

Enhancing Interest and Performance with a Utility Value Intervention

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Abstract

We tested whether a utility value intervention (via manipulated relevance) influenced interest and performance on a task, and whether this intervention had different effects depending on an individual's performance expectations or prior performance. Interest was defined as triggered situational interest (i.e., affective and emotional task reactions) and maintained situational interest (i.e., inclination to engage in the task in the future). In two randomized experiments, one conducted in the laboratory and the other in a college classroom, utility value was manipulated through a writing task in which participants were asked to explain how the material they were learning (math or psychology) was relevant to their lives (or not). The intervention increased perceptions of utility value and interest, especially for students who were low in expected (laboratory) or actual (classroom) performance. Mediation analyses revealed that perceptions of utility value explained the effects of the intervention on interest and predicted performance. Theoretical and practical implications are discussed.

Keywords: expectancy-value, utility value, motivation, interest development, educational intervention

Enhancing Interest and Performance with a Utility Value Intervention

Things indifferent or even repulsive in themselves often become of interest because of assuming relationships and connections of which we were previously unaware. Many a student...has found mathematical theory, once repellent, lit up by great attractiveness after studying some form of engineering in which this theory was a necessary tool. (Dewey, 1913, p. 22)

As recognized by Dewey, one way to enhance motivation and achievement may be to help students find value and meaning in their schoolwork (Brophy, 1999; Hidi & Harackiewicz, 2000; National Research Council and the Institute for Medicine, 2004; Stipek, 2002; Wagner et al., 2006; Wigfield & Eccles, 2002). Unfortunately, the research literature on student motivation suggests that such motivation is in short supply in American schools. An alarming trend indicates that interest in school tends to decrease over time (Anderman & Maehr, 1994; Lepper, Corpus, & Iyengar, 2005), and that students with lower competence beliefs report lower interest and motivation than students with higher competence beliefs (Jacobs, Lanza, Osgood, Eccles, & Wigfield, 2002). Students' competence perceptions arise, in part, from prior performance experiences and are predictive of achievement (Bandura, 1997; Usher & Pajares, 2008). We hypothesize that a value intervention may be particularly effective in enhancing motivation for individuals with a history of poor performance or low performance expectations

Perceived Value

A useful theoretical framework for understanding the role of perceived value in achievement contexts is the expectancy-value model (e.g., Atkinson, 1957; Eccles et al., 1983; Edwards, 1954; Lewin, Dembo, Festinger, & Sears, 1944; Tolman, 1955; Vroom, 1964), and the Eccles expectancy-value model of achievement choices has been particularly influential in education research (Eccles et al., 1983; Eccles & Wigfield, 2002; Wigfield & Eccles, 1992). Eccles et al. posit that perceived expectancies for success and task values contribute to

achievement choices and task performance. Expectancies for success are defined as individuals' beliefs about how well they will perform on an upcoming task. There are important theoretical and operational differences in expectancy constructs (e.g., self-efficacy, expectancies for success, and perceptions of competence) across various theoretical formulations, but the general principle is that students who believe that they can do well on a task are more likely to be motivated and persist on the task (c.f. Bandura, 1997; Pintrich, 2003). Furthermore, recent reviews of the expectancy literature reveal that prior performance experiences are the primary foundation for expectancies of future success (Usher & Pajares, 2008), and thus students' history of performance should also predict motivation and performance.

Task values are more situation-specific types of values than other frameworks that define values as broader constructs, such as benevolence, religiosity, and power (e.g., Feather, 1995; Fries, Schmid, Dietz, & Hofer, 2005; Lewin, 1951; Rokeach, 1973; Schwartz, 1992). Eccles et al. (1983) define task values as the perceived importance of the task because: it is useful or relevant for other tasks or aspects of an individual's life (*utility value*); it is enjoyable and fun to engage in (*intrinsic value*); doing well on the activity influences the individual's self-concept, self-worth, and identity (*attainment value*); and because of the perceived negative aspects of engaging in the activity, such as effort or negative emotional states (e.g., performance anxiety, fear of failure). In contrast to earlier expectancy-value models of achievement motivation that conceptualized expectancy and value as inversely related (Atkinson, 1957; Fischhoff, Goitein, & Shapira, 1982; Lewin et al., 1944; Vroom, 1964), the Eccles et al. model suggests that they are independent constructs that are often positively and reciprocally related. Positive expectancies or a sense of competence can enable individuals to perceive value in activities. In addition, finding value and meaning in activities can increase task engagement, and the development of

competence and positive performance expectations (e.g., Eccles & Harold, 1991; Eccles & Wigfield, 1995).

Research utilizing distinct measures of expectancy and task value supports the separation of expectancy and value, finding that they are often moderately and positively correlated, as well as the differentiation of value into task value factors (Eccles & Wigfield, 1995). However, despite being conceptually distinct, task values have often been analyzed as a single factor, with empirical studies most often combining intrinsic, utility, and attainment value (e.g., Anderman, Eccles, Yoon, Roeser, Wigfield, & Blumenfeld, 2001; Bong, 2001; Jacobs et al., 2002; Wigfield et al., 1997). A substantial body of research has found that expectancies are correlated with performance (e.g., course grades, GPA), whereas perceived task values are correlated with interest and achievement choices (Eccles & Harold, 1991; Updegraff, Eccles, Barber, & O'Brien, 1996; Wigfield, 1994; Xiang, Chen, & Bruene, 2005; see Wigfield & Eccles, 1992 for a review). When examined separately, both utility and intrinsic task value have been associated with measures of motivation such as course enrollment decisions (Durik, Vida, & Eccles, 2006; Updegraff et al., 1996), leisure time activity choices (Durik et al., 2006), and interest in specific school subjects (Harackiewicz, Durik, Barron, Linnenbrink, & Tauer, 2008; Hulleman, Durik, Schweigert, & Harackiewicz, 2008). In addition, there is evidence that perceived utility value is associated with performance (Bong, 2001; Cole, Bergin, & Whitaker, 2008; Durik et al., 2006; Hulleman et al., 2008; Mac Iver, Stipek, & Daniels, 1991; Simons, Dewitte, & Lens, 2004). Thus, utility value may be of particular importance for both motivation and performance in educational settings (Simons, Vansteenkiste, Lens, & Lacante, 2004). However, because the majority of the research regarding utility value effects has been correlational, there is a need to explore the causal effects of utility value (Maxwell & Cole, 2007).

The few studies that have manipulated task value demonstrate that value interventions can promote situational interest in laboratory activities (Durik & Harackiewicz, 2007; Godes, Hulleman, & Harackiewicz, 2007; Simons, Vansteenkiste et al., 2004) and high school science classrooms (Hulleman & Harackiewicz, in press), although these effects vary according to important individual differences. Godes et al. (2007, Study 1) found that emphasizing the utility value of a math activity (e.g., A nurse may use mental math computations to calculate medication amounts) actually undermined subsequent interest for individuals with low perceptions of competence in math. In contrast, the utility manipulation promoted interest in the math activity for individuals with high perceptions of competence. Durik and Harackiewicz (2007) used a similar intervention and found the same effect on situational interest for a math activity for students with low and high initial interest in math, respectively. Thus, simply informing students of the applications of an activity may not always promote interest. It is possible that the method used to promote perceived utility value undermined the manipulation's effectiveness for some students. Godes et al. (2007) and Durik and Harackiewicz (2007) emphasized the utility value of a math activity by informing students about the relevance of the material for their lives. For a student who does not do well in math or find math interesting, being told that math is important to his future may be threatening and intensify negative reactions. Rather than increase his engagement in the material, he may withdraw further from the learning environment.

We believe that a more effective approach would be to encourage students to generate their own connections and discover the relevance of course material to their lives for themselves. This method provides students the opportunity to make connections to topics and areas of their lives of greatest interest. Allowing students to discover the connections between an activity and

their lives on their own may be a less threatening way to promote the perception of utility value, and may therefore be particularly beneficial for students with low performance expectations.

Such utility value interventions are intended to enable change in interest over time. Thus, like Hidi and Renninger (2006), we consider interest to be both a psychological state of activity engagement and a predisposition to engage with a topic or activity over time. Similar to other models of interest, the four-phase model of interest (Hidi & Renninger, 2006) distinguishes between cognitive (i.e., meaning) and affective (feeling) components of interest (Alexander, Jetton, & Kulikowich, 1995; Harp & Mayer, 1997; Kintsch, 1980; Krapp, 2002; Schiefele, 1996), and short-term or situation-specific interest (i.e., *situational interest*) and long-term or enduring personal interest (i.e., *individual interest*; Hidi & Renninger, 2006; Schiefele, Krapp, & Winteler, 1992; Silvia, 2001, 2006). Interest is important as both an educational process that contributes to effective learning (e.g., attention, complexity of knowledge, levels of learning; for reviews see Alexander & Murphy, 1998; Hidi, 1990; Schiefele, 1991) and outcomes (e.g., achievement, educational choices; e.g., Harackiewicz, Barron, Tauer, Carter, & Elliot, 2000; Harackiewicz, Barron, Tauer, & Elliot, 2002; Harackiewicz et al., 2008; Schiefele et al., 1992).

