Modeling Teachers’ Efficacy, Knowledge, and Pedagogical Beliefs

Helenrose Fives
Texas Tech University
Patricia A. Alexander
University of Maryland


Please direct all correspondence regarding this paper to Helenrose Fives at Texas Tech University, College of Education Box 41071 Lubbock TX 79409-1071 or 

helenrose.fives@ttu.edu
Abstract

Although teacher efficacy has been related to many positive educational outcomes, little research assessing its relation to pedagogical knowledge or pedagogical beliefs has been conducted. This work explored the relations among these constructs. We tested a proposed model wherein efficacy served as a mediator between teachers’ demonstrated knowledge, pedagogical beliefs, and performance. One-hundred-twenty preservice and 102 practicing teachers completed measures assessing demographic information, knowledge, efficacy, beliefs, and ability to gauge instructional situations. Correlational analyses demonstrated a significant relation between pedagogical beliefs and efficacy. The data for preservice and practicing teachers were fit to the proposed model and analyzed by path analyses. The resulting models differed by group. Both models are discussed in relation to the existing literature and educational practice.
Modeling Teachers’ Efficacy, Knowledge, and Pedagogical Beliefs

Teacher efficacy is related to many positive educational outcomes (e.g., Tschannen-Moran, Woolfolk-Hoy, & Hoy, 1998). However, little research has examined the nature of this construct in relation to pedagogical knowledge or pedagogical beliefs, although such associations are presumed or expected (Fives, 2003b). The present study explored the relations among these constructs. Specifically, we tested a proposed path model in which teacher efficacy mediates the relation between teachers’ demonstrated knowledge, pedagogical beliefs, and their subsequent performance on an instructional task.

Teacher efficacy can be defined as teachers’ beliefs in their abilities to organize and execute courses of action necessary to bring about desired results (Tschannen-Moran et al. 1998). So defined, teacher efficacy research takes the more general construct of efficacy (Bandura, 1997) and applies it to educators and the teaching context. The construct of teacher efficacy has become a pillar in the research on teachers’ beliefs. The persistent interest in this construct lies in its continued predictive and relational power in research on teachers and teaching. Teachers’ beliefs in their ability to perform instructional tasks have been related to student achievement (e.g., McLaughlin & Marsh, 1978), student motivation (e.g., Midgley, Feldlaufer, & Eccles, 1989), teacher valuing of educational innovations (e.g., Cousins & Walker, 2000), classroom management skills (Woolfolk, Rosoff, & Hoy, 1990), and teacher stress (Greenwood, Olejnik, & Parkay, 1990).

Tschannen-Moran et al. (1998) offered an extensive review of the construct of teacher efficacy and its relation to salient educational outcomes and precursors. This review concluded with a model depicting the cyclical influence of teacher efficacy on subsequent performance and beliefs. Specifically, the Tschannen-Moran et al. model hypothesized that the sources of efficacy
beliefs (i.e., mastery experiences, vicarious experiences, verbal persuasion, and physiological cues) influence teachers’ cognitive processing, which is reflected in teachers’ analysis of instructional tasks and assessment of their personal competence. Such analyses and assessments thereby contribute to teachers’ efficacy, which carries into their goals, persistence, and other “consequences of teacher efficacy,” as Tschannen-Moran et al. label them.

Because these consequences influence performance, and subsequently become additional sources of efficacy information, the Tschannen-Moran et al. model conveys a cyclical nature to teacher efficacy beliefs. However, this model does not provide explicit information as to the nature or product(s) of the efficacy sources that serve to affect efficacy beliefs and consequences. It is our contention that those sources of efficacy information, those experiences, do not lead directly to cognitive processing, but rather contribute to the development of knowledge and beliefs within the teachers’ cognitive system. Those knowledge and beliefs then influence how teachers analyze the task and evaluate their own competence, resulting in efficacy beliefs. Thus, we contend that experiences alone do not affect subsequent cognitive processing. Rather, these experiences allow teachers to construct knowledge and belief structures that subsequently influence cognitive processing. Therefore, the question the present investigation seeks to answer is how knowledge and beliefs influence teacher efficacy and performance.

Relations among Teacher Efficacy, Knowledge, and Beliefs

There have been a limited number of quantitative research studies conducted that have explored the relation of teacher efficacy to teacher knowledge or beliefs. And none that could be found that explored relations among these three constructs. Here we will briefly outline the quantitative research that has been conducted with regard to these constructs.
Raudenbush, Rowan, and Cheong (1992) suggested that teacher efficacy mediates the relations between knowledge and action. The Tschannen-Moran et al. (1998) captured this mediation in their model and argued that teacher efficacy and teacher knowledge, often considered independently, need to be considered in tandem (Raudenbush et al., 1992). If teacher efficacy is a mediator between knowledge and action, we need to know more about what teachers know and how that knowledge correlates with efficacy.

A few researchers have looked at the extent to which teachers’ knowledge relates to efficacy beliefs. Specifically, this body of work can be configured into three distinct categories, based on the manner of knowledge assessment. The first category consists of studies in which formal education was used as proxy variable for teacher knowledge. In these studies, teachers’ knowledge was gauged by education level (Benz, Bradley, Alderman, & Flowers, 1992; Hoy & Woolfolk, 1993) or by courses taken (i.e., Enochs, Scharmann, & Riggs, 1995). The second category focuses on the learning experiences of teachers or teacher-education students as measures for knowledge (Minke, Bear, Deemer, & Griffin, 1996; Parameswaran, 1998; Reid, Vasa, Maag, & Wright, 1994). These specific learning experiences were considered to be specialized opportunities that would enable participants to have some form of specialized knowledge. For example Minke et al. (1996) compared teachers with and without experience teaching in inclusive settings and considered those with experience to be more knowledgeable.

The final category of research includes investigations that assessed participants’ demonstrated knowledge through paper-and-pencil assessments (Schoon & Boone, 1998; Sciutto, Terjesen, & Bender Frank, 2000). In this body of work, the efficacy of preservice or inservice teachers has been compared and the relations between knowledge and teacher efficacy
assessed. For the current study, we took this particular approach to the assessment of teacher knowledge by constructing a paper-and-pencil measure that required teachers to respond strategically to certain instructional situations.

