

SPRING CLEANING FOR THE “MESSY” CONSTRUCT OF TEACHERS’ BELIEFS: WHAT ARE THEY? WHICH HAVE BEEN EXAMINED? WHAT CAN THEY TELL US?

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The research on teachers’ beliefs, to our knowledge, spans more than 57 years (Oliver, 1953) and runs the gamut of research methodologies, theoretical perspectives, and identification of specific beliefs about any number of topics. It seems that the initial goal of the research on teachers’ beliefs was to establish a clear psychological construct, beliefs, that could serve as an explanatory and predictive mechanism for explaining differences in teachers’ practices (e.g., Abrami, Poulsen, & Chambers, 2004), outcomes with students (e.g., Muijs & Reynolds, 2002), and experiences (e.g., McAlpine, Eriks-Brophy, & Crago, 1996). Unfortunately, this has not been the case. Although the published empirical research on teachers’ beliefs includes more than 700 articles, the lack of cohesion and clear definitions has limited the explanatory and predictive potential of teachers’ beliefs. Still, the pervasive conviction in the literature, schools, and teacher education programs is that teachers’ beliefs matter. We also believe they do. However, the manifestation of beliefs in teachers’ practice is complicated, and the understanding of what is meant by teachers’ beliefs in the research literature remains murky.

CHAPTER OVERVIEW AND ORGANIZATION

In this chapter, we consolidate the topics of beliefs that have been addressed, reveal how teachers’

beliefs are defined, and synthesize trends in empirical findings across research paradigms. We focus on empirical investigations of teachers’ beliefs and seminal reviews (e.g., Calderhead, 1996; Fang, 1996; Kagan, 1992; Pajares, 1992; Richardson, 1996; Thompson, 1992; Woolfolk-Hoy, Davis, & Pape, 2006). Previous reviews or commentaries on the field of teachers’ beliefs have carved the field into manageable chunks to make meaning. For instance, Thompson (1992) focused on quantitative studies of teachers’ beliefs related to mathematics, whereas Kagan (1992) reviewed longitudinal studies of pre-service and novice teachers.

In contrast, our perspective is broad and spans multiple disciplinary perspectives. We engaged in an exhaustive review of the published literature until August 2009 by searching ERIC, PsycINFO, and PsycARTICLES for peer-reviewed empirical articles using the search term “teach* belief*.” Our search yielded more than 745 articles, of which 627 were viable on the basis of our criteria (i.e., peer reviewed, empirical, written in English). We exhaustively coded approximately 300 articles to identify the themes in the research. We physically sorted our codes and organized them into seven general topics that included beliefs about development, diversity, knowledge (including subject area, pedagogy, and pedagogical content knowledge), self, schools, vested parties, and teacher preparation.

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Cutting across these belief topics were studies that examined beliefs in relation to practice and belief change. With the aid of three graduate assistants, we then coded the remaining articles. We also recorded if and how belief was defined, the research questions asked, the methods used, and the key findings from each study. In preparing this chapter, we engaged in an in-depth examination of the coded articles to identify meaningful trends that cut across the belief topics and research methodologies. On the basis of this analysis, we identified a pervasive concern related to a lack of agreement regarding the nature of teachers' beliefs. We also found that most studies either related teachers' beliefs to their practice or examined changes in teachers' beliefs, typically as the result of an intervention.

In this chapter, we include a discussion of what teacher beliefs are in which we address findings related to the topic of teachers' beliefs as well as a consideration of how this construct is defined and characterized. We then discuss the research that relates teachers' beliefs to practice and studies of belief change. We offer recommendations for researchers, teacher educators, school leaders, and teachers. We conclude with open questions about the field.

NATURE OF TEACHERS' BELIEFS

There are two approaches to addressing the question "What are teachers' beliefs?" One can approach this query from a descriptive perspective and name the various topics about which teachers hold beliefs and attempt to summarize commonly held beliefs across teachers. Alternatively, one can respond by attempting to define the underlying construct of teachers' beliefs and identify the characteristics used to distinguish it. In this section, we offer a brief overview of the former approach and an in-depth consideration of the latter.

Identifying the Contents of Teachers' Beliefs

We identified specific belief topics studied in the articles reviewed and looked for common beliefs. However, few topics are used in consistent ways across researchers or fields of study. Thus, a descriptive analysis of the specific beliefs teachers hold was not

feasible given our expansive approach to this work. Instead, we identify major topics of interest. In the later sections of the chapter, we provide enough detail so the reader can get a sense of these topics. Moreover, we mapped the specific studies we mention throughout the text onto this framework in Appendix 19.1.

