Journal of Educational Psychology
2007, Vol. 99, No. 3, 597–610

0022-0663/07/$12.00 DOI: 10.1037/0022-0663.99.3.597

Different Strokes for Different Folks: How Individual Interest Moderates the Effects of Situational Factors on Task Interest

Amanda M. Durik
Northern Illinois University

Judith M. Harackiewicz
University of Wisconsin—Madison

Individual interest was examined as a moderator of effects of situational factors designed to *catch* and *hold* task interest. In Study 1, 96 college students learned a math technique with materials enhanced with collative features (catch) versus not. Catch promoted motivation among participants with low individual interest in math (IIM) but hampered motivation among those with high IIM. In Study 2 ($n = 145$), catch was crossed with a hold manipulation, emphasizing utility. Effects of each manipulation depended on IIM. The catch results were similar to those in Study 1. Hold promoted motivation among participants with high IIM and undermined it among participants with low IIM. Discussion centers on the intersection of individual and situational interest.

Keywords: individual interest, situational interest, motivation, math

Interest and intrinsic motivation are important learning outcomes. The goal of most educators is not only to teach so that students learn the material but also to motivate students so that they care about what they are learning. If students are motivated during instruction, then they may enjoy the learning experience, value their educational endeavors, and perhaps even seek out similar educational experiences in the future. Interest has been defined as a particular relation between a person and a content area (e.g., task, topic, or domain) that is characterized by focused attention and heightened engagement (Hidi & Baird, 1988; Krapp, 2002; Renninger, 1990, 2000). Similarly, intrinsic motivation is the desire to engage in an activity for the value inherent in doing it (Deci & Ryan, 1985). Although there is some debate about the differences between these constructs (see Deci, 1992; Hidi, 2000; Ryan & Deci, 2000; Renninger, 2000), there is consensus that there is significant overlap and that each is critical for optimal learning experiences. We review this literature together (often using the term *interest*) and draw on a process model of intrinsic motivation (Harackiewicz & Sansone, 1991) to illuminate the effects of situational factors on task interest.

Given the potential of interest and intrinsic motivation to promote important educational outcomes, it is necessary to explore the types of factors that might promote interest in learning situations (Hidi & Renninger, 2006; Renninger, 1990). Several situational factors have been found to promote interest and intrinsic motivation in achievement tasks (see Schraw & Lehman, 2001, for a review). One approach is to manipulate features of the general context. For example, the extent to which an instructor supports autonomy, offers helpful instructions, or provides positive performance feedback, can promote task interest (Cordova & Lepper, 1996; Deci & Ryan, 1985, 1987; Flink, Boggiano, & Barrett, 1990; Grolnick & Ryan, 1987; Sansone, Sachau, & Weir, 1989). Task interest also varies depending on how tasks are introduced, such as when they are presented in ways that encourage individuals to focus on particular achievement goals or to perceive the tasks as purposeful (Deci, Eghrari, Patrick, & Leone, 1994; Harackiewicz, Barron, & Elliot, 1998; Mitchell, 1993; Ross, 1983).

Another approach has been to examine features of tasks themselves (Cordova & Lepper, 1996; Harp & Mayer, 1997; Malone & Lepper, 1987; Parker & Lepper, 1992; Reeve, 1989). Dewey (1913) suggested that in order for an activity to be interesting, it must awaken and excite the immediate needs of the individual. Researchers have identified some task features that trigger interest by appealing to the natural tendencies of learners (Cordova & Lepper, 1996; Malone & Lepper, 1987; Parker & Lepper, 1992). For example, children were more likely to choose versions of a computer programming activity that involved fantasy or allowed learners to personalize aspects of the task (Parker & Lepper, 1992). This suggests that young learners respond positively to tasks that capture their imaginations and allow them to participate in the activity at a personal level.

Yet another approach identifies additional variables that capitalize on perceptual tendencies that can spontaneously trigger interest. Berlyne (1958, 1960) tested the effects of collative features on interest and appeal of visual stimuli, such as shapes and shape arrangements. In these studies, collative features, such as complexity, vividness, and novelty increased attention and arousal and led to higher interest ratings (Berlyne, 1963, 1970; Berlyne, Ogilvie, & Parham, 1968; Silvia, 2005). This body of research points to a direct link between visual input and interest. However, the presence of collative features might affect the evaluation of how material is presented without affecting interest in the material itself. For example, the presentation of material in a college textbook might involve colorful headers, a complex layout with boxes and sidebars, and intriguing photographs, but the presence of these features does not necessarily mean that readers will find the material covered in the text more interesting.

Amanda M. Durik, Department of Psychology, Northern Illinois University; Judith M. Harackiewicz, Department of Psychology, University of Wisconsin—Madison.

Correspondence concerning this article should be addressed to Amanda M. Durik, Department of Psychology, Northern Illinois University, DeKalb, IL 60115. E-mail: adurik@niu.edu

Two studies have examined the effects of collative features on task interest, with mixed results. In one study, some college students completed an anagram task under conditions designed to promote collative motivation (i.e., varied along dimensions such as color, placement, and font size), whereas others worked with stimulus words written in plain text (Reeve, 1989). Participants who worked with the more varied stimuli reported higher interest in the task, providing some evidence that collative features can promote task interest. However, Harp and Mayer (1997) tested the effects of visual enhancements on interest in material presented in a science textbook passage and found different results. The researchers manipulated the presence (vs. absence) of attractive photographs in the passage and found that the illustrations did not affect participants' reports of interest in the text (Harp & Mayer, 1997). These data suggest that collative features might not always affect task interest. However, an alternative possibility is that the effects of collative features on task interest were moderated by a third variable that was not measured in this study, specifically, people's individual interest in the topic.

Interest as a Personal Characteristic

Up to this point, we have focused on interest that emerges in response to features of the situation. This type of interest, *situational interest*, is a reaction to specific cues in the environment (Hidi & Baird, 1986; Hidi & Harackiewicz, 2000; Mitchell, 1993). Although these cues may be captivating or attention-grabbing in the moment, they are bound to the particular situation. In contrast to situational interest, *individual interest* is a more enduring, dispositional tendency to gravitate toward, respond positively to, and appreciate certain classes of stimuli across situations (Deci, 1992; Renninger, 1990, 2000; Schiefele, 1991). Individual interests are related to the desire to explore and learn, become absorbed in tasks, and persist through difficulty (Hidi & Harackiewicz, 2000; Hidi & Renninger, 2006; Renninger, 2000; Schiefele, 1991).

People enter learning situations with preexisting levels of interest, and their individual interest influences the way they approach and experience tasks. Not surprisingly, individuals are curious and care about the topics in which they are personally interested (Renninger, 1990, 2000; Rheinberg, Vollmeyer, & Rollett, 2000; Schiefele, 2001). They feel excited and channel energy into exploring the domain and expanding their knowledge of it. These feelings contribute to the value that an individual associates with the domain of individual interest, creating a solidified link between the person and the domain or activity (Krapp, 2002; Renninger, 2000).

Individuals who enter learning situations with high levels of individual interest in the topic are in an ideal situation. They are receptive to the information and eager to engage in the learning activity. In contrast, individuals who enter situations with low individual interest in the topic are unlikely to become engaged in the activity or to value the material that is being taught. These two groups of individuals enter the learning situation with very different orientations to the material.

Theorists have posited that individual interest might change how situational factors affect task interest (Bergin, 1999; Hidi & Harackiewicz, 2000; Hidi & Renninger, 2006; Murphy & Alexander, 2000), but these ideas have rarely been tested. One exception is a set of studies in which the researchers tested individual interest as a moderator of the effects of choice on interest in reading an expository text (Flowerday, 2000, as cited in Schraw, Flowerday, & Lehman, 2001). The positive effect of choice on text interest was more pronounced for those with low versus high individual interest, supporting the idea that individual interest is an important variable to consider when examining the effects of situational factors on task interest. In the present studies we test whether the effects of contextual factors hypothesized to affect situational interest are moderated by individual interest.

Situational Factors That Promote Interest

Collative features are theorized to trigger the initial stage of situational interest. *Catch* is the first of two processes involved in the development of situational interest and is related to stimulation and focused attention (Hidi & Baird, 1986; Mitchell, 1993). Instructional materials must first catch an individual's attention before interest can be held. Situational factors that *hold* interest empower individuals by bringing meaning and importance to the material (Mitchell, 1993). Once a person attends to a task, interest can develop or deepen if the material becomes infused with value (Brophy, 1999; Hidi & Harackiewicz, 2000; Krapp, 2002; Renninger, 2000). According to Mitchell (1993), educators can empower individuals by involving them in the learning process and by couching material in meaningful ways. The material to be learned becomes personally relevant to the learner by acquiring new information actively (rather than passively receiving it) and by using the information to accomplish meaningful tasks (Dewey, 1913; Mitchell, 1993).

The specific features of situations that actually empower individuals and spark continued interest are varied. Mitchell (1993) focused on the extent to which individuals learn material by way of active (vs. passive) means and perceive the material as meaningful for their lives. Our approach to the holding of interest is centered on this second process, meaningfulness, because we wanted to be able to hold constant the actual learning task. Moreover, this focus on personal utility and its connection with interest and motivation is bolstered by other research and theory (Brophy, 1999; Feather, 1988; Hidi & Harackiewicz, 2000; Krapp, 2002; Renninger, 2000; Wigfield & Eccles, 1992). For example, research has shown that college students are more likely to major in a given field if they find meaning in the material learned in an introductory course (hold), independent of whether they enjoy the lectures (catch; Harackiewicz, Barron, Tauer, & Elliot, 2002). Moreover, individuals who perceive math as having high utility value were found to be more likely to take elective math courses in high school (Updegraff, Eccles, Barber, & O'Brien, 1996). These data suggest that students may find material more interesting if it is perceived as having personal utility, and instructors may be able to help foster those perceptions with interventions that emphasize the utility of the material being taught.