Interest Development

In the Hidi and Renninger (2006) model, interest development is influenced by the experience of positive affect in relation to an activity, and perceiving value and developing knowledge in a domain. Further, interest is theorized to develop in four phases. As momentary interest in a specific situation is activated by some external cue (triggered situational interest: Phase 1), an individual may perceive value in the activity, and the desire to continue pursuing the activity may then deepen over time (maintained situational interest: Phase 2). If situational interest is maintained and an individual continues to engage in the activity and perceive value in

it, then individual interest may begin to develop (emerging individual interest: Phase 3).

Continuing re-engagement with the task over a period of time, along with increased knowledge and positive affect, can create an enduring interest in the activity (developed individual interest: Phase 4). Thus, the interest that develops or deepens in a particular context depends on the extent to which value, positive affect, and knowledge are experienced in relation to the activity (Hidi & Renninger, 2006; Mitchell, 1993).

In addition, interest is reciprocally related with other motivational variables such as self-efficacy and self-regulation. Lipstein and Renninger (2007) hypothesize that interest is a mediator for the development of self-efficacy and self-regulation skills, as interest maintains attention and effort required to develop knowledge and continue learning over time. This reasoning is congruent with some of self-regulation (e.g., Sansone & Thoman, 2005; Zimmerman & Kitsantas, 2005) that demonstrate that higher levels of self-regulation are associated with higher levels of interest (Cleary & Zimmerman, 2001; Kitsantas & Zimmerman, 2002; Zimmerman & Martinez-Pons, 1988). Self-regulation skills that help students learn and stay motivated enable them to know when to connect material to their lives, thereby helping them be more engaged and interested (Sansone & Thoman, 2005; Zimmerman & Kitsantas, 2005). The development of self-efficacy beliefs is also hypothesized to interact reciprocally with interest, with interesting activities leading to the development of competence beliefs and competence beliefs leading children to explore and develop interest in activities (Pajares, 1996; Renninger et al., 2008; Schunk & Pajares, 2005). Because self-regulation skills co-vary with self-efficacy and interest, students with lower levels of self-efficacy and competence do not tend to have these self-regulatory skills (e.g., they do not ask curiosity questions; Renninger, 2000). These students may have a more difficult time maintaining interest, and thus require external

support to maintain task engagement (Hidi & Harackiewicz, 2000; Hidi & Renninger, 2006). In contrast, students with higher levels of self-efficacy and competence are less in need of situational supports for interest because their interest is already at a higher level. In fact, these students may require different supports, such as providing more challenging material or setting proximal learning goals (Lipstein & Renninger, 2007; Renninger, Bachrach, & Posey, 2008).

Thus, it is plausible that students who are disengaged from school due to a history of poor performance or low expectations may benefit the most from a utility value intervention (Hulleman & Harackiewicz, in press). The extrinsic nature of utility value makes it particularly amenable to situational interventions from teachers or parents, who may be able to help students discover and appreciate the connections between a task and their lives. In the classroom, one way to highlight utility value could be to ask students to describe the relevance of course material to their own lives. For example, a student interested in basketball might apply math to calculating free throw percentages for her favorite players, whereas a student interested in nursing might apply his knowledge to calculating the correct dosage of medicine to give patients. The resultant perception of utility value could then promote active engagement in learning, which may in turn generate excitement, effort, interest, and achievement (Brophy, 1999; Cordova & Lepper, 1996; Wagner et al., 2006).

As presented in Figure 1, we hypothesize that a situational intervention that encourages individuals to make a connection between a task and their lives (i.e., a relevance intervention) will increase perceptions of utility value for the task. In turn, these perceptions of utility value should lead to increases in situational interest and possibly performance. These direct effects will be moderated by perceived or actual competence in the activity (the dashed path in Figure 1). Specifically, we expect that the relevance intervention to be particularly effective in promoting

perceived utility value for students with a history of poor performance or low expectations. In turn, perceptions of utility value will promote both subsequent interest and performance. Because the utility value intervention is most likely to trigger situational interest, this type of interest is best captured in terms of affective and emotional responses to the material (Hidi, 1990; Hulleman et al., 2008). If maintained over time, this externally triggered situational interest could become the beginning of emerging individual interest. Because students with low levels of competence will likely need additional supports to enhance interest, such as proximal goal setting and freedom to pursue curiosity questions (Lipstein & Renninger, 2007; Renninger, 2000), the utility valued intervention is less likely to enhance their interest.

Current Research

In our research, we explore how features of the situation can trigger situational interest and promote the transition from situational to individual interest. Although educators have little influence over the individual interests that students bring to their classrooms, they can play a pivotal role in designing, implementing, and maintaining the quality of the classroom environment, and they may be able to influence students' perceptions of value. The perception of value is hypothesized to be a key contributor in the progression from situational (Phase 2) to individual (Phase 3) interest, and to the deepening of existing individual interest (Hidi & Renninger, 2006). Situations that highlight task value could serve to stimulate engagement for students who are less engaged with an activity, and facilitate the development and maintenance of situational interest. Although the relationship between perceived utility value and interest has been established in previous correlational research, we investigated whether we could increase perceived utility value with an external intervention, and if so, whether these changes in perceived utility value fostered interest and performance.

To this end, we tested whether perceptions of utility value can be influenced with an experimental intervention, and whether changes in utility perceptions trigger situational interest (i.e., emotional and affective task reactions), maintain this interest over time (i.e., intention to return to the activity), and improve performance. Because we focus on the role of value in the development of interest, our measures of situational interest focus on the emotional aspects of interest and thus are not confounded with our task value measures. In addition, although knowledge is an important aspect of the four-phase model, we do not measure it within the research presented herein. In two randomized experiments, one conducted in the laboratory and the other in a college classroom, personal relevance was manipulated through a writing exercise in which participants were asked to explain how the activity was relevant to their lives. We tested whether expected (Study 1) or actual (Study 2) performance moderated the direct effects of our intervention on the outcomes. In addition, we tested our theoretical model by examining whether perceptions of utility value mediated the effects of the intervention on interest and performance.

Study 2 was designed to extend the results of Study 1 from the laboratory into the classroom. However, there are some important differences between the two studies that need to be highlighted, mainly due to differences in context. A math activity was used in Study 1 to provide an ecologically valid learning activity, albeit one that required a low level of processing skills (e.g., 2-digit multiplication). In Study 2, we tested our intervention in the context of an introductory psychology course, due to our belief that the relevance intervention is not domain specific. Because of its design, the introductory course matched the math task as both required relatively lower levels of processing skills and knowledge complexity compared to more complex tasks. In addition, because students entered the laboratory activity with little or no

familiarity with the specific math task they were about to learn, we used their expectations for performance as the moderator of the relevance intervention. In the classroom, students had half a semester of experience in the psychology class to develop an understanding of their performance level in the course. As a result, we used actual performance (in terms of early exam scores) as the moderator of the relevance intervention.

Study 1 – The Laboratory

In this study, undergraduates were taught a new mental mathematics technique for solving two-digit multiplication problems. Participants were randomly assigned to the relevance or control conditions. Participants in the relevance conditions were asked to write a short essay describing how the math activity could relate to their life or to the lives of college students in general, whereas participants in the control condition were asked to complete a writing task unrelated to the math activity. We measured participants' perceived utility value, situational interest in the task, maintained situational interest (i.e., inclination to re-engage in the task at a later time), and performance on the task.

We hypothesized that participants in the relevance condition would be more interested in the math activity at the end of the session than those in the control condition. We also expected that these effects would be moderated by participants' performance expectations, such that students with low performance expectations would benefit more from the intervention than those with high performance expectations. In addition, we hypothesized that both of these effects would be mediated by participants' utility perceptions, and that utility value perceptions might also be associated with performance.

Method

Participants

One hundred and seven undergraduate students (50 males, 57 females) from the introductory psychology class at the University of Wisconsin, Madison participated in the study. Participants were 92% Caucasian, 4% Hispanic, 3% Asian, and 1% African American. Participants were run individually and received extra credit upon completion of the 60 minute session.

Measures

Participants' initial interest in math was measured using a 4-item scale (e.g., "I find math enjoyable"). Participants' performance expectations for answering the multiple problems during the experimental session were measured with a 3-item scale (e.g., "I think I'll do well on the following sets of problems"). Participants' perceptions of the technique's utility value were measured using a 3-item scale (e.g., "This technique could be useful in everyday life," Perceived Utility Value). Participants' situational interest in the technique was measured using a 5-item scale (e.g., "The left-to-right technique is interesting"). Participants responded to all self-report scale items in this study on a 7-point Likert-type scale from 1 (*strongly disagree*) to 7 (*strongly agree*). Participant's maintained situational interest in the technique was assessed by asking, "Do you think you will use the technique you learned today on your own in the future?" Participant responses were coded as '0' for "no" and '1' for "yes". Appendix A lists the individual items and reliability coefficients for each self-report scale in Study 1. The total number of problems solved correctly on the official problem set was used as a measure of participants' performance.