We found that the topics of teachers' beliefs could be framed to include beliefs about (a) self, (b) context or environment, (c) content or knowledge, (d) specific teaching practices, (e) teaching approach, and (f) students. Within beliefs about self, we included studies that examined teachers' sense of efficacy, identity, and role as a teacher. We construed context to largely include teachers' beliefs about their school climate or culture, as well as their perceived relationships with colleagues, administrators, and parents. Beliefs about content encompassed all beliefs teachers have regarding the different bodies of knowledge they teach to students or learn themselves, such as beliefs about mathematics, science, literacy, or social studies.

We separated teachers' beliefs about teaching into two areas that reflect the levels at which these beliefs have been examined. The first area is teachers' beliefs about specific teaching practices, which included beliefs about topics such as cooperative learning, teaching science, or the use of inquiry strategies. The second area of teaching beliefs refers to teachers' beliefs about a holistic approach to teaching such as constructivism, transmission, or developmentally appropriate practices. We distinguished between these categories on the basis of how the beliefs were described in the individual studies. Thus, instances of overlap in language used are not reflected in specific descriptions. For instance, *inquiry* may be referred to as a specific classroom strategy for some studies and as a general teaching approach for others. The final topic pertains to teachers' beliefs about students, including (but not limited to) beliefs about diversity, exceptionalities, language differences, ability, learning, and development.

Defining the Construct of Teachers' Beliefs

Much has been written in the literature about the difficulty in defining teachers' beliefs (e.g., Johnson,

1994; Pajares, 1992). We disagree. Defining the term *teachers' beliefs* is not difficult because several authors have done so (see Table 19.1). What is difficult is getting authors to consistently define and use terms within and across fields that examine these constructs. Table 19.1 reveals the inconsistency in how beliefs have been defined. In it, we offer specific examples of how teachers' beliefs have been defined and where these definitions fall along the identified characteristics. Characteristics prevalent in definitions of teachers' beliefs include their (a) implicit and explicit nature, (b) stability over time, (c) situated or generalized nature (not addressed in Table 19.1), (d) relation to knowledge, and (e) existence as

individual propositions or larger systems. In addition to these descriptive characteristics, we have also explored the functions of teachers' beliefs.

Teachers' beliefs are implicit and explicit. The distinction here lies in the theoretical conceptualization of beliefs as understandings of which individuals are conscious (explicit) or unaware (implicit or tacit). The reviewed literature often did not address the implicit or explicit nature of beliefs. When noted, the common perspective was that teachers' beliefs are implicit (e.g., Kagan, 1992; Osisioma & Moscovici, 2008). We view this perspective as an ongoing challenge. An implicit view suggests that

TABLE 19.1

Defining Teachers' Beliefs

Definition	Implicit or explicit	Stable or dynamic	Knowledge and belief	Individual or systems
"The term <i>belief</i> as used in this chapter is derived from Green (1971) and describes a proposition that is accepted as true by the individual holding the belief. It is a psychological concept and differs from knowledge, which implies an epistemological warrant" (Richardson, 1996, p. 104).			Distinct	Individual
"Beliefs are understood to be a set of interrelated notions. . . . Educational beliefs are a substructure of the total belief system and must be understood in terms of their connections to other, perhaps more influential, beliefs. Most belief systems are formed early and changes in belief systems during adulthood are difficult and thus rare" (McAlpine, Eriks-Brophy, & Crago, 1996, p. 392).		Stable		System
"Teacher belief is a particularly provocative form of personal knowledge that is generally defined as pre- or inservice teachers' implicit assumptions about students, learning, classrooms, and the subject matter to be taught. . . . Teachers' beliefs appear to be relatively stable and resistant to change (e.g., Brousseau, Book, & Byers, 1988; Herrmann & Duffy, 1989)" (Kagan, 1992, pp. 65–66).	Implicit	Stable	Same	
"Belief systems are dynamic, permeable mental structures, susceptible to change in light of experience. . . . The relationship between beliefs and practice is a dialectic, not a simple cause-and-effect relationship" (Thompson, 1992, p. 140).		Dynamic		System
"An individual's judgment of the truth or falsity of a proposition" (Pajares, 1992, p. 316).				Individual
"Teacher beliefs can be represented as a set of conceptual representations which store general knowledge of objects, people and events, and their characteristic relationships (Clark & Peterson, 1986; Fang, 1996)" (Hermans, van Braak, & Van Keer, 2008, p. 128).			Related	System

beliefs guide a teacher's behavior and filter interpretation of teaching experiences without the teacher's awareness. Moreover, implicit beliefs are also beyond the control of the teacher (Nespor, 1987) and cannot be influenced through personal reflective practice.