The consensus that has emerged across these categories is that individuals with higher levels of knowledge tend to have higher levels of efficacy (e.g., Benz et al., 1992; Minke et al., 1996; Schoon & Boone, 1998; Sciutto et al., 2000). One exception to this trend was reported by Enochs and colleagues (1995) who found significant negative correlations between preservice elementary teachers’ science knowledge, as assessed by number of science course taken in high school and college, and their efficacy for teaching science. In contrast, Schoon and Boone (1998) administered a paper-and-pencil test to preservice teachers on alternative conceptions of core science principles. They found that the preservice teachers with the greatest number of correct answers also reported higher feelings of science teaching efficacy. Moreover, Schoon and Boone (1998) found that holding particular alternative conceptions in science was related to lower levels of science teaching efficacy. Thus, this contradiction and the limited amount of research that has been done in this area are evidence of the need for more specific studies of knowledge and efficacy.

Given the research findings, we anticipated finding a positive path from teacher knowledge to teacher efficacy in the present study. Further, because a majority of the research in this area has focused on preservice teachers, we were particularly interested in the knowledge and belief relations for practicing teachers.

**Efficacy and Belief**

Among the relatively few studies that have explored teacher efficacy in relation to other belief constructs, beliefs have been characterized in several ways. Here we differentiate these
studies into two groups; those that explored more ontological orientations, and those that explored more particularized beliefs. Specifically, two studies explored the extent to which teachers’ ontological orientations were related to their efficacy perceptions. Ontological orientations refer to how teachers perceive the world. The ontological orientations that have been investigated include classical philosophies (Anderson et al., 1988) and teachers’ degree of dogmatism versus open-mindedness (Payne, 1994). Anderson and colleagues (1998) found that practicing teachers who held a more pragmatic (i.e., practical, problem solving) philosophical orientation toward teaching were more likely to express higher levels of teacher efficacy than those who held to a classical idealism belief system.

Payne (1994) found that urban teachers who reported a more open-minded (i.e., values the need to know above personal comfort) versus dogmatic or closed (i.e., focused on self concerns and is unable to examine personal beliefs) belief system also reported higher levels of personal teaching efficacy. Personal teaching efficacy is a dimension of teacher efficacy that pertains to teachers’ beliefs about their own ability to bring about change in learning environments. So defined, personal teaching efficacy is akin to internal locus of control (Gibson & Dembo, 1984; Guskey & Passero, 1994). Further, Payne (1994) asked the students of these teachers to evaluate their teachers’ significance. Significance indicated the amount of trust and importance students felt toward their teachers. Results indicated that teachers’ beliefs were unrelated to their perceived significance. However, open-mindedness was positively related to teacher efficacy, which in turn was positively related to teacher significance. In effect, teacher efficacy served as a mediating force between a belief system (openmindedness) and teacher performance (student evaluation of teacher significance), a finding particularly relevant to the present study.
More narrow belief systems investigated in association with teacher efficacy include restorative versus preventative beliefs (Jordan, Kircaali-Iftar, & Diamond, 1993), pupil control beliefs (Woolfolk & Hoy, 1990), ability beliefs (Midgely, Feldlaufer, & Eccles, 1989), and concerns for specific teaching related activities (Martin, Linfoot, & Stephenson, 1999; McKinney, Sexton, & Meyerson, 1999). For example, restorative beliefs reflect the extent to which teachers believe student problems reside in the student, whereas preventative beliefs attribute those problems to the environment. Jordan and colleagues (1993) found that teachers who felt students’ problems could be influenced by instruction (more preventative beliefs), reported higher levels of efficacy than teachers with more restorative beliefs. In addition, Midgely and colleagues (1989) explored teachers’ beliefs about student abilities as fixed or modifiable. They reported that the seventh-grade teachers assessed were more likely to have fixed than modifiable ability beliefs and that those beliefs were negatively related to efficacy. Finally, Woolfolk and Hoy (1990) found that preservice teachers with higher levels of beliefs about the potential of teachers in general to influence student learning (i.e., general teaching efficacy) were more likely to see the school as an educational community in which students learn through cooperative interaction, as compared to those with lower general efficacy.

Teachers’ level of concern for particular school related problems, such as classroom misbehavior (Martin et al., 1999) or implementing reform (McKinney et al., 1999) has also been assessed in relation to efficacy beliefs. Martin and colleagues (1999) found a negative relation between teachers’ concerns regarding student misbehavior and feelings of efficacy such that the greater concern teachers had for student misbehavior, the less efficacious they felt in their ability to manage this misbehavior. Similarly, McKinny and colleagues (1999) evaluated the role of self-efficacy in the process of change in teachers’ practice. This study demonstrated that teachers
with lower levels of efficacy for implementing whole language instruction (reform) were more concerned with how this intervention affected their own experience and with attributes of the task itself than teachers with higher levels of efficacy. Further, teachers with higher levels of efficacy seemed to demonstrate qualitatively different concerns for the task that those with lower efficacy beliefs. Specifically, high efficacy teachers demonstrated more impact concerns, focused on the outcome of the intervention or change on the students and their learning process, and on whether the intervention is achieving the desired outcome.

The research on teacher beliefs in relation to teacher efficacy provides evidence that a relation exists between these two constructs. However, in addition to being relatively limited, this research varies greatly in the type of beliefs assessed, thereby providing a limited framework upon which to model teacher efficacy. At a minimum, the work of Payne (1994) gives some credence to the hypothesis that efficacy may play a mediating role between teachers’ pedagogical knowledge beliefs and their performance.

Present Study

Clearly, the relations between teachers’ efficacy, knowledge of pedagogy, and beliefs about pedagogical knowledge require further exploration. Teacher efficacy provides a powerful and unique tool for those convinced that one of the strongest routes to improving the education of individuals is by enhancing perceived self-competence. The four sources of efficacy outlined by Bandura (1993, 1997) and included in the Tschannen-Moran et al. (1998) model (i.e., mastery experience, vicarious experience, verbal persuasion, and physiological arousal) identify potential avenues for such enhanced beliefs. However, those sources do not identify the specific nature of such beliefs. Further, those sources do not specify what, if any, specific types or content of
knowledge or beliefs may lead to higher levels of efficacy, and, consequently better performance.

Additionally, the nature of teacher efficacy, as it functions in the process of teaching, also needs to be investigated empirically. In effect, the role of teacher efficacy as a mediator between teacher knowledge, teacher knowledge beliefs, and performance warrants examination. If this relation emerges, it gives greater credence to the theoretical models and assumptions offered in the literature.

Lastly, differences between preservice and practicing teachers relative to their efficacy, knowledge, and pedagogical beliefs need to be explored in more detail. The current literature tends to look at either preservice or practicing teachers rather than exploring the developmental trajectory of teaching practice as individuals progress from naiveté to expertise. Thus, in the present study we examined differences between these educational groups. We anticipated that preservice teachers would demonstrate higher, perhaps inflated, levels of efficacy in comparison to practicing teachers, as has typically been reported in the literature (Tschannen-Moran & Woolfolk-Hoy, 2001). We also expected that practicing teachers would demonstrate higher levels of demonstrated knowledge and strategy awareness given their wealth of practical and schooled experience. With respect to pedagogical knowledge beliefs, we were unsure as to what differences might emerge. Given the scarcity of research on such beliefs, we considered this comparison to be more exploratory than the others.

