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Fostering Creativity in the Classroom: Effects of Teachers' Epistemological Beliefs, Motivation, and Goal Orientation

ABSTRACT

The relationships of teachers' epistemological beliefs, motivation, and goal orientation to their instructional practices that foster student creativity were examined. Teachers' perceived instructional practices that facilitate the development of multiple perspectives in problem solving, transfer, task commitment, creative skill use, and collaboration were measured as indicators of their effort to foster creative thinking in students. Participants were 178 elementary-school teachers of third-, fourth-, and fifth-graders. Teachers' learning goal orientation was the most significant teacher attribute that demonstrated significant impacts on all five creativity-fostering instructional practices. Teachers with sophisticated beliefs about knowledge and with high intrinsic motivation for creative work also reported supporting student creativity through some of their instructional practices. However, teachers' motivation for challenging work, beliefs about learning, or performance goals did not significantly predict most of the creativity-fostering instructional practices. Educational implications of the current findings are offered.

INTRODUCTION

In the creativity-fostering classroom, teachers generate and maintain a climate in which creative thinkers are respected, students tolerate new ideas, conformity is not imposed, and diversity in ideas is encouraged and appreciated (Cropley, 2006). Teachers can improve creative thinking in students by providing choices, rewarding different ideas and products, encouraging sensible risks, and emphasizing students' strengths and interests (de Souza Fleith, 2000; Kaufman & Sternberg, 2007). With increasing diversity in the classroom, teachers can utilize the positive aspects of cultural diversity that can benefit all students and make efforts to promote creative problem solving and idea generation among students (Leung, Maddux, Galinsky, & Chiu, 2008). Furthermore, when teachers construct real and critical events, model their own creativity for students, and use space creatively, creative learning is likely to occur (Jeffrey, 2006; Rejskind, 2000).

Unfortunately, the majority of teachers prefer a classroom full of intellectual, high-achieving students to those who are highly creative and unconventional (Davis & Rimm, 1994). Some teachers see creative children as a source of interference or sometimes incorrectly identify them as having impulsive/hyperactive or disruptive behavior (Brandau et al., 2007; Scott, 1999). With these observations, it is not too surprising to read Schacter, Thum, and Zifkin's (2006) report that the majority of elementary-school teachers do not implement strategies that foster creativity in students.

Stein and Poole (1997) challenge teachers to question their teaching practices and views concerning student learning. Along with other recommendations by creativity scholars introduced above, Stein and Poole recommend that teachers create classroom environments to meet individual students' interests and needs, design curriculum to ensure open-ended activities, and utilize real-life contexts for assessing and reporting learning outcomes. These strategies help students not only become more versed in creative thinking, but also situate them in an environment that fosters creativity.

Although there are suggestions as to what instructional strategies may improve creativity in students, there is a paucity of studies investigating teacher characteristics which impact their creativity-fostering instructional practices. Teacher characteristics studied in the past that are considered effective include enthusiasm, a sense of humor, empathy, accepting and caring, openness, or dedication to students, which place high value on interpersonal relationships (McGreevy, 1990; Whitlock & DuCette, 1989). However, cognitive-motivational constructs that have been studied in recent years in education and psychology have not been examined regarding their relationships to creativity-fostering instructional practices. The current research focused on teachers' epistemological beliefs, intrinsic motivation, and goal orientation as these constructs have been widely studied to examine their effects on student learning (Amabile, 1996; Dweck & Leggett, 1988). Due to the lack of research on relationships between teacher characteristics and creativity-fostering instructional practices, we first review instructional approaches related to creative thinking, followed by teachers' beliefs and attributes.

INSTRUCTIONAL STRATEGIES FOR FOSTERING CREATIVE THINKING

Of the instructional strategies that facilitate the development of creative thinking and the formation of creative habits discussed in the literature (e.g., Daiute & Dalton, 1993; Renzulli, Smith, White, Callahan, Hartman, & Westberg, 2002), we directed our focus on multiple perspectives in problem solving, transfer of knowledge to different situations, task commitment, creative skill use, and collaboration.

Multiple perspectives in problem solving. Creative thinkers generate not only novel ideas but multiple, divergent ideas (Guilford, 1967). Runco (2003) defines being creative as a type of problem solving that involves the construction of new meaning. Creative thinkers across a wide age range demonstrate abilities in real-life problem-solving in various domains (e.g., social leadership, mathematics,

sales, and management) as indicated by their ability to produce original and divergent solutions to problems posed to them (Hong & Milgram, 2008). As shown in meta-analytic studies (Ma, 2006), training to improve creative thinking has shown positive effects in increasing creative problem-solving skills (Chen, Himsel, Kasof, Greenberger, & Dmitrieva, 2006), although effect sizes varied for domain-general, domain-specific, or task-specific problems (Baer & Kaufman, 2005).

