et al., 2019). Such autonomy-supportive teaching generally has a positive effect on students' educational outcomes—irrespective of how agentically-engaged students are (Reeve & Cheon, 2021). In the present study, we included high vs. low autonomy-supportive teaching as a second independent variable. Given the past literature, we predicted that all three student benefits (supportive learning environment, motivational satisfactions, and effective functioning) would be higher under conditions of high (vs. low) autonomy support.

The primary reason we included manipulated autonomy support as the second independent variable was to explore for a possible interaction effect between student agency and teacher autonomy support. The central research question was whether manipulated agentic engagement could produce educational benefits by itself (i.e., when exposed to low autonomy-supportive teaching) or only in the presence of high autonomy-supportive teaching. If manipulated autonomy support was a necessary condition for student agency to produce its benefits, then

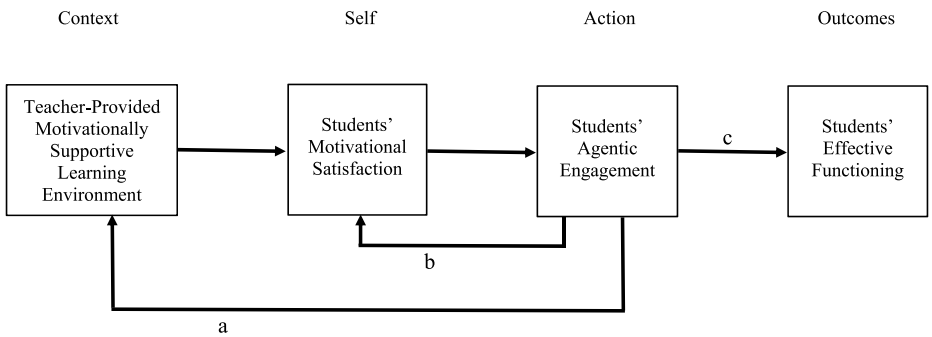

Fig. 1. Three hypothesized functions of agentic engagement: Create a supportive learning environment (path "a"); generate motivational satisfaction (path "b"); and increase effective functioning (path "c").

benefits would be observed only in the experimental condition that included both manipulated high agentic engagement and manipulated high autonomy support.

2.2. Method

2.2.1. Participants

Participants were 242 undergraduate students (144 females, 98 males) enrolled as preservice teachers in the College of Education at a large, private university in South Korea who received the equivalent of $10 for participating in an hour-long experimental session. During the sign-up process, the research team organized participants into 121 same-gender pairs (72 female pairs, 49 male pairs) in which one participant was randomly assigned into the role of the teacher and the other into the role of the student. All participants were ethnic Korean and were, on average, 23.0 years old ($SD = 2.4$; *range* = 18–29). This sample size of 121 participant-pairs was selected a priori based on a power analysis for an *F*-test (ANOVA: Fixed effects, main effects, and interactions) using $p = .05$, *power* = .90, 4 groups, with an expected medium-large effect size ($\eta^2 = 0.08$, or $f = 0.333$) that recommended an *N* of 117 (G*Power 3; Faul et al., 2007).

2.2.2. Procedure and experimental design

The research protocol was approved by the University Research Ethics Committee. The experimental design featured two independent variables (manipulated agentic engagement; manipulated autonomy support). Participant pairs were randomly assigned into one of four conditions within a 2 *x* 2 experimental research design (i.e., high vs. low levels of the two independent variables).

We adopted the laboratory-based teacher-student paradigm introduced by Deci et al. (1982) and since utilized by others (Reeve & Jang, 2006). The complete research protocol may be found in the online Supplemental Materials.

Upon arriving at the laboratory, the pair of participants entered a central waiting room, were told that one participant would be in the role of a teacher while the other would be in the role of a student, were informed that the experimental session would be videotaped, and signed a consent form. To begin the session, the experimenter first escorted the "teacher" to an adjacent room. On a rectangular table lay the experimental task, which was a 7-piece puzzle called TANGO that could be shaped into a large number of different patterns. The experimenter explained that the teacher was to take the next 10 min to prepare to teach the student three pre-selected puzzle solutions during a 12-min teaching session. To manipulate autonomy support, the experimenter gave the teacher a 4-card laminated booklet of instructions. In the autonomy support "high" condition, the booklet stated the teacher's role ("Be supportive"; page 1) to then recommend how to begin the session ("Take the student's perspective"; page 2), how to teach ("Listen to the student and respond accordingly"; page 3), and what to do when the student struggled ("Accept any anxiety as okay and as understandable"; page 4). These recommended instructional behaviors were taken from the aforementioned formal autonomy-supportive teaching interventions (e.g., Cheon & Reeve, 2015). In the autonomy support "low" condition, the booklet stated the teacher's role ("Be a teacher"; page 1) to then recommend how to begin the session ("Take a moment to plan what you will say and do to begin your teaching"; page 2), how to teach ("Take a moment to plan what you will say and do during your teaching"; page 3), and what to do when the student struggled ("Take a moment to plan what you will say and do when the student struggles"; page 4). The experimenter then left the room to return to the central waiting room, as the teacher took 10 min to prepare for the upcoming teaching session.

The experimenter then escorted the "student" to a second adjacent room containing a rectangular table with two seats positioned side by side. The experimenter explained that the student was "to learn how the puzzle works and to try to solve some or all of its solutions." The experimenter began the session by showing a square drawn on a piece of paper to ask the student to try to solve a square TANGO solution as a warm-up puzzle, saying, "see if you can arrange the 7 pieces into the square pattern." The student was given up to 2 min to solve the practice puzzle. Using a stopwatch, the experimenter measured how long the student took to solve the puzzle as well as whether or not the student solved the puzzle (to collect a possible covariate to use in the statistical analyses to control for possible individual differences in puzzle-solving ability). To manipulate agentic engagement, the experimenter then gave the student a 4-card laminated booklet of instructions. In the agentic engagement "high" condition, the booklet stated the student's role ("Be agentic"; page 1) to then recommend how to start the session ("Show initiative" [don't wait for the teacher to tell you what to do"]; page 2), how to puzzle solve ("Speak up [let the teacher know what you are interested in"]; page 3), and what to do when encountering difficulties ("Ask questions [to help you learn]"; page 4). These acts of agency were taken from observations of what highly agentically-engaged students do in the classroom (Koenigs et al., 1977; Reeve & Tseng, 2011). In the agentic engagement "low" condition, the booklet stated the student's role ("Be a student"; page 1) to then recommend how to begin the session ("Take a moment to plan what you will say and do to begin the session"; page 2), how to puzzle solve ("Take a moment to plan what you will say and do during the session"; page 3), and what to do when encountering difficulties ("Take a moment to plan what you will say and do when you encounter puzzle-solving difficulties"; page 4).

