Motiv Emot
DOI 10.1007/s11031-014-9419-0

ORIGINAL PAPER

What if I can't? Success expectancies moderate the effects of utility value information on situational interest and performance

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Abstract Two studies tested how the effects of a utility value manipulation on interest and performance were moderated by expectations for success. College students learned a new technique for mentally solving multiplication problems with instructions containing task utility information or not. In Study 1 ($N = 62$), the effect of the utility value information was positive for individuals with high success expectancies, but negative for individuals with low success expectancies. Study 2 ($N = 148$) examined the causal role of success expectancies by manipulating whether participants received an expectancy boost before receiving the utility manipulation. The results showed further support for the importance of success expectancies in moderating the effect of directly-communicated utility value. The results are discussed in relation to other research on utility value, interest, and expectancy–value models of achievement behavior.

Keywords Interest · Utility value · Task value · Success expectancies · Perceived competence

Introduction

Achievement activities afford opportunities not only to perform well, but also to experience interest and enjoyment. The experience of interest is especially important if the achievement activity involves a skill that takes time and repetition to develop because the choice to seek out and to practice the skill will be guided at least in part by whether individuals enjoy doing it (Sansone and Thoman 2005). *Situational interest* captures this desire to engage in activities in the moment, and is characterized by heightened attention, intensified emotional experience (often positive), and perceived meaning (Chen et al. 2001; Linnenbrink-Garcia et al. 2010; Mitchell 1993; Schraw and Lehman 2001).

Researchers have made gains in identifying variables that are related to situational interest in achievement situations (see Schraw and Lehman 2001 for a review). Some of this research focuses on task values. Task values define the particular significance that a task holds for an individual, and are correlated with continued engagement in activities and the experience of situational interest (Eccles et al. 1983; Eccles and Wigfield 2002). Although Eccles et al. (1983) identified several task values, the focus of the current research is utility value. A task has utility value if it is perceived as useful for accomplishing personal goals, either in everyday life or in the future.

Utility value

The relationships between self-reported utility value, situational interest, and achievement choices are well established in correlational research. Perceptions of utility value tend to be strongly correlated with reports of task interest and enjoyment (e.g., Eccles and Wigfield 1995; Hulleman et al. 2008; Simpkins et al. 2006) and related to continued engagement in domains. For example, students who reported utility value in their course content took more classes in related areas, thought more broadly about their schoolwork, and were more likely to consider careers in

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Published online: 02 August 2014

related fields (Eccles and Wigfield 1995; Harackiewicz et al. 2012; Husman and Lens 1999; Jacobs and Eccles 2000; Meece et al. 1990; Wigfield 1994).

Self-reported utility value has also been correlated with processes of task engagement that can facilitate learning and task performance (Bong 2001; Hulleman et al. 2008; Simons et al. 2000, 2004). Those who perceived activities as useful or instrumental for future goals used deep-level learning strategies (Lens et al. 2001), wanted to perform well (Lens and Decruyenaere 1991), and evidenced higher effort even when they did not enjoy the work (Sansone et al. 1992, 1999).

Even though utility value is positively correlated with measures of interest and personal choices, utility value has been described as having certain extrinsic qualities because the value emerges from a task's association with other pursuits rather than from direct experience with the task itself (Eccles and Wigfield 2002). That said, the extrinsic aspects of utility value are linked to personally held goals (Eccles and Wigfield 2002). Moreover, individuals with low task interest may be more open to an intervention suggesting that a task could be useful (i.e., has utility value) than that it is fun (i.e., has intrinsic value), because the utility value might match their personal goals without blatantly contradicting their task experience. Interventions directly targeting intrinsic task value may have an ironic effect of undermining a sense of autonomy (Deci and Ryan 1985). On the other hand, individuals might be more receptive to utility value interventions because of the extrinsic nature of utility value, and as they come to appreciate a task's utility value, they may become more engaged and develop more interest in the task.

In this vein, researchers have begun to test the effects of interventions designed to infuse tasks with utility value (Durik and Harackiewicz 2007; Harackiewicz et al. 2012; Hulleman et al. 2010; Hulleman and Harackiewicz 2009; Vansteenkiste et al. 2004). Some of this research has compared different types of utility, testing the content of utility information. For example, utility value in service of communal goals led to better outcomes than utility value in service of material goals, suggesting that the benefits of utility value may vary depending on how individuals internalize the information (Vansteenkiste et al. 2004). However, this research did not compare the effect of the presence versus absence of utility value information. Subsequent research focused on whether the presence of utility value information affected task engagement by comparing task outcomes for participants exposed to utility or not. Two approaches have been used to expose individuals to utility value information. The utility value information is either self-generated by learners or directly communicated to them (see Durik et al. in press). In studies testing self-generated utility, individuals are prompted to generate their own uses for a task. In contrast, in studies testing directly-communicated utility, individuals are explicitly told about plausible uses for a task.

Experimental tests of both self-generated and directly-communicated utility have been shown to increase situational interest and performance for some people but not for others (Durik et al. in press). For example, the self-generated utility intervention was found to promote situational interest and performance more for individuals with lower expectancies for success, compared with those with higher expectancies for success (Hulleman et al. 2010; Hulleman and Harackiewicz 2009). In other words, if individuals who did not expect to perform well were prompted to reflect on the utility of the activity, then they were more likely to enjoy the activity and perform better.

The research examining self-generated utility has revealed effects that are not consistent with traditional expectancy–value models of motivation (e.g., Atkinson 1974; Tolman 1932; Vroom 1964). Expectancy–value models posit stronger motivation when individuals have both high expectations of success and high value (i.e., a positive interaction). In contrast, experimental tests of self-generated utility show interactions with success expectancies in the opposite, negative direction: the presence of utility is more effective for those with low versus high expectancies. One important difference between studies testing self-generated utility and other tests of expectancy–value models, however, is that self-generated utility value relies on beliefs that are derived from the person. In contrast, many of the first experimental studies of the expectancy–value model relied on value that was defined by the task or situation (e.g., Atkinson and Raynor 1974). This difference may be critical in understanding when to expect positive versus negative expectancy × value interactions. In other words, the predicted interactive expectancy × utility value effects are less prominent when the values were derived from the self (Nagengast et al. 2011). In studies of self-generated utility, the prompt typically asks individuals to write about how a given achievement activity is useful to them personally. In response, individuals reflect on the task and make personal connections with it. This may be particularly effective for individuals with low expectancies of success because they come to value the activity in their own terms. This might be one effective way that these individuals are able to internalize the utility value, which previous research shows might be critical for producing positive effects on task outcomes (Vansteenkiste et al. 2004).