Procedure

Participants were run through the experimental session individually. After completing a consent form and a measure of initial interest in math, an audio recording guided the participants through a colorful instructional notebook that taught them a four-step method for solving two-

digit multiplication problems in their head (adopted from Flansburg & Hay, 1994; see Barron & Harackiewicz, 2001, for a more detailed description of the experimental procedures). The instructions also indicated the basic outline of the session, which went as follows. After the learning period, participants were given three minutes to practice the technique on a problem set. Following this practice period they reported their performance expectations for the experimental session. Next, the experimenter handed the participant a folded sheet of paper (to ensure that the experimenter was blind to condition) that contained instructions for writing either a relevance or control essay. Based upon pilot testing, all participants were given 10 minutes to type the essay on a laptop computer. All participants indicated a familiarity with the computer and word processing program used to record their essays. Participants in the relevance condition were asked to:

Type a short essay (1 – 3 paragraphs in length) briefly describing the potential relevance of this technique to your own life, or to the lives of college students in general. Of course, you'll probably need more practice with the technique to really appreciate its personal relevance, but for purposes of this writing exercise, please focus on how this technique could be useful to you or to other college students, and give examples.

Participants in the control condition were asked to write about two pictures that were hanging on the wall of the experimental room. The pictures were of math-related (e.g., a man examining charts and figures) and art-related scenes (e.g., covers from the *New Yorker* magazine) that contained enough objects and detail to describe in a 10 minute essay. Participants in the control writing were asked to:

Type a short essay (2 paragraphs) describing the objects that you see in both pictures; simply describe in detail the objects that you see. First, in one paragraph, simply describe in detail the objects that you see in the picture on the left. Second, in one paragraph, simply describe in detail the objects that you see in the picture on the right.

After writing the essay, the experimenter informed the participants that they would have six minutes to work on the official problem set while using the new technique. After participants were told how many problems they solved correctly on the official problem set, they then completed measures of utility value and situational interest. Finally, we assessed their inclination to use the technique in the future (maintained situational interest).

Results

Manipulation Check

In order to assess the effectiveness of the intervention on the content of participants' essays, each of the essays was coded by two research assistants who were blind to the experimental conditions and hypotheses of the study. The essays were coded for the presence (yes/no) of utility value for the math technique, and the number of examples of utility value in the essay. The coders read each of the 107 essays independently and assigned a rating. Differences were resolved through discussion (84% initial agreement). The two scales (number of types, number of examples) were each standardized and averaged to create a composite index of the degree of Observed Utility Value that participants mentioned in their essays ($M = 0.00$, $SD = 0.98$; $\alpha = .98$).

In order to test whether or not the relevance condition caused participants to write about more personal relevance in their essays than those in the control condition, we conducted an independent samples t-test using the coders' ratings of Observed Utility Value as the dependent

variable. The t-test indicated that participants in the relevance condition mentioned significantly more utility value in their essays ($M = 1.74$, $SD = 0.61$) than those in the control condition ($M = 0.00$, $SD = 0.00$), $t(105) = 19.91$, $p < .01$. We also examined the number of sentences that participants wrote in their essays. The t-test indicated that participants in the relevance condition ($M = 9.52$, $SD = 2.87$) wrote fewer sentences than those in the control condition ($M = 12.87$, $SD = 3.50$), $t(105) = -5.43$, $p < .01$. Thus, we could be assured that any effects of our intervention were due to participants mentioning more utility value in their essays and not because they wrote more in that condition.

Analytic Approach

The data were analyzed using hierarchical multiple regression in two steps. First, we examined the direct effects of the relevance intervention and performance expectations on the outcomes of situational interest, maintained situational interest, and performance. Second, we tested whether perceptions of utility value mediated the direct effects of the relevance intervention on the outcomes.

Prior to conducting analyses we standardized all continuous variables. Interaction terms were created by multiplying the variables together. Preliminary analyses revealed that the main and interactive effects of gender were not significant predictors of any outcome, and were thus trimmed from the regression models. The basic regression model consisted of four terms: initial interest in math, performance expectations, the relevance intervention contrast ($-1 = \text{control}$, $+1 = \text{relevance}$), and the two-way interaction between performance expectations and the relevance intervention. The interaction was included to test whether the intervention functioned differently for individuals with low and high levels of performance expectations. Significant interactions were examined by computing predicted values based on estimates for one standard deviation

below and above the mean on performance expectations (Aiken & West, 1991). Descriptive statistics and zero-order correlations for all Study 1 measures are presented in Table 1, and the results of the regression analyses are presented in Table 2.

Direct Effects on Situational Interest, Maintained Situational Interest, and Performance

The basic model accounted for a significant portion of the variance in situational interest, $F(4, 102) = 8.12, p < .001, R^2 = .21$. There was a significant main effect of the relevance contrast, $t(102) = 2.69, p = .01, (\beta = .24)$, indicating that participants in the relevance condition ($\hat{Y} = 5.09$) became more interested in the technique than participants in the control condition ($\hat{Y} = 4.61$). This main effect were qualified by the significant interaction between performance expectations and the relevance contrast, $t(102) = -2.30, p = .02, (\beta = -.22)$. As shown in the upper-left panel of Figure 2, participants low in performance expectations found the technique to be more interesting in the relevance condition ($\hat{Y} = 4.93$) than in the control condition ($\hat{Y} = 4.17$). In contrast, individuals with high performance expectations found the new technique to be equally interesting in both the relevance ($\hat{Y} = 5.26$) and control conditions ($\hat{Y} = 5.06$). There was also a significant main effect of initial interest, $t(102) = 2.30, p = .05, (\beta = .21)$, and performance expectations, $t(102) = 3.77, p < .01, (\beta = .48)$, indicating that participants with higher initial interest and/or performance expectations became more interested in the technique than those with lower initial interest or performance expectations.

Logistic regression was used to analyze the results from the dichotomous (0 = no, 1 = yes) measure of maintained situational interest. Regressing inclination on the basic model revealed that the four variables in the model accounted for approximately 33% of the variation in interest (Nagelkerke $R^2 = .33$)¹. There was a significant main effect of the relevance contrast, Wald $\chi^2(1, N = 107) = 7.23, p < .01$, odds ratio (OR) = 8.29, indicating that participants in the

relevance condition were more inclined to use the technique in the future than those in the control condition. There was also a significant main effect of performance expectations, Wald $\chi^2(1, N = 107) = 6.48, p = .01$, odds ratio (OR) = 2.24, indicating that participants with higher performance expectations were more inclined to use the technique in the future than those with lower performance expectations. As shown in the middle-left panel of Figure 2, these main effects were qualified by a significant interaction between performance expectations and the relevance contrast, Wald $\chi^2(1, N = 107) = 10.10, p < .01$, odds ratio (OR) = 0.23, indicating that participants with lower performance expectations were more inclined to use the technique in the relevance condition than in the control condition. Participants with higher performance expectations reported similar levels of inclination in the two conditions.

The basic model accounted for a significant portion of the variance in performance, $F(4, 102) = 6.31, p = .01, R^2 = .20$. There were significant main effects of initial interest, $t(102) = 1.97, p = .05, (\beta = .18)$, and performance expectations, $t(102) = 3.77, p < .01, (\beta = .37)$, indicating that participants with higher initial interest and/or performance expectations scored higher on the problem sets than those with lower initial interest or performance expectations. No other effects were significant.

Mediation Analyses

We examined whether perceived utility value mediated the effect of the relevance intervention on situational interest and maintained situational interest, and whether perceived utility value was related to final performance. We first regressed perceived utility value on the basic model. We then added perceived utility value to the basic model, resulting in a 5-term mediation model. We followed procedures outlined by Kenny, Kashy, & Bolger (1998) to test the mediated effects. In this case, the direct effect of the relevance intervention, and the

interaction between the intervention and performance expectations, were multiplied by the effects of perceived utility value on the focal outcome (i.e., the alpha-beta term, or the indirect effect). The new product term was divided by its standard error to produce a significance test for mediation. This technique has been shown to be robust to Type I errors (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002).

The basic model accounted for a significant portion of the variance in perceived utility value, $F(4, 102) = 3.69, p < .01, R^2 = .14$. As predicted, the main effect of the relevance intervention was significant, $t(102) = 2.03, p = .05, (\beta = .19)$, indicating that participants in the relevance condition ($\hat{Y} = 5.33$) found the technique to be more useful at the end of the session than participants in the control condition ($\hat{Y} = 4.92$). This effect was qualified by a significant interaction between the intervention and performance expectations, $t(102) = -3.06, p < .01, (\beta = -.29)$. As shown in the bottom-left panel of Figure 2, participants with lower performance expectations found the technique more useful in the relevance condition ($\hat{Y} = 5.21$) than in the control condition ($\hat{Y} = 4.43$). In contrast, participants with higher performance expectations found the technique equally useful in the relevance ($\hat{Y} = 5.32$) and control conditions ($\hat{Y} = 5.32$).

The mediation model on situational interest accounted for significantly more variance than the basic model (R^2 -change = .38, $p < .001$). Perceived utility value was a significant predictor of situational interest, $t(101) = 9.57, p < .01, (\beta = .65)$, indicating that participants who perceived more utility value in the math technique found it more interesting than those who perceived less utility value in the technique. Importantly, the main effect of the relevance intervention, the main effect of performance expectations, and their interaction were no longer significant. The formal test of mediation revealed that perceived utility value mediated the

effects on situational interest for the relevance intervention, $z = 1.86$ ($p = .06$), performance expectations, $z = 3.19$ ($p < .01$), and their interaction, $z = 2.93$ ($p < .01$).

