Motiv Emot (2013) 37:14–32
DOI 10.1007/s11031-012-9305-6

ORIGINAL PAPER

Student autonomy and course value: The unique and cumulative roles of various teacher practices

Erika A. Patall · Amy L. Dent · Melissa Oyer · Susan R. Wynn

Published online: 29 May 2012

Abstract High school students ($N = 278$) in 30 classrooms with ten teachers (grades 9 through 12) reported on teacher practices in a single course, autonomy need satisfaction, and value for that course. Using hierarchical linear modeling, results indicated that student perceptions of teachers providing choices and engaging in perspective-taking to a greater extent uniquely related to greater autonomy need satisfaction. Subsequent analyses suggested that students' autonomy need satisfaction was greatest when they perceived that teachers also identified the importance and usefulness of coursework and considered students' interests and opinions in course activities. Provision of choice and perspective-taking related to greater course value through autonomy need satisfaction, while identifying the importance and usefulness of course activities had only direct positive effects on course value. The pattern of total, direct, and indirect effects was slightly different depending on the component of course value. Results underscore the importance of including provision of choice in conceptualizations of teacher autonomy support.

Keywords Choice · Autonomy-support · Motivation · Course value · Teacher practices

E. A. Patall (✉)
Department of Educational Psychology, The University of Texas at Austin, 1 University Station, D5800, Austin, TX 78712, USA
e-mail: erika.patall@mail.utexas.edu

A. L. Dent
Department of Psychology and Neuroscience, Duke University, Box 90086, Durham, NC 27708, USA
e-mail: amy.dent@duke.edu

M. Oyer
Department of Psychological Studies in Education, Temple University, 1301 Cecil B. Moore Avenue, Philadelphia, PA 19122, USA
e-mail: tuc06448@temple.edu

S. R. Wynn
Program in Education, Duke University, Box 90739, Durham, NC 27708, USA
e-mail: susan.wynn.@duke.edu

Introduction

Most theorists and educators would agree that the classroom environments teachers create can have a profound effect on students' academic motivation, engagement, and achievement. Self-Determination Theory (SDT) suggests that instructional strategies and classroom environments that support students' *experience of autonomy*, or a sense that one is the origin of his or her own actions, facilitates adaptive motivation, attitudes, and activity in the classroom (Jacobs and Eccles 2000; Ryan and Deci 2000).

Previous research has identified a variety of teacher practices that can support students' experience of autonomy and, subsequently, both their academic motivation and achievement (Assor et al. 2002; Reeve et al. 2004; Reeve and Jang 2006; Reeve 2006; Stefanou et al. 2004). Many studies have shown the independent or combined effects of these teacher practices on students' experience of autonomy and academic motivation (e.g. Assor et al. 2002; Black and Deci 2000; Deci et al. 1994; Koestner et al. 1984; Reeve et al. 2004; Reeve and Jang 2006; Stefanou et al. 2004). However, far less research has compared the unique effects of these teacher practices on different components of academic motivation or the extent to which students' experience of autonomy mediates these relations. Furthermore, theory and research in recent years has begun

to downplay the importance of one particular hypothesized form of autonomy-support—the provision of choice—given contradictory findings regarding the academic effects of choice (e.g. Assor et al. 2002; Reeve and Jang 2006; Reeve 2006; Stefanou et al. 2004). This trend may be ill-advised given theoretical and empirical support for important motivational benefits of choice provision (e.g. see Patall et al. 2008 or Patall 2012 for reviews) and a more refined understanding of the circumstances under which choices can lead to adaptive academic outcomes (Iyengar and Lepper 1999; Katz and Assor 2007; Moller et al. 2006; Patall et al. 2008; Reeve et al. 2003).

In light of unanswered questions about the relative effects of teacher practices and the disputed importance of choice provision among them, this study was undertaken to examine their unique role in supporting students' autonomy need satisfaction and subsequent course value. To examine these relations, we assessed high school students' naturally-occurring perceptions of various teacher practices that previous research indicates may be related to the experience of autonomy. In particular, we examined the unique and cumulative relations between these practices with students' autonomy need satisfaction and three components of course value, intrinsic, attainment, and utility value. In addition, the extent to which relations between teacher practices and course value could be explained by students' autonomy need satisfaction was examined. Within this framework, we focused on the extent to which student perceptions of teachers' provision of choice related to students' experience of autonomy in both the presence and absence of other teacher practices.

The benefits of autonomy support

According to SDT, three fundamental needs—autonomy, competence, and relatedness—underlie people's *intrinsic motivation*, or their propensity to engage in a behavior for its own sake (or out of interest and enjoyment; Deci 1971). Social contexts that satisfy these fundamental needs will enhance intrinsic motivation (Ryan and Deci 2000). Conversely, social contexts that are experienced as controlling or otherwise undermine perceptions of autonomy, competence, and relatedness should diminish intrinsic motivation (Deci et al. 1989).

Autonomy is experienced when actions are perceived as (a) stemming from an *internal locus of causality*, or a perception that actions are initiated and controlled by oneself rather than external forces; (b) *volitional*, or a sense of freedom to engage in behavior rather than it being forced; and (c) chosen and performed out of interest or personal importance (deCharms 1968; Deci and Ryan 1987). Given these conditions, scholars have suggested that teachers can support feelings of autonomy if they (a) listen carefully and assume students' perspectives, (b) structure activities around students' interests and personal preferences, (c) identify the value, usefulness, importance, or relevance of activities, (d) use non-controlling language, (e) elicit questions and feedback from students (f) encourage students to express negative affect, (g) provide opportunities for students to work in their own way, and (h) provide opportunities for making choices (Assor et al. 2002; Reeve 2006; Reeve et al. 2002, 2004; Reeve and Jang 2006; Patall et al. 2008, 2010; Stefanou et al. 2004).

In research examining the individual effects of these teacher practices, they are often shown to promote academic motivation and other learning-related outcomes (e.g. Assor et al. 2002; Boggiano et al. 1993; Deci et al. 1981, 1994; Gagne 2003; Guay et al. 2001; Jang et al. 2010; Reeve and Jang 2006; Reeve et al. 2004; Vansteenkiste et al. 2004). Studies examining the combined effects of autonomy-supportive teacher practices also suggest benefits of adopting several of them at once for classroom engagement, intrinsic motivation, and perceived competence (e.g. Black and Deci 2000; Reeve et al. 2004). For example, a meta-analysis conducted by Su and Reeve (2011) found that teachers were rated as more autonomy supportive when they had been trained to incorporate multiple elements of autonomy support into their instruction. Likewise, primary research has shown that social contexts intended to support feelings of autonomy were associated with better conceptual learning and test performance (e.g. Grolnick and Ryan 1987; Vansteenkiste et al. 2004), deeper cognitive processing (e.g. Vansteenkiste et al. 2004), greater self-efficacy or perceived competence (e.g. Guay et al. 2001), greater effort or persistence (e.g. Reeve et al. 2002; Vansteenkiste et al. 2004) more creativity (e.g. Koestner et al. 1984), situational interest (e.g. Tsai et al. 2008), and more positive affect (e.g. Deci et al. 1992; Ryan and Grolnick 1986).

Further, some studies have shown that students' autonomy need satisfaction mediates the link between such teacher practices and positive motivation outcomes (e.g., Grolnick et al. 1991; Vallerand et al. 1997). For example, Reeve et al. (2002) found that providing a rationale highlighting the personal usefulness of a language learning task using non-controlling language and acknowledging negative affect enhanced students' sense of autonomy and importance, which in turn improved their effort.

Despite the array of motivational outcomes that autonomy support has been found to enhance, empirical tests of the differential impact of various practices hypothesized to support autonomy on separate components of students' value for an academic activity have been somewhat neglected. Modern expectancy-value theorists focused on the academic domain (e.g. Eccles [Parsons] et al. 1983; Feather 1982; Jacobs and Eccles 2000) have outlined four

distinct components of task value: (1) *attainment value*, or the personal importance of doing well on a task, (2) *intrinsic value*, or the interest and enjoyment experienced from performing the task, (3) *utility value*, or the extent to which a task facilitates future or current goals, and (4) *cost*, or the negative aspects of engaging in a task (e.g. Eccles and Wigfield 1995). According to expectancy-value theories, these four components of task value play an important role in determining the activities students choose to engage in (Eccles [Parsons] et al. 1983; Eccles et al. 1984; Eccles and Harold 1991; Eccles and Wigfield 1995), as well as their subsequent use of learning strategies and task performance (Pintrich and De Groot 1990). It is also worth noting that components of task value may also bear some conceptual similarity to other motivation constructs influenced by autonomy-supportive teacher practices. For example, intrinsic task value may be a precursor of intrinsic motivation. Likewise, utility and attainment value may be precursors of *identified regulation*, or intentions to engage in a task because it is personally valued. Further, attainment value bears some conceptual similarity to *competence valuation*, or the importance an individual attaches to doing well at an activity (e.g. Harackiewicz and Manderlink 1984).

Consistent with the tenets of SDT and research exploring them, expectancy-value theorists have suggested that supporting the experience of autonomy and especially opportunities for choice may create the critical context in which task values develop and students' subsequent engagement and achievement are enhanced (e.g. Jacobs and Eccles 2000). For example, Midgley and Feldlaufer (1987) found that middle school students were more likely to feel competent and to value schoolwork if they believed they had some autonomy in choosing activities. Similarly, Garcia and Pintrich (1996) found that college students' perceptions of being afforded more opportunities for decision making predicted greater course value and self-efficacy. However, few if any studies have both explored and compared the effect of multiple autonomy-supportive teacher practices on students' task value as a whole or its four components separately. Therefore, it is unclear whether it is important to distinguish among these practices in terms of their effect on components of task value and the extent to which autonomy need satisfaction mediates their effects. This present study sought to explore these questions.

The benefits and paradox of choice provision

As previously implied, one autonomy-supportive teacher practice that has received a great deal of attention in the literature is the provision of choice (e.g. choices about actions, tasks, topics, classroom management, among other things in a classroom context). Providing choices may be one of the most conspicuous ways to support student's experience of autonomy. As such, theories of motivation suggest that choice should result in positive motivational and performance outcomes (Deci 1980; Jacobs and Eccles 2000; Ryan and Deci 2000). Overall, a great deal of research has supported this theoretical prediction by demonstrating that the provision of choice leads to enhanced interest, enjoyment, and persistence on a task (Cordova and Lepper 1996; Iyengar and Lepper 1999; Swann and Pittman 1977; Mouratidis et al. 2011; Patall et al. 2008, 2010; Zuckerman et al. 1978), as well as enhanced task value, effort, task performance, subsequent learning, and perceived competence (Cordova and Lepper 1996; Garcia and Pintrich 1996; Midgley and Feldlaufer 1987; Iyengar and Lepper 1999; Patall et al. 2008, 2010).