The Current Research

We conducted two experimental studies. In Study 1 we tested the effects of catch on task interest, and in Study 2, we tested the effects of both catch and hold on task interest. Hidi and Harackiewicz (2000) proposed that situational factors geared toward enhancing task interest might be especially helpful for individuals who are otherwise not motivated, because situational factors can promote attention and involvement. More specifically, situational factors designed to catch interest may have positive effects on individuals who otherwise lack individual interest in the domain. Drawing from Berlyne's (1963, 1970) research, we hypothesized that individuals with low individual interest in a topic will evidence more task interest when they learn about it in a collative-rich environment. This is because collative features increase arousal and stimulate curiosity and exploration, all of which can make the learning experience more engaging for individuals who are otherwise uninterested. In contrast, individuals who enter the learning situation with high individual interest in a topic will evidence high interest in the task overall and not be as affected by collative features.

In addition to testing the direct effects of situational factors on task interest, we also wanted to examine the processes through which they worked. The process model of intrinsic motivation developed by Harackiewicz and Sansone (1991) suited our purposes because it outlines the psychological mechanisms that lead from personal and situational factors to intrinsic motivation during task engagement (Harackiewicz & Sansone, 1991). According to this model, three processes are important to the experience of intrinsic motivation: competence valuation, task involvement, and perceived competence. Competence valuation reflects the importance that a person places on competent performance at a given task, typically measured prior to task engagement. Task involvement refers to the extent to which an individual feels focused on and absorbed in an activity during task engagement.[1] Perceived competence refers to an individual's self-assessment of competence at an activity. This model distinguishes between the perception and valuation of competence, which has implications for individuals' motivation during task engagement. For example, two individuals who have low perceived competence will approach a task very differently depending on whether they care about doing well. This model of intrinsic motivation is consistent with other theoretical models of intrinsic motivation (i.e., Csikszentmihalyi & Nakamura, 1989; Deci & Ryan, 1985), but is especially useful here because it outlines the particular psychological mechanisms that lead to task motivation and because it distinguishes between the valuation and perception of competence.

The processes outlined in the model are assessed throughout task engagement. Competence valuation, measured before task engagement, identifies the extent to which individuals are focused on and committed to performing well in the situation before they have an opportunity to do so. Task involvement and perceived competence are not measured until after task engagement because only then can individuals reflect on and report the extent to which they felt involved and perceived themselves as competent. According to this model, a number of situational and individual factors can initiate these processes, but the extent to which a person experiences task involvement, competence valuation, and perceived competence determines their level of subsequent intrinsic motivation. Consequently, this model is flexible enough to accommodate both situational and personal factors in testing the conditions under which intrinsic motivation should develop and flourish. Specific to the current research, these processes can help identify why certain situational factors promote task interest.

Study 1

The purpose of Study 1 was to test the effects of catch (operationalized in terms of the presence of collative features) on task interest among individuals with high and low individual interest in the domain. The learning task was a four-step technique for mentally solving two-digit multiplication problems (Barron & Harackiewicz, 2001). In addition to manipulating catch versus noncatch, we also measured participants' individual interest in math (IIM) in order to test our hypothesis that catch would be especially effective for promoting task interest among individuals with low IIM. In contrast, we reasoned that individuals with high IIM would already be "caught" by the learning task, simply because the task was in a domain that appealed to them. Therefore, we predicted an interaction between IIM and catch, such that participants with low IIM would benefit from the collative features in the catch condition but that the participants with high IIM would be less affected by the collative features.

Moreover, we hypothesized that task involvement would mediate the effects of catch on task interest, reasoning that if collative features heighten arousal and exploration and help learners direct attention toward tasks, then catch would affect interest by way of task involvement. We hypothesized that the effects of catch on individuals with low individual interest would be mediated by the experience of involvement during task engagement (Harackiewicz & Sansone, 1991). Moreover, IIM, measured at the beginning of the session, was also hypothesized to relate to self-reported task involvement because individual interest is related to absorption and deep processing of information (Ainley, Hidi, & Berndorff, 2002; Csikszentmihalyi, Rathunde, & Whalen, 1993; Renninger, Hidi, & Krapp, 1992; Schiefele, 1991). We did not make specific predictions about the other two process measures, competence valuation and perceived competence, because it was not clear how collative features, in conjunction with IIM, would impact them (Harackiewicz & Sansone, 1991). We also did not have reason to predict that catch would affect task performance. However, we did expect those with high IIM to report higher competence valuation and perceived competence and to solve more problems correctly than those with low IIM (Csikszentmihalyi & Nakamura, 1989; Deci, 1992; Hidi & Baird, 1986).

Method

Participants

The participants in this study were 44 male and 52 female undergraduate students who were recruited from an introductory psychology course to participate in the study in exchange for extra credit. The sample was 92% European American, 1% African American, 1% Hispanic, and 3% Asian American. Information regarding race was unavailable for 3% of the sample.

[1] *Task involvement*, used by Harackiewicz and Sansone (1991), should be distinguished from *involvement,* used by Mitchell (1993), due to the similarity in terminology. Whereas Harackiewicz and Sansone described task involvement as the extent to which an individual becomes fully focused on and immersed in a task, Mitchell described involvement as the extent to which an instructor incorporates activity-based versus lecture-based instruction into lessons.

Design and Procedure

This study had a two-cell (noncatch vs. catch) between-participants design. In addition, we measured IIM on a continuous scale and analyzed it as a factor. The focal dependent variable was participants' subjective interest in the mental math technique (task interest). Several self-reported process variables were also assessed during the session, including competence valuation, task involvement, and perceived competence. We also recorded individuals' actual performance while using the technique.

Participants were randomly assigned to either the noncatch or catch condition and run individually. Upon arrival at the laboratory, participants were told about the types of math problems they would do during the session and were asked to report their IIM (Barron & Harackiewicz, 2001). Next, participants proceeded through a notebook that explained a four-step technique for mentally solving two-digit multiplication problems using a "left-to-right technique" (Flansburg, 1996). Individuals using this technique to solve two-digit multiplication problems multiply each of the four digit combinations while keeping in mind each digit's placement, beginning with the digit in the tens column of each number and ending with the digit in the ones column of each number. The products of the four operations are summed to arrive at the final answer. An audio recording accompanied the notebook in order to standardize the pace at which participants proceeded through the notebook.

The catch manipulation was embedded in the technique notebook. Participants in the catch condition proceeded through a notebook that was visually stimulating. It was filled with colorful pages with varied fonts and vivid pictures. In contrast, the notebook used by participants in the noncatch condition contained white pages with black text that was primarily 12-point font. Although the instructional materials across these conditions varied in terms of visual presentation, the text and the accompanying audiotape were identical across conditions.

After participants finished the technique notebook, they evaluated its appeal. This measure was included as a manipulation check to ensure that the collative features present in the catch manipulation enhanced the presentation of the material. Participants also reported the extent to which the left-to-right multiplication technique was explained clearly in order to rule out the possibility that the manipulation altered the perceived clarity of the information that was presented. Finally, we assessed participants' self-reported competence valuation regarding the upcoming problem sets.

The experimenter then administered two, 3-min problem sets, a practice set and a final set. Following the problem sets, participants reported the extent to which they became involved in using the technique and then received feedback about their performances. The feedback for all participants was designed to be positive (so that participants could put to rest any concerns about evaluation) and general (so that everyone received the same information). Participants were given a feedback form that had three lines of text, the first of which had a checkmark and read "Your score indicates above-average performance and skill development." The other two lines referred to "average" and "below-average" performance and skill development and did not have a checkmark. There was no other information on the form. After participants received feedback, they reported their feelings of competence at using the technique and their interest in the technique.

Measures

Participants' IIM was measured using a four-item scale that tapped general math valuation (e.g., "I find math enjoyable," "Math just doesn't appeal to me," [reversed], Barron & Harackiewicz, 2001). On this and all self-report items, participants indicated from 1 (*strongly disagree*) to 7 (*strongly agree*) the extent to which they agreed with each statement.

Several items assessed individuals' initial reactions to the learning session and to the technique. Participants reported the general appeal of the technique notebook (e.g., "The instructional notebook really caught my attention," "The Multiplication Technique Notebook was dull"). We also measured perceptions of the clarity of the materials ("The technique was explained clearly in the notebook"). Participants' self-reported competence valuation was measured by two statements (e.g., "It is important to me that I do well on the next sets of problems"). All multi-item scale reliabilities are presented in Table 1.

After using the technique on the two problem sets, participants responded to 4 items assessing task involvement (e.g., "I got caught up in doing the problems"). Then participants reported their perceived competence ("I think I did well using the multiplication technique on these problems"). At the end of the session, we assessed participants' task interest with three items (e.g., "The left-to-right technique is interesting," "It is a waste of time to learn the left-to-right technique").