As a framework for design and analysis, we posited a model (Figure 1) that hypothesizes positive relations among the constructs of interest in the study. Based on the available literature, we expected that teachers’ demonstrated knowledge in the areas of classroom management, instructional practices, and student engagement would be related positively to teacher efficacy.
We also hypothesized that teachers’ beliefs about the value of pedagogical knowledge would positively co-vary with teacher knowledge, and be positively related to teacher efficacy. Finally, we expected teacher efficacy to serve as a mediator for demonstrated knowledge and pedagogical beliefs and performance on the teaching task. We expected all of these relations to be positive in nature such that teachers with higher levels of demonstrated knowledge would also have higher efficacy, and would perform better on the performance task. However, we assumed that the strength of these relations would vary for preservice and practicing teachers as a consequence of their diverse knowledge base and experiences in the classroom.

Method

The data used in the present study were collected as part of a larger investigation. Detailed descriptions of the instrument development and relations among variables not included in this manuscript can be found in Fives (2003a).

Participants

One-hundred and twenty preservice and 102 practicing teachers of K-12 students were tested. Preservice teachers were identified through required education courses at a large university in the mid-Atlantic region of the United States. Practicing teachers were identified through master’s level courses, professional development workshops, contact via district content coordinators, and through professional contacts within specific schools.

The preservice teachers were predominately females (83%). They described themselves as European American (64%), having Multiple Ethnicities (13.3%), Asian American (5.8%), European (3.3%), Hispanic American (2.5%), Hispanic (2.5%), Other (2.5%), Native American (1.7%), African (0.8%), Asian (0.8%), Caribbean (0.8%), Middle Eastern (0.8%), and Middle Eastern American (0.8%). Participating preservice teachers included university underclassmen
(10.8%), university upperclassmen (75.8%), individuals with bachelor’s degrees enrolled in university courses (10.9%), as well as individuals with degrees at or beyond the master’s level (2.5%). These participants planned to teach at the elementary (48.3%), middle-school (18.3%), or high-school (33.3%) levels.

As was the case for the preservice teachers, practicing teachers were predominately female (77.5%). These participants reported a range of ethnicities including European American (77.5%), Multiple Ethnicities (7.8%), European (4.9%), Hispanic American (2.9%), Asian American (2.0%), Asian (1%), Hispanic (1%), Native American (1%), Middle Eastern American (1%), and Pacific Islander (1%). Practicing teachers included individuals with bachelor’s degrees (26.5%), bachelor’s plus graduate hours (21.6%), master’s degrees (42.2%), and master’s plus graduate hours (9.8%). These teachers taught in elementary schools (35.3%), middle schools (33.3%), and in high schools (31.4%) that were public (71.6%) or private (28.4%) in affiliation.

Measures

The Teacher Sense of Efficacy Scale (TSES). Teacher efficacy was assessed with the 24-item, 9-point, Teacher Sense Efficacy Scale or TSES (Tschannen-Moran & Woolfolk-Hoy, 2001). A general efficacy score was calculated as the mean of the 24-items. Responses to this measure in the current study yielded a Cronbach’s alpha of .93. This measure was developed with three subscales that assess efficacy for instructional practices, classroom management, and student engagement, and those subscales were supported by factor analysis. For the current study, the overall score for the TSES was used in path analyses and the subscale scores were used in the multivariate analyses. Principal component analysis with orthogonal rotation was performed on the data for the total sample, and for each of the subgroups (preservice and practicing teachers). Previous work using this instrument found less distinction in the factor structure when
respondents were preservice teachers (Tschannen-Moran & Woolfolk-Hoy, 2001). Therefore, in this investigation, factor analysis procedures were run on each group of data in order to ascertain whether the preservice and practicing teachers’ responses in this sample were comparable.

An examination of Cattell’s scree indicated a three-factor solution across the three sets of analyses. Across the three-factor solutions, a criterion of .4 or higher was used to determine if the item should be retained on the factor. In cases where double loadings occurred (8 for preservice teachers, 3 for practicing teachers, and 4 for the total sample) items were allocated to the factor for which there seemed to be greater theoretical meaning.¹

Although the preservice responses tended to be less distinct in their factor structure, as anticipated, the factor loadings across the three analyses were statistically comparable. Thus, the three-factor solution for the total sample was retained and used for the construction of the subscales for instructional practices, classroom management, and student engagement. Overall and subscale scores were created for each of the extracted factors by computing an unweighted average of the responses to each of the item loadings corresponding to that factor. Sample items from the TSES and other measures used in this study appear in Appendix A. Responses to the overall teacher efficacy scale yielded a Cronbach’s alpha of .93, with reliabilities for the instructional practice, classroom management, and student engagement subscales as .88, .90; and .83, respectively.

**General Pedagogical Knowledge Measure (GPKM).** In this study, we operationalized teacher knowledge as participants’ responses on a paper-and-pencil measure assessing the areas of instructional practices, classroom management, and student engagement, the three components evaluated in the TSES. The content of this measure targeted what Shulman (1987) called general pedagogical knowledge or broad principles and strategies that “appear to
transcend subject matter” (p. 8). Each item was developed to mirror an item of the TSES, allowing for greater continuity across study dimensions. For example, item 3 of the TSES asks, “How much can you do to control disruptive behavior in the classroom?” An associated item from the GPKM was:

Katie and Michelle are best friends and sit next to each other. Usually this is not a problem in class, however today the girls have started giggling during silent reading time, and are distracting the other students. The best intervention for this situation would be

a. send the girls to the timeout table in the back of the room
b. separate the girls for the remainder of the week
c. stand near the girls’ desks (2 points)
d. assertively tell the girls to stop (1 point)

In the final version of the GPKM, three items assessed knowledge of instructional practice, four items assessed classroom management knowledge, and three items assessed knowledge regarding student motivation (see Appendix A). In addition to the correct response, there was a somewhat plausible choice, and two implausible or incorrect responses. In the prior example, c is the correct response, d is a somewhat plausible but less desirable alternative, and a and b are implausible responses for the given situation. These response levels were confirmed in a pilot study and through the use of focus groups, in consultation with experts in pedagogy and educational psychology. The items were differentially scored based on their response level. A correct response was awarded a score of 2. Participants selecting the less plausible distracter received a score of 1, and the two implausible responses received a 0. Demonstrated knowledge was calculated as the sum of participants’ scores on the total number of items, with a maximum score of 20.

