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MOTIVATION AND SOCIAL PROCESSES

A New Autonomy-Supportive Way of Teaching That Increases Conceptual Learning: Teaching in Students' Preferred Ways

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We tested the educational utility of “teaching in students’ preferred ways” as a new autonomy-supportive way of teaching to enhance students’ autonomy and conceptual learning. A pilot test first differentiated preferred versus nonpreferred ways of teaching. In the main study, a hired teacher who was blind to the purpose of the study taught 63 college-age participants in small groups the same 48-minute lesson in one of these two different ways, and we assessed participants’ perceived autonomy support, autonomy-need satisfaction, engagement (self-report and rater scored), and conceptual learning (self-report and rater scored). Multilevel analyses showed that participants randomly assigned to receive a preferred way of teaching perceived the teacher as more autonomy supportive and showed significantly greater autonomy-need satisfaction, engagement, and conceptual learning. Mediation analyses using multilevel modeling for clustered data showed that this way of teaching enhanced conceptual learning because it first increased students’ autonomy. We conclude that “teaching in students’ preferred ways” represents a way of teaching that increases students’ autonomy, engagement, and conceptual learning.

Keywords *autonomy, autonomy support, conceptual learning, engagement, teaching*

When students engage in learning activities, how much autonomy-need satisfaction they experience while doing so is a reliable predictor of their conceptual learning (Jang, 2008; Kusurkar, Ten Cate, Vos, Westers, & Croiset, 2013; Vansteenkiste, Simons, Soenens, & Lens, 2004; Vansteenkiste, Simons, Lens, Soenens, & Matos, 2005). Further, when studies have utilized an experimental design to manipulate participants' experiences of high versus low autonomy, the effect of autonomy-need satisfaction on conceptual learning has been shown to be a directionally causal one (Jang, 2008; Vansteenkiste et al., 2005). Thus, the extent to which teachers can increase students' autonomy during instruction is a causal pathway to teacher-facilitated gains in several important educational outcomes (e.g., students' classroom engagement, their capacity for unsupervised self-regulation), including conceptual learning. Such a finding leads to a practical question—namely, how can teachers increase students' autonomy-need satisfaction during instruction?

SELF-DETERMINATION THEORY AND TEACHER-PROVIDED AUTONOMY SUPPORT

In self-determination theory, students are said to possess the three psychological needs of autonomy, competence, and relatedness (Ryan & Deci, 2000). The satisfaction of these three needs by the social context provides students with the psychological nutrients necessary for learning, positive classroom functioning, and psychological well-being, an assertion that has received considerable empirical support (Jang, Reeve, Ryan, & Kim, 2009; Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004). How the social context primarily satisfies students' need for autonomy is through the provision of autonomy support (Reeve, 2009).

Autonomy support is a coherent cluster of teacher-provided instructional behaviors that collectively communicate to students an interpersonal tone of support and understanding, such as "I am your ally; I am here to support you and your strivings" (Reeve, 2015). During instruction, the teacher-provided behaviors that have been empirically validated as capable of communicating this interpersonal message of support and understanding (and hence of satisfying students' need for autonomy during learning activities) include the following: offering choices (Patall, Dent, Oyer, & Wynn, 2013); framing the lesson within a context of intrinsic goal pursuit (Vansteenkiste et al., 2004); providing explanatory rationales (Jang, 2008); uttering noncontrolling and informational language (Koestner, Ryan, Bernieri, & Holt, 1984); offering opportunities for self-direction with the learning activity (Nix, Ryan, Manly, & Deci, 1999); acknowledging and accepting expressions of negative affect (Assor, Kaplan, & Roth, 2002); and allowing students to work at their own pace (display patience; Reeve & Jang, 2006). Each of these ways of supporting autonomy during instruction is particularly well suited for some particular instructional situations. For instance, providing explanatory rationales is a particularly timely and situationally appropriate autonomy support when teachers request that students engage in relatively uninteresting activities (Reeve, Jang, Hardre, & Omura, 2002). Similarly, uttering noncontrolling and informational language is a particularly timely and situationally appropriate autonomy support when teachers help students diagnose and attempt to solve their engagement, behavioral, and performance problems (Assor, Kaplan, Kanat-Maymon, & Roth, 2005). By testing the educational utility of a new way of supporting autonomy during instruction, we sought to expand teachers' potential repertoire of autonomy-supportive ways of teaching.

Many ways to support students' autonomy are possible (e.g., see Reeve & Jang, 2006), yet any effective autonomy-supportive instructional strategy starts with the same core prerequisite of first taking the students' perspective (Deci, 1995; Ryan & Deci, 2000). "Taking the students' perspective" is not, however, a behavior per se and that is probably why it does not appear in the above list of empirically validated behaviors. To translate "take the students' perspective" into a concrete instructional behavior, the teacher could introduce a formative assessment that asks students, in one way or another, what they are thinking, needing, and wanting, or for their input, preferences, and suggestions concerning a given lesson. Recognizing this, we created a new, formative assessment-based instructional strategy that assessed students' preferred way of learning.