Results

Hierarchical linear regression was used to analyze these data to test IIM as a continuous factor. A contrast code variable was created to test differences between the noncatch (-1) and catch ($+1$) conditions. The product term of this code and IIM was included to test the interaction. Gender was coded -1 for women and $+1$ for men. Preliminary analyses revealed that none of the interactions with gender (including the three-way interaction) were significant. Therefore, the gender interaction terms were trimmed from the model. This yielded a four-term model, including three main effects (IIM, catch, and gender) and one two-way interaction (Catch × IIM). All variables were standardized prior to analyses, and predicted values are based on estimates for one standard

Table 1
Zero-Order Correlations and Descriptive Statistics for Variables in Study 1

Variable	1	2	3	4	5	6	7
1. Individual interest in math	—						
2. Gender	.28*	—					
3. Competence valuation	.28*	.01	—				
4. Task involvement	.32*	.12	.46*	—			
5. Perceived competence	.40*	.18	.15	.48*	—		
6. Problems correct	.43*	.18	.24*	.33*	.37*	—	
7. Task interest	.28*	−.18	.50*	.56*	.36*	.30*	—
M	4.08	0.46	4.99	5.24	5.24	15.17	5.59
SD	1.67	0.50	1.15	0.93	1.25	5.44	0.85
Cronbach's α	.95		.62	.83			.79

Notes. Values ranged from 1 (*low*) to 7 (*high*) except for gender (0 for females, 1 for males) and number of problems correct.
$^*p < .05$.

deviation below and above the mean. See Table 1 for descriptive statistics, zero-order correlations, and reliabilities for all measures.

Preliminary Analyses

The first set of analyses was conducted on the manipulation checks. First, the four-term model was used to predict participants' reports of the appeal of the instructional materials. As expected, a strong effect of catch emerged, $t(91) = 2.87$, $p < .01$, $\beta = .28$. Participants in the catch condition ($\hat{Y} = 5.42$) reported that the instructional materials were more appealing than did participants in the noncatch condition ($\hat{Y} = 4.83$). In addition, participants with high IIM ($\hat{Y} = 5.34$) reported that the materials were more appealing than did participants with low IIM ($\hat{Y} = 4.91$), $t(91) = 2.04$, $p < .05$, $\beta = .21$. These results suggest that the experimental manipulation had its desired effect: Participants in the catch condition responded more positively to the technique notebook than did participants in the noncatch condition. Perhaps not surprisingly, participants who were more interested in math also reported that the instructional notebook was more appealing than did those who were less interested in math.

Second, we wanted to rule out the possibility that any effects of the manipulations could be traced to the perceived clarity of the instructional materials. Therefore, we used the four-term model to predict participants' ratings of how clearly the technique was explained. There were no significant effects and the model was not significant, $F(4, 91) = 1.20$, $p = .32$, $R^2 = .05$. Participants reported that the technique was explained very clearly ($M = 6.47$, $SD = 0.81$).

Direct Effects on Interest in the Technique

First, the four-term model was used to predict self-reported task interest at the end of the session. The model accounted for a significant portion of variance, $F(4, 91) = 5.43$, $p < .01$, $R^2 = .19$. Three effects emerged. First, the effect of IIM was significant, $t(91) = 3.68$, $p < .01$, $\beta = .36$, and was also qualified by a significant Catch × IIM interaction, $t(91) = -2.23$, $p < .05$, $\beta = -.21$. This interaction indicated that catch affected task interest differently for individuals with low versus high IIM (see Table 2). Simple effects were calculated to test the effect of catch for people who scored one standard deviation below and above the mean on IIM (Aiken & West, 1991). As predicted, the catch manipulation raised task interest somewhat among participants who had lower IIM, $t(91) = 1.83$), $p = .07$, $\beta = .25$. However, the catch manipulation did not affect, and perhaps even depressed, task interest among participants who had higher IIM, $t(91) = -1.34$, $p = .18$, $\beta = -.18$. These results indicate that participants' interest in the technique was affected by their preexisting interest and that this effect was qualified by catch. Finally, a main effect of gender emerged indicating that women ($\hat{Y} = 5.81$) reported higher interest in the technique than did men ($\hat{Y} = 5.38$), $t(91) = -2.55$, $p < .05$, $\beta = -.25$.

Table 2
Predicted Values for Catch × IIM Interactions in Study 1

IIM	Noncatch	Catch
	Task interest	
Low	5.05	5.47
High	6.03	5.72
	Competence valuation	
Low	4.32	4.92
High	5.62	5.06
	Task involvement	
Low	4.72	5.19
High	5.77	5.28

Note. Scores could range from 1 (*low*) to 7 (*high*). Values are predicted for 1 *SD* below and above the mean of individual interest in math (IIM).

Direct Effects on Process Measures and Performance

Task involvement. When the four-term model was used to predict self-reported task involvement, two effects emerged. As expected, the effect of IIM was significant, $t(91) = 3.09$, $p < .01$, $\beta = .31$, and was qualified by a Catch × IIM interaction, $t(91) = -2.67$, $p < .01$, $\beta = -.26$. Simple effect analyses revealed two marginally significant results. For participants who had low IIM, the catch manipulation somewhat promoted their self-reported task involvement, $t(91) = 1.88$, $p = .07$, $\beta = .25$. In contrast, for participants who had high IIM, the catch manipulation slightly undermined their task involvement, $t(91) = 1.94$, $p = .06$, $\beta = -.27$.

Competence valuation. Next, competence valuation was regressed on the four-term model, revealing two effects. Similar to the effects on task interest, the effect of IIM was significant, $t(91) = 3.07$, $p < .01$, $\beta = .31$. Moreover, a Catch × IIM interaction emerged, $t(91) = -2.56$, $p < .01$, $\beta = -.25$. The pattern of predicted values paralleled that found for interest. The catch manipulation led individuals with low IIM to care somewhat more about their competence in the situation, $t(91) = 1.91$, $p = .06$, $\beta = .26$. In contrast, the catch manipulation slightly constrained competence valuation among individuals with high interest in math, $t(91) = -1.74$, $p = .08$, $\beta = -.24$.

Performance. Next, we used the model to predict the number of problems participants solved correctly on the final problem set. This yielded a significant model, $F(4, 91) = 6.18$, $p < .01$, $R^2 = .21$. Participants with high IIM ($\hat{Y} = 17.41$) solved more problems correctly than those with low IIM ($\hat{Y} = 12.93$), $t(90) = 4.24$, $p < .01$, $\beta = .53$. No other effects emerged.

Perceived competence. Finally, participants' perceived competence was regressed on the four-term model, yielding a single main effect for IIM, $t(91) = 3.80$, $p < .01$, $\beta = .38$. Mirroring the effect on performance, participants with higher IIM ($\hat{Y} = 5.72$) perceived themselves as more competent at using the technique than participants with lower IIM ($\hat{Y} = 4.76$).

Mediation Analyses

Two requirements of mediation were satisfied above. First, we identified a significant interaction of Catch × IIM on participants' reports of task interest. Second, we found a similar interaction effect on task involvement. We next tested whether task involvement mediated the Catch × IIM interaction effect on task interest.

When task involvement was added to the four-term model used to predict task interest, the model was significant, $F(5, 90) = 12.44$, $p < .01$, $R^2 = .41$. Task involvement uniquely predicted interest in the technique, $t(90) = 5.73$, $p < .01$, $\beta = .51$, and considerably reduced the size of the interaction effect, $t(90) = -0.95$, $p = .35$, $\beta = -.08$ (from $\beta = -.21$). We conducted a Sobel (1982) test to determine whether significant variability in the direct effect was carried through task involvement, revealing significant mediation, $z' = 2.42$, $p < .05$ (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). In other words, catch promoted task interest among individuals with low IIM by way of task involvement.

Given that the Catch × IIM interaction emerged on competence valuation, we tested it as a separate mediator. When competence valuation was added to the initial four-term model used to predict task interest, the model was significant, $F(5, 90) = 6.94$, $p < .01$, $R^2 = .28$. Competence valuation was a unique predictor of interest in the technique, $t(90) = 3.74$, $p < .01$, $\beta = .36$, but only slightly reduced the size of the interaction effect, $t(90) = -1.78$, $p = .08$, $\beta = -.17$ (from $\beta = -.21$). Although the reduction in the interaction effect was small, the Sobel test showed partial mediation, $z' = 2.11$, $p < .05$. When task involvement was added to the model that contained competence valuation, to predict participants' interest in the technique, the model was significant, $F(6, 89) = 12.58$, $p < .01$, $R^2 = .46$. Task involvement was a strong predictor of task interest, $t(89) = 4.49$, $p < .01$, $\beta = .41$, competence valuation remained significant, $t(89) = 2.88$, $p < .01$, $\beta = .26$, and the interaction effect was attenuated, $t(89) = -0.48$, $p = .63$, $\beta = -.04$.

Discussion

The results supported our hypotheses concerning individuals who entered the situation with low IIM. These individuals benefited from the collative-rich learning environment, such that those in the catch condition evidenced somewhat higher self-reported task interest than those in the noncatch condition. This pattern was also reflected in the extent to which participants with low IIM became involved in the task. However, the experimental manipulation also affected participants who entered the situation with high IIM but in an unexpected direction. For these individuals, the manipulation seemed to diminish somewhat their self-reported task involvement. Finally, as predicted, participants with high IIM performed better on the task and perceived themselves as more competent at using the math technique than those with low IIM.

Consistent with the research concerning the enhancing effects of collative features on attention and pleasantness of visual stimuli, we found that catch promoted task interest for individuals with low IIM. It appears that the attention-grabbing and exploration-promoting properties of collative features helped participants with low IIM to become involved in the task. The presence of collative features also increased the extent to which these individuals cared about doing well on the task. Although individuals with low IIM entered the situation reticent to engage in the activity, the catch manipulation may have helped them become more engaged in the pursuit of competence and involved in the task. Participants with low IIM in the noncatch condition may not have given the task a chance, as reflected in their relatively low levels of competence valuation and task involvement. In contrast, participants with low IIM in the catch condition might have been more open to the material and invested themselves in the task because it was presented in a way that was appealing. It is promising that collative features have the potential to counteract attitudes as entrenched as those that individuals hold toward math. Individuals who arrive at college with low IIM have had many experiences with math that have caused them to decide that they are not interested in the domain. These data suggest that there are ways to raise learners' receptivity to material that, through extensive experience, they have come to expect to be dull and boring.