Others have acknowledged that some beliefs may be explicit to the teacher (e.g., Rimm-Kaufman, Storm, Sawyer, Pianta, & LaParo, 2006). In particular, Dewey (1933/1986) argued that beliefs require both intellectual and practical commitment. He stated, "Beliefs . . . involve precisely this commitment and consequently sooner or later they demand our investigation to find out upon what ground they rest" (Dewey, 1933/1986, p. 117). This perspective on beliefs emphasizes a conscious (explicit) nature that requires justification for beliefs to be maintained.

The tension between the implicit or explicit nature of beliefs is reflected in the methods used to assess beliefs. That is, if beliefs are explicit, researchers can ask teachers what their beliefs are and use those responses as the unit of analysis (e.g., Basturkmen, Loewen, & Ellis, 2004). Thus, teachers state or espouse their beliefs through verbal or written communication and, in doing so, make them explicit. Studies of teachers' espoused beliefs have typically used interview protocols (e.g., Bryan, 2003) or questionnaires (e.g., Fives & Buehl, 2008; Tschannen-Moran & Woolfolk-Hoy, 2001). However, such techniques have been criticized on a number of counts: (a) Teachers will give the desired answer and may not differentiate across beliefs (e.g., Rimm-Kaufman et al., 2006); (b) teachers do not have the language to articulate what they believe, nor do they share the same language as the researchers (Sahin, Bullock, & Stables, 2002; Windschitl, 2002); and (c) teachers are not aware of what they believe (Richardson, 1996).

Therefore, a second approach to understanding teachers' beliefs has been to examine teachers' enacted beliefs. Through analysis of actual teacher actions, planned actions, or talk (e.g., Gill & Hoffman, 2009), researchers infer teachers' beliefs (e.g., Pajares, 1992). In these studies, the researchers' biases and perspectives may influence the beliefs assigned to research participants. For example, how a researcher understands and uses a construct such

as constructivism may differ from how the teacher understands the same construct, which leads to assumptions of incongruence between the teacher's beliefs and practice. Tzur, Simon, Heinz, and Kinzel (2001) modeled how researchers need to recognize their own biases and limitations when making evaluations of teachers' beliefs on the basis of observations. In their work on math teachers' practices and conceptions of mathematics teaching, Tzur et al. clearly indicated their perspective on mathematics teaching and how this influenced their analysis of teachers' classroom interactions with students.

A third approach has been to assess preservice and practicing teachers' metaphors for teaching (e.g., Alger, 2009; Leavy, McSorley, & Boté, 2007). Noyes (2006) argued that the use of the terms "espoused and enacted beliefs suggest[s] that such beliefs have some kind of generative power," and he preferred to use metaphors as indicators of a "pre-reflective embodied sense" (p. 899) that were espoused but still reflective of teachers' implicit beliefs. The use of metaphors, as with observed belief enactment, rests on the researchers' interpretation of what the metaphor means. Alternatively, participants are asked to select from an available set of metaphors or to explicate their metaphors (e.g., Alger, 2009), which causes their beliefs to become explicit and thereby subject to the concerns of other self-report methods.

If beliefs are unconscious guides in teachers' practice, how can they be assessed meaningfully without exposing them to the teachers, and once that is done, what becomes of these implicit beliefs? Alternatively, if researchers are inferring implicit beliefs from actions or artifacts, how does one know that teachers' beliefs are being accurately represented? Also, in focusing on beliefs as implicit, what is missed in terms of understanding those beliefs of which teachers are aware and perhaps rely on to guide practice? We contend that teachers hold both implicit and explicit beliefs that influence their teaching practice. Attempts to access teachers' implicit beliefs may well bring these conceptions into the explicit realm, thereby changing the nature of the beliefs under examination.

Beliefs exist along a continuum of stability.

Conceptualizations of teachers' beliefs can also be

differentiated on the basis of whether beliefs are viewed as stable (e.g., Kagan, 1992) or as dynamic (Thompson, 1992). Both views are supported by research evidence and have implications for research and practice. Many researchers have described beliefs as relatively stable and resistant to change, citing specific studies in which specific beliefs did not change after some form of intervention (e.g., self-efficacy beliefs [Moseley, Reinke, & Bookout, 2002]; constructivist perspectives [Haney & McArthur, 2002]).

In contrast, others have found that teachers' beliefs do change over time (e.g., beliefs about classroom practices, management, and children [La Paro, Siepak, & Scott-Little, 2009]; parent involvement [Burton, 1992]). For instance, Alger (2009) measured practicing high school teachers' past, present, and future beliefs about teaching using a one-time survey instrument to tap into six specific metaphors for teaching. She found that 63% of the teachers surveyed reported changes from their initial beliefs about what teaching should be on entry to the field to the beliefs they currently held.