Although the reliability for this measure, \( \alpha = .59 \), was relatively low, we felt this was acceptable given the exploratory nature of this study. Further, the low reliability was likely attributed to the overall low performance of the preservice teachers, which was to be anticipated.
In fact, when reliability analysis was conducted on the data from the preservice and practicing teachers separately, there was a marked difference in alpha levels for these two groups ($\alpha=.42$ preservice, $\alpha=.65$ practicing).

**Pedagogical Beliefs Measure (PBM).** Teachers’ pedagogical beliefs were assessed using a modified version of a teacher beliefs measure. Specifically, for the purposes of the present study, a subset of items from the Pedagogical Beliefs Measure of PBM (see Fives & Buehl, 2004) was used to assess participants’ beliefs about knowledge related to teaching. The subset of items assessed beliefs about the importance of declarative and procedural knowledge, as well as specific knowledge of instructional practices and student motivation (see Appendix A). For example, participants were asked the extent to which they agreed with statements such as: “Knowledge about how to motivate students is essential for teaching;” and “It is important to understand the theory behind teaching techniques.”

These beliefs were assessed with a 5-item, 9-point Likert scale measure in which 1 represented no agreement and 9 indicated complete agreement. Higher scores were presumed to reflect more sophisticated beliefs. Thus, sophisticated beliefs in this study were those that reflected respondents’ agreement with the importance of diverse forms of pedagogical knowledge, and perceptions of teaching as a complex, demanding, and learned profession. A score for knowledge beliefs was computed as the unweighted mean of responses for the five items, allowing a maximum score of 9. This subscale yielded a reliability of $\alpha=.72$.

**Strategy Awareness Measure (SAM).** Strategy awareness was used as a measure of teacher performance. For the Strategic Awareness Measure or SAM, participants responded to three teaching scenarios focusing on instructional practices, classroom management, and student engagement, as addressed in the TSES (Tschannen-Moran & Woolfolk-Hoy, 2001). Appendix B
presents the scenario designed to assess strategies relative to instructional practices. Following each scenario participants were asked to “[l]ist as many strategies, techniques, plans or actions that you can think of for resolving the aforementioned situation.” Responses to each scenario were scored using a rubric assessing the parameters of elaboration and strategy sophistication. See Appendix B for the scoring rubric and sample responses to the instructional practices vignette.

Elaboration was evaluated based on the number of strategies reported by each participant. Responses that included four or fewer strategies were considered more limited, while those listing five or more strategies were considered more extensive. It is important to note here that strategies listed separately, but which reflected the same basic concept, were counted once. For example, one scenario centered on a student who demonstrated unmotivated behaviors in class and declares to the teacher that school is unimportant because she is going to be a pop star. One participant wrote: “Show her lots of statistics about how many people try to be entertainers and how many actually succeed, point out all the flash in the pans/one hit wonders who now have real jobs, and explain to her that she needs a backup plan if she doesn’t succeed.” These statements reflect the same basic strategy of providing the student with evidence demonstrating the importance of education, given her desired career. Therefore, we scored these separate points as one strategy.

The second parameter in the rubric related to the sophistication of the strategies. Overall, strategies were judged as simple, mixed/moderate, or sophisticated. Simple strategies included those that addressed limited facets of the scenario (e.g., symptoms rather than the cause of the problem), were impractical, procedurally poor or less detailed in description (e.g., “parent involvement”), or were irrelevant to the case described. In contrast, sophisticated strategies
referred to those procedures that responded to the underlying problems of the case. Additionally, sophisticated strategies were practical (i.e., the strategy could be implemented), pedagogically sound (i.e., could potentially bring about desired results), procedurally rich (i.e., contained more detailed and specific description of what would occur, and were relevant to the case described. Strategies were classified as mixed or moderate if they contained both simple and sophisticated strategies, were multifaceted (i.e., addressed multiple aspects of the case) but procedurally limited in fashion, or if respondents provided a procedurally-rich strategy for only one aspect of the case.

Based on these two parameters, we coded responses to the SAM on a 0 to 6 scale. A score of 0 was given if no strategy was provided. Responses that were limited and simple received a score of 1. A score of 2 was granted to responses with extensive but simple strategies. A response was rated 3 if it included a limited number of mixed or moderate strategies. A response was rated as 4 if there were an extensive number of mixed or moderate strategies. Sophisticated strategies, limited in number, were scored as 5, while sophisticated strategies that were also extensive in number were scored as 6.

To establish interrater reliability, the first author and a doctoral candidate with classroom teaching experience were trained in the scoring protocol. For the purpose of training, a base rate of 75% agreement or higher was targeted. Once training was completed, 10% of all responses for each vignette were independently scored in order to ascertain interrater agreement. Further, for items in which disagreement occurred, conflicts were resolved through discussion. Levels of interrater agreement were: 87.5% for instructional practices, 80% for classroom management, and 85% for student engagement. Given this level of agreement the remaining data were scored independently. An overall strategic awareness score was calculated based on individuals’
responses across the three vignettes. This resulted in a maximum score of 18, and a Cronbach’s alpha of .65.

Results and Discussion

Preservice and Practicing Teacher Comparisons

We examined the ways that preservice and practicing teachers differ with regard to their levels of teacher efficacy, demonstrated knowledge, and pedagogical knowledge beliefs through a series of statistical procedures. First, to explore whether preservice or practicing teachers differed with respect to their total efficacy score, as measured with the TSES, a t-test was employed. This test revealed no significant differences between preservice teachers ($M=6.99; SD=.88$) and practicing teachers ($M=7.12; SD=.85$) with respect to their total teaching efficacy [$t(220)=-1.08; p=.28$]. This finding was surprising, because the majority of previous research has found preservice teachers to have significantly higher efficacy than practicing teachers (e.g., Soodak & Podell, 1998). For this and subsequent analyses, we ensured that the data met all relevant assumptions (e.g., homogeneity of variance).

Analyzing the descriptive data for the two educational groups, we determined that levels of efficacy reported by all participants were relatively high, but especially for the preservice teachers. There are perhaps two explanations for these high levels of report. Participants may tend to overestimate their abilities and thereby their levels of efficacy. Or, it may be that part of the reason these individuals have chosen the teaching profession is because they do feel capable of these tasks.