As the student prepared for his or her role (7 min), the experimenter left the room, kept time on a stopwatch, and returned to the teacher's room to bring the teacher into the student's room to conduct the teaching session, which was videotaped (with the pair's awareness and consent). After 12 min, the experimenter returned, announced that the puzzle-solving session was over, asked the teacher to accompany the experimenter back to the teacher's room for a debriefing session. The experimenter then returned to the student's room and administered an unannounced test of learning/performance by asking the student to take 3 min to try to solve as many of the three TANGO puzzles used in the

teaching session as possible (possible range, 0–3). The number of puzzles the student solved during these 3 min served as the measure of performance. Lastly, the experimenter administered a post-experimental questionnaire and, finally, debriefed the student.

2.2.3. Measures

We collected both self-report and rater-scored dependent measures. The self-reported student measures included four aspects of engagement (agentic, behavioral, emotional, and cognitive), perceived autonomy-supportive teaching, autonomy need satisfaction, task interest, and perceived skill development. Each of these measures used the same 7-point Likert scale that ranged from 1 (*Strongly Disagree*) to 7 (*Strongly Agree*). We had available from previous investigations a back-translated Korean version of each questionnaire (e.g., Jang et al., 2016) and rating scale (Cheon, Reeve, & Ntoumanis, 2018).

Student-Reported Measures. *Agentic engagement* was assessed with the 5-item Agentic Engagement Scale; Reeve, 2013; "I let the teacher know what I was interested in"; α = 0.83). *Perceived autonomy-supportive teaching* was assessed with the 6-item Learning Climate Questionnaire (Williams & Deci, 1996; "The teacher listened to how I would like to do things; α = 0.71). *Autonomy satisfaction* was assessed with the Autonomy Satisfaction subscale from the Basic Psychological Need Satisfaction and Need Frustration Scale (Chen et al., 2015; "During the puzzle solving, I felt a sense of choice and freedom in the things I undertook; 4 items; α = 0.69). *Task interest* was assessed with the 3-item Interest subscale from the Interest-Enjoyment scale (Reeve, 1989; "The puzzle was interesting"; α = 0.93). *Perceived skill development* was assessed with the 5-item Perceived Skill Development scale (Cheon, Reeve, & Moon, 2012; "I learned new and important skills during the puzzle solving"; α = 0.91). *Overall engagement* was assessed as an aggregate score from three scales (3-scales, α = 0.76): behavioral engagement (the 5-item Engagement versus Disaffection with Learning measure; Skinner et al., 2009; "During the puzzle-solving, I worked hard"; α = 0.73); emotional engagement (the 5-item Engagement versus Disaffection with Learning measure; "I enjoyed learning new things during the puzzle-solving"; α = 0.83); and cognitive engagement (the 4-item Deep Learning Strategies measure; Senko & Miles, 2008; "During the puzzle-solving, I generated examples to help me understand the puzzle solutions better; α = .69).

Rater-Scored Measures. Two members of the research team who were blind to the experimental condition received training on the conceptual definition of the constructs and conducted practice scoring sessions. During these sessions, they watched and scored video-recorded teaching sessions from a pilot study. Afterwards, they discussed disagreements in the ratings to reach a consensus. Once an acceptable level of interrater reliability was reached, the two raters proceeded to rating the video-recorded teaching sessions from Study 1. They independently watched the videos and scored one teacher measure (autonomy support) and three student measures (agentic engagement, overall engagement, and performance). *Autonomy-supportive teaching* was assessed using the Behavior Rating Scale (BRS; Cheon et al., 2018). Raters scored six autonomy-supportive instructional behaviors (e.g., "Takes the student's perspective"), which were averaged into a single score (α = 0.92) as is standard practice with the scoring of the BRS. *Agentic engagement* was assessed using a single item with multiple indicators ("Agentic Engagement: speaks up, offers input, makes suggestions, communicates preferences, asks questions"), while *overall engagement* was assessed by aggregating the scores from three items (each with multiple indicators) measuring behavioral, emotional, and cognitive engagement (α = .95). *Performance* was assessed by the number of puzzles students solved during the unannounced post-experimental test of learning (possible range, 0–3 solutions). For the ratings used in the main analysis, the raters did not discuss or adjust their scores, yet the two raters scored each measure in a reasonably reliable way (r = 0.67 for autonomy-supportive teaching, 0.71 for agentic engagement, 0.62 for overall engagement, and 0.99 for performance).[1] To create the dependent measures used in the statistical analyses, we averaged the two raters' scores into a single score.

2.2.4. Data analyses

We grouped the 10 dependent measures into four categories: agentic engagement (student-reported and rater-scored); supportive learning environment (student-reported and rater-scored autonomy-supportive teaching); motivational satisfactions (student-reported autonomy satisfaction and task interest); and effective functioning (student-reported overall engagement and perceived skill development, rater-scored overall engagement and performance). For each category of dependent measures, we used a multivariate analysis of variance (MANOVA) to test for the two main effects (manipulated agentic engagement, manipulated autonomy support) and their interaction. If the MANOVA was significant ($p \leq .05$), we then conducted follow-up univariate ANOVAs (one for each dependent measure); if the MANOVA was not significant ($p > .05$), we did not conduct follow-up univariate ANOVAs on the individual dependent measures. We explored for associations of student gender, student age, and pre-task performance (on the square-shaped TANGO puzzle) with scores on the 10 dependent measures, but neither gender nor age correlated significantly with any dependent measures while pre-task performance correlated significantly with only performance (r = 0.23, p = .010). Given the lack of significant associations with these possible covariates, all hypotheses were assessed with MANOVA, rather than with a multivariate analysis of covariance (MANCOVA).

2.3. Results

2.3.1. Preliminary analyses

Values for skewness and kurtosis for all dependent measures were less than |1.5|, indicating little deviation from normality. Missing data on the student questionnaire and raters' scoring sheets were rare (<0.1%), so we used the expectation-maximization (EM) algorithm to impute these few missing values (Dong & Peng, 2013). Table 1 shows the descriptive statistics (means and standard deviations) for all 10 dependent measures broken down by experimental condition, while Table 2 shows the intercorrelation matrix for all variables included in the analyses (2 independent variables, 10 dependent measures).

2.3.2. Agentic engagement

In the MANOVA for the two agentic engagement dependent measures, the main effect of manipulated agentic engagement was significant, $F(2, 116) = 10.18$, $p < .001$, the main effect of manipulated autonomy support was not significant, $F(2, 116) = 1.64$, $p = .198$, and the two-way interaction was not significant, $F(2, 116) = 0.70$, $p = .696$. We therefore conducted follow-up ANOVA analyses only for the manipulated agentic engagement main effect. Univariate tests were significant for both student-reported agentic engagement, $F(1, 117) = 13.47$, $p < .001$, and rater-scored agentic engagement, $F(1, 117) = 11.85$, $p < .001$. Specifically, both agentic engagement scores were higher in the high vs. low agentic engagement conditions: *Ms*, 5.36 vs 4.58, $d = 0.62$ (for student reports) and *Ms*, 5.37 vs 4.55, $d = 0.61$ (for rater scores).