TEACHING IN STUDENTS' PREFERRED, VERSUS NONPREFERRED, WAYS

The purpose of the present study was to test the educational utility of a new autonomy supportive way of teaching—namely, teaching in students' preferred (versus nonpreferred) ways. To teach in students' preferred ways, teachers need to do at least two things. First, they need to take their students' perspective, often by soliciting their input. Second, teachers need to act on that input to adjust how they deliver a lesson plan so that it aligns more with students' preferred ways of teaching and less with students' nonpreferred ways of teaching. If teachers can do this, then students are more likely to experience autonomy-need satisfaction during that instructional episode, because autonomy is defined as the inner endorsement of one's behavior (Ryan & Deci, 2000). Engaging in a preferred course of action is much more likely to generate an inner endorsement ("Yes, this behavior reflects who I am and what I want to do.") than is engaging in a nonpreferred course of action.

Teaching in students' preferred ways asks two things of teachers: (1) become aware of students' preferences and (2) adapt one's instruction so as to teach in those preferred ways. To provide the data needed to accomplish these instructional objectives, we conducted a pilot test. In the pilot test, we sampled from the same population of students that we planned to include in our main experiment to determine what their preferred, versus nonpreferred, ways of learning a subject matter were. Once determined, our plan in the main study was to offer students the same lesson taught in two different ways—the first of which reflected students' preferred ways of teaching and the second of which reflected relatively nonpreferred ways of teaching. We expected that the former group of participants would perceive the teacher to be significantly more autonomy supportive than the latter group of participants, because students in this condition would find the teaching to be more need satisfying (rather than need neglecting or need thwarting). More importantly, we expected that teaching in students' preferred ways would increase students' autonomy-need satisfaction, lesson-specific engagement, and conceptual understanding of the learning material. Our core hypothesis reflected a motivation mediation model—namely, exposure to our newly proposed autonomy-supportive way of teaching would increase participants' autonomy-need satisfaction that, in turn, would explain the observed gains in conceptual learning.

PILOT STUDY

We undertook the pilot study to identify two pairs of contrasting ways of teaching that (a) were widely used in classrooms, (b) could be produced in a laboratory setting, and (c) could

be used interchangeably to communicate the same lesson but in two different ways. To identify candidate ways of teaching, we reviewed three contemporary textbooks in educational psychology (Ormrod, 2014; O'Donnell, Reeve, & Smith, 2012; Woolfolk, 2012) to generate the following ways of teaching: listen to a guest speaker; listen to a student presentation; listen to a lecture; listen to an audio clip; watch a video clip; engage in independent seatwork; participate in a whole-class discussion; complete a prepared worksheet; participate in cooperative learning; and complete a drill-and-practice session. The goal of the pilot study was to produce a student-generated rank order of these 10 ways of teaching from most to least preferred. Once we had these rank orders in hand, our plan was to select one pair of preferred versus non-preferred ways of teaching to use in the teaching phase of the main study and a second pair of preferred versus nonpreferred ways of teaching to use in the learning phase of the main study.

METHOD

Participants and Procedure

Participants were 91 undergraduate students (71 females, 20 males) enrolled in various sections of a large, required educational psychology course at a large public university in the Midwestern United States. Students who participated in the pilot test were enrolled in the same educational psychology class as were students in the main study with the difference being that participants in the pilot test took the course in the fall semester while participants in the main study took the course in the spring semester. A one-page questionnaire was administered at the beginning of the class period, and students completed it without talking to one another. Participation was voluntary, and participants were told that their scores were confidential and anonymous.

Measures

The questionnaire presented a consent form, assessed demographic characteristics, and featured the following instructions: "Rate each of the following classroom activities in terms of how interesting and enjoyable you would expect it to be if carried out during this class period." The page then listed the 10 previously mentioned ways of teaching in alphabetical order accompanied by a 1 to 7 response scale in which 1 = *This instructional activity would be not at all interesting/not at all enjoyable to me* and 7 = *This instructional activity would be extremely interesting/extremely enjoyable to me*.

RESULTS AND DISCUSSION

Table 1 presents the mean rating for each of the 10 ways of teaching. We tested differences between these means using paired-sample *t* tests. Given the number of tests performed, we adopted a significance level of .01. Listen to a guest speaker, watch video clip, and participate in a whole-class discussion emerged as relatively preferred ways of teaching, while complete a drill-and-practice session, complete a prepared worksheet, and listen to a student presentation emerged as relatively nonpreferred ways of teaching. Given these data, we selected the following contrasting pair of preferred versus nonpreferred ways of teaching to use in the teaching phase of the main study: second-ranked "watch video clip" versus sixth-ranked "engage in independent

TABLE 1
Descriptive Statistics for Students' Preference Ratings of 10 Different Ways of Teaching