The second analysis conducted explored differences in the sub-components of teacher efficacy (i.e., efficacy for instructional practices, classroom management, and student engagement), demonstrated knowledge, pedagogical beliefs, and strategy awareness. Data were
analyzed via a one-way MANOVA. In this analysis, teaching level (i.e., preservice or practicing) served as the independent variable and the dependent variables were efficacy for instructional practices, classroom management, student engagement, demonstrated knowledge, pedagogical knowledge beliefs, and strategy awareness. The multivariate test (Wilks’ Lambda) indicated that significant differences existed between the two groups relative to the dependent variables \( F(7, 214)=14.172; \ p<.001 \). Table 1 presents the \( F \) values, and significance levels of the follow up univariate tests, as well as the means, standard deviations, and observed power for the dependent variables for all participants and by experience level.

The follow-up univariate tests demonstrated five significant relationships. The first two significant differences related to the efficacy scales. Efficacy for classroom management was significantly higher in practicing teachers than for preservice teachers. In contrast, preservice teachers held significantly higher efficacy beliefs for student engagement than did practicing teachers. However, no significant differences between preservice and practicing teachers were found with respect to efficacy for instructional practices. Thus, while practicing teachers were more efficacious than preservice when the task dealt with classroom management, the reverse was true when the focus was on student motivation. Yet, both groups felt relatively competent when it came to general instructional tasks, such as providing appropriate challenges for students or offering alternative explanations or examples when students are confused.

These results suggest that differences, not evidence when overall efficacy is targeted, emerge for efficacy between preservice and practicing teachers when data are disaggregated. This interpretation is supported by the research of Benz and colleagues (1992) who explored efficacy for student motivation, planning and evaluation, classroom management, and socialization of students among multiple levels (i.e., beginning students, student teachers,
practicing teachers, student teacher supervisors, and college faculty). Benz et al. (1992) found that efficacy for specific tasks differed across the groups assessed. As found in the present study, preservice teachers demonstrated greater levels of efficacy for student motivation than practicing teachers. However, Benz and colleagues (1992) found that only college faculty felt significantly greater efficacy for classroom management than the other groups.

This multivariate analysis also demonstrated significant differences between preservice and practicing teachers with respect to their pedagogical beliefs, demonstrated knowledge, and strategy awareness. With respect to pedagogical beliefs, preservice teachers held significantly more sophisticated beliefs than practicing teachers. This indicated that the preservice teachers in this study were more likely to report greater value for beliefs about the importance of knowledge in education than practicing teachers. Several plausible explanations can be forwarded for these outcomes.

For one, practicing teachers, who have had more opportunities for mastery experiences, may recognize that there are other, perhaps more ill-defined, educational skills or intervening factors that were not represented in the items used to assess pedagogical knowledge beliefs. On the other hand, preservice teachers who are limited in experience with classroom settings may feel stronger beliefs for the value of knowledge because they are currently immersed in the acquisition of such knowledge.

Although the efficacy literature suggests that knowledge and efficacy are linked, we found that practicing teachers who seem to value pedagogical knowledge less demonstrated significantly higher levels of demonstrated knowledge. The performance of practicing teachers, as measured by their ability to respond strategically to instructional scenarios was also higher than for preservice teachers. Nonetheless, it may be important to note that overall performance of
participants on the SAM was not at the same level as their self-judgments of competence. In essence, efficacy outpaced strategic performance in this study.

**Modeling the Relations among Knowledge, Beliefs, Efficacy, and Performance**

Table 2 presents the correlation matrices for efficacy, pedagogical knowledge beliefs, demonstrated knowledge and strategy awareness for total sample and for each education group. These correlations formed the basis for the path analyses we conducted. The predicted path model (Figure 1) positioned teacher efficacy as a mediator in relation to demonstrated knowledge, pedagogical knowledge beliefs, and performance. The present study investigated the extent to which teachers’ efficacy served to mediate the relations between teachers’ knowledge and performance, as well as teachers’ beliefs and performance. In the proposed path model, teacher demonstrated knowledge and teacher pedagogical knowledge beliefs were hypothesized to influence teacher efficacy positively. Teacher efficacy was then expected to serve as a mediator and influence teachers’ performance. In addition, it was expected that teacher demonstrated knowledge and teacher pedagogical knowledge beliefs would covary. We chose to test the hypothesized model separately for preservice and practicing teachers. This was done to take into account the differences between these two groups is described in the prior analysis. Inclusion of the two groups in a combined model could potentially mask such differences.

Because we were concerned with model fit, as well as with the influences of individual paths, we elected to use moderately conservative fit values. Specifically, the fit criteria used were Comparative Fit Index (CFI) and Goodness-of-Fit (GFI) ≥ .95, Adjusted Goodness-of-Fit (AGFI) ≥ .90, Standardized Root Mean Square Residual (SRMR) ≤ .10. Further, the Root Mean Square Error of Approximation (RMSEA), which measures the difference between the hypothesized covariance matrix and the actual sample covariance matrix, should approach zero.
To obtain these indices of fit, and other analyses that follow, we used EQS Version 5.7b (Bentler, 1987; 1995). This is a program specifically designed to test path models and structural equation models.

The statistical significance of specific paths in the model was also of interest. These paths were estimated using Maximum Likelihood (ML). This estimation procedure is robust for multivariate normal data (Bollen, 1989). The EQS program provides a test statistic that functions as a Z score when conducting the ML procedure (Bryne, 1994). Therefore, to conclude that a path estimate is significantly different from zero, the test statistic would need to be greater than ±1.96.

Preservice teachers. The data from preservice teachers resulted in poor model fit (e.g., CFI=.53). To improve the model fit, we used the Lagrange Multiplier Test to identify new paths to add to the model. Based on this test, we iteratively added paths from demonstrated knowledge to teacher performance and from teacher beliefs to teacher performance. Additionally, Wald’s test indicated that the path from demonstrated knowledge to teacher efficacy should be dropped. After making these changes we determined that the fit was acceptable (CFI=1; GFI=1; AGFI=1; SRMR=.002; RMSEA=0).

The path model for preservice teachers, displayed in Figure 2, demonstrated a significant direct relation between demonstrated knowledge and performance. There was also a significant direct path from pedagogical knowledge beliefs to performance. Additionally, the path from pedagogical knowledge beliefs to teacher efficacy was also significant. However, the path from efficacy to performance was non-significant.

Because the hypothesized path from demonstrated knowledge to efficacy was not significant, based on the Wald test, it was dropped from the model. Thus, for these data, efficacy
neither mediated nor moderated the knowledge-performance relationship. There are three potential reasons for the lack of a significant relation. First, the efficacy beliefs of those who have yet to experience fully the demands of teaching seemed inflated relative to their demonstrated knowledge and strategic performance. At this point, they may simply not yet know what they need to know and be able to do instructionally in order to judge their competence adequately. Second, there are measurement issues, particularly the low internal reliability of the demonstrated knowledge measure for preservice teachers, due to the limited variability on this measure among preservice teachers. Such an occurrence is not unexpected with a knowledge measure administered to a naïve or inexperienced population (Alexander, Jetton, & Kulikowich, 1995). Third, it could be that efficacy does not mediate the relation between knowledge and performance, as we hypothesized.