Needing consideration are which teachers' beliefs may be more open to change and what factors, including teaching experience, may contribute to change. McAlpine et al. (1996) suggested that the degree of belief stability may be related to how interconnected a belief is to other aspects of a belief system as well as to the newness of the belief. In a qualitative study, Gooya (2007) found that after a 10-day, 100-hour professional development program designed to introduce a new national textbook and curriculum in Iran, experienced teachers were more resistant to changing their beliefs about teaching and learning geometry than were novice teachers.

Beyond the empirical realm, there are also theoretical issues relative to the stability of beliefs. If teachers' beliefs are relatively stable and unchanging, there is little room for belief intervention. The best option in this case is to identify adaptive beliefs and then hire, admit, or retain individuals who hold those beliefs through the use of teacher selection instruments. On the basis of their meta-analysis of 24 studies, Metzger and Wu (2008) critiqued this approach to hiring teachers and discussed the various complications with it. Conversely, if beliefs are

in a constant state of dynamic flux, there is little point in investigating them. Understanding moment-to-moment processes, although interesting, provides little to inform teacher education or practice. We argue that for teachers' beliefs to be a viable construct for research, intervention, or practice, some degree of plasticity is needed that will allow beliefs to change with experience and interactions in professional communities, but some degree of consistency is also necessary. In light of the previous discussion, it seems evident that specific beliefs may be considered on a continuum with long-held, deeply integrated beliefs at the most stable end and new, more isolated beliefs at the most unstable end.

Teachers' beliefs are activated by context demands.

Another issue in defining teachers' beliefs pertains to whether they are viewed as situated in contexts or generalizable across situations. This theme is similar to the issue of stability in that it questions whether teachers' beliefs are changeable. However, the research in this area does not focus on whether beliefs can change but rather on the degree to which teachers' beliefs vary or remain consistent across different contexts or settings. Thus, a teacher may hold a stable belief about the viability of inquiry learning, but that belief may appear to shift as the teacher responds to more information from a specific learning context, such as the available resources and students' prior knowledge.

At first glance, it may seem that teachers' beliefs can be viewed as either context (or situation) dependent or independent. A context-dependent view of beliefs would argue that teachers' beliefs change on the basis of the specific situation presented, including the content to be taught, the physical resources in the environment, and the specific students present (Verjovsky & Waldegg, 2005). In contrast, a context-independent perspective would suggest that teachers hold fairly coherent beliefs across multiple contexts (Hermans, van Braak, & Van Keer, 2008). Hermans et al. (2008) argued that teachers' beliefs are influenced by the larger cultural context beyond their classrooms and concluded that a more general measure assessing underlying beliefs was necessary.

The tension between the context-dependent and context-independent views of beliefs may be

resolved, in part, by recognizing that beliefs vary in their level of specificity. That is, teachers hold both general and specific beliefs about a variety of topics. The beliefs that are activated or espoused may depend on the context. For instance, teacher-efficacy researchers have pressed the issue of level of specificity in measuring belief, resulting in greater clarity in the ways in which teachers' sense-of-efficacy beliefs are assessed and discussed (Tschannen-Moran & Woolfolk-Hoy, 2001). If the area of interest is specific classroom actions, then beliefs need to be assessed with regard to those specific classrooms. Alternatively, if the area of interest is general levels of planning and ongoing practice, then beliefs can be assessed at a more general, context-independent level. Our research on teachers' beliefs about the nature of pedagogical knowledge has also suggested that teachers hold different beliefs about the stability and source of knowledge depending on the specific aspect of pedagogical knowledge under consideration (Buehl & Fives, 2009). Given that beliefs vary in their level of specificity, it is important to assess them at a level that is appropriate and informative for the researchers' or practitioners' purpose.

On closer inspection (second glance), the issue of whether beliefs are situated or general becomes even more complex if one shifts to a situated theoretical perspective (e.g., Skott, 2001, 2009). This perspective recognizes the immediacy of the physical and social environment as meaningful contributors to knowing and potentially to beliefs. This perspective reframes beliefs from an individual characteristic to beliefs *in situ*, recognizing that beliefs exist in the immediate context and, as such, the construction of beliefs and belief enactment is shared in the classroom community (Skott, 2009). Teachers' beliefs, when rooted in situativity theory (e.g., Cobb & Yackel, 1996; Wenger, 1998), are viewed as shared and "situations [are recognized] as co-producers of beliefs" (Skott, 2001, p. 5).