The mediation logistic regression model on maintained situational interest accounted for more variance than the basic model (Nagelkerke R^2 -change = .41). There was a significant main effect of perceived utility value, Wald $\chi^2(1, N = 107) = 9.95, p < .01$, odds ratio (OR) = 80.38, indicating that participants who perceived more utility value in the math technique were more inclined to use the technique in the future. The direct effect of the relevance intervention was reduced in size but still significant, Wald $\chi^2(1, N = 107) = 5.37, p = .02$, odds ratio (OR) = 15.53, but its interaction with performance expectations was not, Wald $\chi^2(1, N = 107) = 3.35, p = .07$, odds ratio (OR) = 0.26. The formal test of mediation revealed that perceived utility value mediated the effects on maintained situational interest for both the relevance intervention, $z = 1.84$ ($p = .06$), and its interaction with performance expectations, $z = 2.86$ ($p < .01$). The top panel of Figure 3 presents the path model results for Study 1.

Regressing performance on the mediational model did not account for significantly more variance than the basic model (R^2 -change = .01, $p = .22$), and the effect of perceived utility value was not significant, $t(101) = 1.23, p = .22, (\beta = .12)$.

Discussion – Study 1

The results of Study 1 demonstrated that an experimental intervention designed to influence perceptions of the utility of a math task was successful in doing so. The relevance intervention triggered situational interest in the math technique, as indicated by their reports of interest at the end of the experimental session. In addition, the intervention maintained participants' interest beyond the experimental session, as indicated by their inclination to use the math technique in the future. These direct effects were particularly strong for participants with

lower performance expectations. In addition, the direct effects of the relevance intervention on interest were mediated by the degree of utility value participants perceived in the math technique. These findings are unique in several ways.

First, the findings reveal direct evidence of the causal role of utility value in the interest development process outlined by Hidi and Renninger (2006). This extends prior correlational research by demonstrating, through a randomized experiment, that utility value can play a causal role in triggering and maintaining interest in a topic. Second, the results support also our theoretical model, in particular that the relevance intervention was more effective for students with low performance expectations. However, because the study was conducted within an experimental laboratory, it remains to be seen whether they generalize to actual classroom environments. In addition, the relevance intervention did not impact performance, neither directly nor indirectly through utility perceptions. It is possible that the effects of the intervention require more time to impact actual achievement, and thus a longitudinal field experiment may reveal performance effects.

Study 2 – The College Psychology Classroom

Study 2 was a randomized experiment that extended the laboratory experiment (Study 1) into an undergraduate psychology classroom. Students were randomly assigned to one of four conditions at mid-semester: two were relevance conditions and two were control conditions. The primary questions addressed in Study 2 were: 1) Can a relevance intervention increase perceptions of utility value within the context of a college class? 2) Can the same intervention affect students' subsequent situational interest? 3) Does the relevance intervention trigger and maintain situational interest in psychology by increasing perceptions of utility value, thus supporting our hypothesized model? and 4) Does the relevance intervention impact performance

directly, or indirectly through utility perceptions? We hypothesized that students in the relevance condition would be more interested in the course at the end of the semester, and more inclined to major in psychology, than those in the control condition. We again expected that these effects would be more pronounced for students with lower performance expectations. However, in Study 2 we examined students' early performance in the class instead of their expected performance. Thus, we predicted that the effects of the relevance intervention would be greater for students who were not performing well in the course at mid-semester. In addition, we hypothesized that the effects of the intervention would be mediated through students' perceptions of utility value.

Method

Overview

This study took place during the course of a 15-week semester at a large, Midwestern university and consisted of three waves of data collection during the semester. Students' initial interest in the course topic and inclination to major in psychology were assessed on the second day of the semester (Time 1); their initial perceptions of utility value for the course were measured two weeks into the semester and before the first exam (Time 2); and final measures of utility value, interest in the course, and inclination to major in psychology were collected during the 13th week of the semester (Time 3). We also obtained students' final course grades from department records. The relevance intervention occurred during the second half of the semester (weeks 9-12).

Participants and Setting

Participants were recruited from an Introductory Psychology class that consisted of approximately 350 students. Only students who were taking the course for graded credit and who

agreed to complete our surveys were included in the sample ($N = 318$; 91% of the students in the course). Classes were primarily in lecture format and students' grades were determined by their performance on several multiple-choice exams given throughout the semester. Final grades were assigned based upon a normative curve. Students completed the surveys during class time and received extra credit for completing all three surveys.

Relevance Intervention

At mid-semester (after the second exam), students were randomly assigned to one of two sets of writing conditions – one set was intended to help students see the relevance of the course material to their lives (relevance), and the other set was intended to serve as a control (control). The writing exercises were part of the course syllabus and were completed for 5 points of course credit. Each student was asked to complete their assigned essay twice during the second-half of the semester – once in the 10th week and again in the 12th week. All students ($N = 318$) completed at least one of the essays, and 92% ($N = 295$) completed both of the required essays. The instructor, who was blind to students' condition, graded each essay on a scale from 0 to 5 (essay 1: $M = 4.16$, $SD = 0.86$; essay 2: $M = 4.24$, $SD = 4.24$). In each condition, students were asked to select a topic that was currently being covered in class (e.g., the effect of sleep loss on cognitive functioning) and write a 1-2 page essay. From this point, the instructions for each condition varied as follows.

In the relevance conditions, students were randomly assigned to either write a letter to a significant person in their lives (e.g., friend, relative, partner) describing the relevance of their topic to this person (letter, $N = 78$), or to find a media report (e.g., magazine, newspaper, internet, etc.) that pertained to their topic and write an essay that discussed the relevance of the media report to information they were learning in class (media, $N = 82$). The letter and media

assignments asked students to connect the course material to their lives through their social connections or the popular media. Our preliminary testing of these conditions showed no differences on our outcomes, and thus they were combined into one relevance condition for the analyses reported herein.

In the control conditions, students were randomly assigned to either write an outlined summary of the topic they selected (outline, $N = 78$), or to search the PsycINFO database for two abstracts relating to the topic they selected and discuss how the abstracts expanded upon the material they were learning in class (PsycINFO, $N = 80$). The purpose of the outline condition was to control for increases in knowledge that could occur by summarizing the material in written form. Prior research has demonstrated that knowledge development can occur through such knowledge consolidation exercises (Bransford, Brown, & Cocking, 2003), and the outline condition would control for this effect. The PsycINFO condition was used to control for the triggering of interest that can occur from the opportunity to explore a particular topic in-depth (Flum & Kaplan, 2006; Hidi & Renninger, 2006). Compared to the relevance conditions, which asked students to make connections between the course material and their lives, the PsycINFO condition asked students to make connections between the course material and the psychological research from which it is derived. In combination, the outline and PsycINFO conditions control for knowledge consolidation (and increased learning) and in-depth topic exploration (and increased interest). Our preliminary testing of these conditions showed no differences in the control conditions on our outcomes, and thus they were combined into one control condition for the analyses reported herein.

Measures

Students' initial interest in the course topic was assessed with five items (e.g., "I think I will like learning about psychology in this course") and were based on prior research (Harackiewicz et al., 2002; Harackiewicz et al., 2008; Hulleman et al., 2008). Students' situational interest in the course was assessed with a five-item scale (e.g., "I think the field of psychology is very interesting"). Students' maintained situational interest in psychology (initial and final) was measured with a single item (e.g., "I am interested in majoring in psychology"). Students' perceptions of utility value (initial and final) were assessed with a 3-item scale (e.g., "I think what we are studying in Introductory Psychology is useful for me to know"). Participants responded to all self-report items in this study on 7-point Likert-type scales from 1 (*strongly disagree*) to 7 (*strongly agree*). Appendix B lists the individual items and reliability coefficients for each self-report scale in Study 2.

Student course grades were based on four multiple-choice exams given throughout the semester, with each exam given equal weight. Students' early performance in the course was calculated by summing their scores on their first two exams (mid-term exams). Students' final course grades were obtained from departmental records. Each student could receive one of seven possible grades, based on the university's 4-point scale. The average grade for students in this study was 2.75 ($SD = .90$). Grades were distributed as follows: A = 17.3%, AB = 13.1%, B = 18.5%, BC = 17.3%, C = 25.3%, D = 5.7%, and F = 3.0%.

Results

Attrition and Missing Data

The initial sample of 318 students included individuals who did not complete all three waves of the survey: 292 students completed Time 1, 272 completed Time 2, and 272 completed Time 3. The attrition was primarily due to students missing class on the day the surveys were

administered: Eight students did not complete any of the three waves of data collection, 20 missed two waves of data collection, and 81 students (26%) missed at least one wave of data collection. In sum, of the original sample of 318 students, 237 students (74%) had complete data on all 3 waves.