*Practicing teachers.* The proposed model was also fit to the data for practicing teachers. The fit for the hypothesized model was acceptable (CFI=1; GFI=.998; AGFI=.988; SRMR=.021; RMSEA=0). Figure 3 reveals a significant negative relation between demonstrated knowledge and pedagogical knowledge beliefs (-.12). It may be that as these practicing teachers gain declarative knowledge, as assessed by this measure, they recognize that this is not enough to fulfill their role as teachers effectively. Thus, their belief in its importance decreases.

There was also a significant negative path from demonstrated knowledge to teacher efficacy. As with pedagogical beliefs, a unit increase in demonstrated knowledge was associated with a .21 decrease in teacher efficacy. Thus, teachers with greater demonstrated knowledge exhibited lower levels of teacher efficacy. Others have reported similar outcomes. For example, Roberts and Moreno (2003) found that as teachers in a science teaching training program gained knowledge of better ways to teach science, their overall efficacy decreased. Prior to training,
these teachers held significantly higher levels of teacher efficacy than they did at the end. In interpreting this outcome, those researchers conjectured that the drop in efficacy could be attributed to the teachers’ changed perspective on how to teach and what each of the teaching tasks on the efficacy instrument meant in light of their newly acquired knowledge.

Following this same line of reasoning, the current findings may indicate that higher levels of knowledge provide practicing teachers with a different, perhaps more conservative, perspective on the teaching tasks assessed in the efficacy items. This potentially more stringent understanding of the efficacy items may, in turn, lead to lower reports of efficacy. There is also the possibility that the practicing teachers, confronted with the dynamic and complex nature of teaching and learning in today’s classrooms, recognize that pedagogical knowledge, while of some direct value, is but a piece of the entire educational puzzle and has only a limited role to play in fostering student achievement.

The practicing teacher model also identified a significant positive path from pedagogical knowledge beliefs to teacher efficacy. Thus, the more practicing teachers believed that pedagogical knowledge was important, the higher their reported levels of efficacy. There were no significant paths to performance as assessed by strategy awareness. Alternative models were explored allowing direct paths from demonstrated knowledge and pedagogical beliefs to performance, as seen with the preservice teachers. However, these paths neither improved the fit of the model nor were they statistically significant.

Conclusion and Implications

In this study, we set out to explore the interrelations between demonstrated knowledge, pedagogical beliefs, and teacher efficacy by means of multivariate and path analyses for preservice and practicing teachers, incorporating both beliefs about pedagogical knowledge and
the self. We appreciate that outcomes from this investigation must be interpreted in light of certain limitations. For example, the nature of the data collection relied on voluntary participation and self-report techniques. Teachers willing to participate in a research project, such as this, might be specialized in some way or the responses they gave might demonstrate aspects of social desirability or self-promotion. Additionally, we were unable to constrain the participant pool by teaching level. Some research on teacher efficacy suggests that teachers working at different grade levels demonstrate different efficacy levels (e.g., Soodak & Podell, 1987).

Further, although this research sought to explicate the extent to which teacher efficacy mediates knowledge and action, there are two concerns with how this was addressed. First, teacher performance was assessed via responses to simulated classroom situations. While this method has merits (e.g., similar situations across all participants and realistic problem situations), it is an approximation of actual teaching. Second, this study relied on path models to test a theory-based sequence of relations among constructs. The confirmation of directionality of relations in the path model cannot be confirmed empirically. Such confirmation requires a longitudinal research design.

Given these limitations, we nonetheless contend that the current study contributes to the existing literature on teacher efficacy in several critical ways. First, this study is one of the few that offers an exploration of the assumptions regarding the relations between teachers’ knowledge and teachers’ efficacy. Additionally, we included both preservice and practicing teachers, adding to the existing literature investigating teacher knowledge and teacher efficacy which has relied primarily on preservice teachers’ responses. Findings underscore the need to explore these educational groups in tandem rather than in isolation. The study also employed a
creative measure to assess teaching performance. Through the use of vignettes, participants were able to reveal both their declarative and procedural knowledge of pedagogical strategies.

Yet, this study offers a paradox for efficacy researchers: The more educators knew, the less they valued that knowledge, and the less capable they felt about teaching. It could be that actual teaching experiences provided practicing teachers in this study with a “reality check” that influenced their belief systems. Conversely, without comparable experiences, preservice teachers were left with higher, and potentially, unjustified beliefs in their abilities, when contrasted to the knowledge and strategic behavior they could demonstrate. This particular finding may underscore the need to incorporate more substantive, in-class experiences for preservice teachers as part of their professional development. Of course, such an idea is not new to teacher education, and is part of various internship programs and professional development schools operating nationally (e.g., Odell, & Huling, 2000; Steffy, Wolfe, Pasch, & Enz, 1999).

Another significant finding of this current study was in the differential patterns in efficacy by task area (e.g., student engagement or classroom management). This outcome signals the need for studies of teacher efficacy to move beyond global measures to those that are more task-specific in nature (e.g., Benz et al., 1992). It also suggests that current professional development experiences for preservice teachers may be more effective in building their competence in student motivation than in their ability to manage the classroom environment. Of course, it could be argued that only extended opportunities to function within the dynamic and uncertain context of the classroom will provide preservice teachers with the knowledge and competence they require in the area of classroom management.

Relatedly, the results of the present study may serve to direct the attention and focus of educational experiences for preservice and practicing teachers. Preservice teachers may benefit
from more explicit training in classroom management practices that incorporate mastery and vicarious experiences, in addition to the construction of a knowledge base. In contrast, practicing teachers may benefit from more educational experiences in the area of student motivation, which may lead to their developing greater confidence in their ability to engage their students.

Finally, the results of this investigation suggest that interrelations existed between knowledge and competence beliefs, as would be expected from theory. However, those relations were not always suggested or predicted by the existing literature or theoretical models. Practicing teachers demonstrated a negative relation between demonstrated knowledge and efficacy beliefs. In these teachers, greater levels of declarative knowledge were not always related to higher levels of confidence. This outcome has at least two implications for schools and teacher educators.