The participants with high IIM revealed a very different pattern. First, it should be noted that these individuals evidenced higher motivation than those with low IIM across all variables and performed better. Therefore, one can conclude that individuals with high IIM were functioning quite well in this learning context that emphasized a domain in which they had preexisting interest. However, the collative features seemed to dampen their self-reported competence valuation and task involvement. It is important to consider why the catch manipulation negatively affected individuals with high IIM. One possibility is that the colors and pictures present in the catch manipulation were annoying or frustrating for them; if these participants wanted only to get to the core content of the learning materials so that they could learn the technique, the apparent superfluous addition of collative variables may have been distracting. Before speculating further, first it is important to replicate the interactions found in Study 1.

Study 2

Study 2 had two purposes. First, we wanted to replicate the positive effects of catch for individuals with low IIM and broaden the generalizability of our findings by using a different version of catch. Whereas the catch manipulation in Study 1 included bright colors and cartoon-like pictures that were eye-catching and stimulating, the catch manipulation in Study 2 included collative variables in ways that were more muted and sophisticated.

Second, we introduced a second factor that was designed to manipulate hold, the second process involved in the development of situational interest. As mentioned previously, situational factors that hold interest empower individuals, allowing them to be active in the learning process and perceive meaning in what they do. We focused on the meaningfulness aspect of hold, articulated by Mitchell (1993), with the emphasis on personal utility. Consistent with this, when students have been asked how math could be more interesting, they have mentioned that it would be more engaging if it was relevant to their own lives (Eccles & Wigfield, 2002; Mitchell, 1993).

In Study 2, we crossed the catch manipulation with a manipulation of hold. This manipulation emphasized how the technique could be useful in a variety of situations in which college students find themselves. Therefore, some participants learned about how the technique could be relevant to their everyday lives, whereas others were taught the technique without this emphasis. We reasoned that participants with high IIM might be more receptive to the utility manipulation due to their desire to learn, to become competent, and to experience challenge within the math domain. These individuals are already caught by the domain of math itself and therefore may be ready to enter the second phase of situational interest (hold). Therefore, we hypothesized that these individuals would find the technique more interesting when it was couched in terms of personal utility (hold) than when it was not (nonhold). In contrast, participants with low IIM were not expected to respond as positively to the hold manipulation.

In the current study we tested the effects of catch and hold factors on students' interest in the math technique. As in Study 1, the learning materials were either enhanced with collative features (catch) or not (noncatch). Furthermore, throughout the technique notebook, participants in hold (vs. nonhold) conditions were informed about how the mental math technique could be useful in everyday life. After the learning session, participants used the technique on a problem set and reported their task interest.

Consistent with the results of Study 1, we hypothesized that catch would promote task interest for participants with low IIM. In addition, we speculated that these individuals might benefit from learning the technique with materials designed to both catch and hold interest. This hypothesis is derived from the idea that catch and hold are sequential processes involved in the triggering of situational interest. Therefore, the combination of both catch and hold might allow individuals with low IIM to proceed through both phases in quick succession. Finally, we also hypothesized that hold would promote task interest for individuals with high IIM.

As in Study 1, competence valuation, task involvement, and perceived competence were tested as mediators of the effects of catch and hold factors on task interest (Harackiewicz & Sansone, 1991). We expected to replicate the mediation results from Study 1 showing that task involvement and competence valuation mediated the effects of catch on task interest. In addition, we hypothesized that competence valuation and perceived competence would mediate the effects of hold because the potential for utility should make competence salient (i.e., the technique is useful to the extent that individuals can use it effectively). Individuals who care more about using the technique competently (have high competence valuation) should find the activity more interesting (Harackiewicz & Sansone, 1991). Moreover, we hypothesized that competence valuation and task involvement might foster perceived competence and further promote interest. Finally, we tested whether the hold manipulation promoted task performance, consistent with research indicating that perceiving utility in a task can lead to increased performance (e.g., Bong, 2001; Simons, Dewitte, & Lens, 2003).

Method

Participants

One hundred forty-five participants (70 men, 75 women) volunteered to take part in the experimental session in return for extra credit toward their course grade. Participants were 89% European American, 1% Hispanic, 6% Asian American, and 4% other.

Design and Procedure

This study had a 2 (noncatch vs. catch) × 2 (nonhold vs. hold) between-participants design. As in Study 1, participants were randomly assigned to an experimental condition. IIM was measured as a continuous variable and analyzed as a third factor. The dependent variable was participants' subjective task interest in the technique. The same mediators were assessed in Study 2 as in Study 1.

The procedure for Study 2 was similar to that of Study 1, with four exceptions. First, we used a different version of the catch manipulation. In Study 2 we used slightly more muted colors in the catch conditions and replaced many of the cartoon pictures with color photographs depicting similar images.

Second, a new factor was introduced in Study 2. The catch manipulation was crossed with a hold manipulation. Participants in hold conditions learned from a technique notebook that contained several pieces of information that pointed out the utility of the mental math technique in everyday situations that would be relevant to college students. For example, passages were inserted that described how mental math could be useful for doing personal banking, tallying grocery bills, and taking notes during math lectures. Examples were also provided in hold conditions of how to use the technique to calculate tips at restaurants and to determine discounts at retail stores. In nonhold conditions, no mention was made of personal utility. The hold manipulation text was identical across catch conditions and was either enhanced with collative features or not.

The third procedural difference in Study 2 was that participants completed one, 5-min problem set following the instructional notebook rather than two, 3-min sets, as in Study 1. This change was implemented so that participants would have a longer, uninterrupted stretch of time to develop skills at using the technique. Participants were provided five problems (and answers) in the instructional notebook so that they could practice the technique before using it on the timed set of problems.

The fourth difference from Study 1 involved variations in measurement (detailed below).

Measures

The constructs that were measured in the same way across both studies included IIM, perceived clarity of the instructional notebook, task involvement, and perceived competence. Unless otherwise noted, participants indicated from 1 (*strongly disagree*) to 7 (*strongly agree*) the extent to which they agreed with each self-report item.

The extent to which participants were caught by the materials was measured by three items (e.g., "I like the way the notebook was laid out," "The Multiplication Technique Notebook was dull"). A single item ("This technique could be useful to me") tapped participants' reactions to the task and served as a manipulation check of the hold manipulation. Participants' competence valuation was measured by one statement ("It is important to me that I do well on the next set of problems"). At the end of the session, we assessed participants' individual interest in the technique with three items (e.g., "This technique is interesting," "I like the new technique"). One item used in Study 1 ("It was a waste of time to learn this technique") was not used in Study 2 because it was thought to be ambiguous with regard to interest versus value, which was especially relevant to Study 2.

Results

Hierarchical linear regression was used to analyze these data. Three terms in the model were contrast codes designed to test the effects of the experimental manipulations. These included codes for catch (+1) versus noncatch (−1), hold (+1) versus nonhold (−1), and the product of these terms to test the interaction. IIM, measured at the beginning of the session, was a third factor in the model, including its interaction with each of the contrast codes.

Preliminary analyses revealed that the three-way interaction of IIM, catch, and hold was not a significant predictor of any outcome and was therefore trimmed from the model. Gender was coded −1 for women and +1 for men. Only the main effect of gender was tested in the final model because no interactions with gender and other variables were significant. This yielded a seven-term basic model, including four main effects (catch, hold, gender, and IIM) and three two-way interactions (Catch × Hold, Catch × IIM, and Hold × IIM). All variables were standardized prior to analyses, and predicted values are based on estimates for one standard deviation below and above the mean. See Table 3 for descriptive statistics, zero-order correlations, and reliabilities for all measures.

Preliminary Analyses

The first set of analyses was conducted on the manipulation checks. First, the seven-term model was used to test whether the collative variables in the catch conditions increased participants' ratings of the appeal of the technique notebook. As expected, only a strong effect of catch emerged, $t(137) = 4.96$, $p < .01$, $\beta = .39$. Participants in catch conditions ($\hat{Y} = 5.13$) reported that the instructional materials were more appealing than did participants in the noncatch conditions ($\hat{Y} = 4.43$). No other effects were significant.

Next, the same model was used to predict perceived utility, measured immediately after the instructional program as a check of the hold manipulation. As expected, participants in the hold conditions ($\hat{Y} = 5.58$) reported that the technique could be more useful than did participants in the nonhold conditions ($\hat{Y} = 5.00$), $t(137) = 2.91$, $p < .01$. No other effects were significant.

To test for condition differences in the perceived clarity of the instruction, we used the seven-term model to predict participants' ratings of how clearly the technique was explained. There were no significant effects and the model was not significant, $F(7, 137) = 1.07$, $p = .39$, $R^2 = .05$. Participants reported that the technique was explained very clearly ($M = 6.11$, $SD = 0.83$).

Taken together, these results suggest that the experimental manipulations had their intended effects: Participants in the catch conditions reported that the materials were more appealing than did those in the noncatch conditions, and participants in the hold conditions reported that the technique could be more useful than did those in the nonhold conditions. Moreover, the manipulations did not affect participants' ratings of the clarity of the instruction.