However, there has been inconsistent evidence that the effect of providing choices is positive. For example, some studies have found that choice may have no or even a negative effect on motivation and performance related outcomes (Assor et al. 2002; Flowerday and Schraw 2003; Flowerday et al. 2004; Reeve et al. 2003; Parker and Lepper 1992; Overskeid and Svartdal 1996). As a consequence, a number of researchers have assumed that choice may not be either effective or essential in supporting the experience of autonomy or that other teacher practices may be more effective in supporting students' academic motivation and learning than the provision of choices. (Assor et al. 2002; Stefanou et al. 2004; Reeve and Jang 2006; Reeve et al. 2003).

Indeed, recent research has suggested that not all choices are equally effective. In particular, the effects of choice have been found to vary based on the extent to which they promote freedom to express one's preferences and initiate or regulate one's own behavior (Katz and Assor 2007; Reeve et al. 2003) and whether choices are administered in an autonomy-supportive or controlling manner (Moller et al. 2006; Patall et al. 2008). For example, Reeve et al. (2003) found that while choices between experimenter prescribed task options had little impact on intrinsic motivation, choices that involved making decisions regarding the initiation of behavior did enhance motivation. Moreover, Moller et al. (2006) found that only an unrestricted form of choice had a beneficial effect on persistence and performance, whereas controlled choices in which participants were led to choose a particular option diminished persistence and performance. Taken together, these studies suggest that when choice is defined as ongoing decision-making, rather than merely picking between options prescribed by the teacher, then the provision of choice may play an important role in the experience of autonomy. Indeed, Reeve and Jang (2006) found that having time to work in one's own way, which reflects ongoing action choices and decision-making, uniquely

predicted the experience of autonomy and interest-enjoyment even after accounting for ten other hypothesized autonomy-supportive practices.

The present study

To date, a great deal of research has linked autonomy support as both a Gestalt-like perception of multiple practices or as individual practices or sets of practices to an array of motivation-related outcomes. However, several questions remain unanswered.

First, few studies have explicitly included the provision of choices and decision-making opportunities in their investigations of the association between *multiple* teacher practices and students' experience of autonomy. Therefore, the relative importance of autonomy-supportive teacher practices remains unclear. To address this gap in the literature, this study examines both the unique effects of various teacher practices on students' autonomy need satisfaction, as well as the cumulative effect of simultaneously experiencing multiple autonomy-supportive teacher practices.

Moreover, providing choice may be especially important because it may influence students' perception of many other adaptive teacher practices in a single interpersonal interaction. That is, when students' perceive that teachers allow them to make their own choices and decisions, this may also promote students' perception that the teacher is listening to them, taking their perspective into consideration, and attempting to understand or respect them. Given this potential hierarchical nature of these practices, it remains in question whether the provision of choice might have a unique effect on autonomy need satisfaction even after accounting for other teacher practices or in their absence.

Consistent with what the prior literature has implied (e.g., Reeve and Jang 2006), we expected to find that teachers' provision of choice would emerge as a unique predictor of students' autonomy need satisfaction after accounting for other teacher practices when choice provision was defined as both teacher-determined option choices and open-ended action choices. Given its potential richness to provide autonomy-supportive information, we expected that choice may be able to enhance the experience of autonomy even when students perceived that their teacher infrequently engaged in the other practices. We also expected that other teacher practices would uniquely predict students' autonomy need satisfaction. However, the diversity of results in prior research and the relative infrequency with which all of the autonomy-supportive practices have been explicitly linked to students' experience of autonomy (rather than more distal motivation outcomes) prevented us from forming any firm hypotheses about which practices would be most important. In line with past research and our reasoning that multiple teacher practices would especially support students' need for autonomy, we expected that their autonomy need satisfaction would be strongest in the presence of more autonomy-supportive teacher practices.

Finally, the extent to which teacher practices have differential relations with the three components of course value, and the role of autonomy need satisfaction in mediating these relations, remains in question. Some scholars have suggested that the provision of choice may have positive effects on the most proximal motivation related outcomes (i.e. intrinsic motivation), but other practices may be more effective for supporting enduring engagement and learning (e.g. Stefanou et al. 2004). In line with this reasoning, we might expect that teacher practices may support different components of task value either directly or through an effect on students' experience of autonomy. For example, providing or perceiving choices may support students' autonomy need satisfaction and the somewhat transitory state of intrinsic motivation or intrinsic task value. However choice may support other forms of motivation and enduring learning outcomes, such as attainment value, utility value, or long-term engagement to a lesser extent. Instead, these outcomes may be more strongly related to teacher practices such as highlighting the importance or relevance of course material, perspective-taking, providing opportunities to express negative affect, and providing opportunities for students to express and utilize personal opinions, preferences, and interests (Patall et al. 2010).

Methods

Participants

A total of 278 high school students from grades 9 through 12 (62 % female; mean age = 16.37) participated in this study. Participants were from 30 English and Social Studies classrooms at one urban high school in a southeastern state. Approximately 62 % of these students were from an honors-level course, with all others from courses taught at the traditional level. A majority (58.6 %) of the students across these classes were Caucasian, while 19.1 % were African American, 7.2 % were Asian, 6.8 % were Hispanic, 0.4 % were Native American, and 7.9 % were of mixed ethnicities or did not report ethnicity. Participation was voluntary and students secured parental permission to do so. The number of students participating in each class ranged from one to twenty-four. The 30 classrooms had one of ten pre-service teachers who were completing their required teaching internship at a nearby private university. The pre-service teachers prepared and administered anonymous surveys to students as part of their research

requirement for the certification program after receiving training from the first or second author.

Procedure

During a single class session, students were administered a background and school experiences questionnaire by the pre-service teacher completing their internship in the class, which occurred from January through May. Pre-service teachers began their internship by first observing their classrooms and interacting with students and teachers for several weeks in order to become comfortable in the classroom environment. Midway through their internship, pre-service teachers took over the majority of class instruction and management. The questionnaire was administered immediately following the end of the instructional unit (approximately 6 weeks) in which pre-service teachers had been responsible for the majority of the classroom instruction, activities, and homework. Students were explicitly instructed to complete questions about teacher practices with regard to their pre-service teacher. Students had been interacting with their pre-service teacher for approximately 4 months at the point when they completed the questionnaires. As a result, we felt they would have become sufficiently familiar with the pre-service teacher and their teaching practices over the course of those 4 months. The questionnaire included questions about the students' gender, ethnicity, perception of various teacher practices intended to support autonomy, autonomy need satisfaction, and value for the course. Perceptions of teacher practices, autonomy need satisfaction, and course value were all in reference to the particular class in which the participant was completing the survey. Upon completion, the pre-service teachers explained the purpose of the study to their students.

Materials

Background questionnaire

The background questionnaire included questions regarding students' gender, age, and ethnicity.

School experiences questionnaire

The school experiences questionnaire consisted of three measures: the Perceived Self-Determination scale (PSD; Reeve 2002), a scale of value for the course (Wigfield et al. 1997), and a teacher practices scale designed for use in this study. All questionnaire items were measured on a Likert-type scale ranging from 1 (not at all true) to 7 (very true).

Students' *autonomy need satisfaction* was assessed with 6 items from the PSD (Reeve 2002; Reeve et al. 2003) measuring the students' experience of an internal perceived locus of causality and volition. Although perceived choice is often included in this scale, these items were excluded for this administration of the scale because they would have been redundant with our measurement of choice provision as one of the teacher practices. Further, prior research has suggested that perceived choice may be more appropriately thought of as a construct separate from, though related to, perceived self-determination or the experience of autonomy (Reeve et al. 2003). Three items assessed an internal perceived locus of causality (e.g., "I feel I do what I want to be doing in class") and three items assess volition (e.g., "In class I feel free"). The validity and reliability of this scale have been established in previous studies (Reeve et al. 2003; Reeve and Jang 2006).

Students' *course value* was measured with six items adapted from a subjective task value scale created by Wigfield et al. (1997). Two items assessed each of the following components of course value: intrinsic value (e.g., "In general, I find working on my academic work for this class very interesting" and "I like doing work for this class"), attainment value (e.g., "For me, being good in this class is very important" and "Compared to other activities, is it for very important to be good in this class"), and utility value (e.g., "In general, what I am learning in this class is useful" and "Compared to most other activities, what I learn in this class is useful"). The validity and reliability of the scale have been established in previous studies (Wigfield et al. 1997).

We submitted students' responses to the scales measuring their autonomy need satisfaction and course value to an exploratory factor analysis (EFA) using principal axis extraction with oblique rotation in order to determine whether these scales were assessing distinguishable constructs. Results of the EFA suggested a three factor solution was most appropriate, with items measuring intrinsic and utility value loading most strongly on Factor 1, items assessing attainment value loading most strongly on Factor 2, and all items measuring autonomy need satisfaction loading most strongly on Factor 3. Scores for autonomy need satisfaction and attainment value were computed by taking the mean of the items on each respective scale (autonomy need satisfaction: $\alpha = .74$; attainment value: $r = .68$, $\alpha = .81$). Although the EFA did not support computing separate scores for utility and intrinsic value, motivation theory suggests that these constructs are conceptually distinct (Wigfield and Eccles 2000). Therefore, we computed separate scores for these two components of course value by taking the mean of items on each scale (intrinsic value: $r = .73$, $\alpha = .84$; utility value: $r = .77$, $\alpha = .87$). Additional details regarding the EFA may be obtained from the first author.

Students' perceptions of the extent to which teachers used practices intended to support autonomy were assessed

with a scale designed explicitly for use in this study. Similar to the approach taken by Katz et al. (2009) to develop a measure of teachers' psychological need support, we created a 36-item scale using two strategies. First, we adapted items from various measures used in prior research. Second, we referred to previous research on autonomy-supportive practices to developed new items that assess students' perceptions of eight categories of teacher behavior that may support students' feelings of autonomy (Assor et al. 2002; Belmont et al. 1992; Connell 1990; Wellborn and Connell 1987; Reeve et al. 2004; Reeve and Jang 2006; Reeve 2006; Stefanou et al. 2004). These eight categories of teacher behavior were: (1) *provision of teacher-specified choices and options* (4 items; e.g. "When my teacher gives us an assignment, he or she allows us to choose which questions to answer"), (2) *opportunities for students to choose how to work or to work in their own way* (6 items; "My teacher allows me to choose how to do my work in the classroom"), (3) *use of non-controlling language* (3 items; e.g. "The way my teacher speaks with students expresses how we "could" or "might" do things, rather than how we "should" or "must" do things"), (4) *identifying the usefulness, importance, and relevance of course activities* (7 items; e.g. "My teacher explains how what we are learning may be important"), (5) *listening and student perspective-taking* (3 items; "My teacher listens carefully to students"), (6) *providing opportunities for student questions and opinions* (6 items; "My teacher provides opportunities for students to ask questions" or "My teacher asks students their opinions about what we are learning"), (7) *providing opportunities for students to express negative affect* (4 items; "My teacher is accepting when students express negative feelings about course material"), and (8) *structuring activities around student interests* (3 items; "My teacher structures class activities around the students' interest").