Manipulation Check

As in Study 1, each of the student essays was coded by two research assistants who were blind to the experimental conditions and hypotheses of the study. The essays were coded on two categories. The degree of utility value that students wrote about was coded on a scale from 0 to 3, with more points indicating an increased number of applications and/or a better description of how the material was useful or applicable to life (observed utility value). To rate the extent to which participants connected the material to their lives in particular, the coders counted the number of personal pronouns used in the essay (e.g., I, me, mine, us, our, ours; personalization). The coders read each of the 624 essays independently and assigned a rating. Cronbach's alphas were acceptable for ratings of utility value (0.72 for essay 1 and 0.82 for essay 2) and number of pronouns (0.99 for essay 1 and 0.95 for essay 2). Differences were resolved through discussion. The ratings for essay 1 and essay 2 were averaged to create an overall index of observed utility value ($M = 0.64$, $SD = 0.76$) and number of personal pronouns ($M = 9.91$, $SD = 13.23$). Because these two measures were highly correlated ($r = .76$, $p < .001$), the values were standardized and averaged to form a composite rating of observed relevance ($M = 0.01$, $SD = 0.95$; $\alpha = .86$).

In order to test whether or not the relevance conditions caused participants to find more personal relevance in the material than those in the control conditions, we conducted t-tests using the coders' ratings of observed relevance as the dependent variable. The results indicated that students in the relevance conditions mentioned more utility value and used more personal

pronouns in their essays ($M = 0.50$, $SD = 1.10$) than those in the control conditions ($M = -0.44$, $SD = 0.44$), $t(235) = 8.79$, $p < .01$ ($d = 1.25$). We also tested whether students' essay grades varied by condition. The results indicated that there were no differences in essay grades between students in the relevance conditions ($M = 8.16$, $SD = 1.54$) and those in the control conditions ($M = 8.41$, $SD = 1.54$), $t(235) = -1.25$, $p = .22$ ($d = .16$).

Analytic Approach

The same analytic approach was used in Study 2 as in Study 1 except as noted below. Actual competence (mid-term exams) was entered in the regression models instead of performance expectations. In addition to initial interest, the regression models also controlled for initial inclination and initial utility value perceptions. Thus, the basic model contained six terms: initial interest, initial inclination, initial utility value, mid-term exams, the relevance contrast, and the interaction between the relevance contrast and mid-term exams. Descriptive statistics and zero-order correlations for all Study 2 measures are presented in Table 3, and the results of the regression analyses are presented in Table 4.

Direct Effects on Situational Interest, Maintained Situational Interest, and Course Grades

The basic model for situational interest was significant, $F(10, 236) = 32.13$, $p < .01$ ($R^2 = .46$). There was a significant main effect of the relevance contrast, $t(236) = 3.24$, $p < .01$, ($\beta = .16$), indicating that participants in the relevance conditions reported more interest in psychology at the end of the course than participants in the control conditions. This direct effect was moderated by a significant interaction with mid-term exams, $t(236) = -3.54$, $p < .01$, ($\beta = -.18$). This interaction is presented in the upper-right panel of Figure 2. The predicted values indicated that students with lower exam scores in the relevance conditions reported more interest in the course ($\hat{Y} = 4.91$) than those in the control conditions ($\hat{Y} = 4.03$, $\beta = .34$, $p < .01$). Students with

higher exam scores reported equivalent levels of interest in the course in the relevance ($\hat{Y} = 4.83$) and control conditions ($\hat{Y} = 4.88, \beta = -.02, p = .62$). In addition, there were direct effects of mid-term exams, $t(236) = 2.90, p < .01, (\beta = .15)$ initial interest, $t(236) = 6.35, p < .01, (\beta = .44)$, and inclination, $t(236) = 2.19, p = .03, (\beta = .13)$, indicating that students with higher levels of early performance, interest in psychology, and inclination to major in psychology at the beginning of the semester were more interested in the course at the end of the semester than those students with lower levels.

The basic model accounted for a significant amount of variance in inclination to major in psychology $F(10, 236) = 18.47, p < .01 (R^2 = .47)$. Students who initially took the course because they were interested in majoring in psychology reported being more interested in majoring in psychology at the end of the course than those who were not initially interested, $t(236) = 11.69, p < .01, (\beta = .66)$. Students who performed better early in the course also reported being more interested in majoring in psychology at the end of the course, $t(236) = 2.21, p = .03, (\beta = .11)$. This effect was qualified by the significant interaction between mid-term exams and the relevance contrast, $t(236) = -2.06, p = .04, (\beta = -.10)$. As presented in the middle-right panel of Figure 2, the predicted values indicated that students with lower exam scores in the relevance conditions reported more interest in majoring in psychology ($\hat{Y} = 2.40$) than those in the control conditions ($\hat{Y} = 1.92, \beta = .13, p = .09$). In contrast, students with higher exam scores reported equivalent levels of interest in majoring in psychology in the relevance ($\hat{Y} = 2.43$) and control conditions ($\hat{Y} = 2.70, \beta = -.07, p = .24$).

The basic model did not account for a significant amount of variance in final grade, and there were no significant direct effects on final grade.

Mediation Analyses

The same procedures used to test mediation in Study 1 were used in Study 2. We first tested whether the basic model predicted final perceptions of utility value, and then whether perceptions of utility value accounted for the effects of the relevance intervention on the outcomes. The mediation model contained seven terms: initial interest, initial inclination, initial utility value, mid-term exams, the relevance contrast, the interaction between the relevance contrast and mid-term exams, and final perceptions of utility value.

The basic model accounted for a significant amount of variance in perceived utility value, $F(10, 236) = 14.96, p < .01 (R^2 = .46)$. Although the direct effect of the relevance contrast was not significant, $t(236) = 1.55, p = .12, (\beta = .08)$, the interaction between the relevance contrast and mid-term exams was significant, $t(236) = -2.66, p < .01, (\beta = -.15)$. This interaction is presented in the bottom-right panel of Figure 2. The predicted values indicated that students with lower exam scores in the relevance conditions ($\hat{Y} = 4.52$) perceived more utility value in the course than those in the control conditions ($\hat{Y} = 3.98, \beta = .23, p < .01$). Students with higher scores perceived equivalent levels of utility value in the course in the relevance ($\hat{Y} = 4.75$) and control conditions ($\hat{Y} = 4.86, \beta = -.07, p = .24$). The significant direct effects of mid-term exams, $t(236) = 5.02, p < .01, (\beta = .24)$, initial utility value, $t(236) = 5.82, p < .01, (\beta = .36)$, and initial interest, $t(236) = 3.44, p < .01, (\beta = .30)$, indicated that students who performed well on the mid-term exams, and/or reported higher levels of initial utility value and interest subsequently perceived more utility value in the course than those with lower levels. No other effects were significant.

Situational interest was regressed on the mediation model and it accounted for significantly more variance than the basic model (R^2 -change = .21, $p < .01$). The significant direct effect of perceived utility value, $t(236) = 12.00, p < .01, (\beta = .61)$, indicates that students

who perceived higher levels of utility value in the course reported more interest in psychology at the end of the semester. Although the direct effects of the relevance contrast and its interaction with mid-term exams remained significant in the mediation model, the formal test of mediation revealed that perceived utility value partially mediated the direct effect of the value contrast on situational interest, $z = 1.66$ ($p = .096$), and fully mediated the interaction between the value contrast and mid-term exams on situational interest, $z = 2.60$ ($p < .01$).

Maintained situational interest was regressed on the mediation model and it accounted for significantly more variance than the basic model (R^2 -change = .05, $p < .001$). The significant direct effect of perceived utility value, $t(236) = 5.05$, $p < .001$, ($\beta = .31$), indicates that students who perceived higher levels of utility value in the course reported more interest in majoring in psychology at the end of the semester. The interaction between the relevance contrast and initial exams was no longer significant, and perceived utility value mediated the interaction effect on maintained situational interest, $z = 2.35$ ($p = .02$).

Final grades were regressed on the mediation model and accounted for significantly more variance than the basic model, (R^2 -change = .07, $p < .01$). There was a significant direct effect of perceived utility value, $t(236) = 3.55$, $p < .01$, ($\beta = .33$), indicating that students who perceived higher levels of utility value in psychology received higher grades than students who perceived lower levels of utility value. The overall mediation path model for Study 2 is presented in the bottom panel of Figure 3.

Study 2 Discussion

The results of Study 2 replicate and extend those of Study 1 in several important ways. First, Study 2 demonstrated that the relevance intervention triggered and maintained students' situational interest in psychology over the course of the semester, particularly for students who

had performed more poorly on the first two exams. These results replicated the effect in Study 1 – that the intervention works better for some students than others – and extended the results to include participants with poor performance histories. We found the same pattern of results for students' perceived utility value of psychology that we found in Study 1 for the math activity: the relevance intervention increased perceptions of utility value, which in turn mediated the direct effects of the intervention on situational interest and interest in majoring in psychology.

Study 2 also replicated prior research that has demonstrated an association between perceived utility value and performance (Hulleman et al., 2008; Hulleman & Harackiewicz, in press; Simons, Dewitte & Lens, 2003, 2004). In particular, Study 2 revealed that increases in utility value predicted students' final course grades, controlling for utility value at Time 1. By controlling for initial utility perceptions, this analysis demonstrates that changes in utility value (as predicted by the relevance intervention) lead to increases in graded performance. Although there was no direct effect of the intervention on performance, students performed better when they perceived value in the course material, and our intervention was successful in promoting those perceptions. In sum, we were able to extend our laboratory results to the college classroom and document that our relevance intervention promoted interest and performance by enhancing students' perceptions of utility value.