Table 3
Zero-Order Correlations and Descriptive Statistics for Variables in Study 2

Variable	1	2	3	4	5	6	7
1. Individual interest in math	—						
2. Gender	.10	—					
3. Competence valuation	.29*	−.15	—				
4. Task involvement	.33*	−.03	.45*	—			
5. Perceived competence	.32*	.01	.25*	.56*	—		
6. Problems correct	.32*	.13	.10	.17*	.29*	—	
7. Task interest	.16	−.01	.46*	.62*	.47*	−.04	—
M	4.16	0.48	4.63	4.82	4.90	20.21	5.22
SD	1.51	0.50	1.36	1.01	1.23	6.13	0.91
Cronbach's α	.92			.86			.83

Notes. Items ranged from 1 (*low*) to 7 (*high*) except for gender (0 for females, 1 for males) and number of problems correct.
* $p < .05$.

Direct Effects on Interest in the Technique

First, the seven-term model was used to predict task interest reported at the end of the session. The model accounted for a significant portion of variance, $F(7, 137) = 2.88$, $p < .01$, $R^2 = .13$. There was a significant Catch × IIM interaction, $t(137) = -2.53$, $p < .05$, $\beta = -.20$ (see Figure 1, left panel). Similar to the results of Study 1, the catch manipulation adversely affected the task interest of participants who had high IIM, $t(137) = -2.10$, $p < .05$, $\beta = -.23$, but did not reliably increase the task interest of participants who had low IIM, $t(137) = 1.50$, $p = .14$, $\beta = .17$. Participants who liked math found the technique more interesting if they were in noncatch conditions. Participants who had lower interest in math were slightly, but not significantly, more interested in the technique when in catch conditions.

Moreover, there was a significant main effect of hold, $t(137) = 2.13$, $p < .05$, $\beta = .17$, but this was qualified by a significant Hold × IIM interaction, $t(137) = 2.53$, $p < .05$, $\beta = .19$ (see Figure 1, right panel). Hold did not affect the task interest of participants who had low IIM, $t(137) = -0.17$, $p = .87$, $\beta = -.02$, but hold had a strong, positive effect on task interest among participants who reported high IIM, $t(137) = 3.15$, $p < .01$, $\beta = .35$. Participants who entered the session with high IIM found the experimental task even more interesting if they were told how the technique could be useful to them. The Catch × Hold interaction was not significant. Predicted values for the Catch × IIM interactions are presented in Table 4, and the predicted values for the Hold × IIM interactions are presented in Table 5.

Direct Effects on Process Measures and Performance

Competence valuation. Next, we tested whether the model predicted the extent to which participants valued competence while using the technique during the session. A main effect of IIM emerged, $t(137) = 4.26$, $p < .01$, $\beta = .32$. As predicted, participants with high IIM cared more about using the technique well than did participants with low IIM. In addition, women ($\hat{Y} = 4.87$) reported higher competence valuation than men ($\hat{Y} = 4.37$) did, $t(137) = -2.44$, $p < .01$, $\beta = -.19$. The hold manipulation also affected the extent to which individuals valued competence, $t(137) = 3.83$, $p < .01$, $\beta = .29$. Participants in hold conditions ($\hat{Y} = 5.01$) reported higher competence valuation than participants in nonhold conditions ($\hat{Y} = 4.23$). Finally, a Catch × IIM interaction also emerged, $t(137) = 1.94$, $p = .05$, $\beta = -.15$ (see Table 5). The pattern revealed that although catch did not affect competence valuation among participants with high IIM, $t(137) = -0.74$, $p = .46$, $\beta = -.08$, catch positively affected the competence valuation of participants who had low IIM, $t(137) = 2.02$, $p < .05$, $\beta = .22$, replicating the results of Study 1. In sum, the potential utility of the technique boosted the competence valuation of participants in general, but the presence of collative features in the learning materials positively affected competence valuation only for participants with low IIM.

Task involvement. Next, we used the model to predict the extent to which individuals became involved in using the tech-

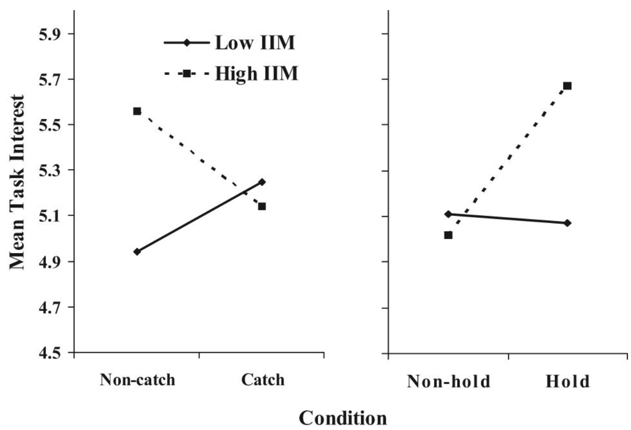

Figure 1. Interactions of Catch × Individual Interest in Math (IIM) and Hold × IIM on task interest. Values are based on 1 *SD* below and above the mean of IIM.

nique during the problem set. As predicted, IIM was a strong predictor of task involvement, $t(137) = 4.00$, $p < .01$, $\beta = .31$. We also found two significant interactions (see Figure 2). First, the effect of catch depended on IIM, $t(137) = -2.80$, $p < .01$, $\beta = -.22$. Catch reduced task involvement among individuals with high IIM, $t(137) = -1.95$, $p = .05$, $\beta = -.22$, but promoted task involvement among individuals with low IIM, $t(137) = 2.03$, $p < .05$, $\beta = .23$, replicating the pattern observed in Study 1. Moreover, the effect of hold also depended on participants' IIM, $t(137) = 1.94$, $p = .05$, $\beta = .15$. Hold fostered task involvement somewhat among participants who liked math, $t(137) = 1.80$, $p = .07$, $\beta = 20$, but did not affect task involvement among participants who did not like math, $t(137) = -0.98$, $p = .33$, $\beta = -.10$. Thus, catch and hold had opposite effects on the task involvement of participants who had high IIM.

Performance. Next we used the model to predict the number of problems participants solved correctly on the follow-up test. As in Study 1, one effect emerged. As predicted, participants with high IIM ($\hat{Y} = 22.51$) solved more problems correctly than participants with low IIM ($\hat{Y} = 17.95$), $t(137) = 4.33$, $p < .01$, $\beta = .35$.

Perceived competence. Finally, we tested whether the manipulations affected participants' perceptions of competence reported at the end of the session. Not surprisingly, there was a positive effect of IIM, $t(137) = 3.64$, $p < .01$, $\beta = .28$. Moreover, this effect was qualified by a Hold × IIM interaction, $t(137) = 3.91$, $p < .01$, $\beta = .31$ (see Table 5). Hold had a positive effect on perceived competence among people with high IIM, $t(137) = 2.32$, $p < .05$, $\beta = .25$, but had a negative effect on perceived competence among people with low IIM, $t(137) = -3.28$, $p < .05$, $\beta = -.36$. Interestingly, these effects do not parallel those found on performance described above. Although the actual performance of individuals with low and high IIM did not vary by hold condition, their perceptions of competence did vary. Participants with high IIM felt more competent in hold than in nonhold conditions, but the reverse was true for participants with low IIM.

Table 4
Predicted Values for Catch × IIM Interactions in Study 2

IIM	Noncatch	Catch
	Task interest	
Low	4.94	5.25
High	5.56	5.14
	Competence valuation	
Low	3.88	4.48
High	5.16	4.94
	Task involvement	
Low	4.27	4.72
High	5.34	4.91

Note. Scores could range from 1 (*low*) to 7 (*high*). Values are predicted for 1 *SD* below and above the mean of individual interest in math (IIM).

Table 5
Predicted Values for Hold × IIM Interactions in Study 2

IIM	Nonhold	Hold
	Task interest	
Low	5.11	5.07
High	5.02	5.67
	Task involvement	
Low	4.61	4.40
High	4.93	5.33
	Perceived competence	
Low	5.00	4.11
High	4.92	5.56

Note. Scores could range from 1 (*low*) to 7 (*high*). Values are predicted for 1 *SD* below and above the mean of individual interest in math (IIM).

Mediation Analyses

Next we conducted analyses to determine whether the effects on task interest were mediated by the extent to which participants valued competence, became involved, and perceived themselves as competent at the task. We added the process variables sequentially, resulting in an 8-term model when competence valuation was added, a 9-term model when task involvement was added, and a 10-term model when perceived competence was added.

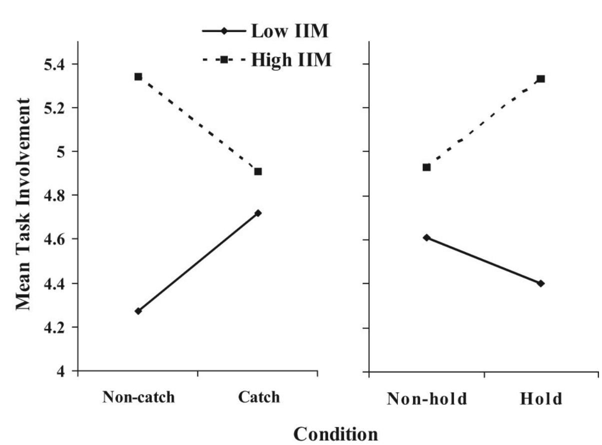

Figure 2. Interactions of Catch × Individual Interest in Math (IIM) and Hold × IIM on task involvement. Values are based on 1 *SD* below and above the mean of IIM.