With this backdrop, consider the effects of directly-communicated utility value information. In this research, individuals are exposed to utility information from an outside source. The effects of such manipulations were also found to depend on an individual difference variable; however, the individual difference that was examined was not success expectancies. Instead, individual interest was shown to moderate the effect (Durik and Harackiewicz 2007; Shechter et al. 2011). *Individual interest*, in contrast to situational interest, is the level of interest a person starts with. It is an enduring predisposition to attend to and re-engage with particular subject matter, characterized by stored knowledge, value, and affect (Hidi and Renninger 2006; Krapp 1999; Renninger 1990; Renninger et al. 1992; Schiefele 1991). The results showed that, for participants with initially higher individual interest in math, directly-communicated utility value facilitated situational interest, but not for those with lower individual interest in math. These data were interpreted to suggest that when utility value information is encountered in a learning situation, some individuals embraced it. Those with an ongoing individual interest in the domain may not have considered the utility of the math task on their own, but agreed with it once it was pointed out because the information was consistent with their value for the domain overall.

However, there may be another reason why those with higher individual interest benefited from the presence of directly-communicated utility information, and this reason ties directly to traditional expectancy–value models of achievement. Individual interest and expectancies for success often co-occur (Hidi and Renninger 2006; Koller et al. 2001; Krapp 2000; Marsh et al. 2005), but success expectancies have not yet been tested as a moderator of directly-communicated utility value on interest. It is plausible that individuals need to feel somewhat competent at a task in order to be open to information conveyed about its utility. Therefore, expectancies of success, which tend to overlap with individual interest, may be the reason why individuals with higher individual interest benefited from the presence of directly-communicated utility value in the prior research. In other words, the combination of high expectancies for success and utility may have led to the highest task motivation.

Moreover, this explanation is in line with traditional expectancy × value models of achievement motivation. If expectancies for success are tested interactively with the presence or absence of directly-communicated utility information, then the positive interaction between these variables may predict both situational interest and also task performance. Specifically, the combination of entering into the situation with high success expectancies and learning about the utility value of the task may result in higher levels of situational interest and task performance.

Study 1

In Study 1, we examined how directly-communicated utility of a novel math technique (Barron and Harackiewicz 2001) affected situational interest and performance, and tested whether perceived competence in math (PCM) as well as individual interest in math moderated the effect of utility value information on task interest and performance. PCM was measured as an alternative for success expectancies for two, related reasons. First, given that participants would be completing a new math activity, it was unclear whether they would feel able to predict with sufficient certainty their expectancies for success on the activity. Moreover, prior research has shown that expectancies for success and perceived competence are correlated to the point that they are not empirically separable (Eccles and Wigfield 1995). Therefore, we assessed both individual interest and PCM to test whether the effects of the manipulation differed for individuals with low versus high perceived competence as well as for low versus high individual interest in math.

We hypothesized that both individual interest and perceived competence would moderate the effect of utility value information on situational interest, and that perceived competence may also show an effect on task performance. Specifically, participants with high levels of initial perceived competence (or individual interest) should show more situational interest when exposed to utility value information. On the other hand, participants with low levels of initial perceived competence (or individual interest) should not benefit from utility value information. We also tested whether PCM moderated the effects of the utility value manipulation on task performance. Although no effects of directly-communicated utility on performance were found in prior research, it is possible that these effects would emerge if the more specific competence variable were tested.

Method

Participants

Sixty-two students (50 % were women) from a large Midwestern university participated in exchange for course extra credit. The sample was 92 % Caucasian, 2 % African American, 3 % Hispanic, and 3 % Asian.

Design and procedure

Participants were randomly assigned to either the utility or control condition. Initial PCM and individual interest in math were measured at the beginning of the session. The dependent variables were participants' situational interest in the math technique and performance on two problem sets.

Participants completed the session individually. To obtain a baseline measure of math performance to use as a covariate, participants first used their usual method of multiplication to solve as many problems as they could in 2 min. Then participants reported their initial individual interest and their PCM.

Next, participants learned the new technique with an instructional notebook that was accompanied by an audio recording in order to standardize the time spent with the task materials (Barron and Harackiewicz 2001). The instructional portion of the session lasted approximately 20 min. It focused on a technique for solving 2-digit-by-2-digit multiplication problems (e.g., 32 × 45). The technique outlines a series of calculations whereby each digit in the first number is multiplied by each digit in the second number, while keeping in mind whether each digit is in the “tens place” or “ones place.” Individuals are instructed to multiply digits starting with the left and moving to the right of each number, and then summing the products to arrive at the final answer. The technique makes it easier to calculate answers to these types of problems without pencil and paper. After describing the general principles of this technique, the instructional notebook walked participants through two example problems and then invited them to practice several problems on their own.

The utility value information was embedded in the beginning, middle, and end of the instructions. For example, the beginning passage described how the new technique could increase working memory capacity, and therefore improve college performance. In the middle of the instructions, participants were told about how the technique could be used in six different occupations (e.g., “A psychologist may use mental math to evaluate a test report”). Pictures of professionals from these occupations accompanied the manipulation. At the end, a summary paragraph reminded participants of the usefulness of mental math in courses, careers, and graduate school. The control condition did not contain utility information.

After completing the technique instructions, participants solved two 4-min problem sets using the new technique, and were told which problems they solved correctly. Finally, participants reported their situational interest.

Measures

Baseline performance equaled the number of problems, from 0 to 9, participants solved correctly in 2 min, using their usual method of multiplication. Individual interest in math was assessed with four items [e.g., “I find math enjoyable,” “Math just doesn’t appeal to me” (reversed), “I enjoy working on math problems” and “I like learning new math concepts”]. PCM was assessed with two items [e.g., “I consider math to be one of my best subjects” and “I don’t feel comfortable when it comes to doing math problems” (reversed)].

Table 1 Zero-order correlations and descriptive statistics for major variables in Study 1

		1	2	3	4	5
1	Baseline performance					
2	Individual interest in math	.29*				
3	PCM	.54*	.64*			
4	Situational interest	−.06	.32*	.24		
5	Task performance	.37*	.34**	.44*	.37*	
	Mean	6.15	4.00	4.52	5.17	34.06
	SD	2.57	1.46	1.53	1.07	11.55
	Cronbach’s alpha		.92	.84	.88	

N = 62. Variables ranged from 1 (*low*) to 7 (*high*) except for baseline performance (from 0 to 9 problems) and Task Performance (from 2 to 61 problems)

PCM perceived competence in math

* $p < .05$

After the session, participants responded to three items assessing situational interest in the technique (e.g., “The left-to-right technique is interesting,” “Using this multiplication technique is fun” and “The learning program was enjoyable”). Task performance equaled the total number of problems solved correctly on the two problem sets.