First, the research on teacher efficacy has revealed that teachers with positive or higher levels of teaching efficacy are more willing to experiment with classroom strategies and ideas (e.g., Meijer & Foster, 1988; Soodak & Podell, 1993), to adopt instructional innovations in the classroom (e.g., Berman, McLaughlin, Bass, Pauly, & Zellman, 1977; Ghaith & Yaghi, 1997; Guskey, 1988; Rohrbach, Graham, & Hansen, 1993), and to be successful in the implementation of adopted innovations (Berman et al., 1977). This research in combination with the negative relation between demonstrated knowledge and efficacy in this study suggests that those who wish to influence teaching practices must address both teachers’ knowledge and their ensuing beliefs in their competence (i.e., their efficacy beliefs), lest they produce teachers who are knowledgeable but who lack confidence in their pedagogical abilities.

Second, we must consider why practicing teachers demonstrated a negative relation between demonstrated knowledge and efficacy when the reverse was expected based on the
literature. This may be related to the assumption that with increased knowledge of the best practices for teaching, educators develop higher expectations. However, with experience, teachers’ self-judgments about their competencies to teach effectively may well be evaluated against an expanding awareness of the challenges they face, both within the classroom and from public and political forces outside the classroom. The result is a wavering or perhaps more realistic judgment of their competence to meet those internal and external challenges. Of course, this potential explanation for an unanticipated finding needs to be examined more fully. Should this pattern in relations between knowledge and efficacy hold for practicing teachers and the rationale forwarded here prove viable, then changes in professional development programs that attend to teacher self-competence as well as to their knowledge base may be warranted.

In contrast the preservice teachers in this study demonstrated a positive relation between demonstrated knowledge and teacher efficacy. If we consider the context of preservice teachers this relation seems logical. In this study, preservice teachers are typically enrolled in method courses. They are dedicating a great deal of time and effort to the task of learning how to teach, with the expectation that the courses they are taking are preparing them for their chosen career. The feedback these preservice teachers receive is most often about their pedagogical knowledge. This may lead them to assume that if they do well in their education classes, they should do well as teachers. Thus, it makes sense that there is a significant path between preservice teachers’ demonstrated knowledge and their efficacy.

Because of the limited research on the relations between teachers’ knowledge and beliefs, and because of the unpredicted patterns that emerged in the path analyses, further research is required. For instance, it would seem worthwhile to examine the changing relations between knowledge and beliefs for those who have differential years of experience in the classroom. We
can only speculate here as to the effect that actual teaching experiences has on those facing the challenges of educating children and youth. Tracking relations between knowledge and beliefs over time in a cohort of practicing teachers would help us understand more about the factors and conditions that shape those relations—particularly if quantitative data are augmented with teacher interviews.

The road to successful teaching remains of great interest to teacher educators and teacher researchers. As the world we live in changes and shifts, so do the expectations of teachers and the knowledge they need to be successful in their academic endeavors. Therefore, it seems of great import that we come to understand how to assist teachers in constructing requisite pedagogical knowledge, while maintaining a belief in that value of that knowledge and a confidence in their abilities to employ that knowledge strategically in their classrooms.
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Author Note

Direct correspondence to Helenrose Fives, Assistant Professor of Educational Psychology, Texas Tech University, College of Education, Box 41071, Lubbock, TX 79409-1071; or helenrose.fives@ttu.edu
Table 1

Results of the One-Way MANOVA Comparing Preservice and Practicing Teachers

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>$F$(1,220)</th>
<th>$p$</th>
<th>Power eta$^2$</th>
<th>Max.</th>
<th>Preservice (n=120) $M$($SD$)</th>
<th>Practicing (n=102) $M$($SD$)</th>
<th>Total (n=222) $M$($SD$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructional Practices Efficacy</td>
<td>.23</td>
<td>.64</td>
<td>.08</td>
<td>9</td>
<td>7.10(.86)</td>
<td>7.16(.97)</td>
<td>7.12(.91)</td>
</tr>
<tr>
<td>Classroom Management Efficacy</td>
<td>16.25</td>
<td>.00**</td>
<td>.98</td>
<td>9</td>
<td>7.01(1.05)</td>
<td>7.55(.93)</td>
<td>7.26(1.03)</td>
</tr>
<tr>
<td>Student Engagement Efficacy</td>
<td>4.99</td>
<td>.03*</td>
<td>.61</td>
<td>9</td>
<td>6.78(1.00)</td>
<td>6.46(1.09)</td>
<td>6.64(1.05)</td>
</tr>
<tr>
<td>Demonstrated Knowledge</td>
<td>6.89</td>
<td>.01*</td>
<td>.74</td>
<td>20</td>
<td>13.82(2.92)</td>
<td>16.32(3.02)</td>
<td>15.01(3.20)</td>
</tr>
<tr>
<td>Pedagogical Knowledge Beliefs</td>
<td>36.94</td>
<td>.00*</td>
<td>1.00</td>
<td>9</td>
<td>6.45(1.04)</td>
<td>6.06(1.14)</td>
<td>6.27(1.10)</td>
</tr>
<tr>
<td>Strategy Awareness</td>
<td>6.37</td>
<td>.01**</td>
<td>.71</td>
<td>18</td>
<td>8.01(3.63)</td>
<td>9.28(3.86)</td>
<td>8.59(3.76)</td>
</tr>
</tbody>
</table>

Note. * $p$<.05; ** $p$<.001
Table 2

**Correlation Matrices of Teachers’ Efficacy, Knowledge, and Beliefs for All Teachers and for Practicing and Preservice Groups**

<table>
<thead>
<tr>
<th></th>
<th>All Teachers (n=222)</th>
<th>Practicing Teachers (n=102)</th>
<th>Preservice Teachers (n=120)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>1. TSES</td>
<td>1.00</td>
<td>0.31**</td>
<td>-0.09</td>
</tr>
<tr>
<td>2. Pedagogical Knowledge Beliefs</td>
<td></td>
<td>1.00</td>
<td>-0.16*</td>
</tr>
<tr>
<td>3. Demonstrated Knowledge</td>
<td></td>
<td></td>
<td>1.00</td>
</tr>
<tr>
<td>4. Strategy Awareness</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

*p ≤ .05; ** p ≤ .01 (two-tailed)
Figure Captions

*Figure 1.* Proposed path model of teacher efficacy as a mediator between knowledge and performance.

*Figure 2.* Path model for preservice teachers.

*Figure 3.* Path model for practicing teachers.
Efficacy, Knowledge, and Beliefs

- Demonstrated Knowledge
- Pedagogical Knowledge
- Teacher Efficacy
- Teacher Performance

+ indicates a positive relationship.
Demonstrated Knowledge

Pedagogical Knowledge Beliefs

Teacher Efficacy

Performance (Strategy Awareness)

Note. *p < .05
Note. *p<.05
Footnote

¹Specific factor loadings for the overall and subscales of the TSES are available from the first author upon request.
Appendix A

Sample Items

Teacher Sense of Efficacy Scale

Instructional Practices

How much can you do to help your students think critically?