Although we recognize the connectedness of teachers' beliefs to their specific context, we maintain the perspective that these beliefs are held by individual teachers and stay with them as they move in and out of different situations. Rather than perceiving beliefs as existing in situations, we contend

that different situations or contexts may activate specific beliefs that influence the teachers' understanding and actions. In our view, beliefs are individually held conceptions that are in constant relation to the context and teachers' experiences, similar to Bandura's (1997) theory of triadic reciprocal determinism. Reciprocal determinism posits that direct, bidirectional relationships exist among the person's self-system (which would include beliefs), her or his actions, and the environment, such that each of these is directly shaped by and shapes the others. Thus, a teacher working in a school holds personal beliefs about the school community that in turn influence and are influenced by the school environment and his or her own behaviors.

Teachers' knowledge and beliefs are interwoven.

The relationship between beliefs and knowledge is a recurring theme in the discussion of beliefs (e.g., Pajares, 1992; Richardson, 1996; Woolfolk-Hoy et al., 2006). Although philosophers and psychologists have offered definitions that differentiate the constructs, empirically these concepts are difficult to disentangle, and distinctions between them become blurred (Murphy & Alexander, 2004; Southerland, Sinatra, & Matthews, 2001). Beliefs have been described as subjective claims that the individual accepts or wants to be true (e.g., Pajares, 1992; Richardson, 1996) as well as individuals' conceptions of what should be, ought to be, or is preferable (e.g., Basturkmen et al., 2004; Nespor, 1987). In contrast, knowledge has been characterized as having a truth component that can be externally verified or confirmed using procedures accepted by the larger community as appropriate for evaluating and judging the validity of a claim (e.g., Richardson, 1996).

The condition of external verification using procedures accepted by the larger community raises the issue of who is the larger community and what are the procedures used to judge the validity of claims. In studies of teachers' beliefs and knowledge, understanding the warrants for truth expected for particular communities is crucial. That is, what do teachers use to identify knowledge in the field? Our research has suggested that teachers attribute their knowledge about teaching to a variety of sources, including formal education, observational learning, and

research findings (Buehl & Fives, 2009). However, teachers do not regularly turn to research but instead find justification for their practices from sources they, and members of their community, do embrace, namely experience and, as Shulman (1987) described, the wisdom of practice. Although we value these personal sources of information and beliefs, we also see this as a call for teacher education programs to acculturate new teachers into an understanding of justified knowledge that recognizes the value of research-based practices and provides teachers and school leaders with the requisite skills to avail themselves of this work. In the same way, researchers must come to understand the warrants used by practitioners to gain a complete understanding of the ways beliefs and knowledge manifest in practice.

It is also important to note that holding beliefs without knowledge and knowledge without belief is possible, and changes in only one of these are not particularly meaningful. For instance, Holt-Reynolds (1994) described a case in which a preservice teacher performed well on assessments of her knowledge of reform-oriented strategies but held specific beliefs about good teaching that were at odds with the application of that knowledge to practice.

Beliefs are best understood as integrated systems.

Empirical and theoretical work has overwhelmingly recognized that teachers' beliefs exist as a system. Pajares (1992) concluded this eloquently: "Belief substructures, such as educational beliefs, must be understood in terms of their connections not only to each other but also to other, perhaps more central, beliefs in the system" (p. 325). Moreover, most authors in the field, including Pajares, reference Rokeach's (1968) description of a belief system "as having represented within it, in some organized psychological but not necessarily logical form, each and every one of a person's countless beliefs about physical and social reality" (p. 2).

Despite the widespread agreement that teachers' beliefs exist in a system, few empirical investigations have examined beliefs as complex systems. Two unique exceptions come from the field of science education (Bryan, 2003; Mansour, 2008) and examine belief systems from a constructivist perspective.

However, Bryan's (2003) work was influenced by an individual constructivist perspective (von Glasersfeld, 1996), whereas Mansour's (2008) investigation was guided by a social-cultural constructivist perspective (Wenger, 1998).

Mansour (2008) provided a qualitative investigation of 10 Egyptian science teachers' beliefs. Using a grounded theory approach, Mansour proposed a contextualized system of the teachers' personal religious beliefs, social context, experiences, identity, and teaching-learning beliefs (including the science curriculum, teachers' roles, and practices). Although the qualitative nature of this study limits generalizations to other groups, the perspective taken to examine teachers' larger belief systems, and the recognition of teachers as people with a range of beliefs and experiences beyond school settings, should be noted by others in the field. In the context of this study, situated within socio-Islamic culture, personal religious beliefs had a pivotal influence on teachers' beliefs about teaching and learning (Mansour, 2008).