Results

Preliminary analyses and exploratory factor analysis

We first used Grubbs' (1950) test to examine the distribution of scores on each item for statistical outliers. There were no outliers detected.

In line with the approach taken by Katz et al. (2009) and research showing that various teacher practices may be reduced to four or five categories (e.g. Su and Reeve 2011), we conducted a series of EFAs to reliably distinguish between categories of teacher practices within the data collected from the 36-item teacher practices questionnaire. A series of EFAs using principal axis extraction with oblique rotation suggested that four categories of teacher practices could be reliably distinguished once ten items that did not load strongly on any factor (<.40) were removed. In this series of EFAs, we next removed four items with high cross-loadings (>.30) on multiple factors. The resulting four categories were labeled: provision of choices, rationale provision, perspective-taking, and consideration for student preferences. Of particular note, items used to measure non-controlling language were found to be problematic in that they neither formed an independent factor nor load adequately (>.40) on any of the factors.

Results of the EFAs with the final 22 items suggested that the data were indeed suitable for factor analysis (Kaiser–Meyer–Olkin measure of sampling adequacy [KMO] = .93; Bartlett's Test of Sphericity: $\chi^2(231) = 3{,}356.35$, $p < .001$). Both the Kaiser–Guttman retention criterion and Cattel's scree plot suggested a four factor solution. The four factors explained 63 % of the total variance in the set of variables. The criterion of a factor loading greater than or equal to .40 was used. Factor 1 accounted for 43 % of the variance, with six items measuring the provision of teacher-determined option choices, opportunities for students to choose how to work, and opportunities for students to work in their own way loading onto this factor (eigenvalue = 9.53). Factor 2 accounted for 8 % of the variance, with six items measuring the extent to which teachers identify the importance, usefulness, and relevance of material loading onto this factor (eigenvalue = 1.76). Factor 3 accounted for 7 % of the variance, with five items measuring perspective-taking, opportunities to ask questions, and opportunities for students to express negative affect loading onto this factor (eigenvalue = 1.44). Factor 4 accounted for 5 % of the variance, with five items measuring the extent to which teachers structure the class around students' interests and provide opportunities for students to express opinions loading onto this factor (eigenvalue = 1.14). Table 1 presents a list of these items and factor loadings. Scores were computed by taking the mean of the items on each factor, with all scales demonstrating high reliability (choice provision: $\alpha = .84$; rationale: $\alpha = .92$, perspective-taking: $\alpha = .80$; preference consideration: $\alpha = .84$).[1]

[1] Several aspects of this analysis are worth noting. First, we had expected to be able to distinguish between two different types of choices: (1) those for which teachers simply provide options for or during activities and assignments or (2) more complex choices where teachers allow students to work in their own way and give students the decision-making freedom to guide their own study process. However, our EFA suggested that these two forms of choice were not easily distinguished, at least in the minds of students. We likewise found that a number of teacher practices seem to cluster together, aside from the factor that exclusively represented teachers' rationale provision for course activities. There was intuitive appeal in the finding that teachers' listening, perspective-taking, encouraging student questions, and providing opportunities to express negative feelings about the class formed one cluster of practices, while teachers' consideration for students' interests and opinions formed a

Table 1 Factor loadings from exploratory factor analysis

Item	Factor			
	Choice	Rationale	Perspective taking	Interests/ opinions
My teacher allows me to choose how to do my work in the classroom	.71			
My teacher encourages students to approach course assignments in their own way	.67			
My teacher encourages me to work in my own way	.60			
I feel that my teacher provides me with choices and options	.55			
My teacher asks us if there are things we would like to change in the way we study	.47			
When my teacher gives us an assignment she/he allows us to choose which questions to answer	.40			
My teacher demonstrates how what we are learning is useful		−.86		
My teacher explains how what we are learning may be important		−.81		
My teacher explains how course assignments may be important		−.74		
My teacher provides reasons for what we are learning in class		−.71		
My teacher explains how classroom activities may be valuable		−.66		
My teacher talks about the connection between what we are studying in school and real life		−.66		
My teacher is accepting when students express negative feelings about course material			.74	
My teacher is open to hearing student criticism or complaints about activities and assignments			.70	
My teacher is understanding when students express that course material is hard			.59	
My teacher listens carefully to students			.51	
My teacher provides opportunities for students to ask questions			.49	
My teacher asks students their opinions about various assignments				−.81
My teacher asks students to give feedback about their reactions to various assignments				−.67
My teacher asks students their opinions about what we are learning				−.65
My teacher works the students' interests into his/her lessons				−.41
My teacher takes students' preferences into consideration for assignments				−.41

Factor loadings < .30 are not presented

The unique relations between teacher practices, autonomy need satisfaction, and course value

Table 2 presents correlations and descriptive statistics for the study variables. We explored the direct relations between teacher practices and both students' autonomy need satisfaction and the three components of course value, as well as the indirect relations between teacher practices and course value through autonomy need satisfaction. We performed a series of analyses using hierarchical linear modeling to evaluate the direct, indirect, and total effects of teacher practices on course value through autonomy need satisfaction (e.g. Raudenbush and Bryk 2002). The mediation procedures we used are largely consistent with those commonly used in a single-level modeling context (e.g. Baron and Kenny 1986; MacKinnon et al. 2002). However, the nested structure of our data in which students (Level 1) were nested within teachers (Level 2) was accounted for by using multilevel mediation procedures (Bauer et al. 2006; Zhang et al. 2009). With this approach, the within- and between-group effects were decomposed through appropriate variable centering.

First, we calculated the intraclass correlations (ICCs) for all relevant outcome variables from their unconditional (intercept-only) models. To allow for comparisons between unconditional models and subsequent models in which predictors were added, only participants with complete data across teacher practices, course value, and demographic characteristics ($N = 267$) were included in the analyses.

Footnote 1 continued
separate cluster of practices. Although we had intended to examine a broader set of practices hypothesized to support autonomy than prior measures included (e.g. Assor et al. 2002; Belmont et al. 1992), we found it somewhat reassuring that our data-reduction strategy instead led to a similar grouping of practices as those assessed by measures used in earlier investigations (e.g. Assor et al. 2002). It should be noted that results from EFAs examining our measure of autonomy supportive practices conflict with those found by Katz et al. (2009), where teacher's support for autonomy, competence, and relatedness loaded on a single factor. However, results from EFAs of our measure are more in line with other previous research (e.g. Reeve 2006; Su and Reeve 2011) and suggested that students can indeed differentiate between several broad categories of teacher behavior intended to be autonomy supportive.

Table 2 Means, standard deviations, and intercorrelations among variables

Measure	M	SD	1	2	3	4	5	6	7	8	9	10	11
1. Ethnicity	.41	.49	–										
2. Honors class status	.63	.48	−.23***	–									
3. Sex	.63	.48	−.03	.17**	–								
4. Grade level	.57	.50	−.01	−.05	−.004	–							
5. Choice provision	4.25	1.18	.13*	−.22***	−.20***	.04	–						
6. Rationale provision	5.11	1.27	.12*	−.25***	−.08	.05	.57***	–					
7. Perspective-taking	5.64	.91	.11†	−.10†	−.05	.02	.52***	.57***	–				
8. Interests/opinions	5.12	1.20	.13*	−.15*	−.12*	.08	.65***	.63***	.59***	–			
9. Autonomy need satisfaction	4.73	1.12	.13*	−.16*	−.04	.04	.52***	.44***	.47***	.47***	–		
10. Intrinsic value	4.69	1.60	.23***	−.10†	.06	.16**	.37***	.45***	.28**	.30***	.53***	–	
11. Attainment value	5.44	1.39	.13*	.11	.17**	−.09	.18**	.32***	.30***	.22***	.23***	.44***	–
12. Utility value	5.29	1.51	.14*	−.07	−.01	.17**	.28***	.50***	.37***	.30***	.45***	.71***	.45***

$N = 267$; only participants with complete data on all variables included

† $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

The ICCs suggested that a multilevel model approach would provide an advantage over a standard fixed-effects model approach, at least for some outcome variables (autonomy need satisfaction: ICC = .06, intrinsic value: ICC = .11; attainment value: ICC = .14; utility value: ICC = .27). The variance component for teacher (τ_{00}) was not significant in the unconditional model for any outcome, though it was marginally significant for utility value ($p = .07$). Nevertheless, we decided to retain this term in the multilevel models because doing so was consistent with the data structure, the lack of significance may have been a reflection of lower power at Level 2, and the two-level data structure did not produce any estimation difficulties.

To examine the relation between teacher practices and students' autonomy need satisfaction, we conducted a random intercept-only model in which autonomy need satisfaction was first regressed on four covariates: student ethnicity (white = 1, non-white = 0), honors class status (regular class = 0, honors class = 1), student sex (male = 0, female = 1), and student grade level (lower classman = 0, upper classman = 1). Next, we added three Level 1 teacher practices predictors (rationale provision, perspective-taking, and consideration for student preferences). We initially excluded provision of choices from the model because of the likely hierarchical nature of the practices. We next examined the unique contribution of providing choice over and above the other teacher practices by including this variable in a third random intercept-only model. All teacher practices were group-mean centered (the group in this case being the teacher) to produce a pure within-group effect estimate. This model provided the first part of the within-teacher indirect effect estimate for our meditational models.

We next conducted a series of multilevel models to examine the direct, indirect, and total effects of teacher practices on students' course value. First, we conducted a series of three random intercept-only models in which the course value outcome was regressed on the four covariates listed above. Second, three Level 1 teacher practices predictors (rationale provision, perspective-taking, and consideration for student preferences) were added to the models. Third, teachers' provision of choices was added to each of the models. Again, all teacher practice predictors were group-mean centered. Finally, we added autonomy need satisfaction to the full model predicting students' course value to produce both the within-group direct effect estimate and the second part of the within-group indirect effect estimate. This set of models was run independently for the three components of students' course value.[2] Next, we present the results of these multilevel analyses.