When competence valuation was included in the analysis on task interest, the model was significant, $F(8, 136) = 6.41$, $p < .01$, $R^2 = .27$, and competence valuation was a strong predictor of interest, $t(136) = 5.23$, $p < .01$, $\beta = .44$. Its addition caused a sizable reduction in the main effect of hold, $t(136) = 0.58$, $p = .56$, $\beta = .04$, and the mediation test revealed a significant mediated effect, $z' = 3.09$, $p < .05$. The interactions of Catch × IIM, $t(136) = -1.87$, $p = .06$, $\beta = -.14$, and Hold × IIM, $t(136) = 2.51$, $p < .05$, $\beta = .19$, were still present. However, the interaction effect of Catch × IIM was reduced in magnitude and no longer significant. The test for mediation indicated that competence valuation partially mediated this effect on task interest, $z' = 1.80$, $p < .05$. In summary, competence valuation mediated the main effect of hold on task interest and partially mediated the Catch × IIM interaction effect on task interest but did not mediate the interaction of Hold × IIM.

When task involvement was added to the model along with competence valuation, the entire model accounted for significant variance in interest, $F(9, 135) = 12.65$, $p < .01$, $R^2 = .46$. Moreover, both task involvement, $t(135) = 6.76$, $p < .01$, $\beta = .51$, and competence valuation, $t(135) = 3.04$, $p < .01$, $\beta = .24$, uniquely predicted interest in the technique. The addition of task involvement attenuated the interaction of Catch × IIM, $t(135) = -.87$, $p = .39$, $\beta = -.06$, and the mediated effect was significant, $z' = 2.08$, $p < .05$. The interaction of Hold × IIM was also reduced, $t(135) = 1.67$, $p = .10$, $\beta = .11$, and indicated significant mediation, $z' = 1.98$, $p < .05$. Therefore, task involvement mediated the remaining Catch × IIM interaction as well as the Hold × IIM interaction on task interest.

Finally, we tested whether perceived competence shared variability with the remaining variance of the Hold × IIM interaction that predicted task interest. When perceived competence was added to the nine-term model (including competence valuation and task involvement), the model was significant, $F(10, 134) = 12.45$, $p < .01$, $R^2 = .48$. Perceived competence predicted task interest, $t(134) = 2.50$, $p < .05$, $\beta = .20$, as did competence valuation, $t(134) = 3.03$, $p < .01$, $\beta = .23$, and task involvement, $t(134) = 5.00$, $p < .01$, $\beta = .42$. Moreover, the Hold × IIM interaction was no longer present, $t(134) = 0.95$, $p = .35$, $\beta = .06$. Follow-up tests revealed significant mediation, $z' = 2.00$, $p < .05$. Perceived competence mediated the remaining covariation of the Hold × IIM interaction and task interest.

In conclusion, all three process measures were significant mediators but for different effects. The Catch × IIM interaction on task interest was partially mediated by both competence valuation and task involvement. The main effect of hold on task interest was mediated by competence valuation. Finally, the Hold × IIM interaction on task interest was mediated by task involvement and perceived competence.

Discussion

The results of this study replicated and extended the results of Study 1. Situational factors had different effects, depending on individuals' preexisting individual interest in the domain. Although individuals with high IIM evidenced higher task interest and performance overall, the presence of collative features dampened their task interest. Conversely, the personal utility emphasis benefited individuals with high IIM. Among individuals with low IIM, the mediating variables illuminated how catch and hold differentially affected their motivation in this situation. These participants reported higher competence valuation and task involvement in catch than in noncatch conditions. These results highlight the need to include individual differences in individual interest when examining effects of situational variables hypothesized to promote situational task interest.

The effects of collative features on self-reported task interest and the mediating variables were similar to the results reported in Study 1. Catch led individuals with low IIM to value their own competence on the experimental task and become absorbed in the activity. However, the collative features again undermined task interest for individuals with high IIM. As suggested earlier, one possibility is that the collative features were distracting for individuals with high IIM because they may have wanted to receive the learning material in the most straight-forward way possible, without being bothered by visual complexity inherent in the layout of the instructional materials. This hypothesis is supported by the negative effects of collative features across both studies on task involvement for participants with high IIM. If the presence of collative features distracted them, then it is plausible that they may have found it more difficult to become involved and absorbed in the task in catch than in noncatch conditions. Another possible explanation is that individuals with high IIM take pride in being good at advanced math and that the presence of the collative variables made the technique seem like something that was beneath their skill level, leading them to identify less with the task. This, in conjunction with the slight alteration of the catch manipulation across the studies, might explain why participants with high IIM reported lower competence valuation in the catch than in the noncatch condition in Study 1 but not in Study 2. The catch manipulation in Study 2, with more muted tones and fewer cartoon-like pictures than in Study 1, might not have raised concerns that the technique was juvenile or below their level of math ability for participants with high IIM. Importantly, however, the positive effects of collative features on task motivation for participants with low IIM in Study 2 were not as strong as those in Study 1. Thus, the modified catch manipulation used in Study 2 may have helped participants with high IIM at the expense of participants with low IIM, who responded more positively to the catch manipulation employed in Study 1.

The effects of the hold manipulation were somewhat consistent with hypotheses in that participants with high IIM reported that the task was more interesting in hold than in nonhold conditions. Importantly, however, the hold manipulation did not affect the task interest of individuals with low IIM, and it actually undermined their task involvement and perceived competence. Recall that a theoretical distinction between features of tasks that hold interest (vs. catch attention) is that hold operates at a deeper, more personal level (Mitchell, 1993). Consistent with this, participants exposed to the hold manipulation reported higher competence valuation overall (independent of IIM), which reflects personal investment in the activity (Harackiewicz & Sansone, 1991). However, once individuals started using the technique, the reactions of high and low IIM participants diverged. Specifically, individuals with high IIM, who actually performed better overall, became more task involved and perceived themselves as more competent at using the technique in hold than in nonhold conditions. In contrast, individuals with low IIM were less task involved and felt less competent. Individuals with low IIM performed worse than those with high IIM overall. As such, competence valuation may have become a liability for low IIM individuals once they started using the technique. The possibility that the technique could be useful to them in their everyday lives might have seemed promising until they were reminded (during task engagement) that they really didn't like math or didn't feel competent. At that point, the hold manipulation may have added pressure that caused them to disengage from the task.

Finally, hold did not affect task interest for individuals with low IIM, and the combination of catch and hold was not especially advantageous for them. These results are in contrast to theoretical descriptions of catch and hold, suggesting that they work sequentially (Mitchell, 1993). The manipulation check indicated that the emphasis on utility did impact participants' beliefs about the utility of the task overall. However, this did not translate into interest for individuals with low IIM. There are at least three reasons why this might have occurred. First, the collative features and utility emphasis were presented to participants simultaneously rather than sequentially. Theoretical descriptions of catch and hold often suggest that the effects of catch factors are transitory and will dissipate if not followed by hold factors that sustain interest. Consequently, the hold manipulation might not have affected these participants because it coincided with, rather than followed, the catch manipulation. The hold manipulation might be more effective for all participants if it comes after a catch manipulation and can therefore work to solidify the early interest fostered by the catch manipulation.

Second, it is also possible that other versions of a hold manipulation might be more conducive to promoting the interest of individuals with low IIM. Although meaningfulness is one aspect of hold in his model, another aspect of hold identified by Mitchell (1993) included the extent to which learners are active participants in knowledge acquisition. It is possible that active learning exercises might be a better bridge between the catch manipulation and task interest for these individuals. It may be too much to expect individuals to develop a sense of meaningfulness after one session with a new activity, whereas active learning might facilitate the development of perceived utility over time. This suggests that there is a sequence even within Mitchell's model, such that active learning might be one way to sustain interest and that perceived meaning is a later step. This analysis is consistent with the idea that as interest develops it becomes more internalized and less externally supported by others (Hidi & Renninger, 2006).

A third possible reason for why catch and hold, in combination, was not optimal for individuals with low IIM rests in the nature of IIM. Participants who report low IIM might be better described as having a noninterest in math rather than an underdeveloped interest in math (Renninger, 2000). Individuals with a noninterest are those who have knowledge of a domain and an explicit disinterest in it (Renninger, 2000). In contrast, a person who has an underdeveloped interest might have very little knowledge of a domain as well as low reported interest. Although theorizing on catch and hold has not specified this, the combination of catch and hold might be optimal for those individuals with an underdeveloped interest rather than a noninterest because an underdeveloped interest might have more room for growth via exposure to the domain and knowledge acquisition. Participants in this study, who were college students, may have had a lot of prior experience with the domain of math, and therefore their low level of IIM may have reflected an explicit disinterest in math, based on their knowledge about the domain. If the combination of catch and hold is best for individuals with underdeveloped interests, we would expect to see the benefits of catch and hold on task interest in situations in which people have very little prior experience with the learning material. Interest has the potential to develop for individuals with low knowledge of the material, and catch and hold interventions might be most effective for attracting individuals to the domain content during initial exposure to the material.

Although we replicated the positive relationship between IIM and task performance found in Study 1, we did not find any effects of the manipulations on task performance. Whereas prior research has identified a positive link between perceived utility and task performance (Bong, 2001; Simons, Dewitte, & Lens, 2003), no effect of hold on performance was evident here. It is possible that the absence of a hold effect on performance is due to the length of the experimental session. The relatively short time frame in which participants learned and performed the technique might have prevented any effects of hold from becoming evident. Further research should be conducted to illuminate when perceived utility predicts performance versus when it does not.