Bryan (2003) focused on a single preservice teacher, Barbara, and sought to understand her belief system about science teaching and learning. In contrast to Mansour (2008), Bryan constrained her study to a specific aspect of the belief substructure (educational beliefs) and found this portion of the system to be highly complex. She identified six categories of beliefs that grouped into two overarching categories: foundational beliefs and dualistic beliefs. Foundational beliefs included Barbara's deeply entrenched, resilient beliefs about the value of science, the nature of scientific knowledge, goals of science instruction, and control in the science classroom. These beliefs reflected Rokeach's (1968) understanding of central beliefs, in that these foundational beliefs seemed to support her dualistic beliefs, identified as vacillating views regarding how children learn science, the students' role, and the teacher's role. Bryan divided these beliefs into two separate "nests," each holding opposing views to the other but harmonious within themselves. Nest A beliefs reflected a teacher-centered, didactic, students-as-receivers perspective. In contrast, Nest B beliefs described the teacher as a manager, students as interactive, and learning as hands on. In her analysis, Bryan found that Barbara was able to switch in

and out of Nest A and B beliefs throughout her coursework and student teaching and used her foundational beliefs to support either nest as needed.

These two studies highlight the embedded nature of belief systems and the importance of such systems in understanding potential influences on teachers' beliefs and practices. Researchers need to examine or determine which aspects of the system are most beneficial in particular contexts or for specific goals. From our review of the literature, beliefs systems that may be particularly promising include beliefs about self, pedagogy, knowledge (domain specific and general), and students (students in own classes and students in general; their ability to learn, developmental processes, culture, language, and socio-economic status).

FUNCTION OF TEACHERS' BELIEFS

Our examination of the characteristics of teachers' beliefs, described in the preceding section, lead us to what is perhaps the most important issue: What is the function or purpose of teachers' beliefs? That is, what do they do? Much of the empirical work we reviewed for this chapter revealed that the field of teachers' beliefs seems to be stymied in context- and content-specific descriptive and relational analyses that do little to uncover the specific mechanisms and processes that explain how beliefs function for

teachers engaged in practice, planning, learning, or reflection.

Numerous researchers have justified the importance of teachers' beliefs by referencing their role as filters (e.g., Hermans et al., 2008; Nespor, 1987; Pajares, 1992), frameworks for decision making (e.g., Rimm-Kaufman et al., 2006), and guides for action (e.g., Hancock & Gallard, 2004). To understand what these descriptions are meant to represent and how beliefs relate to practice, we examined previous theoretical discussions and empirical works. We identified three functions that beliefs serve related to action: as (a) filters for interpretation, (b) frames for defining problems, and (c) guides or standards for action (see Figure 19.1).

Beliefs Filter Information and Experience

As a filter, beliefs are related to practice by the manner in which they influence human perception (Nisbett & Ross, 1980) and the interpretation of information and experience. Gates (2006), referring to mathematics teachers' beliefs, described this function of beliefs as habitus and theorized that beliefs take on the shape of habits that serve as implicit filters for information. Because an individual's understanding of reality is always seen through the lens of existing beliefs, the role of beliefs as a filter is particularly relevant in the context of teacher education. That is, if beliefs influence how individuals interpret new information and experiences, preservice and

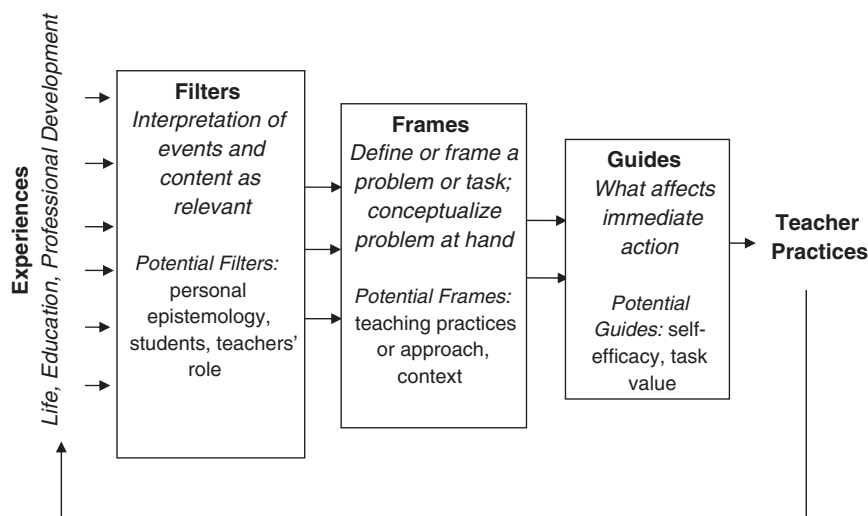


FIGURE 19.1. Beliefs act as filters, frames, or guides.