Way of teaching	Preference rating	
	M	(SD)
1. Listen to a Guest Speaker	5.86 _a	(1.01)
2. Watch Video Clip	5.66 _{a b}	(1.24)
3. Participate in a Whole-Class Discussion	5.26 _{b c}	(1.36)
4. Listen to Audio Clip	5.11 _{c d}	(1.52)
5. Participate in Cooperative Learning	4.63 _{d e}	(1.27)
6. Engage in Independent Seatwork	4.21 _{e f}	(1.46)
7. Listen to a Lecture	4.08 _f	(1.50)
8. Complete a Drill-and-Practice Session	3.57 _g	(1.42)
9. Complete a Prepared Worksheet	3.38 _g	(1.46)
10. Listen to a Student Presentation	3.37 _g	(1.47)

$N = 91$. Means with different subscripts differ from one another, $p < .01$, based on paired-sample t test. Possible range, 1–7.

seatwork" (M_s , 5.66 versus 4.21; $t(90) = 7.76$, $p < .001$). And we selected the following contrasting pair of preferred versus non-preferred ways of teaching to use in the learning phase of the main study: third-ranked "participate in a whole-class discussion" versus ninth-ranked "complete a prepared worksheet" (M_s , 5.26 versus 3.38; $t(90) = 9.60$, $p < .001$).

MAIN STUDY

Using the pilot test data, we used "watch video clip" followed by "participate in a whole-class discussion" to create the preferred version of the lesson and we used "engage in individual seatwork" followed by "complete a prepared worksheet" as the nonpreferred version. We hypothesized that, when teachers provided instruction to students in their preferred, relative to their nonpreferred, way of learning, participants would report greater perceived autonomy support (manipulation check) and greater (a) autonomy-need satisfaction, (b) lesson-specific engagement, and (c) conceptual understanding of the learning material. Further, we believed that the reason why participants would show greater conceptual learning was because they would first experience greater autonomy-need satisfaction (i.e., a hypothesized mediation model).

In testing the hypothesized mediation model, we added a measure of perceived teaching expertise, because perceptions of autonomy-supportive teaching have been shown to be rather highly correlated with perceived teaching expertise (Filak & Sheldon, 2003); that is, we expected that students who received instruction taught in their preferred way would experience not only high levels of autonomy-need satisfaction but also high levels of perceived teaching expertise. Thus, in the test of the hypothesized mediation model, we entered perceived teaching expertise as a second possible mediator to function as a statistical control to make sure that it was autonomy-need satisfaction and not a confounding perception of teaching expertise that explained why teaching in students' preferred ways might increase conceptual learning.

TABLE 2
Experimental Script Used to Create Students' Preferred Versus Nonpreferred Ways of Learning

<i>Minutes</i>	<i>Preferred ways of learning</i>	<i>Nonpreferred ways of learning</i>
0–5	Consent Form and Introduction	Consent Form and Introduction
6–15	PowerPoint Presentation and Lecture on Attachment Theory	PowerPoint Presentation and Lecture on Attachment Theory
16–17	Handout of Prepared Questions	Handout of Prepared Questions
18–21	Watch Video Clip	Engage in Independent Seatwork
22–33	Whole-Group Discussion	Complete Prepared Worksheet
34–43	Postexperimental Questionnaire	Postexperimental Questionnaire
44–48	Debriefing	Debriefing

METHOD

Participants

Participants were 63 undergraduate students (49 females, 14 males) at the same large, public Midwestern university. Participants were enrolled in one of several sections of the same large, required, spring semester educational psychology course. Most participants were Caucasian (57), with other participants being Asian American (5) or African American (1).

Procedure

We prepared an eight-slide Microsoft PowerPoint presentation on “attachment theory” to present to students in both conditions to serve as the subject matter to be learned. We chose this subject matter content because it was relevant to the course the participants were enrolled in, yet was not taught in that class (as we confirmed with each instructor and with each course syllabus). The eight slides presented an outline, defined attachment, identified types of attachment classifications, showed how attachment classifications are assessed among adults using self-report, explained why attachment classifications are important (what they predict), identified their developmental origins, overviewed characteristics of high-quality relationships, and offered an overall theoretical model of attachment theory.

To present this lesson, we recruited, trained, and paid one female instructor to deliver the lesson to all participants. We recruited and paid this outside instructor to deliver the lesson plan so that we could employ an instructor who was blind to the purpose of the study and to the experimental hypotheses. We trained the outside instructor to deliver the lesson in two different ways (as described below and in Table 2) and to do so with the same levels of enthusiasm, expressiveness, and responsiveness to students and to follow a prepared 48-minute script. We also trained the outside instructor to act the same way during minutes 18 to 33, by staying at the front of the classroom and by not initiating interactions with the participants (e.g., not elaborating on the video and not giving hints during the seatwork, not leading the group discussion and not providing feedback during the worksheet).