2.3.3. Supportive learning environment

In the MANOVA for the two autonomy-supportive teaching dependent measures, the main effect of manipulated agentic engagement was significant, $F(2, 116) = 5.50$, $p < .001$, the main effect of manipulated autonomy support was significant, $F(2, 116) = 9.67$, $p < .001$, while the two-way interaction was not, $F(2, 116) = 1.01$, $p = .367$. We therefore conducted follow-up ANOVA analyses for both the manipulated agentic engagement and the manipulated autonomy support main effects. For manipulated agentic engagement, univariate tests were significant for both student-perceived autonomy-supportive teaching, $F(1, 117) = 4.73$, $p = .032$, and rater-scored autonomy-supportive teaching, $F(1, 117) = 7.60$, $p = .007$. Specifically, both autonomy-supportive teaching scores were higher in the high vs. low agentic engagement conditions:

Table 1
Descriptive statistics for the 10 dependent measures broken down by experimental condition (study 1).

Dependent Measure		Low Autonomy Support		High Autonomy Support	
		Low Agentic Engagement (n = 29)	High Agentic Engagement (n = 28)	Low Agentic Engagement (n = 32)	High Agentic Engagement (n = 32)
Student-Reported Agentic Engagement	*M* (*SD*)	4.32 (1.31)	5.28 (1.00)	4.91 (1.53)	5.45 (0.68)
Rater-Scored Agentic Engagement	*M* (*SD*)	4.55 (1.35)	5.46 (1.20)	4.55 (1.36)	5.28 (1.30)
Student-Reported Perceived Autonomy-Supportive Teaching	*M* (*SD*)	3.78 (0.64)	4.14 (0.54)	4.28 (0.53)	4.34 (0.47)
Rater-Scored Autonomy-Supportive Teaching	*M* (*SD*)	4.55 (0.89)	4.99 (0.84)	5.06 (0.96)	5.48 (0.74)
Student-Reported Autonomy Satisfaction	*M* (*SD*)	3.29 (0.72)	3.54 (0.71)	3.47 (0.83)	3.73 (0.57)
Student-Reported Task Interest	*M* (*SD*)	5.54 (1.02)	5.85 (1.08)	5.58 (1.33)	6.15 (0.80)
Student-Reported Overall Engagement	*M* (*SD*)	5.83 (0.58)	5.96 (0.58)	6.11 (0.57)	6.22 (0.52)
Rater-Scored Overall Engagement	*M* (*SD*)	4.40 (1.31)	5.26 (1.26)	4.57 (1.40)	5.22 (1.26)
Student-Reported Perceived Skill Development	*M* (*SD*)	4.82 (0.89)	4.90 (1.09)	5.23 (1.29)	5.44 (0.73)
Rater-Scored Performance	*M* (*SD*)	2.55 (0.83)	2.29 (0.85)	2.52 (0.77)	2.41 (0.80)

$N = 121$.

Ms, 4.24 vs 4.02, $d = 0.36$ (for student reports) and *Ms*, 5.24 vs 4.80, $d = 0.50$ (for rater scores). For manipulated autonomy support, univariate tests were significant for both student-perceived autonomy-supportive teaching, $F(1, 117) = 11.80$, $p = .001$, and rater-scored autonomy-supportive teaching, $F(1, 117) = 9.95$, $p = .002$. Specifically, both autonomy-supportive teaching scores were higher in the high vs. low autonomy support conditions: *Ms*, 4.30 vs 3.96, $d = 0.68$ (for student reports) and *Ms*, 5.27 vs 4.77, $d = 0.57$ (for rater scores).

2.3.4. Motivational satisfactions

In the MANOVA for the two motivational satisfaction dependent measures, the main effect of manipulated agentic engagement was significant, $F(2, 116) = 3.07$, $p = .050$, the main effect of the manipulated autonomy support was not significant, $F(2, 116) = 1.03$, $p = .362$, and the two-way interaction was not significant, $F(2, 116) = 0.25$, $p = .779$. We therefore conducted follow-up analyses only for the manipulated agentic engagement main effect. Univariate tests were significant for both autonomy satisfaction, $F(1, 117) = 3.98$, $p = .048$, and task interest, $F(1, 117) = 4.92$, $p = .028$. Specifically, both motivational satisfaction scores were higher in the high vs. low agentic engagement conditions: *Ms*, 3.64 vs 3.38, $d = 0.36$ (for autonomy satisfaction) and *Ms*, 6.00 vs 5.56, $d = 0.42$ (for task interest).

2.3.5. Effective functioning

In the MANOVA for the four effective functioning dependent measures, the main effect of manipulated agentic engagement was significant, $F(4, 114) = 5.18$, $p = .001$, the main effect of the manipulated autonomy support was only marginally significant, $F(4, 114) = 2.40$, $p = .055$, while the two-way interaction was not significant, $F(4, 114) = 0.24$, $p = .913$.[2] We therefore conducted follow-up ANOVA analyses only for the manipulated agentic engagement main effect. Univariate tests were significant for rater-scored overall engagement, $F(1, 117) = 9.91$, $p = .002$, as overall engagement scores were higher in the high vs. low agentic engagement conditions: *Ms*, 5.24 vs 4.48, $d = 0.56$. Univariate ANOVAs for the other three indicators of effective functioning were not statistically significant: self-reported overall engagement, $F(1, 117) = 1.42$, $p = .236$; perceived skill development, $F(1, 117) = 0.66$, $p = .420$; or rater-scored performance, $F(1, 117) = 1.61$, $p = .208$.

2.4. Discussion

Study 1 introduced two experimental manipulations. For manipulated agentic engagement, students were able to take on the role of an agentically-engaged student (according to both self-reported and rater-scored measures). When they did show some initiative, students recruited more supportive learning conditions (e.g., perceived autonomy-supportive teaching) and generated greater motivational satisfaction (e.g., autonomy satisfaction, task interest). They did not, however, generate more effective functioning for themselves (e.g., skill development, performance). It is possible that students in the high agentic engagement condition were so focused on initiating the behaviors needed to create more favorable learning conditions that they failed to take personal ownership over their own learning—and hence failed to do what was needed to directly enhance their own effective functioning. Given this possibility, we designed Study 2 to add a second (new) agentic engagement condition—one that encouraged students to take ownership over their own learning (as discussed in the next section).

For manipulated autonomy support, teachers were able to take on the role of an autonomy-supportive teacher (according to both student-reported and rater-scored measures). When teacher-participants did show some autonomy support, their students did not report benefits. These findings suggest that the brief training session (a 4-page instructional booklet and 10-min self-guided learning experience) encouraged teachers to be autonomy supportive but was nevertheless too mild of a professional development experience to equip our teacher-participants with the instructional skills they needed to provide authentic need-satisfying and interest-enhancing instruction.

Study 1 also tested whether the benefits from manipulated agentic engagement might depend on the presence of manipulated autonomy support. None of the tests of the 10 two-way interaction effects were statistically significant. Given these null effects, we made the decision to drop the manipulated autonomy support independent variable from Study 2. That said, we discuss the implications of our brief, mild training session in the General Discussion for the question as to whether autonomy-supportive teaching is necessary for the emergence of agentic engagement and its benefits.