practicing teachers' beliefs shape what and how they learn about teaching. The filtering role of beliefs is exemplified in a study of kindergarten teachers' beliefs about developmentally appropriate or inappropriate practices (Lee, Baik, & Charlesworth, 2006). These researchers surveyed 242 teachers to identify those holding developmentally appropriate (above the third quartile) or developmentally inappropriate beliefs (below the first quartile). Teachers from each group ($n = 40$ in each) were randomly assigned either to receive inservice training on the use of scaffolding or to serve as a control group member. Before the training, no differences were observed in the two groups' use of scaffolding in observations of their interactions with students. After the training, the developmentally appropriate teachers used scaffolding more than did those with developmentally inappropriate beliefs. This suggests that the developmentally appropriate beliefs were more adaptive for teachers learning this new teaching practice (i.e., scaffolding), presumably because it was congruent with their existing beliefs.

The filtering role of belief also pertains to what information teachers recognize as worth discussing with students. Using qualitative analyses, Yerrick, Parke, and Nugent (1997) found that eight middle-school science teachers viewed scientific knowledge as static and approached the teaching of science as the transference of a list of concepts. Even when new scientific information was presented in the media (e.g., a comet crashing into Jupiter), most of the teachers predicted they would not share this information with students unless it was directly related to the curriculum. This example indicates how teachers' beliefs filter out information they do not see as relevant.

Beliefs Frame Situations and Problems

The framing role of beliefs is reflected in the ways in which beliefs are used to define or frame a problem or task. Nespor (1987) noted the importance of beliefs for framing ill-defined problems that are typical within the classroom. Gates (2006) also discussed the role of beliefs as covert systems (i.e., ideological positions) that shape "how we elaborate meaning, interpret behavior, and shape our social reality and social relations with others" (p. 353).

Thus, once teachers extract information from the environment through belief filters, beliefs continue to play a role in how they conceptualize or frame the problem at hand.

An example of how beliefs serve as a framing device is seen in a study of preservice teachers' beliefs about knowledge and learning in an early literacy course (Yadav & Koehler, 2007). Participants were asked to review videotaped cases, select clips as examples of good reading instruction, and describe the events in the selected clips, noting why each was an example of good instruction. Two participants with different beliefs about knowledge and learning selected different video clips and discussed each in very different terms. The preservice teacher with the more simplistic view of knowledge focused on how the teacher in the video pointed out mistakes and corrected student errors without explanation as an example of good instruction. In contrast, the preservice teacher with a more integrated view of knowledge focused on how the teacher discussed the students' work instead of just giving the correct answers. These findings suggest that individuals' beliefs help them to define the nature of the problem (i.e., to correct mistakes or to discuss deeper aspects of the students' work and help the student develop an understanding of the writing process). Other studies have also suggested that teachers' beliefs about content (e.g., science) and beliefs about teaching and learning affect how they interpret pedagogical reforms (filter) and what they perceive as the task at hand (frame; Enyedy, Goldberg, & Welsh, 2006).

Beliefs Guide Intention and Action

Once the problem is defined, the stage is set for beliefs to guide action. Teachers' sense-of-efficacy beliefs (i.e., belief in one's "capability to organize and execute courses of action required to successfully accomplish a specific teaching task in a particular context"; Tschannen-Moran, Woolfolk-Hoy, & Hoy, 1998, p. 233) are viewed as motivational constructs that influence (or guide) the goals teachers set, their effort toward meeting those goals, their perseverance in the face of challenges, and how they feel while engaged in the task (Bandura, 1997). These behaviors (i.e., decisions, effort, and persistence) then influence the quality of teachers' practices. The guiding function of

beliefs emerges in their motivational abilities to move teachers to action. For instance, Abrami et al. (2004) examined teachers' use of cooperative learning in relation to their motivational beliefs—expectancy for success with cooperative learning, valuing of the technique, and perceived cost of using it. Whereas the latter two beliefs related minimally to the use of cooperative learning, teachers' beliefs that they could successfully implement the technique with their students differentiated teachers who used cooperative learning from those who did not. Thus, expectancy beliefs may serve as a guide for immediate action.

Beliefs Filter, Frame, and Guide

Given the three functions of belief, different types of beliefs may serve different functions in different situations. For instance, some beliefs (e.g., beliefs about appropriate teaching practices, beliefs about the nature of knowledge) may serve as filters used in the evaluation of information entering the cognitive system, influencing what things teachers pay attention to, how they interpret information, and how that information is (or is not) incorporated into a teacher's explicit beliefs, knowledge, or practice as seen in Lee et al.'s (2006) and Yerrick et al.'s (1997) examples. At other times, belief systems regarding the nature of knowledge, learning, and teaching, such as beliefs about constructivist or transmission models of teaching (e.g., Barkatsas & Malone, 2005), may help teachers frame the current problem space (Nespor, 1987). These beliefs may be particularly meaningful during teachers' planning, reflection, and observations of others (e.g., student teachers). Finally, teachers' motivational beliefs, such as self-efficacy, outcome expectancy, and task value, may serve as antecedents to actual classroom practices. Systematic theoretical and empirical work is needed to articulate clearly how belief systems function and the role of specific belief constructs as mechanisms for varied psychological processes.