Autonomy need satisfaction

When the provision of choices was not included in the model, there was a significant fixed effect of two teacher

[2] Although we examined the total effects of teacher practices on course value, we did not require that total effects be significant to establish mediation (MacKinnon et al. 2002). Instead, we required that the teacher practice predictor demonstrate a significant relation with autonomy need satisfaction, that autonomy need satisfaction demonstrate a significant relation with the course value outcome, and that a test of this indirect effect be significant.

Table 3 Conditional models for perceived autonomy

Fixed effects	Autonomy need satisfaction			Autonomy need satisfaction (without provision of choice)			Autonomy need satisfaction (with provision of choice)		
	Coeff	SE	*t*	Coeff	SE	*t*	Coeff	SE	*t*
Intercept (γ_{00})	4.89***	.22	22.35	4.70***	.19	24.60	4.63***	.19	24.81
Ethnicity (γ_{10})	.22	.14	1.54	.14	.12	1.16	.13	.12	1.12
Honors class status (γ_{20})	−.30	.20	−1.47	−.25	.18	−1.45	−.27	.17	−1.60
Sex (γ_{30})	−.02	.14	−.15	.05	.12	.44	.18	.12	1.46
Grade level (γ_{40})	.14	.17	−.79	.11	.15	.72	.12	.15	.80
Rationale provision (γ_{50})				.11	.07	1.61	.01	.07	.16
Perspective-taking (γ_{60})				.28**	.09	3.24	.21*	.09	2.50
Interests/opinions (γ_{70})				.23***	.07	3.14	.09	.07	1.23
Choice provision (γ_{80})							.36***	.07	4.96
Random effects	Var comp	SE	*Z*	Var comp	SE	*Z*	Var comp	SE	*Z*
Teacher (level 2, τ_{00})	.09	.07	1.17	.06	.05	1.15	.06	.05	1.22
Student (level 1, σ^2)	1.18***	.10	11.26	.92***	.08	11.20	.84***	.07	11.18

$N = 267$

Coeff coefficient, *Var comp* variance component

† $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

practices on students' autonomy need satisfaction within teachers. Specifically, teacher perspective-taking and consideration for student preferences was significantly related to greater autonomy need satisfaction. When provision of choices was included in the model, however, consideration for student preferences was no longer a statistically significant predictor of autonomy need satisfaction. This finding suggests that the student perception of teachers' provision of choice subsumes at least some of the relation between student perceptions of teachers taking consideration of interests and opinions and their autonomy need satisfaction. Provision of choices significantly predicted autonomy need satisfaction, controlling for all other teacher practices and demographic covariates. This finding suggests that students' autonomy need satisfaction is positively related to their perception of teachers providing choices within the classroom. Student perceptions that teachers provide importance or usefulness rationales did not significantly predict students' autonomy need satisfaction, nor did any of the demographic covariates.[3] These results are summarized in Table 3.

[3] Interactions between the demographic characteristics and teacher practices were examined in a series of subsequent random intercept-only models to explore whether the relation between teacher practices and autonomy need satisfaction might vary as a function of students' ethnicity, honors class status, sex, or grade level. Interactions between all demographic characteristics and teacher practices were added to separate models for each characteristic. No significant interaction effects were found.

Intrinsic value

There was a significant total fixed effect of rationale provision on intrinsic value within teachers. Further, rationale provision remained a significant predictor even after choice provision was added to the model. The provision of choices also significantly predicted intrinsic value controlling for all other teacher practices and demographic characteristics.

Next, the full model predicting intrinsic value for the course was estimated. As expected, students' autonomy need satisfaction significantly predicted students' intrinsic value for the course. This finding suggests that students with greater autonomy need satisfaction have greater intrinsic value for the course. As shown in Table 4, the coefficient for the relationship between provision of choices and intrinsic value was initially significant ($\gamma_{80} = .39$, $p < .001$) within teachers. However, this value became only marginally significant when autonomy need satisfaction was added to the model ($\gamma_{80} = .17$, $p = .10$). A Sobel test (1982) confirmed that within any given teacher, students' autonomy need satisfaction was a significant mediator of the relation between their perceptions of teachers providing choices and their intrinsic course value ($z = 4.05$, $p < .001$). The proportion of mediated effect (PME) for the relation between choice provision and intrinsic value was .55, suggesting that autonomy need satisfaction partially mediated their relation. In contrast, autonomy need satisfaction did not mediate the relation between rationale provision and intrinsic value. That is, the coefficient for the relation between student perceptions that teachers' identified the importance or relevance of course

Table 4 Conditional models for intrinsic value

Fixed effects	Intrinsic value (without mediator and practices)			Intrinsic value (without choice and mediator)			Intrinsic value (with choice and without mediator)			Intrinsic value (with mediator)		
	Coeff	SE	*t*	Coeff	SE	*t*	Coeff	SE	*t*	Coeff	SE	*t*
Intercept (γ_{00})	4.25***	.32	13.43	4.02***	.30	13.56	3.94***	.29	13.49	4.52***	.36	12.52
Ethnicity (γ_{10})	.70***	.19	3.63	.67***	.18	3.71	.66**	.18	3.73	.58***	.16	3.60
Honors class status (γ_{20})	−.32	.30	−1.08	−.22	.28	−.80	−.25	.27	−.92	−.22	.26	−.87
Sex (γ_{30})	.20	.20	1.00	.24	.18	1.34	.38*	.18	2.07	−.27	.17	−1.58
Grade level (γ_{40})	.23	.25	.93	.49*	.23	2.08	.51*	.23	2.21	.56*	.22	2.56
Rationale provision (γ_{50})				.50***	.10	4.99	.39***	.10	3.83	.39***	.09	4.11
Perspective-taking (γ_{60})				.01	.13	.06	−.07	.13	−.54	−.19	.12	−1.62
Interests/opinions (γ_{70})				.02	.10	.23	−.12	.11	−1.10	−.17†	.10	−1.72
Choice provision (γ_{80})							.39***	.11	3.59	.17†	.10	1.68
Autonomy need satisfaction (γ_{90})										.59***	.09	6.86
Random effects	Var comp	SE	*Z*	Var comp	SE	*Z*	Var comp	SE	*Z*	Var comp	SE	*Z*
Teacher (level 2, τ_{00})	.23	.16	1.42	.20	.14	1.41	.20	.14	1.42	.20	.14	1.50
Student (level 1, σ^2)	2.22***	.20	11.28	1.92	.17	11.21	1.83***	.16	1.19	1.55***	.14	11.16

$N = 267$

Coeff coefficient, *Var comp* variance component

† $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

activities and their intrinsic course value was initially .39 ($p = .001$) within teachers and it remained the same after autonomy need satisfaction was added to the model (Sobel test: $z = .14$, $p = .89$; PME = .016).

We also examined the significance of perspective-taking on intrinsic course value through autonomy need satisfaction because perspective-taking remained a significant predictor of students' autonomy need satisfaction after controlling for the other teacher practices. A statistically significant indirect effect of perspective-taking was found (Sobel test: $z = 2.20$, $p = .03$; PME = .40).[4]

Attainment value

There was a significant total fixed effect of students' perceptions of the extent to which their teachers provided rationales and engaged in perspective-taking within teachers for attainment course value. That is, students who perceived their teachers as providing a rationale for course activities and engaging in perspective-taking to a greater extent reported greater attainment value for the course. There was not a significant total effect of either consideration for student preferences or provision of choices on students' attainment value once all other teacher practices and demographic covariates were controlled.

Next, the full model predicting attainment value for the course was estimated. As shown in Table 5, there was not a significant overall effect of students' autonomy need satisfaction on attainment value for the course within teachers

[4] To explore the possibility that the indirect path between teacher practices and intrinsic course value through autonomy need satisfaction might vary as a function of students' ethnicity, honors class status, sex, or grade level, moderated mediation and mediated moderation were explored following recommendations of Muller et al. (2005) and Preacher et al. (2007) in a series of subsequent random intercept-only models. First, to examine the moderated relations between predictors and the course value outcome, interactions between demographic characteristics and teacher practices were added in separate models for each characteristic. However, no significant interaction effects were found. Therefore these interaction terms were removed from the models. As previously explained, there were also no significant interactions between demographic characteristics and teacher practices on autonomy need satisfaction. Finally, we added the interaction terms between autonomy need satisfaction and each demographic characteristic in a series of four separate models for each characteristic. A significant interaction effect between grade level and autonomy need satisfaction was found for intrinsic course value ($\gamma_{100} = .32, p < .03$). Examination of the simple slopes suggested that the coefficient between autonomy need satisfaction and intrinsic value was larger for older students ($\gamma_{90} = .74$, $p < .001$) than younger students ($\gamma_{90} = .42$,$p < .001$). The effect of choice provision on intrinsic course value was significantly partially mediated by autonomy need satisfaction for both younger (Sobel test: $z = 3.07$, $p < .002$, PME = .39) and older students (Sobel test: $z = 4.09$, $p < .001$, PME = .69), as was the effect of perspective-taking (Sobel test for younger students: $z = 2.01$, $p = .04$, PME = .33 and for older students: $z = 2.23$, $p = .03$, PME = .46) In contrast, the effect of rationale provision on intrinsic course value was not significantly mediated by autonomy need satisfaction for either younger (Sobel test: $z = .14$, $p = .89$, PME = .01) or older students (Sobel test: $z = .14$, $p < .89$, PME = .02). The effect of autonomy need satisfaction on intrinsic course value was not significantly moderated by any other demographic characteristics.