Table 2
Intercorrelation matrix among the two independent variables and 10 dependent measures (study 1).

Dependent Measure	1	2	3	4	5	6	7	8	9	10	11	12
1. Manipulated Agentic Engagement (0, 1)[a]		.01	.30	.30	.18	.24	.18	.20	.11	.28	.08	-.11
2. Manipulated Autonomy Support (0, 1)[a]	–	–	16	−03	31	28	13	08	24	03	23	02
3. Student-Reported Agentic Engagement			–	.30	.53	.18	.31	.29	.50	.28	.44	.05
4. Rater-Scored Agentic Engagement				–	.10	.22	.27	.05	.20	.83	.19	.46
5. Student-Reported Autonomy Support					–	.23	.45	.32	.47	.14	.38	-.07
6. Rater-Scored Autonomy Support						–	.22	.17	.21	.36	.08	.07
7. Student-Reported Autonomy Satisfaction							–	.47	.55	.27	.37	.01
8. Student-Reported Task Interest								–	.71	.14	.32	−08
9. Student-Reported Overall Engagement									–	.26	.47	.05
10. Rater-Scored Overall Engagement										–	.11	.44
11. Student-Reported Skill Development											–	.11
12. Rater-Scored Performance												–
Mean	0.50	0.53	5.00	4.96	4.14	5.03	3.51	5.78	6.04	4.86	5.11	2.44
Standard Deviation	0.50	0.50	1.24	1.36	0.58	0.91	0.72	1.09	0.57	1.35	1.04	0.81

$N = 121$. r's ≥ 0.18, $p < .05$; r's ≥ 0.24, $p < .01$; r's ≥ 0.30, $p < .001$.
[a] For both Manipulated Agentic Engagement and Manipulated Autonomy Support, "High" scored as 1, while "Low" scored as 0.

3. Study 2

In the language of Fig. 1, the Study 1 findings clearly supported the causal underpinnings of agentic engagement's "a" path, moderately or inconsistently supported the "b" path, but failed to support the "c" path. One reason for the lack of support for the "c" path might be because we defined manipulated agentic engagement too narrowly. Agentic engagement refers to initiatives to change one's circumstances and surroundings for the better, but this conceptual definition might be missing some essential and necessary elements to translate personal initiative into effective functioning. The notions of "taking ownership over one's own learning" and "taking charge of one's own learning" are concepts from the "learning beyond the classroom" literature (Benson, 2011; Mynard & Shelton-Strong, 2021). In this literature, students take control of their own self-initiated learning and they do show more effective functioning (e.g., learn a foreign language), largely because of their greater exploring, securing new resources, selecting preferred environments, and prioritizing their time to do one thing rather than another.

To test this possibility, we created two different manipulated agentic engagement conditions in Study 2. The first was the same manipulated agentic engagement condition from Study 1, which was re-labeled in Study 2 as "Agentic Engagement to Change the Environment" (abbreviated as AEΔEnvironment). The second was a newly-created "Agentic Engagement to Change One's Functioning" condition (abbreviated as AEΔFunctioning). This new, second experimental condition was designed to encourage students to take initiative to produce more effective functioning for themselves (e.g., skill development, performance).

In terms of hypotheses, we expected that the findings from the AEΔEnvironment condition would replicate the findings from the Study 1 manipulated agentic engagement condition. That is, students in the AEΔEnvironment condition, compared to students in a neutral control condition, would recruit a more supportive learning environment and experience greater motivational satisfaction but not necessarily more effective functioning. We made this prediction because the two experimental manipulations were identical. What was new to Study 2 was that we also predicted that students in the AEΔFunctioning condition, compared to participants in a neutral control condition, would experience greater motivational satisfaction and more effective functioning but not necessarily a more supportive learning environment.

3.1. Method

3.1.1. Participants

Participants were 148 undergraduate students (78 females, 70 males) enrolled as preservice teachers in the College of Education at a large, private university in South Korea who received the equivalent of $10 for participating in an hour-long experimental session. During the sign-up process, the research team organized participants into 74 same-gender pairs (39 female pairs, 35 male pairs) in which one participant was randomly assigned into the role of the teacher and the other into the role of the student. All participants were ethnic Korean and were, on average, 22.4 years old ($SD = 2.1$; *range* = 19–28). This sample size of 74 participant-pairs was selected a priori based on a power analysis for an F-test (ANOVA: Fixed effects, omnibus, one-way) using $p = .05$, *power* = .90, 3 groups, $f = 0.385$ that recommended an N of 90 (G*Power 3; Faul et al., 2007), suggesting that our statistical analyses were somewhat underpowered.

3.1.2. Procedure and experimental design

The research protocol was approved by the University Research Ethics Committee. The experimental design featured random assignment of the participant pairs into one of three conditions: AEΔEnvironment; AEΔFunctioning; and a neutral control. Study 2 adopted the same teacher-student paradigm used in Study 1 and followed the same procedure. Participants first entered a central waiting room, were told that one participant would be in the role of a teacher while the other would be in the role of a student, were informed that the experimental session would be videotaped, and signed a consent form. The complete research protocol may be found in the online Supplemental Materials.

The experimenter first escorted the "teacher" to an adjacent room containing a rectangular table on which lay an 8-block puzzle called the Happy Cubes (Reeve, 1989; Vansteenkiste & Deci, 2003) and 10 wooden block model solutions. The experimenter began the session by showing the teacher a brief (3 min) video on a laptop computer of how the puzzle worked and how 4 of its solutions could be solved step-by-step. This was done to provide teachers with some content on which they could formulate a lesson plan. After viewing the video, the teacher was given 8 additional min to learn about the puzzle and prepare for the teaching session. Unlike in Study 1, there was no experimental manipulation for the teacher, as the teacher's role in Study 2 was the same across all three conditions.

After leaving the teacher's room, the experimenter next escorted the "student" to a second adjacent room containing a rectangular table with two seats positioned side by side. The experimenter explained that the student was "to learn how the puzzle works and to try to solve some or all of its solutions." The experimenter then placed the student into one of three roles by administering one of the three instructional booklets. For the next 7 min, the student became familiar with a 4-card laminated booklet to enact the assigned role. In the AEΔEnvironment condition, the booklet was the same as the one provided to Study 1 participants in the manipulated (high) agentic engagement condition. In the neutral

control condition, the booklet was the same as the one provided to Study 1 participants in the neutral (low agentic engagement) condition. In the new AEΔFunctioning condition, the booklet provided the student's role ("Be agentic"; page 1) to recommend how to start ("Take the initiative to start your own learning"; page 2), how to puzzle solve ("Create your own ways to make progress"; page 3), and what to do when encountering difficulties ("Change things for the better"; page 4). These acts of agency were taken from what students do to take charge of their own learning, according to the "learning beyond the classroom" literature (Benson, 2011; Mynard & Shelton-Strong, 2021).