Students participated in small groups that ranged from three to eight participants.¹ Each experimental session began with the teacher and a graduate student research team member at the

front of a technology-enabled classroom with a conference table that held all the instructional materials (e.g., consent forms, questionnaires, handouts, stopwatch to keep track of time). The research team member introduced the study, handed out the questionnaires, introduced the teacher, and conducted the debriefing, while the outside instructor delivered the lesson. Students sat in movable chairs that had individual desktops mounted into the chairs and faced forward toward the teacher.

How we integrated the four instructional strategies selected from the pilot test into preferred versus nonpreferred ways of teaching appears in Table 2. As can be seen in Table 2, we divided the lesson into seven parts in which five parts presented the identical instructional content and procedures while two parts presented the same instructional content but in two different procedural ways. For the preferred way of learning, the teacher showed the video clip during minutes 18 to 21 and asked students to engage in a peer-to-peer, whole-group discussion using a set of prepared questions during minutes 22 to 33; for the nonpreferred way of learning, the teacher asked students to work individually to read and review the lyrics of the video clip during minutes 18 to 21 and asked students to complete individual seatwork to answer the same set of prepared questions during minutes 22 to 33.

For the *preferred way of learning* (experimental group), participants were introduced to the study, completed a consent form and prestudy questionnaire (0–5 minutes), and then received the previously mentioned PowerPoint-based lecture (6–15 minutes). After the lecture, each participant received an individual handout that asked nine questions pertaining to the next part of the lesson (e.g., Who does the little girl represent? Which attachment style seems to fit the girl best?). The instructor then played the video clip and asked participants to watch it to prepare themselves to answer each of the nine questions (18–21 minutes). To select a brief video clip, we searched for attachment theory keywords on the YouTube website (similar to what a classroom teacher might do) to eventually find the commercially available video, *Because of You*, written by Kelly Clarkson, Ben Moody, and David Hodger and performed by Kelly Clarkson. After the video clip, the instructor asked participants to use the next 12 minutes to discuss as a group how they might answer the nine questions (22–33 minutes). After 12 minutes of group discussion, the instructor called time and the research team member asked participants to complete the postexperimental questionnaire (34–43 minutes). Finally, the member of the research team conducted the debriefing (44–48 minutes).

For the *nonpreferred way of learning* (control group), minutes 0 to 15 were identical to those of the preferred-way-of-teaching condition, including the introduction, consent, and lecture. After the lecture, each participant received the same individual handout that asked the nine questions. Instead of playing the video clip, the instructor provided a one-page document titled, “*Because of You*, Song Lyrics by Kelly Clarkson, Ben Moody, and David Hodges; Published by Smelly Songs.” The upper third of the page listed the setting for the events depicted in the video clip (e.g., married man and woman fighting, as little girl watches. Woman has a flashback to when she was a little girl. In the flashback, girl watches her mom and dad fight and ignore her). The lower two thirds of the page then listed the 30 lines of song lyrics. The instructor asked participants to think about how they might use the information from the lecture and song lyrics to prepare themselves to answer the nine questions (18–21 minutes). After the independent seatwork, the instructor asked students to use the next 12 minutes to complete the prepared worksheet (22–33 minutes). After 12 minutes, the instructor called time and the research team member asked participants

to complete the postexperimental questionnaire (34–43 minutes). Finally, the member of the research team conducted the debriefing (44–48 minutes).

Measures

Participants completed both a prestudy and a poststudy questionnaire. The prestudy questionnaire assessed demographic information. The poststudy questionnaire assessed three perceptions of the teacher (perceived autonomy-supportive teaching, perceived controlling teaching, and perceived teaching expertise), autonomy-need satisfaction, engagement, and conceptual learning. Each scale used the same 1 to 7 response scale in which 1 = *strongly disagree* and 7 = *strongly agree*. The last page of the poststudy questionnaire included an unannounced test to assess conceptual learning.

Perceptions of the Teacher

To assess perceptions of autonomy-supportive teaching, we used the six-item short version of the Learning Climate Questionnaire (LCQ; Williams & Deci, 1996). The short-version of the LCQ has been widely used in investigations of autonomy support (Cheon, Reeve, & Moon, 2012; Jang et al., 2009) and includes items such as, “The teacher tried to understand how I saw things before suggesting a new way to do things.” Scores on the LCQ were internally consistent in the present study ($\alpha = .91$). To assess perceptions of controlling teaching, students completed the four-item Controlling Teacher Scale (CTS; Jang et al., 2009). The CTQ has also been widely used in investigations of autonomy support (Cheon & Reeve, 2013), and includes items such as, “The teacher put a lot of pressure on me.” Scores on the LCQ were internally consistent in the present study ($\alpha = .75$). To assess perceptions of teaching expertise, we created a new brief scale for the purposes of the present study that included the following two items: “The teacher knows a lot about attachment theory” and “The teacher is an expert on attachment theory” ($\alpha = .85$).