Summary of Relevance Intervention Effects Across Studies

In both studies, the relevance intervention had significant direct effects on situational interest and perceived utility value. Significant interactions between the intervention and performance expectations or prior performance on triggered and maintained situational interest, and perceived utility value, were also present in both studies. The intervention also had a significant direct effect on maintained situational interest in the laboratory. As summarized in

Table 5, the average effect for participants with low performance expectations or prior performance was $\beta = .52$ in Study 1 and $\beta = .23$ in Study 2. In contrast, the average intervention effect for students with high performance expectations or prior performance was nearly zero, $\beta = -.03$ in Study 1 and $\beta = -.05$ in Study 2.

General Discussion

The primary purpose of this research was to conduct an experimental test of a utility value intervention by encouraging students to discover the relevance of what they were learning. Across two randomized experiments – one in the laboratory and one in the classroom – we demonstrated that our intervention, a writing exercise in which we encouraged students to apply the task or course material to their own lives, increased perceptions of utility value. In turn, these utility perceptions predicted increases in triggered situational task interest and maintained interest to re-engage in the math task in the future (Study 1), situational interest and maintained interest in majoring in psychology (Study 2), and performance (Study 2). The effects of the intervention were strongest for participants with low performance expectations (Study 1) and prior performance (Study 2). Although the intervention did not benefit students with high expectations or prior performance, it did not undermine their subsequent interest or performance. These results support our hypothesized model outlined in Figure 1, and afford some insight into the mechanisms of the intervention effects documented here.

A unique aspect of this research is that we manipulated utility value in addition to measuring it. This combination of experimental and survey approaches allowed us to draw firmer conclusions regarding the causal nature of utility value (Schneider, Carnoy, Kilpatrick, Schmidt, & Shavelson, 2007). We focused on utility value for two reasons. From a theoretical perspective, we wanted to understand how perceived task value contributed to the development of interest

over time. In their model of interest development, Hidi and Renninger (2006) proposed that perceived value for a task can contribute to both situational and individual interest. From a practical perspective, we wanted to know how we could address the documented decline in student interest over time (Jacobs et al., 2002; Lepper et al., 2005). The task value that seemed to be the most amenable to a classroom intervention was utility value, given its more external nature (Brophy, 1999; Heckhausen, 1977; Hidi & Harackiewicz, 2000; Pintrich & De Groot, 1990; Schiefele, 1991; Wigfield & Eccles, 1992). In addition, prior correlational research has identified utility value as a potentially important antecedent of both interest and performance.

Theoretical Implications

At first glance, the interaction revealed in our research seems opposite to what is predicted by most expectancy-value models. That is, most models predict that the combination of high expectancy and high value will be the most motivating. In contrast, we found that the value intervention worked most effectively for those with low expectancies. However, the effect of our intervention was to raise perceptions of utility value for individuals who did not otherwise perceive value, and so our findings are consistent with the perspective that increases in perceived value can promote motivation and performance. In addition, the consistency of the interaction between expectancies and value in our research supports including it in theoretical and empirical models (e.g., Atkinson, 1957; Edwards, 1954; Lewin, Dembo, Festinger, & Sears, 1944; Tolman, 1955; Vroom, 1964; see Mitchell, 1974, for a review). In addition, the relationship between expectancies and value could not have been uncovered unless task values were considered as conceptually distinct constructs as proposed by Eccles et al. (1983)..

Our theoretical model provides one means of incorporating these novel results into the expectancy-value framework. Considering the variability in tasks and contexts, the consistency

in predictive strength of our intervention and perceptions of utility value suggests that our theoretical model is viable. However, this model should be considered as an initial step in understanding how perceived utility value influences motivation and performance. There are likely other processes, in addition to utility perceptions, that may be influenced by our intervention and associated with interest and performance. For example, finding an application for an activity (e.g., math and engineering) may create the possibility of making connections to goals or aspirations that are personally important to the individual (e.g., a career as an engineer). As outlined in other models that specify an internalization process (e.g., Deci & Ryan, 1985; Vansteenkiste, Lens, & Deci, 2006), an individual can identify with an extrinsic motivator such that it effectively becomes intrinsic in nature. As defined, utility value is a more extrinsic type of task value: The task is important, not for task-intrinsic reasons (i.e., enjoyment), but for task-extrinsic reasons (i.e., as a tool for accomplishing a goal). In contrast, intrinsic value – which focuses on the enjoyment of doing the activity – is associated with more internal processes: enjoyment of the activity arises from both the task (task-intrinsic) and person (person-intrinsic). However, even task-extrinsic values can be person-intrinsic (Hulleman et al., 2008; Simons, Dewitte et al., 2004), and the intrinsic relation to the self may be the critical variable. That is, a task's utility can be important for the individual's sense of self, such as accomplishing a personally meaningful goal. As a result, we hypothesized that perceiving utility value in a task could lead to processes that are both internally and externally motivating.

Asking students to think about the applications of a topic may promote active and involved task engagement which leads them to appreciate the utility value of the topic. In their process model of intrinsic motivation, Harackiewicz and Sansone (1991) proposed that becoming involved during task engagement (i.e., task involvement) is a precursor of intrinsic motivation.

Research has demonstrated that feelings of involvement are associated with subsequent interest and performance on laboratory tasks (Harackiewicz, Barron, & Elliot, 1998; Barron & Harackiewicz, 2001; Durik & Harackiewicz, 2003; Mitchell, 1993) and with positive life outcomes such as happiness and academic performance (Csikszentmihalyi, 1990). In addition, the literature on student engagement in the classroom reveals positive relationships between measures of emotional and behavioral engagement and outcomes such as intrinsic motivation for learning, hope for the future, and academic achievement (Furrer & Skinner, 2003; Patrick, Skinner, & Connell, 1993; Skinner & Belmont, 1993; Van Ryzin, Gravely, & Roseth, 2009). It is therefore possible that by making connections between the material and their lives that students become more involved and engaged in learning – both emotionally and behaviorally – which promotes learning and interest outcomes.

This study also extends prior research and theorizing on the role of value in interest development. In their model of interest development, Hidi and Renninger (2006) proposed that perceived value for a task is a component of both situational and individual interest. In other words, value for a task can be perceived during task engagement or over time as (possibly) a more enduring characteristic of the person. We focused on task value as triggering and maintaining situational interest, and found that utility value played a causal role in the development of interest over the course of a laboratory session or academic semester. Thus, our results provide support for Hidi and Renninger's (2006) model by demonstrating one pathway through which value can promote interest development.

Limitations

There are several noteworthy limitations to our research. First, the math activity, and to some extent the introductory psychology course, did not require deeper level processing or

complex thinking. Thus, any generalizations we could make about the impact of our educational intervention on learning with more complex tasks may be limited. In addition, the samples in both studies were undergraduate students and this also has potential to limit generalizations about our findings to younger students. Second, our analysis of interest was constrained to an emotion-focused situational interest scale and a single-item indicator of inclination to re-engage in the task or topic in the future. Future research will need to clarify the effects of the relevance intervention on other measures of interest that may also include measures of knowledge and value. In doing so, it will be essential to ensure that interest measures are conceptually and empirically distinct from other key dependent or independent variables.

Third, knowledge activation – which is an important aspect of interest in the Hidi and Renninger (2006) model – could also explain the effects of the relevance intervention. Making a connection between a course topic and real-life could facilitate deeper processing of the material, encourage reorganization of the material to facilitate recall and future application, or increase the amount of material encoded into memory (Bransford et al., 2004; Hidi & Renninger, 2006). Although we did not directly test this possibility in our research, one of our control groups in Study 2 was intended to increase knowledge consolidation and depth of processing (the outline condition). The fact that we found effects of the relevance intervention in Study 2 contradicts this possibility, albeit indirectly, and this possibility can be addressed by future research.

Practical Applications

Our results demonstrate that careful theoretical work can pay dividends in terms of real-world implications. The development of the relevance intervention began with a theoretical grounding in expectancy-value and interest development models of motivation. As a result, an often overlooked aspect of expectancy-value theory – the interaction between expectancy and

value – proved valuable in understanding student motivation, particularly in response to classroom interventions. Practically-speaking, the relevance intervention is easy and inexpensive to implement, produces effects in as few as one or two trials, can be flexibly implemented during class or on the students' own time, and is applicable to a diverse array of topics or activities.

Although the participants in our research only wrote about two topics (mental math and psychology), there is no reason to assume that similar results cannot be obtained in other domains, such as history, English, or chemistry. In fact, some recent research indicates that these results also obtain in high school science and college statistics classes (Hulleman, An, Hendricks, & Harackiewicz, 2007; Hulleman & Harackiewicz, in press). Importantly, the students who most often concern teachers – those who perform poorly and have low performance expectations – benefited the most from our intervention, and those with high performance expectations were not harmed by it. These results parallel the positive effects of other psychological interventions intended to diminish the racial achievement gap in school performance (e.g., Cohen, Garcia, Apfel, & Master, 2006), and demonstrate the positive potential of motivational interventions. In other words, this research demonstrates that "...there is nothing so practical as a good theory (Lewin, 1951, p. 169)."