All self-report items were rated on a scale from 1 (*Strongly disagree*) to 7 (*Strongly agree*). The Cronbach alphas for multi-item scales were within the acceptable range and are in Table 1.

Results

Overview

Multiple regression was used to test the hypotheses. Contrast codes compared the utility value condition (+1) with the control (−1), and men (+1) with women (−1). The 2-way interactions between initial PCM, initial individual interest, and the utility value manipulation were tested, and significant interactions were examined by testing the effect of the utility manipulation among individuals one standard deviation below and above the mean on the continuous variables. The interactions with gender were not significant and were excluded from the final model. All other terms were tested in the model, but effects that were not statistically significant are not mentioned in the results.

Descriptive statistics and zero-order correlations are presented in Table 1. As expected, the correlation between initial individual interest and PCM was .64, indicating that these variables were highly related.

The PCM model included five predictors: gender, baseline performance, PCM, the utility value contrast, and

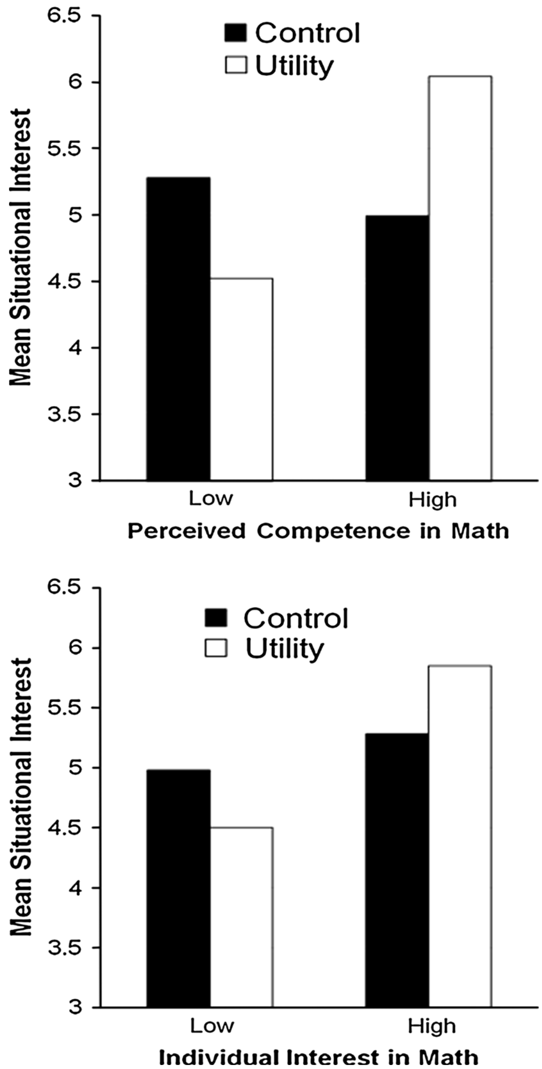

Fig. 1 The effects of utility and perceived competence in math on situational interest (*top panel*) and the effects of utility and individual interest in math on situational interest (*bottom panel*) from Study 1. Situational interest could range from 1 (low) to 7 (high)

the PCM × utility value interaction. The individual interest model also included five predictors, replacing initial PCM with initial individual interest. Finally, due to suppression effects when both PCM and individual interest were in the model, we tested the effects of each proposed moderator using residualized scores as the predictor, having removed variability related to the other moderator.

Perceived competence model

Situational interest A significant effect of PCM, $t(56) = 2.01$, $p < .05$, $\beta = .29$, was qualified by the PCM × utility value interaction, $t(56) = 3.46$, $p < .01$, $\beta = .43$ (see Fig. 1, top panel). Participants with higher PCM found the technique more interesting when they

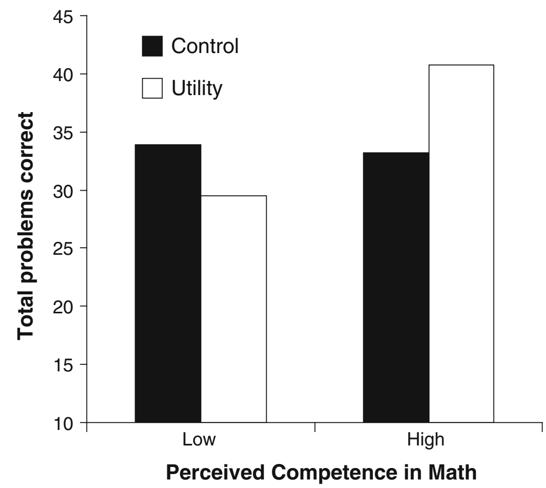

Fig. 2 The effects of utility and perceived competence in math on total problems correct (Study 1)

received the utility value manipulation than when they did not, $t(56) = 2.94$, $p < .01$, $\beta = .50$. The reverse was true for participants with low PCM, $t(56) = -2.10$, $p < .05$, $\beta = -.36$. A significant negative effect of baseline performance also emerged, $t(56) = -2.44$, $p < .05$, $\beta = -.34$, indicating that participants who had lower baseline performance found the technique more interesting. They may have perceived the technique as being an efficient alternative to the typical way of solving these types of problems.

Performance The only effect that emerged when predicting performance was a significant interaction between PCM and the utility value contrast, $t(56) = 2.18$, $p < .05$, $\beta = .26$. Participants with higher PCM solved more problems when assigned to the utility condition, $t(56) = 2.19$, $p < .05$, $\beta = .46$ (see Fig. 2). In contrast, utility information did not affect performance among those with lower PCM, $t(56) = -1.53$, $p = .13$, $\beta = -.33$.

Individual interest model

Situational interest Initial individual interest positively predicted situational interest, $t(56) = 3.04$, $p < .01$, $\beta = .39$, and there was a marginally significant interaction between individual interest and utility value, $t(56) = 1.85$, $p = .07$, $\beta = .25$ (see Fig. 1, bottom panel). Although the simple effects were not significant, the pattern was the same as that found in prior research (Durik and Harackiewicz 2007). The utility value manipulation had opposite effects for those with low compared with high initial individual interest in math, revealing a more positive effect for those with initially higher individual interest.

Performance Individual interest also emerged as a positive predictor of task performance, $t(56) = 2.06$, $p < .05$, $\beta = .25$, and there was a significant main effect of gender, $t(56) = 2.15$, $p < .05$, $\beta = .25$, favoring men. Consistent with prior work (Durik and Harackiewicz 2007), the utility value manipulation did not affect performance when individual interest was tested as the moderator of the utility effect.