Transfer of knowledge and strategies. Transfer indicates the ability to take knowledge or strategies gained in one situation and apply it to a different situation. With the flexible or divergent use of knowledge, skills, and strategies, students are able to transfer their learning to different situations. Gifted students often demonstrate higher ability to transfer strategies to novel tasks as compared to average students (Carr, Alexander, & Schwanenflugel, 1996). Strategy transfer can be trained to all levels of students including gifted and average students, as well as those with learning difficulties (Ferretti & Butterfield, 1992).

Task commitment. Renzulli (2002) defines task commitment as the capacity for high levels of interest, hard work and determination, self-confidence and the drive to achieve, the ability to identify significant problems, and setting high standards for one's work. Task commitment is an essential attribute of children for their achievement (Lee-Corbin & Denicolo, 1998). Task commitment is also an important characteristic of resilient people, along with the desire to learn, reflectiveness, maturity, and self-understanding (Bland, Sowa, & Callahan, 1994). Feldhusen (1995) contends that students need to commit themselves to developing their creativity and talent and that providing challenging tasks is an effective way to encourage commitment.

Creative skill use. To help students realize creative-thinking ability, students must be given opportunities to use it. Giftedness, as determined by test scores and good grades, is only weakly associated with adult creative contributions (Siegler & Kotovsky, 1986; Sternberg, 1987). Challenging activities that creative children engage in are often done to satisfy their own curiosity and interests, rather than to achieve high grades or satisfy their teachers and parents (Hong, Milgram, & Whiston, 1993). Longitudinal studies provide evidence of the predictive validity of challenging activities, as indicated by strong correlations between creative activities in various domains and career choice and accomplishment in corresponding domains (Milgram & Hong, 1999). Encouraging children to participate in activities in school and out of school in a domain of their interest increases opportunities for them to use creative thinking and skills. Teachers can help students improve creativity by providing challenging and interesting tasks in the classroom that require creative skill use.

Collaboration. Collaboration is often viewed as a catalyst in the creative process. The open exchange of ideas can serve to enhance learning for all members of the group (Webb & Palincsar, 1996). Daiute and Dalton (1993) explain how peer collaboration may be effective at increasing awareness of students' inert knowledge. Brainstorming as a form of collaborative work among group members has been used widely as a component in creative training (e.g., Parnes, 1988;

Treffinger, Isaksen, & Dorval, 2003). These collaborative activities provide individual students with opportunities to increase creative abilities and skills. However, effects of brainstorming in creative production are not consistent. Group cohesiveness, for example, is important factor affecting the effectiveness of brainstorming. Group members work hard and produce more ideas in the highly cohesive group as compared to the less cohesive group (Yip, Chow, Cheng, Cheuk, & McBride-Chang, 2007). Moreover, classroom environments that require collaboration have received warning flags for their negative influence on high achievers partly due to the lack of group cohesiveness. Lack of academic challenge can lead to boredom among students and such negative experiences can further lead them to frustration, isolation, or depression (Baker, Bridger, & Evans, 1998; Clasen & Clasen, 1995).

TEACHER CHARACTERISTICS

Numerous psychological constructs have been studied to determine their relationships with students' academic achievement and behaviors. Self-regulated learning, motivation, epistemological beliefs, and goal orientation are among those that have demonstrated their effects on student learning (Amabile, 1996; Brophy, 2005). In this study, we addressed teachers' epistemological beliefs, intrinsic motivation, and goal orientations to determine whether these characteristics have any relationships to their instruction practices for facilitating the development of creative thinking in students. Due to the lack of studies with teachers on these constructs, we reviewed literature on students as well as teachers.

Epistemological beliefs. Epistemological beliefs — beliefs about the nature of knowledge and knowing — influence learning and achievement (e.g., Hofter & Pintrich, 1997). Individuals with naïve beliefs tend to oversimplify information and perform more poorly than those with sophisticated beliefs (Kardash & Howell, 2000). Classroom interactions between teachers and students influence the development of epistemological beliefs (Posner, Strike, Hewson, and Gerzog. 1982). By providing a proper learning environment and by encouraging students to explicitly reflect on their epistemological beliefs, teachers can promote changes in students' epistemological beliefs (Brownlee, Purdie, & Boulton-Lewis, 2001).