(1) Nothing (2) Very Little (3) Some Influence (4) Quite a bit (5) A Great Deal

Classroom Management

How much can you do to control disruptive behavior in the classroom?

(1) Nothing (2) Very Little (3) Some Influence (4) Quite a bit (5) A Great Deal

Student Engagement

How much can you do to motivate students who show low interest in school work?

(1) Nothing (2) Very Little (3) Some Influence (4) Quite a bit (5) A Great Deal

General Pedagogical Knowledge Measure

Directions. Place the letter of the best response for each item on the line next to the number.

Instructional Practices

Which of the following teaching interventions will best allow a teacher to alter lessons to meet the needs of a student with ADHD?

a. Provide instruction on learning and memory strategies (0)
b. Provide motivational training to help him control his own learning. (1 point)
c. Plan instruction so the student encounters limited and well structured tasks with clear consequences. (2 points)
d. Provide instruction in study skills (0)

Classroom Management

How can you get students to cooperate and follow classroom rules?

a. Develop harsh punishments for any infractions of the rules. (0)
b. Call parents as soon as students begin to disobey the rules. (0)
c. Get students to share responsibility for the classroom environment. (2 points)
d. Offer whole class incentives for students’ to exhibit appropriate behavior. (1 point)
Appendix A cont’d

Student Engagement
Ms. Flower’s class seems completely disinterested in her content and focused primarily on their grade point average. Which of the following strategies may help to increase the interest of her students for this content?

a. Provide students with choice and opportunity for self-direction. (2 points)
b. Establish a reward system that is based on performance level. (0)
c. Establish a competition between the boys and girls. (0)
d. Remind students of the importance of this content for their future. (1 point)

Pedagogical Beliefs Measure:
Directions. Indicate the extent to which you agree with each of the following statements.

Knowledge about how to motivate students is essential for teaching.

Do Not Disagree Agree Completely
Agree At all Agree

It is important to understand the theory behind teaching techniques.

Do Not Disagree Agree Completely
Agree At all Agree

Strategy Awareness Measure:
Directions. Please list as many strategies, techniques, plans, or actions that you can think of for resolving the situation described.

Instructional Practices
Ms. McCormick teaches in a very diverse school and her class includes a range of students including several identified as gifted and talented, learning disabled and ESL. She is deeply concerned about meeting the learning needs of all of her students. Specifically, she is often flustered when the gifted and talented students ask difficult but highly interesting questions which the majority of the class does not seem to understand. She is unsure how to deal with the potential confusion those questions often create in other students. Yesterday, for example, when Sam asked about singularities in Science, Jen groaned and gave her, the “not again!” look.
<table>
<thead>
<tr>
<th>Sophistication</th>
<th>Limited: 4 or fewer strategies</th>
<th>Extensive: More than 4 strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Simple:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respond to limited</td>
<td>1 point</td>
<td>2 points</td>
</tr>
<tr>
<td>facets, unpractical,</td>
<td></td>
<td></td>
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<tr>
<td>procedurally poor,</td>
<td></td>
<td></td>
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<tr>
<td>and/or are irrelevant</td>
<td></td>
<td></td>
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<tr>
<td>to case.</td>
<td></td>
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<tr>
<td><strong>Mixed or Moderate:</strong></td>
<td></td>
<td></td>
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<tr>
<td>May contain both</td>
<td></td>
<td></td>
</tr>
<tr>
<td>simple and</td>
<td></td>
<td></td>
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<tr>
<td>sophisticated strategies. Or, may have a procedurally rich strategy for only one aspect of the case.</td>
<td></td>
<td></td>
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<tr>
<td><strong>Sophisticated:</strong></td>
<td></td>
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<tr>
<td>Respond to the</td>
<td></td>
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<tr>
<td>underlying problems of</td>
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<tr>
<td>case, address multiple</td>
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<tr>
<td>core concerns,</td>
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<tr>
<td>practical,</td>
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<tr>
<td>pedagogically sound,</td>
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<tr>
<td>and procedurally rich.</td>
<td></td>
<td></td>
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<tr>
<td><strong>Elaboration</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simple</td>
<td>Teacher’s aid</td>
<td>Try to use analogies the kids can relate to</td>
</tr>
<tr>
<td></td>
<td>Practice homework for ESL</td>
<td>Have the brighter kids teach concepts in groups</td>
</tr>
<tr>
<td></td>
<td>students to learn English</td>
<td>before you explain the answer to the question</td>
</tr>
<tr>
<td></td>
<td>Gifted and Talented meeting</td>
<td>Do more assignments related to the questions</td>
</tr>
<tr>
<td></td>
<td>group away from other students</td>
<td>Do a hands on experiment if possible</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Make the topic fun and interesting</td>
</tr>
<tr>
<td>Mixed or Moderate</td>
<td>When introducing a lesson</td>
<td>Pair up talented and gifted (TAG) students with English as a second language (ESL) or learning disabled students</td>
</tr>
<tr>
<td></td>
<td>have students jot down questions and address them after the lesson, either personally or as a class</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ask 3 then me → students must ask 3 peers before asking the teacher</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Question box → students can write down questions and put them in a little box for the teacher to address at an appropriate time.</td>
<td></td>
</tr>
<tr>
<td>Sophisticated</td>
<td>Set up a system by which the Gifted and Talented students can extend topics on their own – student led discussion, personal research, etc.</td>
<td></td>
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<td></td>
<td>Create centers that focus on the specific needs of the various groups of students</td>
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<tr>
<td></td>
<td>Set up a question box for students who have extension questions: once a week meet with those students to discuss, or set up dialogue journals to facilitate discussion.</td>
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<tr>
<td></td>
<td>Establish a list of objectives broken into categories, i.e., objectives/skills/knowledge that all students should attain, vs. objectives for some.</td>
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<tr>
<td></td>
<td>Assign extra problems/projects for bright students that all can attempt and succeed at in varying degrees</td>
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<td></td>
<td>Partner students in a peer tutoring models</td>
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<tr>
<td></td>
<td>Utilize collaborative teaching techniques that would enable all student to assume roles and contribute in a positive way</td>
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<td></td>
<td>Hold regular review sessions, utilizing teacher aides</td>
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<tr>
<td></td>
<td>Make sure students understand that the objectives will be met to varying degrees</td>
<td></td>
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<tr>
<td></td>
<td>Class rules that encourage respect/not put downs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Positive reinforcement for all</td>
<td></td>
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</table>