Residualized models

Isolating the effect of PCM versus individual interest presents a challenge because the variables are correlated. Therefore, a final set of analyses tested each potential moderator with residualized scores, having statistically removed shared variability with the other potential moderator. Specifically, when PCM (having removed individual interest) was used to predict situational interest, the interaction was robust, $t(56) = 4.06$, $p < .05$, $\beta = .51$, but when individual interest (having removed PCM) was tested, the interaction was not significant, $t(56) = -0.18$, $p = .86$, $\beta = -.03$.

Discussion

Taken together, these results show that PCM moderated the effect of directly-communicated utility value on situational interest, and there is some suggestion that the moderating effect of PCM is stronger than that of individual interest. The utility value manipulation was successful in promoting both interest and performance among participants who had higher expectancies for success in math. These individuals found the new technique more interesting and solved more math problems correctly after learning about the utility value of the task. However, participants with lower expectancies for success in math actually showed less interest in the new technique after being told about its utility value.

These data also replicated the pattern found by Durik and Harackiewicz (2007), showing that initial individual interest moderated to some extent how participants responded to directly-communicated utility value information. However, initial individual interest revealed a weaker moderating effect and did not moderate the effect of the utility value manipulation on performance. Finally, the analyses of residualized variables suggest that the previously observed interaction effect of individual interest and directly-communicated utility value may have emerged because individual interest and perceived competence are related to each other.

The results from the analyses using PCM as the moderator are consistent with traditional expectancy–value models, suggesting that those who received utility information and who reported high success expectancies found the task most interesting. A similar effect emerged on performance, suggesting that the combination of high success expectancies and utility information led participants to work on the task in such a way as to promote performance.

In contrast, the presence of utility value information undermined interest among those with lower success expectancies in math. This suggests that the way individuals respond to direct utility communications may involve a process of internalization (Deci et al. 1994; Ryan and Connell 1989). These data suggest that higher perceptions of competence may facilitate the extent to which individuals internalize suggestions of utility from outside sources. Consistent with this, and with expectancy–value formulations, those with either low expectancies or low value were not as motivated to engage in the activity. However, it is also noteworthy that, not only was the utility value manipulation not helpful for promoting interest for those with low success expectancies, it actually decreased interest. This suggests a separate process, beyond that which would be predicted by expectancy–value models. In other words, the utility information was interpreted by these participants in a way that actually reduced their interest in the activity rather than simply not inspiring it. Drawing from research on intrinsic motivation, we believe that the utility communication may have been perceived as extrinsic and controlling, thereby undermining participants' sense of autonomy in the situation and subsequent interest (Deci and Ryan 1985). Specifically, the statements of utility may have implied a minimal standard of competence that participants were expected to have, and may have been experienced as external pressure to perform well. If so, individuals with lower perceived competence may have been particularly affected by the controlling aspects of the utility value communication. Consistent with this interpretation, the effect was unique to the experience of interest, and did not emerge on task performance.

Study 2

Study 1 showed that initial differences in success expectancies moderated the utility value manipulation, suggesting that expectancy–value models of achievement motivation may be relevant to situations in which utility value is directly-communicated to learners. However, a more definitive test of this idea would be to manipulate not only the presence of utility but also to manipulate expectancies for success. If success expectancies affect reactions to utility information, then an experimental manipulation that promotes feelings of competence should help individuals with low initial PCM find the task interesting and to perform well, when utility is present. We hypothesized that an early manipulation of high expectancy for success would allow individuals with initially low expectancies to experience motivational gains from directly-communicated utility information.

To test this, half of the participants were given an expectancy boost prior to learning the technique, telling them that they had good potential to learn the technique. The manipulation was designed to provide participants with a sense of confidence as they began the instructional program. The expectancy boost was crafted to strengthen participants' beliefs that they would be able to channel resources and effort in ways that would lead to positive task outcomes (e.g., Bandura 1977, 1982; Dweck 1986; Dweck and Leggett 1988). It was designed to suggest high learning potential so that participants might be willing to put effort into the task and to try hard.

In addition, several process measures were included in Study 2 to help explicate the unfolding processes during task engagement that lead to situational interest (Harackiewicz and Sansone 1991). These variables include competence valuation, task involvement, and task perceived competence. Specifically, competence valuation is the extent to which individuals care about performing well on a task and is measured prior to task performance. Individuals who initiate a task while caring about doing well invest themselves more in the activity. After having experienced the task, participants can report their task involvement and perceived competence. Task involvement is the extent to which individuals become absorbed in the activity. Individuals who get more involved are more likely to find the situation interesting. Finally, we examined whether the expectancy manipulation affected perceived competence for the task after doing it.

Study 2 also tested two separate utility manipulations, focused on either short-term or long-term goals (Eccles 1984; Eccles et al. 1983). Proximal utility focuses individuals on how a task may be useful immediately (e.g., current class performance) whereas distal utility focuses individuals on how a task may be useful in the long term (e.g., career; Simons et al. 2004). The effects of these different types of utility vary depending on cultural differences that may relate to how individuals orient to tasks (Shechter et al. 2011). Whereas the manipulation used in Study 1 combined both types of utility, we separated proximal and distal utility in Study 2. We reasoned that individuals with low success expectancies may feel more discouraged about the possibility of proximal utility because they believe they currently lack the necessary skills.

Method

Participants

Participants were 148 college students (49 % were women) who received extra course credit for introductory psychology in exchange for participation. The sample was 93 % Caucasian, 2 % African American, 4 % Hispanic, and 1 % Asian.

Design and procedure

Participants were randomly assigned to a condition within a 3 (proximal utility, distal utility, versus control) × 2 (no boost versus expectancy boost) between-participants design. Initial PCM and individual interest were again tested as continuous factors. The primary dependent variables were situational interest and task performance. We also assessed competence valuation, task involvement, and perceived competence for the task as process variables in order to evaluate how the manipulation affected participants' experiences throughout the task.

Participants were led to believe that the expectancy boost manipulation in Study 2 was based on self-reported math background and interest. To increase the plausibility of the manipulation, participants first completed a form assessing their background and interest in math. When this form was completed, the experimenter explained that the form needed to be taken to a supervisor for scoring and then left the room. Participants completed the baseline performance measure while the experimenter was absent.

When the experimenter returned, participants received a form that conveyed the expectancy boost manipulation and several filler items (expectancy-boost conditions) or just the filler items (no-boost conditions). The paper had been prepared in advance to prevent the experimenter from knowing the condition. Participants who received the expectancy boost read, "Our research has shown that the ability to learn our mental math technique depends on your interest and previous background in math. Your score on the questionnaire was compared to University of Wisconsin norms for incoming freshmen and second year students, and suggest:" Following this message were three options. The first option was always checked, and read, "You have excellent potential for learning the mental math technique in today's session." The other two statements replaced the word "excellent" with either "good" or "fair."