Table 5 Conditional models for attainment value

Fixed effects	Attainment value (without mediator and practices)			Attainment value (without choice and mediator)			Attainment value (with choice and without mediator)			Attainment value (with mediator and interaction)		
	Coeff	SE	*t*	Coeff	SE	*t*	Coeff	SE	*t*	Coeff	SE	*t*
Intercept (γ_{00})	4.81***	.30	16.27	4.62***	.30	15.94	4.61***	.29	15.87	4.61***	.29	15.87
Ethnicity (γ_{10})	.42*	.17	2.48	.38*	.16	2.33	.37*	.16	2.32	.37*	.16	2.29
Honors class status (γ_{20})	.58†	.28	2.05	.65*	.27	2.37	.64*	.27	2.35	.65*	.27	2.38
Sex (γ_{30})	.40*	.17	2.35	.45**	.16	2.74	.46**	.17	2.75	.44**	.17	2.66
Grade level (γ_{40})	−.44†	.23	−1.91	−.21	.22	−.93	−.21	.22	−.91	−.18	.22	−.81
Rationale provision (γ_{50})				.24**	.09	2.71	.23*	.09	2.49	.22*	.09	2.37
Perspective-taking (γ_{60})				.25*	.11	2.23	.25*	.12	2.14	.23*	.12	2.00
Interests/opinions (γ_{70})				.02	.09	.19	.01	.10	.05	.01	.10	.05
Choice provision (γ_{80})							.03	.10	.35	−.01	.10	−.12
Autonomy need satisfaction (γ_{90})										−.08	.13	−.62
Autonomy need satisfaction × honors class status (γ100)										.32*	.15	2.15
Random effects	Var comp	SE	*Z*	Var comp	SE	*Z*	Var comp	SE	*Z*	Var comp	SE	*Z*
Teacher (level 2, τ_{00})	.26	.20	1.30	.27	.20	1.37	.27	.20	1.37	.28	.20	1.41
Student (level 1, σ^2)	1.70***	.15	11.20	1.53	.14	11.14	1.53***	.14	11.12	1.50***	.14	11.08

$N = 267$

Coeff coefficient, *Var Comp* variance component

† $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

($\gamma_{90} = .13$, $p = .12$). However, the addition of an interaction term between students' autonomy need satisfaction and honors class status suggested that the relation between autonomy need satisfaction and attainment value might vary as a function of whether students were in an honors class. Examination of the simple slopes suggested that the coefficient between autonomy need satisfaction and attainment value was significant for honors students ($\gamma_{90} = .24$, $p = .02$), but no different from zero for non-honors students ($\gamma_{90} = -.08$, $p = .53$).[5] Given that autonomy need satisfaction had a statistically significant effect on attainment course value only among honors students, we examined the significance of the indirect paths only for these students. There was little evidence that autonomy need satisfaction mediated the relationship between honors students' perceptions that teachers provided rationales for course activities and their attainment course value (Sobel test: $z = .16$, $p = .88$, PME = .01). There was a marginally significant indirect relation between perspective-taking and students' attainment course value through their autonomy need satisfaction (Sobel test: $z = 1.69$, $p = .09$, PME = .18). Finally, since choice provision had a significant relation with autonomy need satisfaction, we also examined its indirect effect on attainment course value. This indirect effect of choice provision was significant among honors students (Sobel test: $z = 2.17$, $p = .03$, PME = .88).

Utility value

There was a significant total fixed effect of students' perceptions of the extent to which their teachers provided rationales for course activities and engaged in perspective-taking for utility course value. That is, students who perceived their teachers as highlighting the rationale of course activities and engaging in perspective-taking to a greater extent reported greater utility course value. There was not a significant total effect of either consideration for student

[5] As with the other components of course value, we fully investigated whether the indirect path between teacher practices and attainment value through autonomy need satisfaction might vary as a function of students' ethnicity, honors class status, sex, or grade level in a series of random intercept-only models. As in previous analyses, interactions between all demographic characteristics and teacher practices were first added to separate models for each characteristic predicting attainment value without the presence of the hypothesized mediator. However, no significant interaction effects between demographic characteristics and teacher practices on attainment value were found. Therefore, these interactions terms were removed from the models. As previously explained, there were also no significant interactions between demographic characteristics and teacher practices on autonomy need satisfaction. Finally, we added interactions between autonomy need satisfaction and each demographic characteristic in a series of separate models for each characteristic. The only significant interaction to emerge was between students' autonomy need satisfaction and their honors class status.

Table 6 Conditional models for utility value

Fixed effects	Utility value (without mediator and practices)			Utility value (without choice and mediator)			Utility value (with choice and without mediator)			Utility value (with mediator and interaction)		
	Coeff	SE	*t*	Coeff	SE	*t*	Coeff	SE	*t*	Coeff	SE	*t*
Intercept (γ_{00})	4.81***	.37	12.97	4.54***	.36	12.76	4.52***	.36	12.67	4.54***	.35	12.96
Ethnicity (γ_{10})	.39*	.17	2.27	.37*	.16	2.29	.36*	.16	2.27	.31*	.15	2.06
Honors class status (γ_{20})	.11	.34	.33	.20	.32	.65	.19	.32	.61	.22	.31	.73
Sex (γ_{30})	−.04	.18	−.20	.00	.16	−.03	.04	.17	.22	−.04	.16	−.24
Grade level (γ_{40})	.04	.26	.15	.35	.25	1.41	.36	.25	1.45	.40†	.24	1.66
Rationale provision (γ_{50})				.44***	.09	4.94	.41***	.09	4.38	.40***	.09	4.54
Perspective-taking (γ_{60})				.29*	.11	2.58	.27*	.11	2.34	.18†	.11	1.67
Interests/opinions (γ_{70})				−.14	.09	−1.53	−.19†	.10	−1.86	−.22*	.10	−2.32
Choice provision (γ_{80})							.12	.10	1.19	−.03	.10	−.28
Autonomy need satisfaction (γ_{90})										.40***	.08	4.92
Random effects	Var comp	SE	*Z*	Var comp	SE	*Z*	Var comp	SE	*Z*	Var comp	SE	*Z*
Teacher (level 2, τ_{00})	.68†	.38	1.81	.67†	.37	1.84	.67†	.37	1.84	.68†	.36	1.86
Student (level 1, σ^2)	1.78***	.16	11.26	1.49***	.13	11.19	1.49***	.13	11.17	1.36***	.12	11.14

$N = 267$

Coeff coefficient, *Var comp* variance component

† $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

preferences or provision of choices on attainment value controlling for all other teacher practices and demographic covariates.

Next, the full model predicting utility value for the course was estimated. As shown in Table 6, there was a significant effect of students' autonomy need satisfaction on their utility value for the course. This finding indicates that within any given teacher, students with greater autonomy need satisfaction reported greater utility value for the course. The coefficient for the relation between perspective-taking and utility course value was initially significant ($\gamma_{60} = .27$, $p = .02$) within teachers. The coefficient became only marginally significant with the addition of autonomy need satisfaction ($\gamma_{60} = .18$, $p = .10$). A Sobel test (1982) confirmed that within any given teacher, autonomy need satisfaction was a significant mediator of the relation between teacher perspective-taking and students' utility course value ($z = 2.24$, $p < .03$, PME = .32). However, there was no evidence that autonomy need satisfaction mediated the relation between students' perceptions that teachers provide rationales for course activities and their utility value for the course. The coefficient for the relation between rationale provision and utility value was initially significant within teachers ($\gamma_{50} = .41$, $p = .001$) and remained relatively unchanged ($\gamma_{50} = .40$, $p < .001$) when autonomy need satisfaction was added to the model (Sobel: $z = .15$, $p = .88$, PME = .01).

We also examined the significance of the indirect effect of choice provision on utility course value through autonomy need satisfaction, since choice provision was found to be a significant predictor of autonomy need satisfaction even after controlling for other teacher practices and demographic covariates. A statistically significant indirect effect was found (Sobel test: $z = 3.58$, $p < .001$, PME = .84).[6]

Cumulative, differential, and compensatory effects of teacher practices on autonomy need satisfaction

Another goal of this investigation was to examine the cumulative, differential, compensatory effects of various

[6] As with the other components of course value, we fully investigated whether the indirect path between teacher practices and utility value through autonomy need satisfaction might vary as a function of students' ethnicity, honors class status, sex, or grade level in a series of random intercept-only models. As in the previous analyses, interactions between all demographic characteristics and teacher practices were first added to four separate models for each characteristic to predict utility value without the presence of the hypothesized mediator. No significant interaction effects between demographic characteristics and teacher practices on utility course value were found. Therefore, these interaction terms were removed from the models. As previously explained, there were also no significant interactions between demographic characteristics and teacher practices on autonomy need satisfaction. In a third and final step, we added interactions between autonomy need satisfaction and each demographic characteristic in four separate models. However, the relation between autonomy need satisfaction and course utility value was not found to vary as a function of students' ethnicity, honors class status, sex, or grade level.

teacher practices on students' autonomy need satisfaction. A person-centered approach was adopted in which we computed teacher practice profiles for each student that contained information about students' perceptions of their teacher's choice provision, rationale provision, perspective-taking, and consideration for student preferences. For each of these four teacher practices, scores were median split to create two groups: low and high. Each student was assigned to one of the sixteen profiles created from all possible combinations of low and high levels of each teacher practice ($2 \times 2 \times 2 \times 2$ groups). The sixteen teacher practice profiles were combined into five cumulative teacher practice groups: low on all practices (perceptions of all teacher practices were below the median), high on one practice (perceptions of only one teacher practice was above the median), high on two practices (perceptions of two teacher practices were above the median), high on three practices (perceptions of three teacher practices were above the median), high on all practices (perceptions of all four teacher practices were above the median). Table 7 presents a description of the teacher practice profile groups.

To test the hypothesis that we would see increasing autonomy need satisfaction as students perceived an increasing number of teacher practices as high, we conducted a 5 (teacher practice profile) $\times$ 10 (teacher) between-subjects analysis of variance (ANOVA) with autonomy need satisfaction as the dependent variable. We used a fixed effects approach to account for the nested nature of our data by including the grouping factor, teacher, as a fixed factor in this model. A significant univariate effect of teacher practice profile was found, $F(4, 253) = 22.84$, $p < .001$. Tukey pairwise comparisons revealed that students who perceived their teachers as high in all five practices reported greater autonomy need satisfaction than students who perceived that their teachers demonstrated high use of one, two, three or none of the practices. Likewise, students who perceived their teachers to be low in all practices reported significantly lower autonomy need satisfaction compared to all other groups. However, there were no significant differences in autonomy need satisfaction among the groups of students who perceived their teachers to be high in one, two, or three practices.

Next, we examined whether students who perceived their teachers as high in any one of the four teacher practices would demonstrate greater autonomy need satisfaction than students who perceived their teacher's use of all four practices as low. We used the same person-centered approach as before, but compared only two profile groups in four separate models: those who reported that their teachers were low in the use of all practices to those who were high in any one of the four practices. There was a significant effect of group profile on autonomy need satisfaction when comparing the all low practices group (LLLL) to the high choice provision only group (HLLL), $F(1, 72) = 13.07$, $p < .001$. This finding suggests that students who perceived their teachers to be high in their provision of choices and nothing else reported greater autonomy need satisfaction compared to students who perceived their teachers to be low in all practices. There was not a significant effect of group profile on autonomy need satisfaction when comparing the all low practices group (LLLL) to the high rationale provision only group (LHLL), $F(1, 76) = 1.07$, $p = .31$, or the high perspective-taking only group (LLHL), $F(1, 72) = 2.52$, $p = .12$. We did not conduct this analysis for teachers' consideration for student preferences because only five students reported that their teachers were high in this practice and no other. It is also worth noting that the interpretation of these findings is limited because few students perceived their teachers as high in their use of only one practice. Therefore, the non-significant results could be due to a lack of statistical power.