Shommer (1990, 1994) proposed a multidimensional conceptualization of epistemological beliefs, with five dimensions in her earlier work (Schommer, 1994) and four dimensions in the later work (Schommer, Calvert, Gariglietti, & Bajaj, 1997). The four dimensions include beliefs in simple knowledge (knowledge is characterized as isolated pieces versus knowledge is complex), beliefs in certain knowledge (knowledge is absolute versus knowledge is uncertain), beliefs in quick learning (learning is quick or not at all versus knowledge is constructed through learning processes), and beliefs in fixed ability (ability to learn is innate versus ability is malleable) (Schommer & Walker, 1995). Individuals' epistemological beliefs vary along a continuum of naïve to sophisticated beliefs in these dimensions.

However, the dimensions advanced by Schommer have been challenged. Hofer and Pintrich (1997) distinguished the nature of learning (beliefs in fixed ability

and quick learning) from the nature of knowledge (beliefs in certain knowledge and simple knowledge) and other findings also have challenged Shommer's dimensions (Qian & Alvermann, 1995). With these theoretical and empirical backgrounds, we examined two higher order components of teachers' epistemological beliefs — the nature of knowledge and the nature of learning — to determine how they are related to teachers' creativity-fostering instructional practices. To our knowledge, studies of the relationship between epistemological beliefs and creativity have not been conducted.

Intrinsic motivation. Intrinsically motivated individuals are curious, interested, and enjoy the tasks in which they are engaged. By contrast, extrinsically motivated individuals engage in tasks with the goal of seeking rewards (Wigfied & Guthrie, 1997). A recent study (Vansteenkiste, Timmermans, Lens, Soenens, & Van den Broek, 2008) report the advantage of intrinsic motivation over extrinsic motivation in learning, suggesting that teachers can promote intrinsic goals, even when students hold a strong extrinsic goal orientation. Creatively talented people are intrinsically motivated. They exhibit high interest and enjoyment in what they choose to do (Amabile, 1996; Winner, 1996). Although effects of intrinsic motivation on creativity have been discussed, intrinsic motivation distinguished in its manifestation in *challenging* versus *creative* work has not been investigated. In this study, we examined two types of intrinsic motivation in their relationship to teachers' instructions fostering creativity: (a) motivation as manifested by enjoying or favoring *challenging* work and (b) motivation as manifested by enjoying or favoring *creative* work.

Goal orientation. Goals provide a framework within which a person interprets and responds to events and results in a unique pattern of cognition, behavior, and affect (Dweck & Leggett, 1988). Two types of goal orientations have been discussed widely — learning/mastery goal orientation and performance goal orientations. Goal orientation is also described in terms of *approach* (e.g., a person is motivated by the desire to approach success) or *avoidance* (i.e., a person is motivated by the desire to avoid failure) (Elliot & McGregor, 2001). Students with learning goals define success as mastering or learning something new, thus facilitating the development of competence and task mastery, whereas students with performance goals demonstrate their competence relative to others (Midgley & Urdan, 1995).

Learning and performance goals are positively and negatively related to intrinsic motivation, respectively (Colquitt & Simmering, 1998; ValldeWalle & Cummings, 1997). Building on these findings, Farr, Sin, and Tesluk (2003) suggest that during creative process, individuals with learning goal orientations are likely more active participants in creative thinking such as idea generation. Teachers who promote learning goals have a tendency to structure classroom environments that require student involvement, encourage student interaction, emphasize effort, and describe learning as an active process (Patrick, Anderman, Ryan, Edelin, & Midgley, 2001). Teachers who focus on performance goals tend to concentrate their efforts on formal assessments, grades, and the relative performance

of their students (Patrick et al., 2001). Understanding teachers' goal orientation is important because classroom processes and task/goal structures that teachers establish affect students' reasoning and thinking (Ames & Archer, 1988; Nolen, 1988).

RESEARCH QUESTIONS

We examined the relationships of teachers' epistemological beliefs (beliefs about knowledge versus about learning), intrinsic motivation (challenging work versus creative work), and goal orientation (learning versus performance goals) to their instructional practices that facilitate the development of creative thinking in students. Five facilitating instructional practices examined in the study were multiple perspectives in problem solving, transfer, task commitment, creative skill use, and collaboration. Based on the theoretical and empirical work, we predicted that teachers with higher epistemological sophistication, motivation for creative work, and learning goal orientation would self-rate higher on the measures of creativity-fostering instructional approaches.