General Discussion

We designed these studies to examine the effects of situational factors on interest and to test how these effects vary as a function of individual interest. Considering the effects of catch and hold together, the results are consistent with theory suggesting that catch promotes interest by stimulating momentary attention and arousal, whereas hold operates at a deeper, more self-involving level (Dewey, 1913; Mitchell, 1993). Moreover, these studies shed light on the nature of the distinction between catch and hold. Catch is often described as a process that precedes hold, but theoretical accounts have not specified when or for whom one process is more or less beneficial. The effects of catch, as manipulated here, appear to be helpful for individuals who are less personally connected to the domain. Participants with low IIM might have been tempted to disregard the entire exercise from the start, without giving the math task a chance. However, the collative variables in the catch conditions may have been sufficiently appealing to the low IIM participants to cause them to be receptive to the material and to become engaged in the activity.

Our theoretical analysis is supported by the mediation analyses. The lower competence valuation evidenced by low IIM participants in noncatch conditions might reflect their initial resistance to the learning experience. Whereas participants with low IIM in noncatch conditions were not able to put aside their general distaste for math and care about or become involved in the task, those in catch conditions were able to do so—they became personally engaged in the activity, evidenced by their higher competence valuation. In other words, the catch manipulation allowed participants with low IIM to become more involved and absorbed in using the technique than they otherwise would. In contrast, participants high in IIM began the task valuing competence and ready to engage, and these participants did not require external stimulation to prompt their competence valuation and task involvement

Theoretical conceptualizations of hold posit that it is more rooted in the individual, relative to catch (Dewey, 1913; Hidi, 1990; Hidi & Harackiewicz, 2000; Mitchell, 1993). This is evident in the effects of hold on competence valuation and perceived competence found in Study 2. The emphasis on personal utility promoted individuals' competence valuation, irrespective of individual interest, suggesting that the perceived utility of a task can infuse an achievement task with value such that individuals care about it at a more personal level. Moreover, hold factors might solidify interest depending on individuals' prior experience with the domain. For some participants (those with high IIM), the emphasis on personal utility led to greater task interest, task involvement, and perceived competence. These participants entered a situation that involved a domain with which they identify, and this personal connection provided fertile ground in which to plant the idea that the technique could be useful to them. Although the personal utility manipulation promoted competence valuation for all participants, only the individuals with high IIM were prepared to work actively with the possibility that the technique could be useful. They responded to the challenge that the technique presented, piqued by the hold manipulation. They became more involved in the math task and ultimately perceived themselves as more competent when the utility value of the technique was made salient to them.

However, the down side of personal investment was evident among participants with low IIM. For them, the emphasis on personal utility negatively affected their task involvement and perceived competence. These data suggest that there can be costs associated with becoming invested in a domain. As a consequence, individuals might be especially cautious when presented with the opportunity to become personally invested in a domain that is new or threatening. Factors in the environment designed to infuse an activity or domain with personal meaning might actually threaten these individuals and cause them to become less involved in the activity.

The model developed by Deci and Ryan (1991) to describe how an activity's value that is suggested outside the person may become internalized is helpful in understanding the effects of hold. They argued that if a person identifies with the value of the activity then the value will be integrated and the person will pursue the activity in a fully volitional and self-determined way (Deci & Ryan, 1991). In contrast, if a person accepts the value only to the extent that doing so satisfies obligations to others, then the person will involve himself or herself in the activity in a personally limited way that is not self-determined. Thus, the process of internalization can be more or less complete, depending on whether the external value manipulation corresponds to personal identification. This distinction is informative when interpreting the results of hold. The effects of emphasizing personal utility for individuals with high IIM suggest that the value manipulation promoted their interest. According to the Deci and Ryan model, it seems that these individuals integrated the value manipulation into their personal goals for the situation and that this facilitated their motivation to engage fully in the activity. In contrast, participants with low IIM did not respond to the utility manipulation in a whole-hearted way. Although these individuals internalized the proposed value of the activity (evidenced by their enhanced competence valuation), they may have done so only out of external pressure or a sense of obligation. Individual interests might help predict the effects of manipulations geared to promote personal meaning and interest in tasks. Individuals with preexisting interest in the domain might be more ready to internalize value that comes from outside the person.

Although these studies examined the effects of situational factors on learners' interest in a specific math task, repeated enhanced learning experiences may contribute to interest in math more generally as well as achievement. This is especially important for individuals with low IIM because their interest in math has considerable room for growth. If, as these data suggest, certain instructional enhancements can improve individuals' receptivity to material, then a series of learning experiences containing these types of enhancements might ultimately promote their interest in math more broadly. This is a critical direction for future research because it might be a way to not only facilitate math interest but also math performance, evident in the strong relationship found in these studies between IIM and task performance. In other words, transient situational manipulations may help set the stage for the development of more enduring interests.

Finally, two effects of gender emerged, although they appeared to be idiosyncratic. In Study 1, women reported greater task interest than men, and in Study 2, women reported higher competence valuation than men. It is unclear why these effects emerged, and they are somewhat surprising given previous research indicating that, on average, women tend to show somewhat more negative attitudes about math than men (e.g., Hyde, Fenema, Ryan, Frost, & Hopp, 1990). One possibility is that individual women in this context wanted to appear to the experimenter as being especially interested in the task in an attempt to counteract beliefs that women are turned off by math. Alternatively, women's greater interest in this task could be related to the idea that the multiplication task used in this study is a nontraditional way of doing math. It is likely that attitudes about math develop during formal math instruction as students matriculate through high school and college. However, the math task used in this study was novel to students and was presented as an alternative to the way math is taught in school. Women in this study might have perceived the experimental session as an opportunity to think about math differently, which could have been especially enticing for them and caused them to care more about doing well at it. Although these explanations cannot be tested in the current data sets, they identify research directions that might help us better understand gender as well as the nature of self-reported interests.

Implications and Limitations

In these studies we examined the effects of individual interest and situational factors on task interest within a limited context. This is important to consider because of the variation and extremity in interest in math among different individuals. People have a lot of experience with math by the time they reach college, and individuals tend to have strong feelings, either positive or negative, about the domain. Therefore, it is possible that the interactions found between IIM and the catch and hold manipulations would have been less pronounced had the studies involved a topic with which participants had weaker initial individual interest or less prior experience (e.g., geography). Participants' reactions to the catch and hold manipulations might have been more uniform across participants had their individual interest been less variable. If this were the case, their task interest might have been more malleable in response to features of the situation.

In addition, the effects of situational factors on task interest among college students might involve different processes than interest development among younger students. Specifically, developmental trends in task values suggest that utility value and perceived competence become increasingly important predictors of achievement choices as children get older (e.g., Eccles & Wigfield, 1985; Wigfield, 1994). This suggests that the role of catch and hold in predicting task interest might change over the life span. For example, if features of situations that catch attention make activities more fun, then catch factors might be particularly effective for promoting children's interest. This is consistent with prior research, in that most studies that have reported positive effects of task features that are akin to catch have been conducted with children (Cordova & Lepper, 1996; Malone & Lepper, 1987; Parker & Lepper, 1992). This might be due to the nature of learning in childhood (Dewey, 1913) or because children have less developed individual interests than adults (Renninger, 2000).

It is important to consider the specific nature of these manipulations when generalizing these effects to classroom situations. These data suggest that learning materials that are enhanced with colors and pictures can help some individuals find lessons more interesting. Students who enter the learning situation with low interest in the material become more involved in the lessons if the learning materials are visually stimulating and aesthetically pleasing. A benefit of this type of interest-enhancing strategy is that it does not require ongoing support on the part of the teacher, once the materials are produced. For example, these data suggest that a strategy to help unmotivated students find material more interesting is to offer them materials that have colors and vivid pictures. Although these data do not specify how long collative features can affect interest and whether learners reach a saturation point, it seems that a starting place for students with low interest is with learning materials that are rich with color and pictures.

In contrast, emphasis on personal utility was surprisingly ineffective at raising interest among students with low individual interest in math and it actually decreased their perceived competence. Within classroom situations, this suggests that teachers should use caution when emphasizing to students the utility of particular math problem-solving strategies. That said, instructors might be able to spur on their most interested students by highlighting the utility of problem-solving skills outside of the classroom. One solution is that learning materials be designed so that emphasis on utility is embedded only when learners reach a certain level of competence with the material. So, for example, if there is a series of lessons that cover a particular topic, the perceived utility might be most effective when inserted toward the end, at which point learners already have a lot of experience, practice, and comfort with the domain.

Conclusions

These studies tested the effects of situational variables on interest in a novel math task and showed that the effects of collative variables (catch) and utility emphasis (hold) differed for individuals identified as having low or high interest in math. This is in line with theorizing that task interest can deepen in response to situational factors that support its development (Hidi & Renninger, 2006). The interest of learners with low individual interest in math was fostered by collative features of the learning materials, intended to attract attention to the task and stimulate learners but not engage them at a deep level. In contrast, the interest of learners with high individual interest in math was promoted by materials that emphasized the personal utility of learning the task. In sum, both types of learners benefited from external support of their interest, but their resultant task interest depended on the specific form that the support took.

References

Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions.* Newbury Park, CA: Sage.

Ainley, M. D., Hidi, S., & Berndorff, D. (2002). Interest, learning and the psychological processes that mediate their relationship. *Journal of Educational Psychology, 94,* 1–17.

Barron, K. E., & Harackiewicz, J. M. (2001). Achievement goals and optimal motivation: Testing multiple goal models. *Journal of Personality and Social Psychology, 80,* 706–722.

Bergin, D. A. (1999). Influences on classroom interest. *Educational Psychologist, 34,* 87–92.