We explored the flipside of this issue by examining whether students who perceived their teachers to be low in any one of the four practices would demonstrate

Table 7 Descriptive statistics for teacher practice profile groups on autonomy need satisfaction

Group	*n*	*M*	SD
Cumulative teacher practice groups			
All low	68	3.88	1.07
One high	53	4.60	.87
Two high	46	4.74	.98
Three high	43	5.00	.95
All high	57	5.65	.83
Teacher practice profiles (choice–rationale–perspective-taking–interests/opinions)			
LLLL	68	3.88	1.06
HLLL	15	4.96	.68
LHLL	19	4.47	.81
LLHL	14	4.55	.92
LLLH	5	4.20	1.35
HHLL	6	4.61	.90
HLHL	9	5.30	.58
HLLH	12	4.63	.94
LHHL	8	4.75	1.11
LHLH	4	4.04	1.36
LLHH	7	4.69	1.12
HHHL	5	4.83	.95
HLHH	3	5.44	.92
HHLH	22	5.21	.93
LHHH	13	4.59	.91
HHHH	57	5.65	.83

L low, *H* high

reduced autonomy need satisfaction compared to when the use of all practices was perceived as high. Again, we used the same person-centered approach and compared only two profile groups in four separate models: those who reported that their teachers were high in the use of all practices to those who were low in one of the four practices. We found a significant effect of group profile on autonomy need satisfaction when comparing the all high practices group (HHHH) to the low choice provision only group (LHHH), $F(1, 60) = 15.57$, $p < .001$. Specifically, students who perceived that their teachers were high in choice provision as well as all other practices reported significantly greater autonomy need satisfaction compared to students who perceived their teachers as high in their use of all practices except choice provision. There was a marginally significant effect of group profile on autonomy need satisfaction when comparing the all high practices group (HHHH) to the low perspective-taking only group (HHLH), $F(1, 69) = 3.42$, $p = .07$. This finding suggests that students who perceived their teachers as high in their use of all four practices reported marginally significantly greater autonomy need satisfaction compared to students who perceived their teachers as high in their use of all practices except perspective-taking. We did not conduct this analysis for teachers' rationale provision or consideration of student preferences because very few students reported that their teachers were low in these practices but high in all others.

Results do suggest that autonomy need satisfaction is lower in the absence of choice provision, even in the presence of other adaptive teacher practices, and greater in the presence of choice provision, even in the absence of other adaptive teacher practices. Overall, therefore, the provision of choices may play a particularly important role in autonomy need satisfaction.

Discussion

The purpose of this study was threefold: (1) to differentiate among various teacher practices proposed to support autonomy, (2) to test the direct contributions of each practice to students' autonomy need satisfaction and three components of course value (intrinsic, attainment, and utility), and (3) to test how students' autonomy need satisfaction mediates the relation between teacher practices and students' course value. Consistent with SDT and an expectancy-value model of motivation, results suggested that students' experience of autonomy plays an important role in their course value, and especially their intrinsic and utility value for a course. That is, an enhanced experience of autonomy related to greater intrinsic and utility course value among high school students in our sample, as well as greater attainment value among honors students. We also found that the relation between autonomy need satisfaction and intrinsic course value was somewhat stronger for students in upper rather than lower high school grades. However, by and large, the relations between autonomy need satisfaction and course value outcomes seemed to be similar across students of various demographic characteristics. Perhaps more interestingly, we also found that only a subset of teacher practices uniquely predicted autonomy need satisfaction. In addition, a differential set of practices and pathways predicted each form of course value.

Among the four teacher practices, only perceived provision of choice and perspective-taking uniquely related to enhanced autonomy need satisfaction. Consideration for student interests and opinions predicted autonomy need satisfaction only when provision of choice was excluded from the model. Rationale provision did not uniquely predict autonomy need satisfaction when provision of choice was either included or excluded from the model. We did not find this pattern of relations between teacher practices and autonomy need satisfaction to be qualified by demographic characteristics of the students in any way.

In our analysis examining the cumulative effects of teacher practices, we found that autonomy need satisfaction was significantly higher when students perceived their teachers as engaging in all four practices. Furthermore, our analyses examining the differential and compensatory effects of choice provision indicated that students who perceived their teachers as providing option and action choices to a greater extent had significantly greater autonomy need satisfaction, even in the absence of any other teacher practice. Likewise, students' autonomy need satisfaction was significantly greater when they perceived teachers as providing more choices in the classroom, even in the presence of all other autonomy-supportive teacher practices.

Taken together, these results have several important implications for theory and future research. First, results support a Gestalt view of autonomy-supportive teacher practices suggesting that they do indeed operate in concert to create a cumulative perception of autonomy that is greater than the sum of each individual practice. Second, our results suggest that teacher practices vary in the extent to which their relation with autonomy need satisfaction is dependent on the presence of other autonomy-supportive practices. In other words, it would seem that the provision of option and action choices makes a significant contribution to autonomy need satisfaction above and beyond the role of other teacher practices, but also independent of their presence. However, the relation between autonomy need satisfaction and two other teacher practices—the provision of rationales that identify the importance and usefulness of course activities and, to some extent, perspective-taking—

may be more readily revealed in combination with other autonomy-supportive practices. Third, our results highlight the likely hierarchical structure of some teacher practices within the provision of choice. In particular, the provision of choices may subsume the effects of teachers' consideration for student interest and opinions to some extent. That is, it seems likely that teachers may simultaneously cater to students' interests and opinions to some extent when providing choices. This conclusion was supported by the significant relation between consideration for student preferences and autonomy need satisfaction that became non-significant in the presence of choice provision.

Our finding that choice uniquely and independently relates to students' autonomy need satisfaction is noteworthy given the controversy that has surrounded the value of providing choices as a motivational strategy and the frequent failure of prior research to find significant effects of choice provision (e.g. Assor et al. 2002; Flowerday and Schraw 2003; Flowerday et al. 2004; Reeve et al. 2003; Parker and Lepper 1992; Overskeid and Svartdal 1996). Consistent with the perspectives of other researchers, we believe that choice provision emerged as a uniquely important aspect of autonomy need satisfaction because our measure defined choice provision as both allowing students to select among teacher-prescribed options and to engage in ongoing decision-making by interacting with coursework in their own way. This stands in contrast to how choice provision has typically been manipulated and measured as simply the opportunity to select among task options or decisions about the task environment that have been prescribed by another individual (see Reeve et al. 2003 for a review of this issue). Indeed, scholars assert (e.g. Katz and Assor 2007; Reeve et al. 2003), and we agree, that choices would seem to be particularly autonomy supportive when they allow students to continuously regulate their own actions and are closely connected with the expression of their interests, preferences, values, and other components of identity. We would also note, however, that option and action choices may not be separate constructs. Instead, our study suggests that option and action choices were indistinguishable in the minds of students. Therefore, it might be necessary for both forms of choice provision to be present in order for the relations found in this study to be consistently observed. With these considerations regarding our operational definition of choice provision in mind, it is unsurprising that choice provision subsumed the relation between teacher consideration for students' interests and opinions and autonomy need satisfaction. Taken together, we believe that our operational definition of choice provision more accurately reflects the types of choices hypothesized to promote students' experience of autonomy and thus provides a fairer test of the role of choice provision in autonomy need satisfaction.

Also consistent with SDT, our results suggest that students' perception of their teacher's choice provision relates to their intrinsic course value via an enhanced experience of autonomy. That is, results supported our hypothesis that students who experience having choices in the classroom feel more autonomous, and this enhanced sense of autonomy then leads to greater liking of and interest in course material. Given the pattern of results suggesting that autonomy need satisfaction only partially mediated the relation between provision of choice and intrinsic course value, as well as the marginally significant relation between provision of choice and intrinsic value in the presence of autonomy need satisfaction, it seems likely that other mechanisms also mediate the relation between choice and intrinsic value. Consistent with SDT theory and some research (e.g. Guay et al. 2001; Henry 1994; Langer and Rodin 1976), we suspect that choice provision may support needs for competence (or control) and possibly, relatedness, in addition to autonomy.

These findings are hardly surprising and very much in line with previous research suggesting that choice may be an important factor in supporting intrinsic motivation (e.g. Patall et al. 2008, 2010; Zuckerman et al. 1978). For example, one prior study showed that few teacher practices reliably predicted intrinsic motivation for school tasks after accounting for the provision of choice (Patall et al. 2010). As we suggested earlier, it seems plausible that part of the power of choice in the classroom may stem from this practice implying a number of other teacher behaviors that are also autonomy supportive. Shaping learning activities around students' preferences and interests, attentive listening, and perspective-taking could all result from teachers' provision of choice.

Choice was not the only practice that related either directly or indirectly to students' intrinsic course value. Our results revealed a significant indirect path suggesting that students who perceived their teacher as engaging in more perspective-taking that included providing more opportunities for students to express negative affect experienced greater autonomy need satisfaction, which was then related to greater intrinsic course value. There was limited evidence that perspective taking had an effect on intrinsic course value aside from its indirect effect through autonomy need satisfaction. This finding suggests that a need for autonomy may be the primary mechanism through which this teacher practice positively relates to intrinsic course value.

Yet our findings indicate that students' perception of other teacher practices directly related to their intrinsic course value. Specifically, students who perceived that their teachers often explain the importance or relevance of course activities reported more intrinsic value for the course. However, this relation was not mediated by

autonomy need satisfaction in our study. This finding stands in contrast to theory and some previous research suggesting that the teacher practices examined in this study would all support intrinsic motivation and other adaptive motivational outcomes primarily because they satisfy students' need for autonomy (e.g. Assor et al. 2002; Reeve and Jang 2006; Reeve 2006; Stefanou et al. 2004). We would argue that this tenet of SDT has not been sufficiently tested in the prior literature. Often, autonomy need satisfaction has not been explicitly tested as a mediator of the motivational effects of rationale provision in the context of other teacher practices (e.g. Assor et al. 2002; Reeve and Jang 2006; Stefanou et al. 2004). Furthermore, even in the most stringent (experimental) tests of rationale provision (e.g. Reeve et al. 2002; Jang 2008), significant effects of this practice have been found when it was combined with other practices that are hypothesized to be autonomy-supportive (i.e. perspective-taking).