METHOD

Participants

Participants were 178 elementary-school teachers of third-, fourth-, and fifth-graders from a large metropolitan school district. The elementary teachers consisted of 142 (80%) female and 34 (19%) male teachers (2 unspecified). The majority of teachers were Caucasian-American (150; 84%). Ages of teachers varied widely from 21-25 (11; 6%), 26-30 (25; 14%), 31-35 (33; 19%), 36-40 (29; 16%), 41-45 (22; 12%), and 46 and higher (56; 32%), with 2 cases (1%) of unspecified age. Participants' teaching experience (defined as the number of years teaching) ranged from less than one year to 37 years, with a median of 9 years. Fifty-one teachers (29%) had up to 5 years of teaching experience, 52 (29%) 6 to 10 years, 20 (11%) 11-15 years, 21 (12%) 16-20 years, 8 (5%) 21 to 25 years, 16 (9%) 26-30 years, and 7 (4%) 31 to 37 years (3 unspecified). Seven participants were removed from data analyses due to incomplete responses (e.g., skipping an item or a page), thus not yielding scores for all variables required in the current study. Inspection of these cases indicated that the missing items/pages were random.

Measures

Instructional Practices Questionnaire I (IPQ-I, Hong, Hartzell, & Nadelson, 2005, 2006). The IPQ-I measured teachers' perceived instructional practices that facilitate the development of creative thinking in students. The questionnaire has 30 items measuring 5 constructs (6 items per construct). The questionnaire begins with a general stem ("Students in my class are given opportunities to") followed by items. Examples of items are: "solve problems that have more than one answer" (*Multiple perspectives in problem solving*); "apply their knowledge and skills in different or unfamiliar situations" (*Transfer*); "do their best to complete tasks" (*Task commitment*); "demonstrate brainstorming skills" (*Creative skill use*); and "work in groups" (*Collaboration*). Exploratory factor analysis (EFA) for each subscale produced one-factor structure with 46%, 40%, 34%, 43%, and 50% explained variance, respectively. Participants responded to

each item by rating their perception of students' opportunities to receive these instructions on the following 4-point scale: (1) *Almost never*, (2) *Sometimes*, (3) *Often*, and (4) *Almost always,* indicating a continuum of increasing levels of intensity. Internal consistency estimates (coefficient alpha) of subscale scores ranged from .75 to .85 (Mdn = .80).

Epistemological Beliefs in Teaching and Learning (EBTL; Hong & Nadelson, 2005, 2006). The EBTL questionnaire was developed based on Schommer (1990) and Wood and Kardash (2002), by modifying items to measure classroom teachers' beliefs about student learning. Following recent empirical and theoretical works on epistemological beliefs, two subscale scores were computed: *beliefs about the nature of knowledge* (9 items) and *beliefs about the nature of learning* (10 items). Empirical factors were not as well defined (i.e., a complex structure emerged). However, one-factor structure in each subscale was acceptable with 21% and 37% explained variances, respectively.

Examples of the items on *beliefs about the nature of knowledge* are: "When I teach, I prefer to make things as simple as possible" and "It's a waste of time for students to work on problems that have no possibility of coming out with a clear-cut answer." Sample items for *beliefs about the nature of learning* are: "If students don't understand material right away, repeating the same material usually doesn't help" and "Smart students don't have to study very hard to get good grades." Participants responded to each item by rating themselves on a four-point Likert scale of agreement: (1) *Strongly disagree*, (2) *Disagree*, (3) *Agree*, and (4) *Strongly agree*. Internal consistency estimates of scores was .65 and .85 for nature of knowledge and nature of learning, respectively.

Self Assessment Questionnaire (SAQ): Intrinsic Motivation (Hong, 2001, 2004). The intrinsic motivation subscale in the SAQ was used to measure participants' motivational inclination in two areas — enjoying or favoring "challenging" work and enjoying or favoring "creative" work. The items about challenge were modified from the *Work Preference Inventory* by Amabile, Hill, Hennessey, and Tighe (1994). The items about enjoying work that required creativity were developed by the first author. The subscale consisted of 8 items; 4 items regarded the former (e.g., "I enjoy working on complex tasks") and 4 items regarded the latter (e.g., "I prefer the kind of work for which I can use my imagination or creative thinking"). Two-factor structure emerged from EFA (66% explained variance), although two creative items loaded on both factors. One item involved solving open-ended problems that have many different answers and the other involved coming up with new solutions. Inherently, most work involving creativity are challenging, although challenging works may or may not require creative thinking. Thus, these two items remained as "creative" items.