Berlyne, D. E. (1958). The influence of complexity and novelty in visual figures on orienting responses. *Journal of Experimental Psychology, 55,* 289–296.

Berlyne, D. E. (1960). *Conflict, arousal, and curiosity.* New York: McGraw-Hill.

Berlyne, D. E. (1963). Complexity and incongruity variables as determinants of exploratory choice and evaluative ratings. *Canadian Journal of Psychology, 17,* 274–290.

Berlyne, D. E. (1970). Novelty, complexity, and hedonic value. *Perception and Psychophysics, 8,* 279–286.

Berlyne, D. E., Ogilvie, J. C., & Parham, L. C. (1968). The dimensionality of visual complexity, interestingness, and pleasingness. *Canadian Journal of Psychology, 22,* 376–387.

Bong, M. (2001). Role of self-efficacy and task-value in predicting college students' course performance and future enrollment intentions. *Contemporary Educational Psychology, 26,* 553–570.

Brophy, J. (1999). Toward a model of value aspects of motivation in education: Developing appreciation for particular learning domains and activities. *Educational Psychologist, 34,* 75–85.

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

Csikszentmihalyi, M., & Nakamura, J. (1989). The dynamics of intrinsic motivation: A study of adolescents. In R. Ames & C. Ames (Eds.), *Research on motivation in education: Vol. 3. Goals and cognitions* (pp. 45–71). Orlando, FL: Academic Press.

Csikszentmihalyi, M., Rathunde, K., & Whalen, S. (1993). *Talented teenagers: The roots of success and failure.* New York: Cambridge University Press.

Deci, E. L. (1992). The relation of interest to the motivation of behavior: A self-determination theory perspective. In K. A. Renninger, S. Hidi, & A. Krapp (Eds.), *The role of interest in learning and development* (pp. 43–70). Hillsdale, NJ: Erlbaum.

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

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior.* New York: Plenum.

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

Deci, E. L., & Ryan, R. M. (1991). A motivational approach to self: Integration in personality. In R. Dienstbier (Ed.), *Nebraska symposium* *on motivation: Vol. 38* (pp. 237–288). *Perspectives on motivation.* Lincoln: University of Nebraska Press.

Dewey, J. (1913). *Interest and effort in education.* Boston: Riverside Press.

Eccles, J., & Wigfield, A. (1985). Teacher expectancies and student motivation. In J. B. Dusek (Ed.), *Teacher expectancies* (pp. 185–226). Hillsdale, NJ: Erlbaum.

Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology, 53,* 109–132.

Feather, N. T. (1988). Values, valences, and course enrollment: Testing the role of personal values within an expectancy-value framework. *Journal of Educational Psychology, 80,* 381–391.

Flansburg, S. (1996). *Math magic.* New York: Harper Perennial.

Flink, C., Boggiano, A. K., & Barrett, M. (1990). Controlling teaching strategies: Undermining children's self-determination and performance. *Journal of Personality and Social Psychology, 59,* 916–924.

Grolnick, W. S., & Ryan, R. M. (1987). Autonomy in children's learning: An experimental and individual difference investigation. *Journal of Personality and Social Psychology, 52,* 890–898.

Harackiewicz, J. M., Barron, K. E., & Elliot, A. J. (1998). Rethinking achievement goals: When are they adaptive for college students and why? *Educational Psychologist, 33,* 1–21.

Harackiewicz, J. M., Barron, K. E., Tauer, J. M., & Elliot, A. J. (2002). Predicting success in college: A longitudinal study of achievement goals and ability measures as predictors of interest and performance from freshman year through graduation. *Journal of Educational Psychology, 94,* 562–575.

Harackiewicz, J. M., & Sansone, C. (1991). Goals and intrinsic motivation: You can get there from here. *Advances in Motivation and Achievement, 7,* 21–49.

Harp, S. F., & Mayer, R. E. (1997). The role of interest in learning from scientific text and illustrations: On the distinction between emotional interest and cognitive interest. *Journal of Educational Psychology, 89,* 92–102.

Hidi, S. (1990). Interest and its contribution as a mental resource for learning. *Review of Educational Research, 60,* 549–571.

Hidi, S. (2000). An interest researcher's perspective: The effects of extrinsic and intrinsic factors on motivation. In C. Sansone & J. M. Harackiewicz (Eds.), *Intrinsic and extrinsic motivation: The search for optimal motivation and performance* (pp. 309–339). New York: Academic.

Hidi, S., & Baird, W. (1986). Interestingness—a neglected variable in discourse processing. *Cognitive Science, 10,* 179–194.

Hidi, S., & Baird, W. (1988). Strategies for increasing text-based interest and students' recall of expository texts. *Reading Research Quarterly, 23,* 465–483.

Hidi, S., & Harackiewicz, J. M. (2000). Motivating the academically unmotivated: A critical issue for the 21st century. *Review of Educational Research, 70,* 151–179.

Hidi, S., & Renninger, K. A. (2006). The four-phase model of interest development. *Educational Psychologist, 41,* 111–127.

Hyde, J. S., Fenema, E., Ryan, M., Frost, L. A., & Hopp, C. (1990). Gender comparisons of mathematics attitudes and affect: A meta-analysis. *Psychology of Women Quarterly, 14,* 299–324.

Krapp, A. (2002). An educational-psychological theory of interest and its relation to SDT. In E. L. Deci & R. M. Ryan (Eds.), *The handbook of self-determination research* (pp. 405–427). Rochester, NY: Rochester University Press.

MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. (2002). A comparison of methods to test mediation and other intervening variable effects. *Psychological Methods, 7,* 83–104.

Malone, T. W., & Lepper, M. R. (1987). Making learning fun: A taxonomy of intrinsic motivations for learning. In R. Snow & M. Farr (Eds.), *Aptitude, learning, and instruction* (Vol. 3, pp. 223–253). Hillsdale, NJ: Erlbaum.

Mitchell, M. (1993). Situational interest: Its multifaceted structure in the secondary school mathematics classroom. *Journal of Educational Psychology, 85,* 424–436.

Murphy, P. K., & Alexander, P. (2000). A motivated exploration of motivation terminology. *Contemporary Educational Psychology, 25,* 3–53.

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

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

Renninger, K. A. (1990). Children's play interests, representation, and activity. In R. Fivush & J. Hudson (Eds.), *Knowing and remembering in young children* (pp. 127–165). Cambridge, England: Cambridge University Press.

Renninger, K. A. (2000). Individual interest and its implications for understanding intrinsic motivation. In C. Sansone & J. M. Harackiewicz (Eds.), *Intrinsic and extrinsic motivation: The search for optimal motivation and performance* (pp. 373–404). New York: Academic Press.

Renninger, K. A., Hidi, S., & Krapp, A. (1992). *The role of interest in learning and development.* Hillsdale, NJ: Erlbaum.

Rheinberg, F., Vollmeyer, R., & Rollett, W. (2000). Motivation and action in self-regulated learning. In M. Boekaerts, P. R. Pintrich, & M. H. Zeidner (Eds.), *Handbook of self-regulation* (pp. 503–529). San Diego, CA: Academic.

Ross, S. M. (1983). Increasing the meaningfulness of quantitative material by adapting context to student background. *Journal of Educational Psychology, 75,* 519–529.

Ryan, R. M., & Deci, E. L. (2000). When rewards compete with nature: The undermining of intrinsic motivation and self-regulation. In C. Sansone & J. M. Harackiewicz (Eds.), *Intrinsic and extrinsic motivation: The search for optimal motivation and performance* (pp. 13–54). New York: Academic Press.

Sansone, C., Sachau, D. A., & Weir, C. (1989). Effects of instruction on intrinsic interest: The importance of context. *Journal of Personality and Social Psychology, 57,* 819–829.

Schiefele, U. (1991). Interest, learning and motivation. *Educational Psychologist, 26,* 299–323.

Schiefele, U. (2001). The role of interest in motivation and learning. In J. Collis & S. Messick (Eds.), *Intelligence and personality: Bridging the gap in theory and measurement (*pp. 163–194). Mahwah, NJ: Erlbaum.

Schraw, G., Flowerday, T., & Lehman, S. (2001). Increasing situational interest in the classroom. *Educational Psychology Review, 13,* 211–224.

Schraw, G., & Lehman, S. (2001). Situational interest: A review of the literature and directions for future research. *Educational Psychology Review, 13,* 23–52.

Silvia, P. J. (2005). Emotional responses to art: From collation and arousal to cognition and emotion. *Review of General Psychology, 9,* 342–357.

Simons, J., Dewitte, S., & Lens, W. (2003). "Don't do it for me. Do it for yourself!" Stressing the personal relevance enhances motivation in physical education. *Journal of Sport and Exercise Psychology, 25,* 145–160.

Sobel, M. E. (1982). Asymptotic confidence intervals for indirect effects in structural equation models. In S. Leinhardt (Ed.), *Sociological Methodology* (pp. 290–312). Washington, DC: American Sociological Association.

Updegraff, K. A., Eccles, J. S., Barber, B. L., & O'Brien, K. M. (1996). Course enrollment as self-regulatory behavior: Who takes optional high school math courses? *Learning and Individual Differences, 8,* 239–259.

Wigfield, A. (1994). Expectancy-value theory of achievement motivation: A developmental perspective. *Educational Psychology Review, 6,* 49–78.

Wigfield, A., & Eccles, J. S. (1992). The development of achievement task values: A theoretical analysis. *Developmental Review, 12,* 265–310.

Received February 23, 2006
Revision received January 11, 2007
Accepted January 18, 2007 ■