While provision of choice, perspective-taking, and rationale provision related to all three components of course value, results suggested a slightly different pattern of total, direct, and indirect effects of teacher practices across them. Whereas the provision of choice both directly and indirectly related to intrinsic course value, it only had an indirect effect on attainment and utility course value through autonomy need satisfaction. Furthermore, the indirect effect of choice provision on attainment value was demonstrated only for honors students, and it was fairly weak given the small relation between autonomy need satisfaction and attainment course value even among honors students. Our results suggest that the need for autonomy may be the primary mechanism through which choice provision relates to attainment and utility course value.

The pattern of results for perspective-taking and rationale provision was slightly different. Specifically, perspective-taking demonstrated only an indirect effect on intrinsic course value through autonomy need satisfaction, but it had a direct relation with both attainment and utility course value as well as a significant indirect effect on utility course value through autonomy need satisfaction. Students' perceptions that their teacher explains the importance and relevance of course activities directly related to all components of course value, yet autonomy need satisfaction was not found to be the mechanism of this effect. These results suggest that perspective-taking and rationale provision may be important predictors of attainment and utility course value, but the mechanisms through which these teacher practices yield motivational benefits may not be exclusively, or even primarily, through autonomy need satisfaction.

Taken together, our results suggest that teacher practices may be more or less important for the different components of students' course value. In particular, the provision of choice may have a stronger relation with intrinsic course, while perspective-taking may have a stronger relation with utility and attainment course value. Rationale provision seems to be equally important across all three components of course value, and it was often the strongest predictor of course value. That said, the mechanism of effect does not appear to be autonomy need satisfaction. This pattern of findings underscores the need for future research to continue to explore and contrast the pathways through which teacher practices yield motivational benefits.

Limitations and directions for future research

These results reflect two important contributions of the present study. First, this is the only study to examine the unique *and* combined relations between various teacher practices and different components of course value. Moreover, this is the first study to examine the mediating role of autonomy need satisfaction in these relations while accounting for important demographic characteristics.

However, the strengths and results of this study should be interpreted in light of several limitations. First, we relied on a survey design at a single time point that should not be taken to imply a causal relation between teacher practices and students' course value. Many methodologists argue that inferences about mediation assume stability, stationarity and nonspuriousness, none of which are guaranteed in cross-sectional data such as ours (e.g. see Kenny 1979; Cole and Maxwell 2003). Despite theoretical reasons to believe a causal relation underlies our findings, it is entirely possible that students with greater course value or experience of autonomy are also more likely to perceive their teachers as engaging more often in motivationally-supportive practices.

While we have constructed our statistical analyses and interpreted findings in light of the broad existing literature on autonomy support, it is important for the questions addressed in this investigation to be replicated using research designs that allow for stronger causal inferences. Likewise, longitudinal and experience sampling research could enrich our understanding of the psychological processes by which teacher practices differentially support various forms of academic motivation because these methodological approaches meet one criteria of causation (e.g. temporal precedence; see Cole and Maxwell 2003, for a discussion of mediation procedures in longitudinal data).

Moreover, future intervention research could also provide important insight into the relative benefits of autonomy-supportive teacher practices. To date, most interventions designed to increase autonomy-supportive behavior have trained teachers to simultaneously implement multiple practices meant to support students' sense of autonomy and subsequent motivation (e.g. Reeve et al. 2004; Su and Reeve

2011). However, it is important that theorists have a clear understanding of the mechanisms through which these practices yield effects and that teachers have specific guidelines about which practices work best. Therefore, future research should attempt to identify and isolate specific teacher behaviors that are most effective in supporting students' sense of autonomy, intrinsic motivation, and other motivation outcomes.

A second limitation of this study is that student perceptions were the only way we measured teachers' practices and students' motivation. Therefore, future research should incorporate classroom observations of teacher practices, especially in classes where teachers vary in their use of target practices. Moreover, studies examining processes at the classroom level would be useful for expanding on the current findings. Related to this limitation is the fact that student teachers were both the target of the questionnaires and the ones who administered them to students. Though we attempted to limit bias associated with this feature of the design by ensuring respondents' anonymity, social desirability and acquiescence bias may still be at play.

We should also highlight that there are several notable differences between the self-report measures used in this study and those used in past research. In addition to differences in the operational definitions of choice provision, we also altered the measure of autonomy need satisfaction. Specifically, we excluded the subscale on perceived choice from the PSD measure in order not to artificially increase the likelihood of finding a relation between autonomy need satisfaction and student perceptions of teacher's choice provision. However, the extent to which the adapted version of this scale is comparable to versions validated in prior research remains uncertain.

Another limitation of this study is that pre-service rather than experienced teachers were the target of students' responses. Although students interacted with their pre-service teacher for approximately 5 months before completing the questionnaire, they certainly had more limited experiences with the pre-service teacher than their regular teacher. It is possible that the behaviors of novice teachers may not garner the same responses from students as would the same behaviors from a veteran teacher. As such, the findings of this study should be interpreted with caution when generalizing to more experienced teachers.

In addition, although we had a large number of students participate in the study, our sample of pre-service teachers was relatively small (10). The number of participating pre-service teachers likely limited the variability in their practices hypothesized to be autonomy-supportive. In support of this possibility, the sample means for students' perceptions of the various teacher practices (ranging from 4.25 to 5.64 on a seven-point scale) suggest that the pre-service teachers in our study were fairly autonomy-supportive overall. In fact, comparing the means from our study to teachers' autonomy support observed by objective raters in previous studies suggests that the degree of autonomy support provided by our teachers was more similar to that of teachers trained to be autonomy supportive than teachers who have received no such training (e.g. Reeve et al. 2004).

Finally, future research could further address whether instructional supports for course value and related motivational outcomes are differentially beneficial for all students, academic subjects, and task characteristics. While this study explored the role of autonomy support and need satisfaction, researchers have suggested that teacher practices that thwart the experience of autonomy and satisfaction of other psychological needs are also important for understanding motivation processes in the classroom (e.g. Reeve and Jang 2006; Assor et al. 2002, 2005).

Conclusion

In sum, our study supports several important conclusions. First, our results reinforce that a combination of teacher practices most profitably support students' sense of autonomy and motivation. Students' perception of two teacher practices—providing choices and perspective-taking—may play particularly important and unique roles in students' autonomy need satisfaction. Nevertheless, autonomy need satisfaction may be greatest when teachers engage in these practices along with others that are hypothesized to be autonomy-supportive.

Second, our results indicate that teacher practices may work to a different extent or through different mechanisms depending on the motivation outcome. In other words, the pattern of total, indirect, and direct effects of teacher practices varied depending on the course value outcome, suggesting that the relative importance of each practice may differ depending on what component of course value is being considered. Rationale provision supported students' course value, for example, but autonomy need satisfaction did not mediate this effect. However, choice provision and perspective-taking related to course value outcomes through autonomy need satisfaction.

Finally, despite debate, we believe the results of this study highlight that the provision choices, especially choices that allow students to make decisions about how to engage in coursework, are an important component of conceptualizing teacher autonomy support. We hope that this study provides a foundation for future theoretical and empirical work in motivation science, while also providing educators with an empirical basis for new guidelines to support student academic motivation and engagement.

References

Assor, A., Kaplan, H., Kanat-Maymon, Y., & Roth, G. (2005). Directly controlling teachers' behaviors as predictors of poor motivation and engagement in girls and boys: The role of anger and anxiety. *Learning and Instruction, 15*, 397–413.

Assor, A., Kaplan, H., & Roth, G. (2002). Choice is good, but relevance is excellent: Autonomy-enhancing and suppressing teacher behaviors predicting students' engagement in school work. *British Journal of Educational Psychology, 72*, 261–278.

Baron, R., & Kenny, D. (1986). The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations. *Journal of Personality and Social Psychology, 51*, 1173–1182.

Bauer, D. J., Preacher, K. J., & Gil, K. M. (2006). Conceptualizing and testing random indirect effects and moderated mediation in multilevel models: new procedures and recommendations. *Psychological Methods, 11*, 142–163.

Belmont, M., Skinner, E., Wellborn, J., & Connell, J. (1992). *Teacher as social context (TASC). Two measures of teacher provision of involvement, structure, and autonomy support*. Technical Report, University of Rochester, Rochester, NY.

Black, A. E., & Deci, E. L. (2000). The effects of instructors' autonomy support and students' autonomous motivation on learning organic chemistry: A self-determination theory perspective. *Science Education, 84*, 740–756.

Boggiano, A. K., Flink, C., Shields, A., Seelbach, A., & Barrett, M. (1993). Use of techniques promoting students' self-determination: Effects of students' analytic problem-solving skills. *Motivation and Emotion, 17*, 319–336.

Cole, D. A., & Maxwell, S. E. (2003). Testing mediational models with longitudinal data: Questions and tips in the use of structural equation modeling. *Journal of Abnormal Psychology, 112*, 558–577.

Connell, J. P. (1990). Context, self, and action: A motivational analysis of self-system processes across the life span. In D. Cicchetti & M. Beeghly (Eds.), *The self in transition: Infancy to childhood* (pp. 61–97). Chicago IL: University of Chicago Press.

Cordova, D., & Lepper, M. (1996). Intrinsic motivation and the process of learning: Beneficial effects of contextualization, personalization, and choice. *Journal of Educational Psychology, 88*, 715–730.

deCharms, R. (1968). *Personal causation*. New York: Academic Press.

Deci, E. L. (1971). Effects of externally mediated rewards on intrinsic motivation. *Journal of Personality and Social Psychology, 18*, 105–115.

Deci, E. L. (1980). *The psychology of self-determination*. Lexington, MA: Heath.

Deci, E. L., Connell, J. P., & Ryan, R. M. (1989). Self-determination in a work organization. *Journal of Applied Psychology, 74*, 580–590.

Deci, E. L., Eghrari, H., Patrick, B. C., & Leone, D. R. (1994). Facilitating internalization: The self-determination theory perspective. *Journal of Personality, 62*, 119–142.

Deci, E. L., Hodges, R., Pierson, L., & Tomassone, J. (1992). Autonomy and competence as motivational factors in students with learning disabilities and emotional handicaps. *Journal of Learning Disabilities, 25*, 457–471.

Deci, E. L., & Ryan, R. M. (1987). The support of autonomy and the control of behavior. *Journal of Personality and Social Psychology, 53*, 1024–1037.