Autonomy-Need Satisfaction

To assess autonomy need satisfaction, we used the Activity-Feelings States scale (AFS; Reeve & Sickenius, 1994), a measure of psychological-need satisfaction that has been shown in past studies to predict students’ classroom engagement and course grades (Jang, Kim, & Reeve, 2012; Jang et al., 2009; Reeve, Nix, & Hamm, 2003). The AFS offers the stem, “During this class, I feel:” and lists three items to assess autonomy (“free,” “I’m doing what I want to be doing,” and “free to decide for myself what to do”); we altered the stem “During this class, I feel:” to “During this lesson, I feel:” for this assessment. The AFS includes additional items to assess competence and relatedness-need satisfaction, though we only used the autonomy scores in the present study. Scores on the autonomy scale were internally consistent in the present study ($\alpha = .70$).

Engagement

We assessed engagement in two ways: through self-report and rater scored measures. For the self-report measure, we used Jang, Reeve, and Deci’s (2010) three-item measure that is

based on Fredricks's multidimensional conceptualization of student engagement (i.e., behavioral, emotional, and cognitive; Fredricks, Blumenfeld, & Paris, 2004). The three items were as follows: "During the lesson on attachment theory, I paid attention" to assess behavioral engagement; "Learning about attachment theory was very interesting" to assess emotional engagement; and "During the lesson on attachment theory, I tried to learn as much as I could" to assess cognitive engagement. Scores on the self-reported engagement scale were internally consistent in the present study ($\alpha = .81$).

For the rater-scored measure, we used Jang et al.'s (2010) rating sheet that included the following three bipolar 1 to 7 behavioral observations: (1) *Off-task/dispersed attention* (scored 1) to *On-task/focused attention* (scored 7) to assess behavioral engagement; (2) negative emotional tone (*bored, frustrated, confused*; scored 1) to positive emotional tone (*interest, enjoyment, curiosity*; scored 7) to assess emotional engagement; and (3) superficial learning strategies (*memorization, repetition, just reads*; scored 1) versus sophisticated learning strategies (*elaborates, integrates, makes sense of*; scored 7) to assess cognitive engagement. Prior to the study, we trained four raters familiar with the multidimensional conceptualization of engagement to score participants' engagement. During each experimental session, the raters worked in pairs, sat apart from one another in the back of the room, and did not know which group (experimental or control) the participants had been assigned.² The two raters made independent ratings during minutes 18 to 33. Because there was moderate agreement between the two raters' judgments, $Kappa = .563$ ($p < .001$), 95% $CI (.453, .673)$, we averaged the raters' judgments into a single overall "rater-scored engagement" score for each participant.

Conceptual Learning

We assessed learning in two ways: self-report and rater-scored. For the self-report measure, we created a three-item scale for the purposes of the present study that included the following items: "I learned a lot about attachment theory," "I understand attachment theory well," and, "Attachment theory is confusing to me; I don't understand it" (reverse scored). Scores on this self-reported learning scale were only reasonably internally consistent ($\alpha = .64$), because some participants seemed to have difficulty with the reverse-scored item.

For the rater-scored measure, the last page of the postexperimental questionnaire featured an unannounced essay test that asked the following three writing tasks: (1) "Explain why children develop insecure attachments with their parents"; (2) "Explain why insecurely attached children tend toward negative developmental outcomes while securely attached children tend toward positive developmental outcomes"; and (3) "Explain what classroom teachers might do to provide students with a high-quality relationship." Using the information from the PowerPoint slides and the handout, raters scored the essays on a 0 to 3 scale (0 = *no conceptual understanding*; 1 = *low conceptual understanding*; 2 = *moderate conceptual understanding*; and 3 = *high conceptual understanding*). Two raters who were blind to the participants' experimental condition used the rubric to independently score each participant-generated essay. Because there was substantial agreement between the two raters' judgments, $Kappa = .732$ ($p < .001$), 95% $CI (.660, .804)$, we averaged the raters' judgments into a single overall "rater-scored learning" score for each participant.

RESULTS

Multilevel Analyses

Before testing the hypotheses, we first conducted multilevel analyses using hierarchical linear modeling (HLM, version 7; Raudenbush, Bryk, Cheong, Congdon, & du Toit, 2011) to determine whether meaningful between-session differences might have affected the student-reported or rater-scored dependent measures. The intraclass correlation coefficients (*ICCs*) associated with the eight participant and rater-assessed dependent measures calculated from unconditional models were as follows: perceived autonomy support, 21.9%; perceived controlling, 0.1%; perceived teaching expertise, 38.1%; autonomy need satisfaction, 8.4%; self-reported engagement, 18.6%; rater-scored engagement, 41.0%; self-reported learning, 19.1%; and rater-scored learning, 1.7%. Given several meaningful between-session effects, we used multilevel modeling to represent the nested nature of the data, as participants' and raters' scores (Level 1, $N = 63$) were nested within the experimental sessions (Level 2, $k = 15$). By doing so, we sought to parse the "between-session" effects so that the analyses tested the hypotheses in a way that scores on each dependent measure were statistically independent of these "controlled for" session-level effects.