Participants responded to each item by indicating how they generally think or feel on the following 4-point scale: (1) *Almost never*, (2) *Sometimes*, (3) *Often*, and (4) *Almost always*. Internal consistency estimates of the scores for motivation for challenging and creative work were .84 and .76, respectively.

Instructional Practices Questionnaire II (IPQ-II, Hong, Nadelson, & Hartzell, 2005, 2006). The IPQ-II measured teachers' goal orientations as they are manifested in their perceived instructional practices in processing and structur-

ing tasks and instructional materials for their students. This questionnaire consisted of 24 items measuring two subscale constructs, 12 items each for learning and performance goals, respectively. The EFA extracted two non-overlapping factors (41% of variance explained). The questionnaire began with a general stem ("In my class...") followed by items. Examples of these items are: "I select challenging instructional materials for my classes" (*learning goal orientation*) and "I focus on students' test performance because good test scores indicate that I taught well" (*performance goal orientation*). Participants responded to each item by rating their classroom practices on the following scale: (1) *Not at all true*, (2) *Seldom true*, (3) *Somewhat true*, and (4) *Very true*. Internal consistency estimates of scores on learning and performance goals were .87 and .87, respectively.

Procedure

Data collection. In an effort to distribute questionnaires to third-, fourth-, and fifth-grade teachers evenly, volunteers were sought at regional meetings of resource room teachers of gifted students. Packets of survey instruments were distributed to teachers attending the meetings who volunteered to distribute them at the school sites they served. These packets contained consent forms and seven questionnaire packets; two packets for two teachers of each grade and one packet for the resource room teacher who volunteered to distribute the packets. With the permission of the school administrators, volunteers were sought in each grade. The completed questionnaires were then returned to the researchers through the school district's inter-school mail delivery system.

Data analysis. Simultaneous multiple regression analyses were performed to examine the research questions. Intercorrelations among predictors ranged from .02 to .66 in absolute value, with a median correlation of .22. Subscale correlations were .53 for epistemological beliefs, .66 for intrinsic motivation, and .26 for goal orientation. With the current scale (all continuous) for predictors and criterion, correlation patterns, and sample size, simultaneous regression analysis was a proper choice for significance testing. Assumptions for regression analysis were tested. Skewness and kurtosis on each variable ranged from .07 to .92, with an exception of one variable with 1.13. Although there were univariate outliers (one with a z score larger than 3 and a few between 2 and 3), influence analyses indicated that none of the univariate outliers were influential. Thus, all cases were included for analyses. Linearity, homoscedasticity, and multicollinearity (tolerance value and variance inflation factor) assumptions were largely met.

Before attempting to adjust for differences in teaching experience among participants, preliminary analyses of correlations between years of teaching and the dependent measures were conducted. None of the correlation coefficients were larger than .30, thus inclusion of years of teaching would not increase the precision of the study (Pedhazur, 1997). Following the estimation of internal consistency for each construct, five regression models were tested for each dependent measure of instructional approaches with six teacher characteristics as independent variables.

RESULTS

Mean scores and correlations between the variables are presented in Table 1. A preliminary inspection of the mean scores indicated that epistemological beliefs about both the nature of knowledge and learning were below mean, suggesting that teachers in general have more sophisticated than naïve epistemological beliefs. Mean scores of instructional practices ranged from 3.04 to 3.19 (of a maximum score of 4), indicating that on average, elementary teachers perceived themselves as highly involved in the instructional practices examined in the study.

Correlations among predictors (teacher characteristics) ranged from .02 to .67 (median .22, in absolute values). Correlations between dependent variables (instructional practices) and predictors ranged from .001 to .63 (median .27, in absolute values). Teachers' performance goal orientation demonstrated low and nonsignificant correlations with all dependent variables, *p*s > .05, *r*s ranging from .001 to .08, whereas learning goal orientation had high correlations, *r*s ranging from .34 to .63, followed by motivations for creative work, *r*s ranging from .33 to .50.

Whether teachers' beliefs and attributes predict perceived use of instructional approaches that foster creativity in students was examined next. We present the findings for each instructional approach.

Multiple Perspectives

Variance of multiple perspectives in problem solving accounted for by the six teacher characteristics (R^2 = 34%) indicated that the effect size is large (Cohen, 1992) and statistically significant, $F(6, 164) = 15.40$, $p < .0005$. Teachers' intrinsic motivation as manifested in their self-reported enjoyment of creative work ($\beta = .40$, $p = .001$) and learning goal orientation as manifested in their self-reported classroom process and task structure ($\beta = .33$, $p = .001$) were the two strongest teacher characteristics that predicted perceived instructional practice fostering multiple perspective in problem solving. Teachers' beliefs about the nature of knowledge had a negative effect ($\beta = -.18$, $p = .03$), indicating that teachers who scored high (indicating naïve beliefs) on the nature of knowledge (knowledge is simple or certain) scored lower on perceived instructional practice fostering multiple perspectives. Other predictors were not significant in their relationship with the instructional approach for multiple perspectives (see Table 2).