Depending on the condition, the instructions for the technique contained no utility information, proximal utility information, or distal utility information. Participants in the proximal utility conditions were told about how the technique could be useful in the short term. Examples were provided that highlighted how mental math could be useful in college classes (e.g., calculating scores) and everyday activities (e.g., personal banking). In contrast, participants in the distal utility condition were told about how the technique could be useful in the long term, and examples were provided that highlighted how mental math could be useful on graduate school admissions tests and in different careers.

The procedure was otherwise similar to Study 1 except that competence valuation was measured before the problem sets and task involvement and perceived competence were assessed after the problem sets.

Measures

Baseline performance and task performance were measured the same as in Study 1. PCM was measured using the same items as in Study 1, but was assessed prior to the session during a mass screening of a collection of self-report measures. Individual interest in math was measured with only two items, "I enjoy working on math problems" and "Math just doesn't appeal to me" (reversed) that were part of the math background questionnaire.

The measure of situational interest used in Study 2 was reformulated to reflect continued interest in the technique rather than their immediate reaction. We intended this measure to reflect a developing interest in the task that may extend beyond the situation so that it might be relevant to those who were exposed to either utility manipulation. Three items were combined that reflected interest beyond the experimental session ("I am interested in using this technique in the future," "I'd like to learn more about this technique," and "I would like to learn more mental math techniques").

Competence valuation was measured with a two-item scale combining items "It is important for me to do well on the upcoming problem sets" and "I don't care how well I do on the upcoming problem sets" (reversed). Participants responded to all items on a scale from 1 (*Strongly disagree*) to 7 (*Strongly agree*) unless otherwise noted.

After the problem sets, task involvement and perceived competence were measured. Beginning with the stem, "During the problem sets, I…" participants responded to four items measuring task involvement ("got really involved in solving the problems," "tried to make sure that I was solving the problems correctly," "got absorbed in solving the problems with the new technique," and "worked really hard on the problems") and three items measuring perceived competence for the task ("felt that I was using the technique correctly," "felt that I was doing poorly on these problems" (reversed, and "felt confident using the technique"). The task perceived competence and task involvement items were rated from 1 (*Not at all*) to 7 (*Very much*). See Table 2 for reliability estimates.

Results

Overview

Multiple regression was used to test the hypotheses. Two contrast codes were constructed to compare participants with either utility manipulation (+1) to those not given utility information (−2), and those exposed to distal utility (+1) versus proximal utility (−1), with the control condition coded as 0. Participants given the expectancy boost (+1) were compared with those given no boost (−1). We then created the 2-way and 3-way interactions between the contrast codes and the standardized measure of initial PCM and individual interest. See Table 2 for descriptive statistics and correlations.

Replication analyses

Before presenting the primary analyses, it is helpful to present briefly analyses comparable to those reported in Study 1 whereby the moderating effects of PCM versus individual interest in math were each tested in separate analyses, only in conditions without the expectancy boost.

Similar to Study 1, when PCM was used as the moderator in the analysis predicting situational interest, the significant effect of PCM, $t(65) = 1.97$, $p = .05$, $\beta = .24$, was qualified by the PCM × utility value interaction, $t(65) = 2.37$, $p < .05$, $\beta = .20$. Similarly, when individual interest in math was used as the moderator to predict situational interest, it too positively predicted situational interest, $t(65) = 2.37$, $p < .05$, $\beta = .28$, and moderated the effect of utility value, $t(65) = 2.55$, $p < .05$, $\beta = .21$.

When predicting task performance, both PCM, $t(65) = 4.98$, $p < .01$, $\beta = .54$, and individual interest, $t(56) = 2.75$, $p < .01$, $\beta = .32$, positively predicted performance, but neither moderated the utility effect on performance. Therefore, consistent with Study 1 and past research, both PCM and individual interest in math moderated the effect of the utility manipulation on situational interest. However, unlike in Study 1, PCM did not moderate the effect of utility value on task performance.

The residualized models were conducted for Study 2 as well, but were not conclusive. The analyses yielded no moderated effects of either variable with utility, when the variance due to the other variable had been removed. It is worth noting that the correlation between initial individual interest and PCM was stronger in Study 2, $r(146) = .77$, $p < .01$, than in Study 1. The greater overlap between the variables in Study 2 may explain why the models that involved both variables were not diagnostic.

Table 2 Zero-order correlations and descriptive statistics for major variables in Study 2

		1	2	3	4	5	6	7
1	Baseline performance							
2	PCM	.16						
3	Competence valuation	.17*	.33*					
4	Perceived competence	.05	.35*	.28*				
5	Task involvement	.13	.19*	.60*	.45*			
6	Situational interest	.09	.39*	.59*	.39*	.49*		
7	Task performance	.24*	.42*	.21*	.44*	23*	.26*	
	Mean	5.39	4.73	5.29	5.62	6.09	5.07	33.50
	SD	2.28	1.69	1.10	0.95	0.84	1.31	11.38
	Cronbach's alpha		.71	.69	.78	.86	.86	

N = 148. Items ranged from 1 (*low*) to 7 (*high*) except for baseline performance (from 0 to 9 problems), and Task Performance (from 1 to 62 problems)

PCM perceived competence in math

* $p < .05$

Primary analyses

The basic regression model consisted of 13 terms: gender, baseline performance, PCM, the expectancy boost contrast, both utility value contrast codes, and the interactions that were parallel to those used in Study 1. The first set of analyses predicted the focal outcomes, situational interest and performance. The second set predicted the process variables. A final set examined whether the process variables mediated the direct effects of the expectancy and utility value manipulations.

Situational interest A significant positive effect of PCM, $t(134) = 4.86$, $p < .01$, $\beta = .38$, was qualified by the predicted 3-way interaction between PCM, the expectancy manipulation, and the presence of utility information, $t(134) = -2.86, p < .01, \beta = -.16$ (see Fig. 3). Although the simple effects of utility when there was no expectancy boost were not significant, the pattern was the same as that in Study 1. Without an expectancy boost, those with low PCM reported somewhat lower situational interest in the utility than in the control conditions, whereas participants with high PCM reported slightly more interest in the utility than in the control conditions. However, when participants received an expectancy boost prior to learning the technique, the presence of utility value increased situational interest among those with low PCM, $t(134) = 3.24$, $p < .01$, $\beta = .33$, but did not affect situational interest among those with high PCM, $t(134) = 0.13$, $p = .90$, $\beta = .01$. The manipulation of proximal versus distal utility had no effect on this or any of the variables, so will not be discussed further. In this context, the mention of utility was the critical element, regardless of whether the utility was described as relevant to short-term or long-term goals.