As the student prepared, the experimenter left the student's room, returned to the teacher's room, and escorted the teacher to the student's room to conduct a teaching session, which was videotaped (with the pair's awareness and consent). After 12 min, the experimenter returned, announced that the puzzle-solving session was over, and asked the teacher to accompany the experimenter back to the teacher's room for a debriefing session. The experimenter then returned to the student's room and administered an unannounced test of learning/performance by asking the student to take 3 min to try to solve as many of the Happy Cubes solutions used in the teaching session as possible (possible range, 0–10). The number of puzzles the student solved during these 3 min served as the measure of task performance. Lastly, the experimenter administered a post-experimental questionnaire and, finally, debriefed the student.

3.1.3. Measures

We collected the same 10 self-report and rater-scored dependent measures used in Study 1. The student-reported measures included the following: agentic engagement (5-items, $\alpha = 0.76$); perceived autonomy-supportive teaching (6-items, $\alpha = 0.83$); autonomy satisfaction (4-items, $\alpha = 0.74$); task interest (3-items, $\alpha = 0.91$); overall engagement (3-scales, $\alpha = 0.83$); and perceived skill development (6-items, $\alpha = 0.90$). Each measure used the same 7-point Likert scale that ranged from 1 (*Strongly Disagree*) to 7 (*Strongly Agree*). The rater-scored measures included one teacher rating, which was autonomy-supportive instructional behaviors (6-behaviors, $\alpha = 0.92$, interrater reliability = 0.63), and three student ratings, which were agentic engagement (interrater $r = 0.89$), overall engagement (3-items, $\alpha = 0.94$, interrater reliability = 0.87), and puzzle-solving performance (interrater reliability = 0.99). As in Study 1, to create the dependent measures used in the statistical analyses, we averaged the two raters' scores into a single score.

3.1.4. Data analyses

As in Study 1, we grouped the 10 dependent measures into four categories: agentic engagement (student-reported and rater-scored); supportive learning environment (student-reported and rater-scored autonomy-supportive teaching); motivational satisfaction (student-reported autonomy satisfaction and task interest); and effective functioning (student-reported overall engagement and perceived skill development, rater-scored overall engagement and performance). For each category, we used a one-way multivariate analysis of variance (MANOVA). If the MANOVA was significant, we then conducted follow-up univariate ANOVAs (one for each dependent measure); if the MANOVA was not significant, we did not conduct follow-up univariate ANOVAs on the individual dependent measures. For each significant univariate ANOVA, we then tested for significant group mean differences among the three conditions by using Student-Newman-Kuels (SNK) post hoc tests. As in Study 1, we again explored for associations of student gender and student age with scores on the 10 dependent measures, but neither potential covariate correlated significantly with any dependent measure (hence, we used one-way MANOVAs rather than MANCOVAs). In Study 2, we did not include the pre-performance measure used in Study 1.

3.2. Results

3.2.1. Preliminary analyses

Values for skewness and kurtosis for all dependent measures were less than |2.3|, indicating little deviation from normality. Missing data on the student questionnaire and raters' scoring sheets were rare (<0.1%), so we again used the expectation-maximization (EM) algorithm to impute these few missing values. The Table 3 shows the descriptive statistics for all 10 dependent measures broken down by experimental condition, while Table 4 shows the intercorrelation matrix for all the dependent measures included in the Study 2 analyses.

3.2.2. Agentic engagement

In the one-way MANOVA for the two agentic engagement dependent measures, the experimental condition main effect was significant, $F(4, 144) = 4.31$, $p = .003$. Because the MANOVA was significant, we conducted follow-up univariate ANOVA tests for both dependent measures. Univariate tests were significant both for student-reported agentic engagement, $F(2, 72) = 5.04$, $p = .009$, and for rater-scored agentic engagement, $F(2, 72) = 3.47$, $p = .036$. For student-reported agentic engagement, SNK post hoc tests showed that scores were significantly higher in the AEΔEnvironment condition, $M = 5.89$, than in both the AEΔFunctioning condition, $M = 5.10$, or control condition, $M = 5.10$, while the last two conditions did not differ significantly from one another. For rater-scored agentic engagement, SNK post hoc tests showed that scores were significantly higher in both the AEΔEnvironment condition, $M = 5.33$, and the AEΔFunctioning condition, $M = 5.44$, than in the control condition, $M = 4.33$, while the first two conditions did not differ significantly from one another.

3.2.3. Supportive learning environment

In the one-way MANOVA for the two autonomy-supportive teaching dependent measures, the experimental condition main effect was only marginally significant, $F(4, 144) = 2.37$, $p = .053$. Given that the overall MANOVA was only marginally significant, we did not conduct follow-up

Table 3
Descriptive statistics for the 10 dependent measures broken down by experimental condition (study 2).

		Control Condition ($n = 24$)	AEΔEnvironment Condition ($n = 24$)	AEΔFunctioning Condition ($n = 27$)
Student-Reported Agentic Engagement	*M* (*SD*)	5.10 (1.00)	5.89 (0.69)	5.10 (1.22)
Rater-Scored Agentic Engagement	*M* (*SD*)	4.33 (1.74)	5.33 (1.24)	5.44 (1.83)
Student-Reported Perceived Autonomy-Supportive Teaching	*M* (*SD*)	5.18 (0.91)	5.87 (0.71)	5.62 (1.04)
Rater-Scored Autonomy-Supportive Teaching	*M* (*SD*)	4.78 (1.26)	5.47 (0.78)	5.01 (1.22)
Student-Reported Autonomy Satisfaction	*M* (*SD*)	4.78 (1.05)	5.48 (1.00)	5.08 (0.95)
Student-Reported Task Interest	*M* (*SD*)	6.11 (0.97)	6.06 (1.00)	5.91 (1.04)
Student-Reported Overall Engagement	*M* (*SD*)	6.10 (0.52)	6.28 (0.61)	6.08 (0.72)
Rater-Scored Overall Engagement	*M* (*SD*)	4.72 (1.19)	5.14 (1.28)	5.01 (1.54)
Student-Reported Perceived Skill Development	*M* (*SD*)	5.27 (0.93)	5.35 (1.10)	5.15 (1.00)
Rater-Scored Performance	*M* (*SD*)	5.29 (2.35)	5.17 (2.12)	5.00 (1.98)

$N = 75$.
Note. AEΔEnvironment = Agentic Engagement to Change the Environment; AEΔFunctioning = Agentic Engagement to Change One's Functioning.

Table 4
Intercorrelation matrix among the 10 dependent measures (study 2).