Appendix A – Scale items for Study 1

Participants responded to all self-report items in this study on a 7-point Likert-type scale from 1 (*strongly disagree*) to 7 (*strongly agree*).

Initial Interest ($\alpha = .93$)

I find math enjoyable

Math just doesn't appeal to me. (Reversed)

I enjoy working on math problems.

I like learning new math concepts.

Performance Expectations ($\alpha = .74$)

I think I'll do well on the following sets of problems.

I felt that I was using the technique correctly.

I felt that I was doing poorly on these problems. (Reversed)

Utility Value ($\alpha = .84$)

This technique could be useful in everyday life,

I don't think this technique would be useful to me in the future. (Reversed)

To be honest, I don't think this technique is useful. (Reversed)

Situational Interest ($\alpha = .89$)

The left-to-right technique is interesting.

Using this multiplication technique is fun.

It was a waste of time to learn this technique. (Reversed)

I enjoyed using the left-to-right technique.

The learning program was enjoyable.

Maintained Situational Interest

Do you think you will use the technique you learned today on your own in the future? (Yes/No)

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Appendix B - Scale items for Study 2

Participants responded to all self-report items in this study on a 7-point Likert-type scale from 1 (*strongly disagree*) to 7 (*strongly agree*).

Initial Interest ($\alpha = .91$)

I think psychology is an interesting subject.

I am not interested in psychology. (Reversed)

I think I will like learning about psychology in this course.

I think psychology will be interesting.

I've always wanted to learn more about psychology.

Utility Value (Initial, $\alpha = .78$; Final, $\alpha = .88$)

What I am learning in this class is relevant to my life.

I think what we are studying in Introductory Psychology is useful for me to know.

I find the content of this course to be personally meaningful.

Situational Interest ($\alpha = .93$)

I think the field of psychology is very interesting.

I think what we're learning in this class is fascinating.

To be honest, I just don't find psychology interesting. (Reversed)

I think the material in this course is boring. (Reversed)

Psychology fascinates me.

Maintained Situational Interest

I am interested in majoring in psychology.

Footnotes

¹ The Nagelkerke R^2 is an approximation of the R^2 typically used in ordinary least squares (OLS) regression (Cohen, Cohen, West, & Aiken, 2003).

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Table 1

Zero-order Correlations and Descriptive Statistics for Major Variables in Study 1

	1	2	3	4	5	6	7	8	9
1 Initial interest	0.93								
2 Performance expectations	0.27	0.74							
3 Initial performance	0.24	0.51	--						
4 Relevance intervention	-0.03	0.20	0.09	--					
5 Observed utility value	-0.13	0.11	0.05	0.88	--				
6 Perceived utility value	0.07	0.23	0.15	0.21	0.31	0.84			
7 Situational interest	0.24	0.36	0.22	0.27	0.28	0.72	0.89		
8 Maintained interest	0.04	0.21	0.11	0.30	0.37	0.68	0.57	--	
9 Final performance	0.25	0.42	0.83	0.07	0.06	0.18	0.28	0.17	--
Minimum	1.00	1.33	0.00	0.00	-0.99	1.75	1.00	0.00	0.00
Maximum	7.00	7.00	24.0	1.00	1.89	7.00	7.00	1.00	39
Mean	4.12	5.04	10.2	0.57	0.00	5.10	4.89	0.78	22.5
SD	1.43	1.10	5.09	0.50	0.98	1.10	1.04	0.42	7.46

N = 107. Scale reliabilities are presented along the diagonal where applicable. Correlations greater than 0.19 are significant at $p < .05$.

Correlations greater than 0.23 are significant at $p < .01$. Relevance contrast= + 1 (Relevance conditions), - 1 (Control conditions).

Table 2

Standardized Regression Coefficients for Study 1

	Situational Interest		Maintained Interest		Performance		Utility Value
Step 1							
Relevance contrast	0.24 **	0.12	0.30 **	0.18 *	0.01	-0.02	0.19 *
Performance expectations	0.11	0.11	-0.05	-0.05	0.37 **	0.37 **	0.00
Relevance X Expectations	-0.22 *	-0.02	-0.32 **	-0.14	-0.01	0.03	-0.29 **
Initial interest	0.21 *	0.18 **	0.03	0.00	0.18 *	0.17	0.05
Step 2							
Utility value		0.66 **		0.60 **		0.12	
R ²	0.21 **	0.59 **	0.19 **	0.50 **	0.20 **	0.21 **	0.14 **
change R ²		0.38 **		0.31 **		0.01	

Note: Values are standardized regression coefficients.

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

Table 3

Correlations and Descriptive Statistics for Major Variables in Study 2

	1	2	3	4	5	6	7	8	9	10
1 Initial interest	0.91									
2 Initial inclination	0.50	--								
3 Initial utility value	0.59	0.40	0.78							
4 Mid-term exams	-0.07	-0.13	0.02	0.80						
5 Relevance contrast	0.09	0.00	0.02	0.04	--					
6 Observed relevance	0.03	-0.01	-0.07	0.08	0.50	0.86				
7 Situational interest	0.59	0.39	0.49	0.10	0.19	0.11	0.93			
8 Maintained interest	0.37	0.67	0.31	0.02	0.03	0.01	0.48	--		
9 Final grade	-0.05	-0.12	0.00	0.90	0.02	0.06	0.07	-0.01	--	
10 Final utility value	0.53	0.35	0.56	0.20	0.10	0.06	0.78	0.47	0.18	0.88
Minimum	1.63	1.00	1.33	39.00	-1.00	-0.78	1.00	1.00	0.00	1.00
Maximum	7.00	7.00	7.67	117.00	1.00	3.65	7.00	7.00	4.00	7.00
Mean	5.60	2.63	4.60	92.12	-0.04	0.01	4.67	2.38	2.90	4.55
Std. Deviation	0.96	1.83	1.05	13.32	1.00	0.95	1.31	1.83	0.86	1.16

N = 237. Scale reliabilities are presented along the diagonal where applicable. Correlations greater than 0.13 are significant at $p < .05$.

Relevance = + 1 (Relevance conditions), - 1 (Control conditions).

Table 4

Standardized Regression Coefficients for Study 2

	Situational Interest	Maintained Interest	Final Grade	Final Utility Value			
Step 1							
Relevance contrast	0.16 **	0.11 **	0.03	0.01	0.02	0.00	0.08
Mid-term exams	0.15 **	0.00	0.11 *	0.04	--	--	0.24 **
Relevance X Exams	-0.18 **	-0.09 *	-0.10 *	-0.06	--	--	-0.15 **
Initial interest	0.44 **	0.25 **	0.03	-0.06	-0.03	-0.13	0.30 **
Initial inclination	0.13 *	0.06	0.66 **	0.63 **	-0.13	-0.15 *	0.11
Initial utility value	0.20 **	-0.02	0.03	-0.08	0.07	-0.05	0.36 **
Step 2							
Final utility value		0.61 **		0.31 **		0.33 **	
R ²	0.46 **	0.67 **	0.47 **	0.52 **	0.02	0.09 **	0.46 **
change R ²		0.21 **		0.05 **		0.07 **	

Note: Values are standardized regression coefficients.

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

Table 5

Summary of Relevance Intervention Effects on Study 1 and Study 2 Outcomes

	Performance Expectations or Prior Performance		
	Overall	Low	High
Study 1	0.24	0.52	-0.03
Study 2	0.10	0.23	-0.05

Note: Values represent the average standardized regression coefficients from separate multiple regressions. The “Overall” column represents the average standardized regression coefficient of the relevance intervention predicting perceived utility value, situational interest, and maintained situational interest in Study 1 and Study 2. The “Low” and “High” columns represent the standardized regression coefficient for the relevance intervention and one standard deviation below and above the mean of performance expectations or prior performance, respectively.

Figure Captions

Figure 1. Path model of utility value effects on interest and performance. Solid paths represent hypothesized direct effects. The dotted path represents the hypothesized interaction between performance expectations and the relevance intervention on perceived utility value.

Figure 2. Interactive effects of the relevance intervention and performance expectations or prior performance on interest and performance. Study 1 results are presented in the left-hand column and Study 2 results are presented in the right-hand column.

Figure 3. Path models for utility value effects on interest and performance. Study 1 is presented in the top panel and Study 2 in the bottom panel. Solid paths represent standardized regression coefficients significant at $p < .05$ (except for the path from the Relevance Intervention to Perceived Utility Value in Study 1, $p = .06$). Dashed paths are not significant ($p > .10$).

Superscripts ^(a, b, c) indicate that the direct effect is moderated by a significant interaction with performance expectations (Study 1) or mid-term exams (Study 2), and are represented with “Lo” (Low mid-term exams) and “Hi” (High mid-term exams). Non-mediated values are in parentheses. The regression models on which these effects were based controlled for additional variables (see text for details).