Manipulation Checks

As expected, participants in the experimental group rated the teacher as significantly more autonomy supportive than participants in the control group (M_s , 6.02 versus 4.55, $t(47) = 5.26$, $p < .001$ ($d = 1.55$)). We also tested for the possibility that participants in the experimental group might perceive the teacher as significantly less controlling than participants in the control group, but they did not (M_s , 1.54 versus 1.50, $t(47) = 0.18$, $p = .856$). So, the experimental manipulation was specific to increased perceived autonomy-supportive teaching. Participants in the experimental group rated the teacher as significantly higher in expertise than did participants in the control group (M_s , 6.04 versus 5.04, $t(47) = 2.59$, $p = .013$ ($d = 0.76$)).

Main Analyses

Participants who received the lesson taught in a preferred way (experimental group) reported significantly greater autonomy-need satisfaction than participants in the control group (M_s , 5.73 versus 4.88, $t(47) = 3.07$, $p = .004$ ($d = 0.90$)). Experimental condition also predicted both measures of engagement. Participants in the experimental group self-reported significantly greater engagement than participants in the control group (M_s , 6.37 versus 5.55, $t(47) = 3.36$, $p = .002$ ($d = 0.98$)), and raters scored participants in the experimental group as displaying significantly greater engagement than participants in the control group (M_s , 5.08 versus 4.18, $t(47) = 3.62$, $p < .001$ ($d = 1.06$)). Experimental condition also predicted both measures of learning. Participants in the experimental group self-reported significantly greater learning than participants in the control group (M_s , 6.22 versus 5.69, $t(47) = 2.69$, $p = .010$ ($d = 0.78$)), and raters scored the essays authored by participants in the experimental group as displaying greater conceptual understanding than the essays authored by participants in the control group (M_s , 2.09 versus 1.60, $t(47) = 2.79$, $p = .008$ ($d = 0.81$)).

TABLE 3
Descriptive Statistics and Correlation Matrix for All Measures Included in the Mediation Analysis

Variable ^a	<i>M</i>	<i>SD</i>	1	2	3	4
1. Experimental Condition	0.48	0.50	—	.33**	.38**	.42**
2. Perceived Teaching Expertise	5.59	1.62		—	.35**	.32*
3. Autonomy-Need Satisfaction	5.32	1.08			—	.45**
4. Conceptual Learning	0.01 ^a	0.85				—

* $p < .05$; ** $p < .01$.

^a Experimental condition was scored as: control group = 0; experimental group = 1. Conceptual learning was calculated as a z score because the self-reported and rater-scored measures of learning were scored on different scales (1–7 for the self-report measure; 0–3 for the rater-scored measure).

Mediation Analysis

The descriptive statistics and intercorrelations among the four variables included in the mediation analysis appear in Table 3. For the conceptual-learning outcome measure, we calculated one overall score by first standardizing and then averaging (equally weighted) the two z scores for self-reported learning and rater-scored learning ($r(63) = .42, p = .001$). All four variables significantly and positively intercorrelated.³

To examine whether the effect of experimental condition on conceptual learning was mediated by autonomy-need satisfaction (controlling for perceived teaching expertise), we used multilevel modeling for clustered data (Krull & MacKinnon, 2001). Experimental condition predicted both autonomy-need satisfaction ($B = .846, SE = .276, t = 3.07, p = .001$) and perceived teaching expertise ($B = 1.001, SE = .387, t = 2.59, p = .013$). As predicted, autonomy need satisfaction individually predicted conceptual learning ($B = .211, SE = .085, t = 2.47, p = .017$), and the B_aB_b estimate of the mediated effect was significant ($B = .160, SE = .068, p < .05$), which confirmed mediation. Perceived teaching expertise did not individually predict conceptual learning ($B = .151, SE = .088, t = 1.72, p = .092$), and the B_aB_b estimate of its mediated effect was not significant ($B = .152, SE = .088, ns$), which confirmed nonmediation. With the two mediators included in the model, the previously confirmed direct effect of experimental condition on conceptual learning was no longer individually significant ($B = .358, SE = .227, t = 1.58, p = .122$). The final path model appears in Figure 1.

DISCUSSION

Teaching in students' preferred ways enhanced participants' perceptions of autonomy support, and it also enhanced perceptions of teaching expertise. But greater perceived teaching expertise did not explain why participants in the experimental group displayed relatively greater conceptual learning. The mediation analysis (Figure 1) showed that the reason why participants were more able to conceptually learn the material was because they first experienced greater autonomy-need satisfaction. According to Vansteenkiste et al. (2005), autonomy need satisfaction enhances conceptual learning because it energizes learners to engage in a deep and thoughtful (i.e., conceptual) processing of learning material.