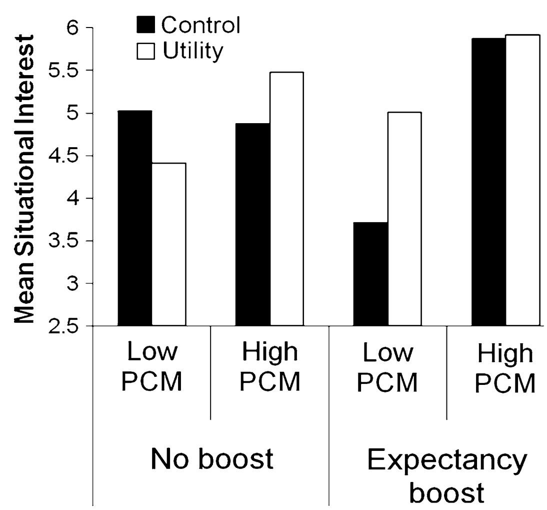

Fig. 3 The effects of utility, perceived competence in math (PCM), and the expectancy manipulation on situational interest (Study 2). Task interest could range from 1 (low) to 7 (high)

Performance Baseline performance positively predicted performance, $t(134) = 2.27$, $p < .05$, $\beta = .17$. PCM also predicted performance, $t(134) = 5.03$, $p < .01$, $\beta = .39$, but this was qualified by a two-way interaction with the expectancy boost manipulation, $t(134) = -1.94$, $p = .05$, $\beta = -.15$ (see Fig. 4). Among participants with low PCM, those who received the expectancy boost performed better than those who did not receive it, $t(134) = 2.67$, $p < .01$, $\beta = .28$, but among those with high PCM, the expectancy boost did not affect performance. This suggests that the feedback suggesting high expectancies for success were more helpful for individuals with initially low perceived competence. The predicted three-way interaction was not significant on task performance.

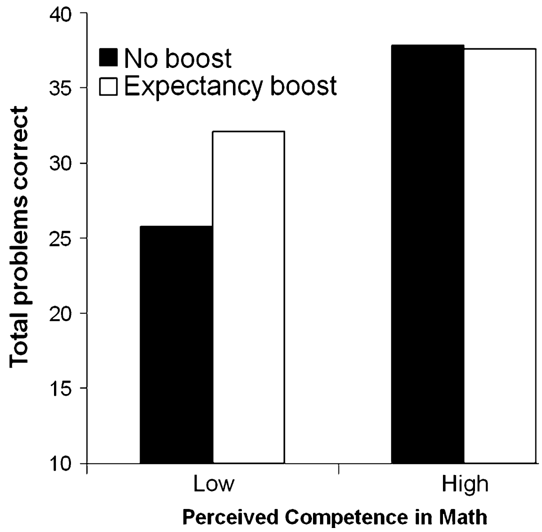

Fig. 4 The effect of perceived competence in math and the expectancy manipulation on task performance (Study 2)

Table 3 Predicted values (standard errors) for process measures showing 3-way interaction (Study 2)

	No expectancy boost		Expectancy boost	
	Control	Utility	Control	Utility
Competence valuation				
Low PCM	4.88 (0.33)	4.62 (0.21)	4.48 (0.28)	5.43 (0.19)
High PCM	5.09 (0.28)	5.76 (0.20)	5.75 (0.29)	5.86 (0.21)
Task involvement				
Low PCM	6.12 (0.27)	5.55 (0.17)	5.72 (0.22)	6.32 (0.16)
High PCM	5.86 (0.22)	6.12 (0.16)	6.32 (0.23)	6.52 (0.17)

Predicted values for low and high perceived competence in math (PCM) were calculated for 1 standard deviation below and above the mean, respectively

Process variables

Competence valuation When the basic model was used to predict competence valuation, there were effects of PCM, $t(134) = 4.46$, $p < .01$, $\beta = .35$, the expectancy manipulation, $t(134) = 2.08$, $p < .05$, $\beta = .16$, the presence of a utility value manipulation, $t(134) = 2.11$, $p < .05$, $\beta = .11$, as well as the three-way interaction, $t(134) = -2.43$, $p < .05$, $\beta = -.13$ (see Table 3 for predicted values). The three-way interaction showed that, among individuals with low PCM who received the expectancy boost, the presence of utility information increased competence valuation, $t(134) = 2.81$, $p < .01$, $\beta = .29$, but not for those who did not receive the expectancy boost. Among participants with high PCM, the utility value manipulation increased competence valuation if they did not receive the expectancy boost, $t(134) = 1.98.$, $p = .05$, $\beta = .20$, but not if they did receive the expectancy boost.

Task involvement The analysis predicting task involvement revealed a positive effect of the expectancy manipulation, $t(134) = .3{,}03$ $p < .01$, $\beta = .24$, a positive effect of PCM, $t(134) = 2.26$, $p < .05$, $\beta = .19$, and an interaction between the two, $t(134) = 1.97$, $p = .05$, $\beta = .11$. These effects were also qualified by a 3-way interaction with the utility value manipulation, $t(134) = -2.09$, $p < .05$, $\beta = -.12$ (see Table 3). Simple effects revealed that, for individuals with low PCM who received the expectancy boost, the utility value manipulation increased task involvement, $t(134) = 2.20$, $p < .05$, $\beta = .24$, but slightly decreased task involvement for those who did not receive the expectancy boost, $t(134) = -1.80$, $p = .07$, $\beta = -.22$. For individuals with high PCM, the utility value manipulation did not affect task involvement regardless of whether they had received the expectancy boost.

Perceived competence Next, we used the model to predict participants' perceived competence after using the technique. This analysis yielded two significant effects. A positive effect of the expectancy manipulation emerged, $t(134) = 2.70$, $p < .01$, $\beta = .21$, showing that participants who received the expectancy boost ($\hat{Y} = 5.82$) felt more competent using the technique than those who did not receive the boost ($\hat{Y} = 5.42$). The confidence manipulation had a lasting effect, even after participants used the technique on the problem sets. In addition, those who had higher initial PCM felt more competent after using the technique than those who had lower PCM, $t(134) = 4.15$, $p < .01$, $\beta = 33$. The three-way interaction did not emerge when predicting perceived competence.