Figure 1

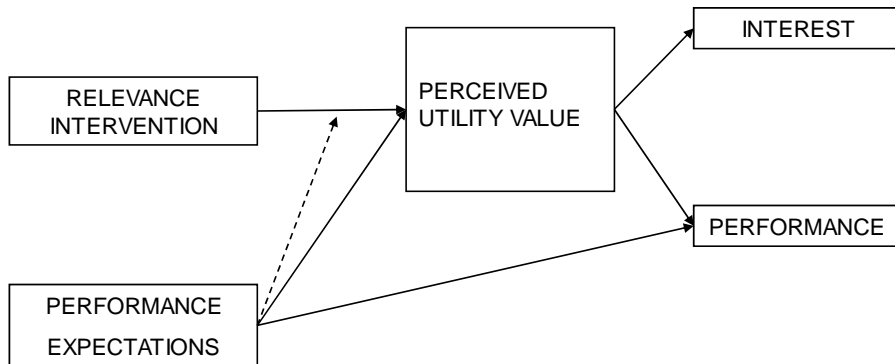
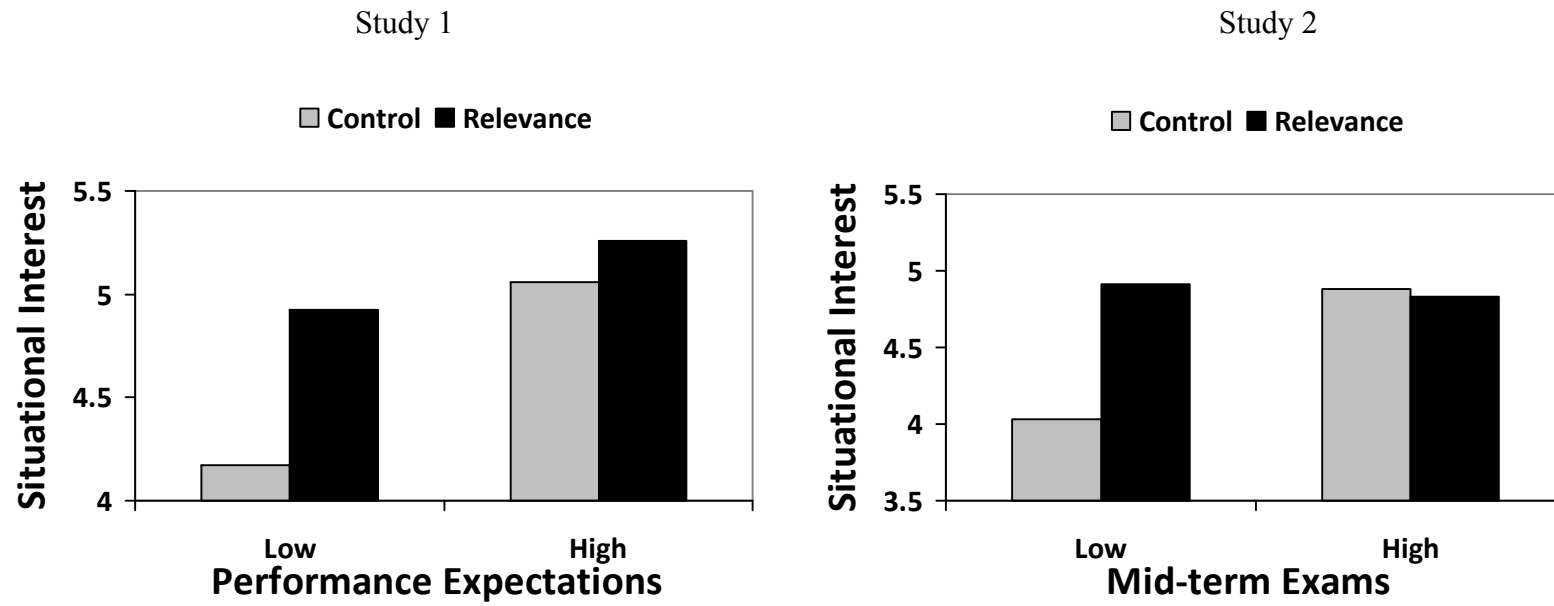


Figure 2



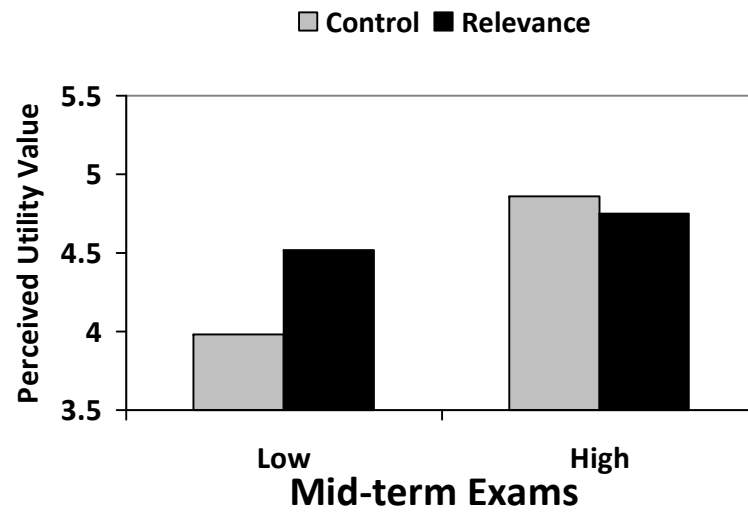
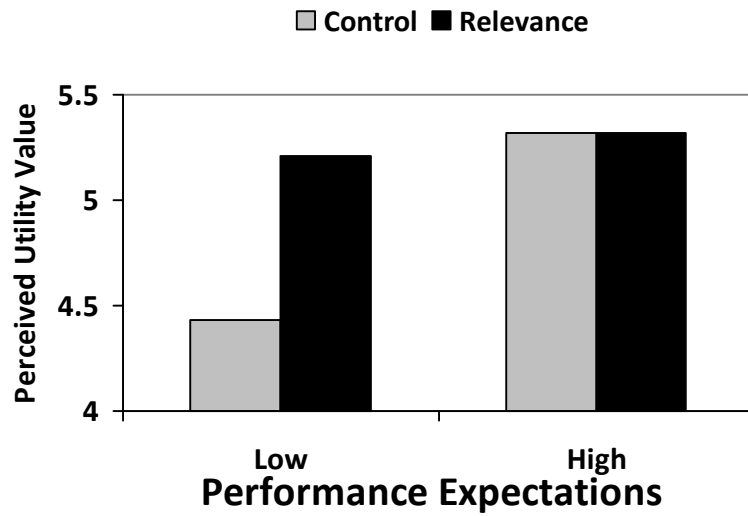
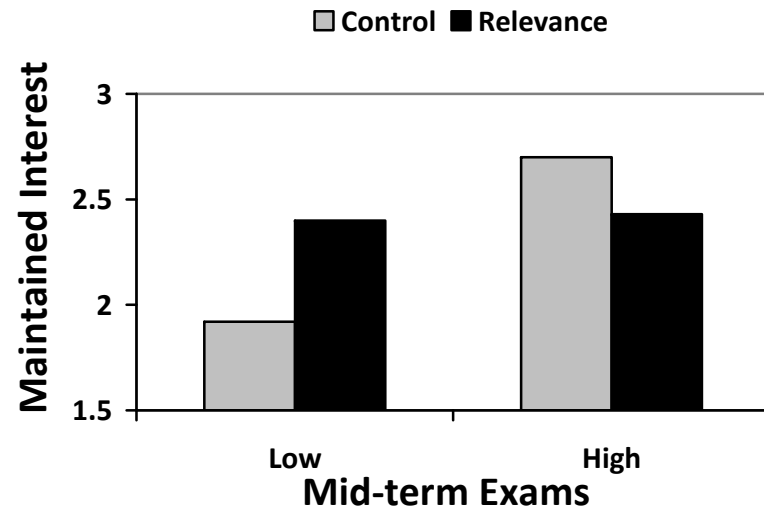
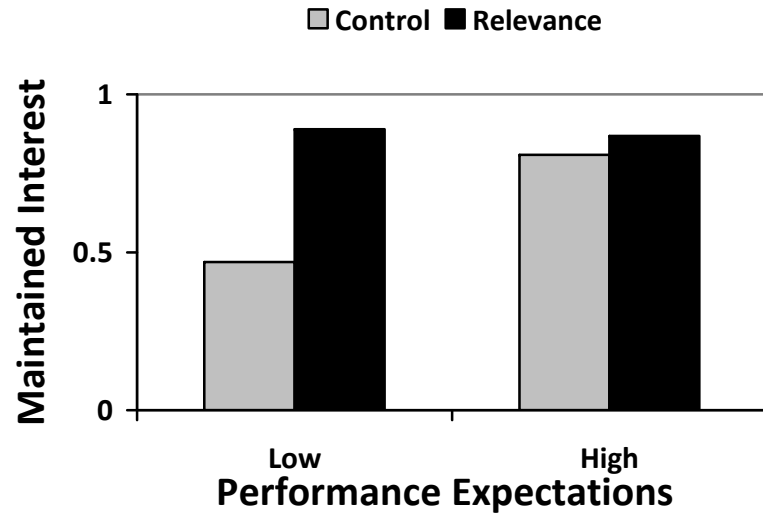


Figure 3