Dependent Measure	1	2	3	4	5	6	7	8	9	10
1. Student-Reported Agentic Engagement	–	-.04	.49	.23	.41	.29	.48	-.02	.33	.13
2. Rater-Scored Agentic Engagement		–	.06	.42	.19	-.01	-.04	.85	-.18	-.02
3. Student-Reported Autonomy Support			–	.26	.69	.40	.46	.10	.42	.21
4. Rater-Scored Autonomy Support				–	.17	-.01	.03	.49	.06	-.11
5. Student-Reported Autonomy Satisfaction					–	.58	.52	.25	.50	.37
6. Student-Reported Task Interest						–	.73	.10	.50	.43
7. Student-Reported Overall Engagement							–	.04	.46	.32
8. Rater-Scored Overall Engagement								–	-.06	-.03
9. Student-Reported Skill Development									–	.18
10. Rater-Scored Performance										–
Mean	5.35	5.05	5.56	5.08	5.11	6.02	6.15	4.96	5.25	5.15
Standard Deviation	1.06	1.68	0.94	1.13	1.02	0.99	0.62	1.35	1.00	2.06

$N = 75$. r's ≥ 0.23, $p < .05$; r's ≥ 0.30, $p < .01$; r's ≥ 0.37, $p < .001$.

univariate analyses.

3.2.4. Motivational satisfaction

In the one-way MANOVA for the two motivation satisfaction dependent measures, the experimental condition main effect was significant, $F(4, 144) = 2.59$, $p = .039$. Because the MANOVA was significant, we conducted follow-up univariate ANOVA tests for both dependent measures. The univariate test for autonomy satisfaction was only marginally significant, $F(2, 72) = 2.96$, $p = .058$, while the univariate test for task interest was not statistically significant, $F(2, 72) = 0.27$, $p = .767$.

3.2.5. Effective functioning

In the one-way MANOVA for the four effective functioning dependent measures, the experimental condition main effect was not significant, $F(8, 140) = 0.39$, $p = .926$.

3.3. Discussion

The Study 2 results support two conclusions. First, the findings for the AEΔEnvironment condition largely replicated the findings for the manipulated agentic engagement condition from Study 1. Students in the AEΔEnvironment condition once again reported greater agentic engagement as well as marginally greater perceived autonomy-supportive teaching and autonomy satisfaction. They did not, however, report two of the benefits observed in Study 1—namely, task interest and overall engagement.

Second, participants in the AEΔFunctioning condition did not experience benefits. While the raters did score these students as more agentically engaged, these students' self-reported scores did not differ from those of students in the neutral control condition. Thus, for students in the AEΔFunctioning condition, their initiative did not produce in them a subjective experience of being agentic and it did not produce gains in a more supportive learning environment, greater motivational satisfactions, or more effective functioning.

4. General Discussion

We undertook this research to pursue two purposes. The first was to test for the causal effect of manipulated agentic engagement on students' educational benefits. The second, which was dependent on the fulfillment of the first, was to assess the possible merits of designing a future student agentic engagement intervention.

4.1. Causal status of agentic engagement

Building on previous correlational and longitudinal findings, Study 1 showed that manipulated agentic engagement improved two aspects of the learning environment (student-reported and rater-scored autonomy-supportive teaching) and two motivational satisfactions (autonomy satisfaction, task interest). These findings suggest that manipulated agentic engagement does have a direct, causal effect on creating a more supportive learning environment for oneself. However, manipulated agentic engagement may or may not have a positive causal effect to boost motivational satisfaction, as it is not clear whether such motivational satisfaction arose out of the students' agentic engagement or out of the teacher's autonomy support. We offer this cautious interpretation because the high agentic engagement condition also boosted autonomy-supportive teaching (an effect that might itself explain student-participants' greater motivational satisfactions). Whether manipulated agentic engagement boosts motivational satisfaction directly or only indirectly (through its facilitating effect on autonomy-supportive teaching) will need to be investigated in future research, but the one direct, causal, and positive effect of manipulated agentic engagement was that it unambiguously helped students create a more (autonomy) supportive learning environment for themselves.

4.2. Implications for a future agentic engagement intervention

The causal status greater agentic engagement suggests that important fruits might be gained from an effort to design and implement a student-focused agentic engagement intervention. The hope for such an intervention would be that, if students could be taught how to express their interests and preferences and let the teacher know what they needed, then they could become proactive, constructive "agents" (Bandura, 2006) or "origins" (de Charms, 1976) who could enrich their own learning environments. In thinking about the merits of such a future agentic engagement intervention, two critical questions arise: (1) What would an agentic engagement intervention teach students to do? and (2) Would such an intervention work (i.e., produce important educational benefits)?

What would an agentic engagement intervention teach students to do? The purpose of an agentic engagement intervention should be to teach students how to recruit a more supportive learning environment for themselves. This recommendation is rooted not only in the findings from the present investigation, but also in the consistent track record showing that students who receive instruction from an autonomy-supportive teacher thrive in multiple ways. A recent review, for instance, showed that students of highly autonomy-supportive teachers experienced all of the following benefits: (a) greater need satisfaction, intrinsic motivation, internalization of school values, classroom engagement, perceived skill development, self-regulated learning, positive emotions, well-being, positive self-concept, academic achievement, and course grades and (b) lesser need frustration, amotivation, controlled motivation, disengagement, negative feelings, and problematic peer relationships (Reeve & Cheon, 2021). So, even if an agentic

engagement intervention "only" helped students learn how to recruit greater autonomy-supportive teaching, its benefits are potentially profound.

Would such an intervention work? Successful, bona fide engagement-based interventions are surprisingly rare. In 2019, the *Handbook of Student Engagement Interventions* was published (Fredricks, Reschly, & Christenson, 2019). That handbook presented the engagement-centric intervention programs from 16 different research teams, each of which was designed to boost some indicator of students' effective functioning (e.g., staying in school). A close inspection of all of these interventions, however, reveals that one focused on engagement (Ardoin & Sayeski, 2019), four were actually interventions to promote students' motivations (e.g., beliefs such as mindset, meaningfulness) while the other 11 were actually interventions to provide more supportive learning conditions (e.g., supportive relationships, culturally-responsive instruction, caring school climate, mentoring, and social support). These findings led editors Fredricks and her colleagues (2019) to conclude that "relationships are the key" (p. 385).

For any engagement intervention to work (i.e., produce educationally-important benefits), we suggest that engagement should not be separated from the motivation that produces it. We suspect that agentic engagement needs to be closely aligned with and emanate out of an energizing motivational catalyst (e.g., autonomy need satisfaction, self-efficacy, or a mastery goal orientation) to yield its gains. Support for this recommendation comes from a pair of longitudinal studies. In the first study (Patall & Zambrano, 2021), researchers first provided students with an online session to teach an "agentic mindset" (i.e., think of their motivation and the teacher's motivational support as malleable and as responsive to agentic engagement strategies). The researchers then suggested some agentic engagement strategies students might try, such as expressing a preference or offering a suggestion. The intervention did boost an agentic mindset (i.e., motivation) but it did not produce a direct effect on educational benefits (i.e., grades). We speculate that students in this intervention would have benefited had they received skill-based training on how to enact the agentically-engaged behaviors the researchers suggested. In the second study (Reeve, Cheon, & Yu, 2020), naturally-occurring agentic engagement produced longitudinal educational benefits for students who began the class with high autonomous motivation, which was not the case for students who began the class with low autonomous motivation. This study showed that autonomous motivation (in the context of autonomy-supportive teaching) was a needed catalyst to the emergence of agentic engagement and its classroom benefits. From these studies, we suggest that a successful student-focused agentic engagement intervention needs to produce two supplemental effects: (1) enhance students' motivation (e.g., agentic mindset, need satisfaction, self-efficacy, personal goals) and (2) provide the skill-based training to help students translate their agency into actual behaviors (e.g., how to offer input, express a preference, let the teacher know what you want) through modeling, scaffolding, practice, and feedback.