Mediation analyses

Given the observed 3-way interaction effects on competence valuation and task involvement, we tested whether either or both of these variables mediated the direct effects on situational interest. First we added competence valuation to the model, and then added task involvement. The ordinal sequencing of these potential mediating variables was chosen based on the different times at which these variables were measured. Whereas competence valuation captured the extent to which individuals cared about doing well prior to task engagement, task involvement is a retrospective analysis of participants' experiences while completing the problem sets. For this reason, we tested competence valuation as an initial mediator, followed by task involvement. Although perceived competence could have been a potential mediator, the absence of the 3-way interaction on perceived competence eliminated this possibility.

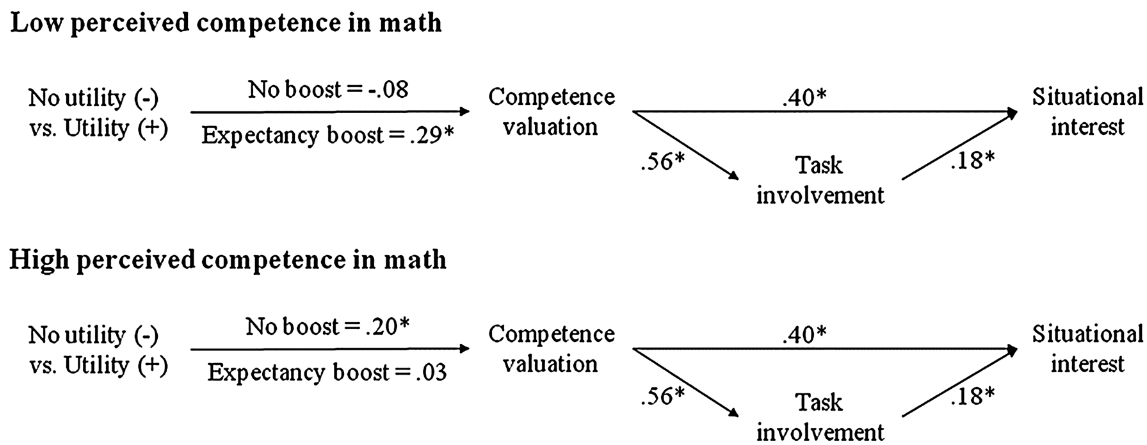

Fig. 5 Path model depicting mediated effects of the utility × PCM × expectancy boost interaction on task interest (Study 2). Values represent standardized regression coefficients. * $p < .05$

When competence valuation was added to the model, it accounted for unique variance in situational interest, $t(133) = 6.79$, $p < .01$, $\beta = .50$, and attenuated the 3-way interaction effect, $t(133) = -1.84$, $p = .07$, $\beta = -.12$. When task involvement was added to the model, it too accounted for unique variability in situational interest, $t(132) = 2.23$, $p < .05$, $\beta = .18$, and slightly reduced the already nonsignificant 3-way interaction effect, $t(132) = -1.69$, $p = .09$, $\beta = -.11$. Sobel tests revealed that competence valuation did account for significant variability in the relationship between the 3-way interaction and situational interest (Sobel = 2.29, $p < .05$), but task involvement did not, above and beyond competence valuation. Figure 5 depicts the mediation model.

An analysis was also performed in which task involvement was tested as the only mediating variable. This analysis revealed a modest mediating effect. When task involvement was added to the initial model, $t(133) = 5.186$, $p < .01$, $\beta = .39$, the 3-way interaction was reduced but still statistically significant, $t(133) = -2.16$, $p = .03$, $\beta = -.15$. A Sobel test revealed that the mediated effect was right at the criterion level of significance, Sobel = 1.94, $p = .05$.

Discussion

The results of Study 2 further support the role of expectancies for success as the critical moderator of directly-communicated utility value. The data provide an experimental test of this idea and show how the effects unfold across the session on processes measured both before and after task engagement.

The mediation model shows that the influence of the utility manipulation depended both on initial PCM and the expectancy boost. If individuals with lower PCM received the expectancy boost, then the presence of utility helped them care about doing well. This effect on competence valuation emerged prior to task performance, but carried through to task involvement and situational interest. What this tells us is that the boost in expectancies allowed individuals with low perceived competence to invest themselves in the activity before performing it. In other words, the process triggered by the expectancy boost and utility was initiated early, and was not contingent on participants' actual experience with the technique. This may suggest that the manipulations initiated a deliberate, top-down process, whereby participants' orientation to the task guided their task engagement. This is in contrast to a process that might materialize in the moment, as individuals work with the activity and corroborate for themselves the utility in the task. That said, the effects were sustained while performing the task, given that the effect also emerged on involvement and task interest.

It is somewhat surprising that perceived competence in the task did not mediate the 3-way interaction effect on situational interest; however, this may relate back to the interactive effects of expectancy and value in predicting motivation. Even though the expectancy boost directly affected perceived competence in the task, the utility manipulation did not. Perceived competence may be a necessary but not sufficient condition for the experience of situational interest. It may be the case that perceived competence needs to reach a threshold for individuals to care about the task and to become involved, but that once met, perceived competence does not add incrementally to situational interest. Additional research can further examine the extent to which perceived competence may help individuals internalize directly-communicated utility value information, so that tasks can become personally meaningful (Deci et al. 1994; Ryan and Connell 1989).

The effects on task performance did not mirror those on task interest, and the performance effect observed in Study

1 was not replicated in Study 2. In other words, although the manipulations affected how much individuals cared about doing well and the extent to which they became involved in the activity, these processes did not translate into performance. These inconsistencies are not easy to explain, but do highlight the difference between wanting to perform well and actually performing well, at least in this short time frame. Although the manipulations did not affect performance in the immediate situation, resultant task interest could produce more noticeable effects on performance if individuals were exposed to subsequent opportunities to engage in the task. If individuals who found the task more interesting were motivated to choose to do the activity over time, then they would likely further develop their skills.

The expectancy boost did increase performance for those with low PCM. This expectancy boost was designed to provide feedback indicating that participants had potential for skill development, consistent with the idea that this skill can grow as a consequence of effort and hard work (Dweck 1986). The rise in performance for participants with low perceived competence in the expectancy boost condition is consistent with prior research suggesting that praise for effort can encourage persistence and facilitate performance (Mueller and Dweck 1998). That said, the expectancy boost was also described as being based on comparisons with other students, which may have invoked social comparisons. Given that the social comparison was subtle, it is somewhat unlikely that the positive effect of the expectancy boost was a result of these individuals' setting normatively referenced goals (Hulleman et al. 2010), but it is worth considering in future research.