Transfer

Forty-two percent of variance in teachers' instructional practice that foster transfer of knowledge and strategies in students was attributed to six teacher characteristics, indicating practical as well as statistical significance, $F(6, 164) = 21.50$, $p < .0005$. As in the analysis of multiple perspectives, teachers' intrinsic motivation for creative work ($\beta = .24$, $p = .006$) and their learning goal orientation ($\beta = .53$, $p < .001$) predicted strongly reported instructional practices fostering knowledge and strategy transfer. No other predictors demonstrated a significant relationship with the instruction for transfer (see Table 2).

TABLE 1. Means and Standard Deviations and Bivariate Correlations Between Six Predictors and Six Dependent Measures.

	Variables	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11
1.	EB knowledge	1.98	.32	__										
2.	EB learning	1.75	.42	.53	__									
3.	Motivation challenge	3.01	.59	−.21	−.20	__								
4.	Motivation creativity	2.42	.55	−.19	−.22	.67	__							
5.	Learning goal	3.37	.38	−.15 [a]	−.27	.32	.46	__						
6.	Performance goal	2.42	.57	.38	.03[a]	.09 [a]	−.02 [a]	.26	__					
7.	Multiple perspectives	3.06	.49	−.26	−.18	.28	.50	.47	−.03 [a]	__				
8.	Transfer	3.15	.45	−.25	−.25	.28	.45	.61	.00 [a]	.77	__			
9.	Task commitment	3.10	.45	−.19	−.19	.29	.41	.63	.08 [a]	.63	.65	__		
10.	Creative skill use	3.19	.47	−.25	−.24	.28	.48	.57	.04 [a]	.81	.77	.70	__	
11.	Collaboration	3.04	.53	−.24	−.23	.37	.33	.34	.03 [a]	.62	.57	.58	.65	__

Note. EB knowledge = Epistemological beliefs in nature of knowledge; EB learning = Epistemological beliefs in nature of learning; Motivation challenge = Intrinsic motivation – enjoying challenging work; Motivation creativity = Intrinsic motivation — enjoying creative work; Learning goal = Learning goal orientation reflected in teachers' instructional approach in classroom; Performance goal = performance goal orientation; Multiple perspectives = Multiple perspectives in problem solving.

[a] Not significant at the .05 significance level. The rest of the correlation coefficients are significant at .05.

TABLE 2. Simultaneous Multiple Regression Predicting Teachers' Instructional Approach to Facilitate Creative Thinking.

	Multiple perspectives			Transfer			Task commitment			Creative skill use			Collaboration		
Variables	*b*	*b*	*p*	*b*	*b*	*p*	*b*	*b*	*p*	*b*	*b*	*p*	*b*	*b*	*p*
EB knowledge	-.28	-.18	.03	-.15	-.11	.16	-.13	-.09	.25	-.23	-.16	.05	-.20	-.12	.18
EB learning	.07	.06	.45	-.02	-.02	.77	.04	.04	.59	-.00	-.00	.97	-.08	-.06	.49
Motivation challenge	-.10	-.12	.18	-.05	-.07	.41	.01	.02	.84	-.09	-1.11	.20	.21	.23	.02
Motivation creativity	.36	.40	.001[a]	.19	.24	.006	.10	.12	.15	.28	.33	.001[a]	.05	.05	.61
Learning goal	.43	.33	.001[a]	.62	.53	.001[a]	.67	.57	.001[a]	.53	.43	.001[a]	.29	.21	.01
Performance goal	-.04	-.04	.58	-.07	-.09	.18	-.04	-.04	.54	-.00	-.01	.95	-.01	-.01	.92
$R^2_{adj,}$ R^2, F	.34	.36	15.40	.42	.44	21.50	.40	.42	19.82	.39	.41	19.11	.19	.22	7.50

Note. The degrees of freedom for *F* statistic were 6 and 164; all *p*s < .0005 for *F* statistics. EB knowledge = Epistemological beliefs in nature of knowledge; EB learning = Epistemological beliefs in nature of learning; Motivation challenge = Intrinsic motivation – enjoying challenging work; Motivation creativity = Intrinsic motivation – enjoying creative work; Learning goal = Learning goal orientation reflected in teachers' instructional approach in classroom; Performance goal = performance goal orientation.