4.3. Is a supportive teacher necessary for agentic engagement to emerge?

The findings from Study 1 suggested that student-initiated agency does not depend on having an autonomy-supportive teacher. Students in the high agentic engagement/low autonomy support condition showed an impressive level of agentic engagement. Still, this null finding does not answer the above question definitively. This is because autonomy-supportive teaching comes in three different versions.

One version of autonomy-supportive teaching is "encouraged-to-be autonomy supportive". This version of autonomy-supportive teaching is represented by our manipulated autonomy support condition in Study 1. When teachers are merely encouraged to be autonomy supportive and are provided with the minimum of "how to" training, then this version of autonomy-supportive teaching seems insufficient to boost students' agentic engagement. That is, students in the high agentic engagement/low autonomy support condition displayed about the same level of agentic engagement as did student-participants in the high agentic engagement/high autonomy support condition.

A second version of autonomy-supportive teaching is "intervention-enabled autonomy-supportive teaching". This version of autonomy-supportive teaching is represented in the theory-based and carefully-designed autonomy-supportive interventions featured in randomized control trials (Reeve & Cheon, 2021). When teachers are provided with a multiple-day professional developmental experience that offers a "how to" workshop-like intervention, teachers become highly skilled in their capacity to provide autonomy-supportive instruction. Under these conditions, students show high levels of agentic engagement (Authors, 2020a). These randomized control trials clearly show that, when executed by a highly-skilled professional, autonomy-supportive teaching clearly boosts students' agentic engagement.

A third version of autonomy-supportive teaching is "naturally-occurring autonomy-supportive teaching". This version of autonomy-supportive teaching is represented by a population of teachers completing a questionnaire to assess their classroom reliance on autonomy-supportive teaching (e.g., Situations in Schools questionnaire; Aelterman et al., 2019) with some teachers scoring as highly autonomy supportive, some as moderately autonomy supportive, and others as not-at-all autonomy-supportive (e.g., a normal distribution of scores). That is, some teachers are just more naturally autonomy-supportive than are other teachers (even without participation in an autonomy-supportive teaching workshop, as discussed above). It is currently not clear to what extent "naturally-occurring autonomy-supportive teaching" boosts students' agentic engagement, though this relation seems like a fruitful question for future research to address.

A related question for future research is whether agentic engagement might "backfire" (as suggested by Patall & Zambrano, 2021). Some teachers adopt a controlling (rather than an autonomy-supportive) motivating style and some teachers are resistant to students' attempts to introduce agentically-engaged behaviors into the classroom. These teachers may not only *not* support such agency, but they may actually discourage and purposely suppress such behaviors. When agentically engaged students encounter a controlling teacher, they may decrease their agentic engagement and, if they continue to express agency in the face of a teacher's resistance, they may even suffer more harm than benefit (the "backfire" effect).

4.4. Limitations

Our laboratory setting included seven methodological features that may limit the conclusions that can be drawn. First, our experimental manipulations were both brief and relatively mild when considered as training opportunities for teachers. Further research should now go beyond our minimal "intervention" to provide students and teachers with richer opportunities (e.g., through modeling, practice, and feedback) to acquire and refine the skills they need to become increasingly agentic or autonomy supportive. Second, our participants were preservice teachers who were strangers, rather than experienced students and teachers who interact in the context of a more meaningful and on-going relationship. Third, the content or subject matter of our teaching episodes focused on puzzle-solving, rather than on more authentic learning material as found in classrooms. Fourth, our laboratory setting featured one-on-one teaching that more resembled private tutoring than classroom teaching. Fifth, the wording of our experimental manipulations (e.g., "show initiative") and the wording used on our questionnaires overlapped a little, so future research should utilize different experimental manipulations, different measures, and perhaps different informants and timeframes as well (to avoid any potential demand characteristics). Sixth, students' scores in the neutral control conditions across both studies were uniformly high. These high scores suggest that we tested our hypotheses using relatively interesting learning activities

and somewhat supportive teaching. The findings might have been different had we used either less interesting learning activities or a range of learning activities that included both interesting and uninteresting things to do. Seventh and finally, our Study 2 sample size was somewhat underpowered, which likely explains why some of the Study 2 findings did not fully replicate those observed in Study 1.

5. Conclusion

When students show a little initiative, they become causal agents who contribute constructively into their own learning. Because greater agency enables educational benefits (especially greater autonomy-supportive teaching), educators now have a proverbial green light to create and implement student-focused agentic engagement interventions. Yet, one word of precaution for anyone interested in designing and implementing such interventions is that, as important as student agency is, educators should not lose sight of the parallel needs to enrich both the motivation students need to be agentically engaged and the autonomy-supportive conditions that allow agentic engagement to flourish.

Footnotes

1. On three dependent measures, we collected both student-reported and rater-scored scores. This assessment strategy allowed us to test for a significant correlation between students' subjective experiences and rater's objective scores. In each case, raters' objective scores correlated significantly with students' self-reported scores: autonomy-supportive teaching, $r(121) = 0.23$, $p = .013$; agentic engagement, $r(121) = 0.31$, $p = .001$, and overall engagement, $r(121) = 0.21$, $p = .023$.
2. We repeated the analyses using pre-performance as a covariate, but the results from the MANCOVA were virtually identical to the results from the above reported MANOVA.

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Declaration of competing interest

None.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.learninstruc.2021.101564.

References

deCharms, R. (1976). *Enhancing motivation: Change in the classroom*. New York: Irvington.

Aelterman, N., Vansteenkiste, M., Soenens, B., Fontaine, J., Haerens, L., Delrue, J., & Reeve, J. (2019). Toward a fine-grained understanding of the components of need-supportive and need-thwarting teaching: The merits of a gradual approach. *Journal of Educational Psychology, 111*, 497–521.

Ardoin, S. P., & Sayeski, K. L. (2019). Assessing and promoting the choice of academic engaged time during reading instruction. In J. Fredricks, S. Christenson, & A. L. Reschly (Eds.), *Handbook of student engagement interventions: Working with disengaged youth (Chpt, 10* pp. 135–150). San Diego, CA: Elsevier.

Assor, A., Kaplan, H., & Roth, G. (2002). Choice is good, but relevance is excellent: Autonomy-enhancing and suppressing teaching behaviors predicting students' engagement in schoolwork. *British Journal of Educational Psychology, 27*, 261–278.