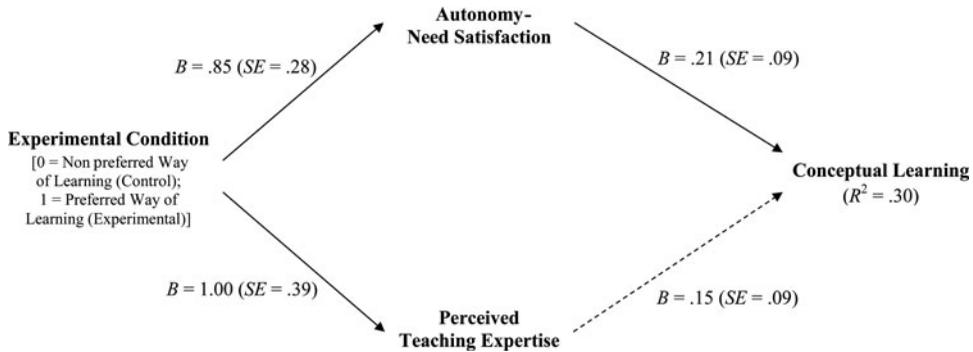


FIGURE 1 Test of the hypothesized mediation model to predict students' conceptual learning. *Notes.* Solid lines represent statistically significant paths, $p < .05$. B = unstandardized estimate of the coefficient; SE = standard error of the coefficient. All variables are observed variables.

GENERAL DISCUSSION

We initiated the present study to answer the teacher call for explicit how-to and practically relevant teaching recommendations that could help solve teachers' toughest classroom challenges, such as motivating students to engage in and to benefit from the learning activities they provide (O'Sullivan & Deglau, 2006). Specifically, teachers are looking for ways to expand their repertoire of evidence-based ways of teaching that are capable of promoting students' motivation (Turner, Warzon, & Christensen, 2011). When compared against a nonpreferred approach to teaching, students who received the lesson taught in their preferred ways perceived the teacher as more autonomy supportive, reported greater autonomy-need satisfaction during the lesson, displayed greater engagement during the lesson, and showed greater conceptual understanding of the material they were taught. This new autonomy-supportive way of teaching therefore seems to answer the aforementioned teacher's call.

Many studies documenting the benefits of autonomy-supportive teaching have contrasted it against controlling teaching (Assor et al., 2005; Deci, Eghrari, Patrick, & Leone, 1994; Koestner et al., 1984; Reeve & Tseng, 2011), a procedure that makes it difficult to discern whether students benefit more from autonomy support or suffer less from control. In the present study, our control group represented neutral instruction, a claim we make because participants in the control group reported low perceived teacher control and reasonably high levels of perceived autonomy support and autonomy-need satisfaction. What we provided to students in the control condition was neither bad nor controlling instruction but, instead, only mildly autonomy-supportive instruction. Thus, we interpret the motivational, engagement, and conceptual learning benefits observed by participants in the experimental group as benefits and gains from truly autonomy-supportive teaching.

Practical Concerns

As a practical concern, we acknowledge that teaching in students' preferred ways might be misconstrued as slapping "bells and whistles" onto a lesson. Bells and whistles (e.g., videos,

stories, jokes, cartoons, games, gifts, going outdoors) might be interesting and entertaining, but they might also be distracting and even undermining of students' learning. Distracting students away from the learning material clearly did not happen in the present study (because experimental condition significantly and positively predicted extent of conceptual learning), but we do recognize that teachers' accommodations to students' preferences needs to be done within a context of what constitutes good pedagogical practice. So, we are not suggesting that instructors accommodate to all student preferences. Instead, we encourage teachers to open a two-way dialogue with students about how the delivery of instruction can be offered in ways that vitalize, rather than neglect, students' preferences and autonomy.

A second practical concern is to ask if some ways of teaching might consistently be more preferred by students than are other ways of teaching, irrespective of students' age, gender, course subject matter, and so on. Our data cannot speak to this question, but it does lead us toward the following teaching recommendation—namely, that teachers might actively seek awareness of whatever ways of teaching their students prefer and then utilize this student input to offer the day's lesson more in students' preferred ways and less in students' nonpreferred ways.

A third practical concern might be a teacher request to simplify our recommended instructional strategy. Formative assessments take time to collect and inform instruction (e.g., teachers conduct a formative assessment on Monday, digest the data that evening, and provide altered instruction on Tuesday). Yet, the essence of "teaching in students' preferred ways" is actually rather straightforward: (1) take the students' perspective; and (2) alter instruction to align better with students' expressed preferences. Hence, in practice, teachers might begin a learning activity by asking students, "What would you like to do?", and then use that input to quickly alter the forthcoming instruction accordingly. The present study did not test this 3-minute version of the instructional strategy, but the findings do support the motivational utility of taking the students' perspective and then altering instruction to align with students' expressed preferences.