[a] $p < .001$.

Commitment

Forty percent of variance in teachers' instructional practices that promote students' commitment to task was accounted for by all predictors, indicating both practical and statistical significance, $F(6, 164) = 19.82$, $p < .0005$. However, only one teacher attribute, learning goal orientation, predicted task commitment significantly ($\beta = .57$, $p < .001$) (see Table 2).

Creative Skill Use

Six teacher characteristics together accounted for 39% of variance in teachers' instructional practice that foster creative skill use in students, $F(6, 164) = 19.11$, $p < .0005$. Teachers' beliefs about the nature of knowledge ($\beta = -.16$, $p = .05$), motivation for creative work ($\beta = .33$, $p < .001$), and learning goal orientation ($\beta = .43$, $p < .001$) predicted significantly perceived instructional practices fostering creative skill use (see Table 2). Teachers with more sophisticated beliefs about knowledge, higher motivation for creative work, and more learning-goal orientation in their class structure reported encouraging students to use creative skills more so than their peers with lower scores in these attributes.

Collaboration

Lastly, 19% of variance in teachers' instructional practices that promote collaboration among students was predicted by all six teacher characteristics, $F(6, 164) = 7.50$, $p < .0005$. Teachers' learning goal orientation ($\beta = .21$, $p = .01$) as well as motivation for challenging work ($\beta = .23$, $p = .02$) predicted significantly perceived instructional practices that facilitate peer collaboration. Unlike other findings, motivation for creative work was not statistically significant, $p > .60$ (see Table 2).

DISCUSSION

Teacher characteristics, collectively, accounted for a statistically significant as well as practically significant proportion of variances in each of the five instructional practices examined in the study with elementary teachers. However, some individual teacher attributes were more strongly predictive of instructional practices than were others, and some did not significantly predict teachers' instructional practices. We present the findings by drawing attention to each teacher characteristics, starting with the strongest attribute that demonstrated its effects on elementary teachers' creativity-fostering instructional practices.

Learning Goal Orientation

Of the six teacher characteristic, teachers' goal orientation toward learning, as reflected in their self-report of course and task structure in their classes, consistently predicted all five creativity-fostering instructional approaches. Effect sizes were consistently medium to large, with standardized regression coefficients ranging from .33 to .57 (mdn = .42), except for one instructional practice involving collaboration (.21). Teachers with higher learning-goal scores reported that they provide instruction that fosters multiple perspectives in problem solving, transfer of learned materials to new or different situations, commitment to tasks, use of creative skills, and collaboration among students. Overall, teachers' own learn-

ing goals, as compared to other attributes, was the most significant predictor of their instructional practices that foster creative thinking in students.

Previous findings indicate that individuals with learning goal orientations likely involve themselves more actively in learning (Midgley & Urdan, 1995), creative thinking (Farr et al., 2003) and creative activities (Hoang, 2008). The contention is further supported by the current study.

Motivation for Creative Work

Teachers who enjoy work that requires creativity tend to provide instruction that increases creative thinking in students. However, this effect was present only on three of the five instructional approaches — multiple perspectives in problem solving, transfer of learned knowledge to new situations, and use of creative skill — all with medium to large effect sizes (.24 to .40). In general, the findings are not surprising in that multiple perspectives, transfer, and creative skill use require creative/divergent thinking since they involve processing or producing more than one way of solving problems or involve more than one learning situation. Teachers enjoying creative work might have easily or naturally used their personal creative tendencies to provide these types of instructional activities in their classrooms.

On the other hand, instruction that encourages collaboration among students may or may not require a creative tendency in teachers. Collaborative activities have been viewed as important to elicit creative thinking (Webb & Palincsar, 1996). Brainstorming is one of the examples that show a strong relationship between group collaboration and creative outcome (Treffinger et al., 2003). However, collaborative activities in classrooms have also shown their negative effects, especially in high ability students, when such activities were not used prudently (Baker et al., 1998). The current finding indicates that elementary teachers who are motivated in creative work do not necessarily promote collaboration among students, a relationship that warrants further understanding.

The finding that instructional practices for facilitating task-commitment were not predicted by the creative tendency in teachers was surprising. Other studies (e.g., Feldhusen, 1995) have indicated the strong presence of task commitment in creative individuals. Perhaps in classroom environments, task commitment is viewed by teachers as diligence or thoroughness that may not rise up the level of commitment required for creative process and production. This finding warrants further investigation.