Bandura, A. (2006). Toward a psychology of human agency. *Perspectives on Psychological Science, 1*, 164–180.

Bandura, A. (2018). Toward a psychology of human agency: Pathways and reflections. *Perspectives on Psychological Science, 13*(2), 130–136.

Benson, P. (2011). *Teaching and researching autonomy in language learning* (2nd ed.). London, UK: Pearson Education.

Chen, B., Vansteenkiste, M., Beyers, W., Boone, L., Deci, E. L., Van der Kaap-Deeder, J., … Verstuyf, J. (2015). Basic psychological need satisfaction, need frustration, and need strength across four cultures. *Motivation and Emotion, 39*, 216–236.

Cheon, S. H., & Reeve, J. (2015). A classroom-based intervention to help teachers decrease students' amotivation. *Contemporary Educational Psychology, 40*, 99–111.

Cheon, S. H., Reeve, J., & Moon, I. S. (2012). Experimentally based, longitudinally designed, teacher-focused intervention to help physical education teachers be more autonomy supportive toward their students. *Journal of Sport and Exercise Psychology, 34*, 365–396.

Cheon, S. H., Reeve, J., & Ntoumanis, N. (2018). A needs-supportive intervention to help PE teachers enhance students' prosocial behavior and diminish antisocial behavior. *Psychology of Sport and Exercise, 35*, 74–88.

Christenson, S. L., Reschly, A., & Wylie, C. (Eds.). (2012). *Handbook of research on Student engagement*. New York: Springer.

Deci, E. L., Spiegel, N. H., Ryan, R. M., Koestner, R., & Kauffman, M. (1982). Effects of performance standards on teaching styles: Behavior of controlling teachers. *Journal of Educational Psychology, 74*, 852–859.

Dong, Y., & Peng, C.-Y. J.((2013). Principled missing data methods for researchers. *SprinerPlus, 2*, 222. https://doi.org/10.1186/2193-1801-2-222

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39*, 175–191. https://doi.org/10.3758/BF03193146

Fredricks, J. A., Christenson, S. L., & Reschly, A. L. (Eds.). (2019). *Handbook of student engagement interventions: Working with disengaged youth*. New Jersey: Elsevier.

Fredricks, J. A., Reschly, A. L., & Christenson, S. L. (2019). Interventions for student engagement: Overview and state of the field. In J. Fredricks, S. Christenson, & A. L. Reschly (Eds.), *Handbook of student engagement interventions: Working with disengaged youth (Chpt, 1* pp. 1–11). San Diego, CA: Elsevier.

Jang, H., Kim, E.-J., & Reeve, J. (2016). Why students become more engaged or more disengaged during the semester: A self-determination theory dual-process model. *Learning and Instruction, 43*, 27–38.

Koenigs, S. S., Fiedler, M. L., & deCharms, R. (1977). Teacher beliefs, classroom interaction and personal causation. *Journal of Applied Social Psychology, 7*, 95–114.

Matos, L., Reeve, J., Herrera, D., & Claux, M. (2018). Students' agentic engagement predicts longitudinal increases in perceived autonomy-supportive teaching: The squeaky wheel gets the grease. *Journal of Experimental Education, 86*(4), 592–609.

Mynard, J., & Shelton-Strong, S. (Eds.). (2021). *Autonomy support beyond the language learning classroom: A self-determination theory perspective*. Bristol, UK: Multilingual Matters.

Patall, E. A., Pituch, K. A., Steingut, R. R., Vasquez, A. C., Yates, N., & Kennedy, A. A. U. (2019). Agency and high school science students' motivation, engagement, and classroom experiences. *Journal of Applied Developmental Psychology, 62*(1), 77–92.

Patall, E. A., Steingut, R. R., Vasquez, A. C., Trimble, S. S., Pituch, K. A., & Freeman, J. L. (2018). Daily autonomy supporting or thwarting and students' motivation and engagement in the high school science classroom. *Journal of Educational Psychology, 110*(2), 269–288.

Patall, E. A., & Zambrano, J. (2021). *Promoting an agentic orientation: An interventionin university psychology and physical science courses* (Manuscript under review).

Reeve, J. (1989). The interest-enjoyment distinction in intrinsic motivation. *Motivation and Emotion, 13*, 83–103.

Reeve, J. (2013). How students create motivationally supportive learning environments for themselves: The concept of agentic engagement. *Journal of Educational Psychology, 105*, 579–595.

Reeve, J., & Cheon, S. H. (2021). Autonomy-supportive teaching: Its malleability, benefits, and potential to improve educational practice. *Educational Psychologist, 56*, 54–77.

Reeve, J., Cheon, S. H., & Jang, H. (2020). How and why students make academic progress: Reconceptualizing the student engagement construct to increase its explanatory power. *Contemporary Educational Psychology*. https://doi.org/10.1016/j.cedpsych.2020.101899

Reeve, J., Cheon, S. H., & Yu, T. H. (2020). An autonomy-supportive intervention to develop students' resilience by boosting agentic engagement. *International Journal of Behavioral Development, 44*, 325–338.

Reeve, J., & Jang, H. (2006). What teachers say and do to support students' autonomy during learning activities. *Journal of Educational Psychology, 98*, 209–218.

Reeve, J., & Lee, W. (2014). Students' classroom engagement produces longitudinal changes in classroom motivation. *Journal of Educational Psychology, 106*, 527–540.

Reeve, J., & Tseng, C.-M. (2011). Agency as a fourth aspect of students' engagement during learning activities. *Contemporary Educational Psychology, 36*, 257–267.

Senko, C., & Miles, K. M. (2008). Pursuing their own learning agenda: How mastery-oriented students jeopardize their class performance. *Contemporary Educational Psychology, 33*, 561–583.

Skinner, E. A. (2016). Engagement and disaffection as central to processes of motivational resilience and development. In K. R. Wentzel, & D. B. Miele (Eds.), *Handbook of motivation at school (Chpt 8* (pp. 145–168). New York: Routledge.

Skinner, E. A., Kindermann, T. A., & Furrer, C. (2009). A motivational perspective on engagement and disaffection: Conceptualization and assessment of children's

behavioral and emotional participation in academic activities in the classroom. *Educational and Psychological Measurement, 69*, 493–525.

Vansteenkiste, M., Aelterman, N., Haerens, L., & Soenens, B. (2019). Seeking stability in stormy educational times: A need-based perspective on (de)motivating teaching grounded in self-determination theory. In E. N. Gonida, & M. S. Lemos (Eds.), *Motivation in education at a time of global change: Theory, research, and implications for practice, 20* pp. 53–80). Bingley, UK: Emerald.

Vansteenkiste, M., & Deci, E. L. (2003). Competitively contingent rewards and intrinsic motivation: Can losers remain motivated? *Motivation and Emotion, 27*, 273–299.

Williams, G. C., & Deci, E. L. (1996). Internalization of biopsychosocial values by medical students: A test of self-determination theory. *Journal of Personality and Social Psychology, 70*, 767–779.