Criticisms, Alternative Interpretations, and Recommendations for Future Research

We identify two primary criticisms against our conclusion that teaching in students' preferred ways enhances their autonomy, engagement, and conceptual learning. The first criticism is that participants in the experimental group likely experienced an interest advantage, an entertainment advantage, or a social engagement advantage over participants in the control group; that is, watching a video clip and participating in a whole-group discussion is sometimes simply more interesting, more entertaining, and more socially engaging than is individual seatwork and completing a prepared worksheet, even if the content of the two lessons is identical. After all, in assessing students' preferences in the pilot test, we asked students to rate how interesting and enjoyable they found each of the 10 instructional strategies to be. That said, our argument is that letting students learn in their preferred way is fundamental to an experience of autonomy-need satisfaction (Deci, Spiegel, Ryan, Koestner, & Kauffman, 1982; Reeve & Jang, 2006). It is important to emphasize that the findings reported in Figure 1 showed that it was autonomy-need satisfaction and not the experimental condition with its built-in interest, entertainment, and social engagement advantages that explained the observed gains in conceptual learning. So, even if the experimental condition had a built-in advantage, it was gains in autonomy-need satisfaction—and not any structural feature of the experimental condition (other than its autonomy-supportive qualities)—that explained

the observed gains in conceptual learning. In a similar spirit, perceived teaching expertise was also affected by the experimental condition but it was shown not to be an alternative explanation to the autonomy need satisfaction interpretation. That said, we recognize a need for future research to assess these potentially confounding experiences (e.g., entertainment, social engagement) to see if autonomy-need satisfaction is the single mediator or if it is only one-among-many possible mediators to explain students' conceptual learning.

A second, related criticism revolves around possible alternative explanations for the observed gains in conceptual learning. While our findings support autonomy-need satisfaction as the source of these observed gains, the addition of other possible mediators and the use of alternative research designs may add new insights. In terms of other possible mediators, teaching in students' preferred ways may increase not only autonomy-need satisfaction but also competence and relatedness-need satisfaction. A future study with greater statistical power than the present study could test this multiple-mediators possibility. Engagement might also mediate the effect of autonomy-need satisfaction on conceptual learning, so we again encourage a future study with greater statistical power to test the following double-mediation hypothesized model: Instructional strategy → autonomy → engagement → conceptual learning. In terms of alternative research designs, it may be instructive to assess students' preferred ways of learning as an individual difference characteristic—that is, some students might prefer instructional strategy A but not prefer instructional strategy B, while other students might prefer instructional strategy B but not A; that is, the important variable may not be whether students are exposed to group discussions rather than to worksheets but, rather, whether or not students personally prefer a group discussion over a worksheet (or vice versa—a worksheet over a group discussion).

CONCLUSION

“Teaching in students' preferred ways” is an approach to instruction that allows teachers to translate what is most central to autonomy support—namely, “take the students' perspective”—into a concrete instructional behavior. We showed that this formative assessment strategy represents a way of teaching that is capable of enhancing students' autonomy, engagement, and conceptual learning.

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AUTHOR NOTES

Hyunshim Jang received her Ph.D. in Educational Psychology from the University of Iowa, USA. Her research interests include human motivation, curiosity, interest, internalization processes, and teacher-student relationships. **Johnmarshall Reeve** received his Ph.D. in General Experimental Psychology from Texas Christian University, USA. His research interests center on the empirical study of all aspects of human motivation and emotion with particular emphases on teachers. motivating styles, students. motivation and engagement, and the neuroscience of

intrinsic motivation. **Marc Halusic** received his Ph.D. in Social/Personality Psychology from the University of Missouri, USA. His research interests include dispositional autonomy and instructional approaches to strengthening students' capacities for thinking and reasoning, as through Socratic questioning.

NOTES

1. Because participants were in small groups that ranged from three to eight participants, we conducted a number of statistical tests to explore for any effects of group size in our data. Group size did not vary with experimental condition, $t(13) = 0.75$, $p = .465$, as the seven groups in the control condition averaged 4.71 participants while the 8 groups in the experimental group averaged 3.88 participants. Group size did not correlate significantly with perceived autonomy support, $r(15) = -.24$, $p = .394$, perceived teaching expertise, $r(15) = -.23$, $p = .417$, autonomy-need satisfaction, $r(15) = -.32$, $p = .245$, engagement, $r(15) = -.29$, $p = .230$, or conceptual learning, $r(15) = -.23$, $p = .415$. When group size was entered as a second possible independent variable (in addition to experimental condition) in the regression depicted in Figure 1, it did not uniquely predict autonomy need satisfaction ($B = .00$, $t = 0.04$, $p = .965$), perceived teaching expertise ($B = -.02$, $t = 0.34$, $p = .734$), or conceptual learning ($B = -.02$, $t = 0.32$, $p = .752$).
2. Though raters entered each experimental session blind to the experimental condition, they could use the teaching events that occurred during minutes 18 to 33 to infer whether participants were in the experimental or control group. While we acknowledge that this possible unblinding might have affected raters' scores, the raters' engagement judgments did correlate significantly with participants' self-reported engagement, $r(63) = .38$, $p = .002$, which provides a measure of validation for the raters' scores.
3. The single score for conceptual learning correlated with experimental condition, perceived teaching expertise, and autonomy-need satisfaction as follows: .42, .32, and .45 (see Table 3). For the self-reported learning measure only, these same three correlations were .37, .49, and .45. For the rater-scored learning measure only, these three correlations were .35, .05, and .31.

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