General discussion

The results from the present studies suggest that the direct communication of utility value information may be an effective tool to stimulate interest in tasks. However, those who do not have high expectancies for success are reluctant to embrace this information. It may be necessary to bolster expectancies for success before individuals can benefit from the communication of utility value. In Study 1, we found that PCM played a larger role than individual interest in moderating the effect of directly-communicated utility value, and that individuals with only high PCM experienced more interest and attained better performance when given utility value information. Study 2 showed that situational interest among those with lower PCM can be sustained if they are led to have higher expectancies for success for the upcoming task. This research extends what is currently known about directly-communicated utility value, and how individual differences moderate its effects.

The effects of directly-communicated utility value found in this research may seem discrepant from the effects of self-generated utility value found in prior research (Hulleman et al. 2010; Hulleman and Harackiewicz 2009). Specifically, a manipulation to encourage self-generated utility value was found to promote interest and performance for learners with low instead of high expectancies for success. The role of success expectancies in moderating the effects of directly-communicated utility value suggests that the manipulation may have prodded individuals to think beyond their current levels of ability. This may have been exciting for those with high success expectancies but daunting for those with low success expectancies. Those with low success expectancies were less receptive to, if not threatened by, directly-communicated utility value. In contrast, self-generated utility value may have been beneficial for those with low success expectancies for exactly the opposite reason: rather than challenging those with low success expectancies to think about expanding their skills, self-generated utility value may have encouraged them to think about their existing skills and consider how they could be useful. In other words, individuals may not readily generate examples of utility that extend beyond their current perceived expectancies for success, and they may be expert in calibrating examples to current competencies. An interesting prediction for further research follows from this possibility. If the prompts for self-generated utility focused on how future (rather than current) skills could be useful, self-generated utility may show the same effects as that of directly-communicated utility.

Implications for interest and expectancy–value theories

Interest in a subject evolves over time, and each of its developmental phases is characterized by varying amounts of stored knowledge and affective value (Hidi and Renninger 2006). Interest in early phases largely depends on external support in the form of attention-grabbing stimuli, engaging presentation of the subject content, and encouragement. Consistent with this, our findings demonstrate that those with low expectancies for success, who are likely still at early phases of interest development, did not benefit from the presence of utility value information unless it was preceded by an initial boost in success expectancies. These individuals had low expectations for success, so hearing that the new technique was relevant for their everyday life and future career detracted from task engagement and lowered task interest unless their confidence was bolstered by an expectancy boost at the outset of the task. On the other hand, individuals with higher expectancies for success did not require an expectancy boost in order to benefit from learning about the utility value of the new technique. Consistent with interest theory (Hidi and Renninger 2006;

Renninger 2000), individuals with high PCM already possessed a well-developed sense of competence in math, so new utility value information was motivating (Krapp 1999; Renninger and Hidi 2002). These results may suggest that expectancies for success do not directly translate into task value and interest, but may increase the extent to which individuals are open to considering the value of tasks in a way to cultivate interest. As suggested earlier, there may be a threshold for expectancies for success that, once reached, allows for the development of interest.

The present results also extend the expectancy–value model of achievement choices (Eccles 1984; Eccles et al. 1983), which posits that expectancies for success and perceived value of the learning activity are vital determinants of achievement behavior. However, the effects of these variables on achievement behavior were not additive as the revised model would suggest (Eccles and Wigfield 2002). Rather, the effectiveness of directly-communicated utility value information depended on initial expectancies for success, consistent with the original formulation of Eccles and colleagues' expectancy–value model and traditional expectancy–value theories.

Both methodological and theoretical reasons may provide insight into why the results of the current research deviated from the revised model and revealed the positive expectancy × value interaction effect. The reasons are related to the correlational nature of much of the previous research that has been used to test the expectancy–value model of achievement choices (Eccles 1984; Eccles et al. 1983). First, researchers have identified a methodological reason why the expectancy–value interaction effects have not emerged in most correlational studies, and show that alternative statistical techniques do lead to the detection of the interactive effects of expectancies and values that are consistent with initial formulations (Nagengast et al. 2011; Trautwein et al. 2012).

Second, there may be a theoretical reason why the positive interactive effects of expectancies and value are more likely to emerge with experimental than correlational data. This explanation rests on the assumption that intrapersonal processes may lead to the convergence of expectancies and values across time. Specifically, the beliefs that individuals hold about themselves tend toward coherence and consistency in order to make sense of their behaviors and sustain an ongoing sense of who they are (e.g., Aronson 1968; Festinger 1957). It is likely that beliefs related to the self in achievement domains play out in this way, such that internal processes may facilitate consistency between personally held beliefs about expectancies and values, which may bring expectancies and values in line (Marsh et al. 2005). In other words, individuals with high success expectancies in a given domain may also come to perceive the domain as valuable in order to feel good about themselves. For similar reasons, individuals with low success expectancies in a domain may come to devalue the domain. Along these lines, research in which expectancies for success and values are self-reported yield strong positive correlations among these variables (e.g., Eccles and Wigfield 1995). Consequently, processes related to the inner workings of the self-concept may reduce the extent to which individuals hold expectancies and values that are misaligned, making it difficult to observe the interactive effect in self-report data. In contrast, experimental manipulations of expectancies and values yield interactive effects, reaffirming the necessary contributions of each dimension. By doing so, the two predictors (expectancies and values) can be tested as independent contributors to achievement choices.

Implications

Although this research is limited in the sense that it tested these effects only among college students and within a single domain, they contribute to knowledge on utility value, and how it can be introduced into learning situations to reap the most benefits. As with other interventions designed to affect interest, the story is not simple, and this intervention tends to be effective only for some people or with the appropriate supports. Increasingly, research is uncovering a handful of tools that educators can use to promote student motivation (see review by Yeager and Walton 2011). Some of these interventions do show continuing effects across time, largely attributed to affecting processes that cyclically foster achievement and motivation. Moreover, several of these interventions involve personal values, similar to directly-communicated utility value. However, a notable feature of the interventions shown to have sustained effects is that they require individuals to actively consider academic domains in relation to themselves, their values, or their developing sense of self. Given that directly-communicated utility value information is provided from an outside source, some of these more personalized processes may not be at play, which may limit the effectiveness of this type of intervention and its longevity. This is an area for future research.

Educators, coaches, and employers are in a perfect position to provide information about how tasks are useful for achieving all kinds of goals. However, an important message from these studies is that it is not enough to emphasize the utility of tasks. According to our results, someone with high success expectancies will benefit from hearing utility value information, whereas someone with low expectancies may not readily benefit from this information. Solid expectancies for success may be necessary before individuals can appreciate utility value that is presented to them.

Acknowledgments The research reported here was supported by the Institute of Education Sciences, U.S. Department of Education, through Award # R305B090009. The opinions expressed are those of the authors and do not represent views of the U.S. Department of Education.

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