Deci, E. L., Schwartz, A. J., Sheinman, L., & Ryan, R. M. (1981). An instrument to assess adults' orientations toward control versus autonomy with children: Reflections on intrinsic motivation and perceived competence. *Journal of Educational Psychology, 73*, 642–650.

Eccles (Parsons), J., Adler, T. F., Futterman, R., Goff, S. B., Kaczala, C. M., Meece, J. L., et al. (1983). Expectancies, values, and academic behaviors. In J. T. Spence (Ed.), *Achievement and achievement motivation* (pp. 75–146). San Francisco: W. H. Freeman.

Eccles, J. S., Adler, T. F., & Meece, J. L. (1984). Sex differences in achievement: A test of alternative theories. *Journals of Personality and Social Psychology, 46*, 26–43.

Eccles, J. S., & Harold, R. D. (1991). Gender differences in sport involvement: Applying the Eccles' expectancy-value model. *Journal of Applied Sport Psychology, 3*, 7–35.

Eccles, J. S., & Wigfield, A. (1995). In the mind of the achiever: The structure of adolescents' academic achievement related-beliefs and self-perceptions. *Personality and Social Psychology Bulletin, 21*, 215–225.

Feather, N. T. (1982). Expectancy-value approaches: Present status and future directions. In N. T. Feather (Ed.), *Expectations and actions: Expectancy-value models in psychology* (pp. 395–420). Hillsdale, NJ: Erlbaum.

Flowerday, T., & Schraw, G. (2003). Effect of choice on cognitive and affective engagement. *Journal of Educational Research, 96*, 207–215.

Flowerday, T., Schraw, G., & Stevens, J. (2004). The role of choice and interest in reader engagement. *The Journal of Experimental Education, 72*, 93–114.

Gagne, M. (2003). The role of autonomy support and autonomy orientation in prosocial behavior engagement. *Motivation and Emotion, 27*, 199–223.

Garcia, T., & Pintrich, P. R. (1996). Effects of autonomy on motivation and performance in the college classroom. *Contemporary Educational Psychology, 21*, 477–486.

Grolnick, W. S., & Ryan, R. M. (1987). Autonomy in children's learning: An experimental and individual difference investigation. *Journal of Personality and Social Psychology, 52*, 977–1077.

Grolnick, W. S., Ryan, R. M., & Deci, E. L. (1991). The inner resources for school achievement: Motivational mediators of children's perceptions of their parents. *Journal of Educational Psychology, 83*, 508–517.

Grubbs, F. E. (1950). Sample criteria for testing outlying observations. *Annals of Mathematical Statistics, 21*, 27–58.

Guay, F., Boggiano, A. K., & Vallerand, R. J. (2001). Autonomy support, intrinsic motivation, and perceived competence: Conceptual and empirical linkages. *Personality and Social Psychology Bulletin, 27*, 643–650.

Harackiewicz, J. M., & Manderlink, G. (1984). A process analysis of the effects of performance-contingent rewards on intrinsic motivation. *Journal of Experimental Social Psychology, 20*, 531–551.

Henry, R. A. (1994). The effects of choice and incentives on the overestimation of future performance. *Organizational Behavior and Human Decision Processes, 57*, 210–225.

Iyengar, S. S., & Lepper, M. R. (1999). Rethinking the value of choice: A cultural perspective on intrinsic motivation. *Journal of Personality and Social Psychology, 76*, 349–366.

Jacobs, J. E., & Eccles, J. S. (2000). Parents, task values, and real-life achievement choices. In C. Sansone & J. Harackiewicz (Eds.), *Intrinsic motivation* (pp. 408–433). San Diego, CA: Academic.

Jang, H. (2008). Supporting students' motivation, engagement, and learning during an uninteresting activity. *Journal of Educational Psychology, 100*, 798–811.

Jang, H., Reeve, J., & Deci, E. L. (2010). Engaging students in learning activities: It is not autonomy support or structure but autonomy support and structure. *Journal of Educational Psychology, 102*, 588–600.

Katz, I., & Assor, A. (2007). When choice motivates and when it does not. *Educational Psychology Review, 19*, 429–442.

Katz, I., Kaplan, A., & Gueta, G. (2009). Students' needs, teachers' support, and motivation for doing homework: A cross-sectional study. *The Journal of Experimental Education, 78*, 246–267.

Kenny, D. A. (1979). *Correlation and causality*. New York: Wiley-Interscience.

Koestner, R., Ryan, R. M., Bernieri, F., & Holt, K. (1984). Setting limits on children's behavior: The differential effects of controlling versus informational styles on intrinsic motivation and creativity. *Journal of Personality, 52*, 233–248.

Langer, E. J., & Rodin, J. (1976). The effects of choice and enhanced personal responsibility for the aged: A field experiment in an institutional setting. *Journal of Personality and Social Psychology, 34*, 191–198.

MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. (2002). A comparison of methods to test the significance of the mediated effect. *Psychological Methods, 7*, 83–104.

Midgley, C., & Feldlaufer, H. (1987). Students' and teachers' decision-making fit before and after the transition to junior high school. *Journal of Early Adolescence, 7*, 225–241.

Moller, A. C., Deci, E. L., & Ryan, R. M. (2006). Choice and ego-depletion: The moderating role of autonomy. *Personality and Social Psychology Bulletin, 32*, 1024–1036.

Mouratidis, T., Vansteenkiste, M., Sideridis, G., & Lens, W. (2011). Vitality and interest-enjoyment as a function of class-to-class variation in need-supportive teaching and pupils' autonomy motivation. *Journal of Educational Psychology, 103*, 353–366.

Muller, D., Judd, C. M., & Yzerbyt, V. Y. (2005). When moderation is mediated and mediation is moderated. *Journal of Personality and Social Psychology, 89*, 852–863.

Overskeid, G., & Svartdal, F. (1996). Effects of reward on subjective autonomy and interest when initial interest is low. *The Psychological Record, 46*, 319–331.

Parker, L. E., & Lepper, M. R. (1992). Effects of fantasy contexts on children's learning and motivation: Making learning more fun. *Journal of Personality and Social Psychology, 62*, 625–633.

Patall, E. A. (2012). The motivational complexity of choosing: A review of theory and research. In R. Ryan (Ed.), *Oxford handbook of human motivation* (pp. 249–279). New York, NY: Oxford University Press.

Patall, E. A., Cooper, H., & Robinson, J. C. (2008). The effects of choice on intrinsic motivation and related outcomes: A meta-analysis of research findings. *Psychological Bulletin, 134*, 270–300.

Patall, E. A., Cooper, H., & Wynn, S. R. (2010). The effectiveness and relative importance of providing choices in the classroom. *Journal of Educational Psychology, 102*, 896–915.

Pintrich, P. R., & De Groot, E. (1990). Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology, 82*, 33–50.

Preacher, K. J., Rucker, D. D., & Hayes, A. F. (2007). Assessing moderated mediation hypotheses: Strategies, methods, and prescriptions. *Multivariate Behavioral Research, 42*, 185–227.

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods* (2nd ed.). Thousand Oaks, CA: Sage.

Reeve, J. (2002). Self-determination theory applied to educational settings. In E. L. Deci & R. M. Ryan (Eds.), *Handbook of self-determination research* (pp. 183–203). Rochester, NY: The University of Rochester Press.

Reeve, J. (2006). Teachers as facilitators: What autonomy-supportive teachers do and why their students benefit. *The Elementary School Journal, 106*, 225–236.

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

Reeve, J., Jang, H., Carrell, D., Jeon, C., & Barch, J. (2004). Enhancing students' engagement by increasing teachers' autonomy support. *Motivation and Emotion, 28*, 147–169.

Reeve, J., Jang, H., Hardre, P., & Omura, M. (2002). Providing a rationale in an autonomy-supportive way as a strategy to motivate others during an uninteresting activity. *Motivation and Emotion, 26*, 183–207.

Reeve, J., Nix, G., & Hamm, D. (2003). Testing models of the experience of self-determination in intrinsic motivation and the conundrum of choice. *Journal of Educational Psychology, 95*, 375–392.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*, 68–78.

Ryan, R. M., & Grolnick, W. S. (1986). Origins and pawns in the classroom: Self-report and projective assessments of individual differences in children's perceptions. *Journal of Personality and Social Psychology, 50*, 550–558.

Stefanou, C. R., Perencevich, K. C., DiCintio, M., & Turner, J. C. (2004). Supporting autonomy in the classroom: Ways teachers encourage student decision making and ownership. *Educational Psychology, 39*, 97–110.

Su, Y., & Reeve, J. (2011). A meta-analysis of the effectiveness of intervention programs designed to support autonomy. *Educational Psychology Review, 23*, 159–188.

Swann, W., & Pittman, T. (1977). Initiating play activity of children: The moderating influence of verbal cues on intrinsic motivation. *Child Development, 48*, 1128–1132.

Tsai, Y., Kunter, M., Ludtke, O., Trautwein, U., & Ryan, R. M. (2008). What makes lessons interesting? The role of situational and individual factors in three school subjects. *Journal of Educational Psychology, 100*, 460–472.

Vallerand, R. J., Fortier, M. S., & Guay, F. (1997). Self-determination and persistence in a real-life setting: Toward a motivational model of high school dropout. *Journal of Personality and Social Psychology, 72*, 1161–1176.

Vansteenkiste, M., Simons, J., Lens, W., Sheldon, K. M., & Deci, E. L. (2004). Motivating learning, performance, and persistence: The synergistic role of intrinsic goals and autonomy support. *Journal of Personality and Social Psychology, 87*, 246–260.

Wellborn, J. G., & Connell, J. P. (1987). *Manual for Rochester assessment package for schools.* Unpublished manuscript, University of Rochester, New York.

Wigfield, A., & Eccles, J. (2000). Expectancy-value theory of achievement motivation. *Contemporary Educational Psychology, 25*, 68–81.

Wigfield, A., Eccles, J. S., Yoon, K. S., Harold, R. D., Arbreton, A. J. A., Freedman-Doan, C., et al. (1997). Change in children's competence beliefs and subjective task values across the elementary school years: A 3-year study. *Journal of Educational Psychology, 89*, 451–469.

Zhang, Z., Zyphur, M. J., & Preacher, K. (2009). Testing multilevel mediation using hierarchical linear models: Problems and solutions. *Organizational Research Methods, 12*, 695–719.

Zuckerman, M., Porac, J., Lathin, D., Smith, R., & Deci, E. (1978). On the importance of self-determination for intrinsically-motivated behavior. *Personality and Social Psychology Bulletin, 4*, 443–446.