Beliefs about the Nature of Knowledge

Teachers who have more sophisticated personal beliefs about knowledge tended to self-report as applying instructional approaches that support using multiple perspectives in problem solving and creative skills in the classroom. That is, teachers who perceive their instruction as enhancing student learning by more than merely imparting factual and simplistic knowledge are more likely to involve students in using or increasing creative ability and skills. However, the effect sizes were small, indicating elementary teachers' beliefs about the nature of knowledge and creativity-inducing instruction are not strongly related to an extent that matter practically. Additional studies may clarify the small practical significance found in the current study.

Beliefs about the Nature of Learning, Motivation for Challenging Work, and Performance Goal Orientation

Interestingly, the rest of the six teacher characteristics — beliefs about the nature of learning, motivation toward challenging work, and performance goal orientation — demonstrated minimum or no effects on teachers' reported instructional effort to foster creative thinking in students. Although teacher's motivation for challenging work is a desirable attribute in student achievement, as far as its relationship to creativity-fostering instruction was concerned, only one instructional practice was strongly related to this attribute — helping students to be collaborative in the classroom. By contrast, teachers' motivation for creative work was not related to instruction promoting collaboration. One would deem that intrinsically motivated individuals would enjoy working on both challenging and creative work (Amabile, 1996), as work that requires creativity is challenging and challenging work may require a certain level creativity to perform well. However, in the current study with elementary teachers in the context of classroom teaching, the two types of work that induce intrinsic motivation were distinguished in their relationship to creativity-fostering instruction.

Lastly, teachers' performance goal orientation did not predict any one of the creativity-fostering instructional approaches. Performance goal orientation has been found to have low or negative impact on student learning and achievement (Midgley & Urdan, 1995). The current findings indicate that this pattern applies also to teachers in regard to their creativity-fostering instructional practices.

Limitations and Future Research

Teachers' instructional practices are influenced by many factors. We focused on examining six teacher characteristics. Future studies might include other variables (e.g., types of teacher-education training) that may explain teachers' instructional practices. How teacher educators can help preservice and in-service teachers develop desirable teacher attributes that impact classroom instruction is an important area for future research. In this study, teachers' instructional practices were measured by self-report. Teachers' actual engagements in classroom instruction may be different from their self-reported behaviors. Measures of students' creativity would enrich future research investigating the relationship between teacher characteristics and outcomes of creativity-fostering instruction. Although a few studies suggest that self-reports can be valid indicators of educational constructs (O'Neil, Sugrue, & Baker, 1995/1996), readers are reminded to exercise caution in interpreting the findings.

CONCLUSIONS AND EDUCATIONAL IMPLICATIONS

The findings of the effects of epistemological beliefs, intrinsic motivation, and goal orientation on teachers' perceived instructional practices examined in this study partly replicated previous findings about the relationship between these constructs and student learning. Elementary teachers with sophisticated beliefs about the nature of knowledge were related to some of instructional practices that facilitate the development of creative thinking in students. Not surprisingly, teachers with intrinsic motivation for creative work reported practicing creativity-fostering instruction. The most significant teacher attribute, however, was goal

orientation toward learning/mastery, which had significant impacts on all instructional practices examined in the study that foster creative thinking in students.

Teacher characteristics are one of the important factors that affect the development of potential talent in all students, along with students' own cognitive ability, personal attributes, and other environmental factors (Hong & Milgram, 2008). The current study indicates that teachers' own personal beliefs and attributes do have influences on how they structure their classroom instruction. It is imperative that instructional approaches of classroom teachers be examined in order to improve their instructional practices (Hong, Greene, & Higgins, 2006). However, it is also important, if not more important, to understand teachers' beliefs and attributes as they have strong influences on their own instructional practices. Examining the relationship between teachers' instructional practices and student creativity may not be sufficient when the influential source (teacher characteristics) that shapes instructional practices is unexamined. Fundamentally, it is what teachers bring to their instructional preparation — their beliefs and attributes — that have a primary impact on their instructional practices (Borko & Putnam, 1996).

The good news of this research is that these teacher characteristics (teachers' sophistication in beliefs about the nature of knowledge, intrinsic motivation related to creative work, and learning goal orientation), widely researched and considered beneficial for student learning and achievement, are also beneficial for increasing student creativity. Preservice and in-service teachers should be provided with how-to-teach methodology courses, but also with opportunities to examine and challenge their beliefs and attributes as they have a major impact on forming and implementing instructional strategies, which in turn may improve chances for students to realize their creative potential.

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