RELATION OF TEACHERS' BELIEFS TO PRACTICE

The significance of teachers' beliefs rests in their relation to practice and ultimately to student outcomes. Almost any published work in this area will

suggest some link to classroom practices and student outcomes. Numerous studies have examined the relations between teachers' beliefs and practices in different content areas (e.g., science [Enyedy et al., 2006]; literacy [Powers, Zippay, & Butler, 2006]; technology integration [Chen, 2008]) with varying levels of specificity. For instance, some studies have focused on more general orientations and approaches to learning (e.g., constructivist views; Lim & Chai, 2008), whereas other studies have focused on beliefs about general (e.g., beliefs about questioning; Sahin et al., 2002) or content-specific pedagogical practices (e.g., use of inquiry in mathematics or science; Akcay, 2007).

However, relatively few studies have substantiated claims about the role of teachers' beliefs on student outcomes using data from both teachers and students. Moreover, findings are often tentative, based on the methods used. For instance, Pećjak and Košir (2004) offered support for the connections between teacher beliefs and student outcomes through a series of analyses. First, they conducted group comparisons to establish that students' reading motivations differed as a function of the frequency, duration, and efficiency of their reading. Second, they identified correlations between teachers' beliefs about the importance of reading and reading goals in the curriculum with self-reports of specific activities enacted in the Grade 7 and 8 classrooms (e.g., frequency of reading materials use, teaching reading strategies). Finally, they identified differences in student reading motivation on the basis of the reading activities teachers used in the classroom. Given the methods used, causality cannot be determined, but teachers' beliefs were indirectly related to student' reading motivation and behaviors.

In a study of implementing a problem-solving curriculum in middle school mathematics, De Corte, Verschaffel, and Depaepe (2008) used a socioconstructivist perspective as a theoretical framework to discuss the connection between classroom culture (including teachers' beliefs) and student outcomes. They noted how one teacher's expressed belief that there are a variety of ways for students to get to an answer was reflected in all of her students' endorsing this idea. In other classes in which teachers did

not express this belief students endorsed this idea in much lower percentages. Furthermore, De Corte et al. noted that the class of students who held the least availing beliefs about mathematics also scored at the lowest level on the word-problem test. Their teacher demonstrated a directive coaching style, never used group work, and rarely modeled negotiated problem-solving strategies. This study illustrates how teacher actions (most likely guided by beliefs) can influence students' beliefs and knowledge. DeCorte et al. (2008) also indicated that these findings were only "tentative and exemplary indications" (p. 33) of a relationship between teacher beliefs and student outcomes.

(In)congruence of Belief and Practice

Despite the number of studies relating teachers' beliefs to their teaching practices, it seems that for every study that offers evidence to support the relation (e.g., Beswick, 2005; Mitchell & Hegde, 2007), an equal number suggest that beliefs are not consistent with practices (e.g., Lee et al., 2006; Stipek & Byler, 1997). Taken with the tentative connections between teachers' beliefs and student outcomes, researchers have often used this work to discount the importance of teachers' beliefs and suggest that the focus should be on teachers' behaviors and practices, not their beliefs. We do not advocate this perspective because we view beliefs as precursors to action and consider changes in teachers' beliefs necessary for effective change in teaching practices. Moreover, we argue that is not a matter of whether beliefs and practice are or are not congruent but rather the degree of congruence or incongruence between beliefs and practice. For instance, Ng and Rao (2008) noted instances of both constructivist and instructivist (i.e., transmissionist) practices in the classrooms of early childhood teachers who expressed constructivist beliefs. We believe that considering why beliefs and practices are not consistent may be more useful. On the basis of our review of the literature, the apparent lack of relation may be attributable to various factors working individually or in concert.

As discussed earlier, beliefs serve different functions (i.e., as filters, frames, or guides; Figure 19.1). Reasons for the lack of congruence between teacher

beliefs and practices may be related to the role a particular belief plays in a teacher's cognition and decision making and the figurative distance between the particular belief and a teaching practice. Thus, even though a teacher may hold and express a particular belief, other beliefs may impinge on the actual practice that is enacted. Beliefs that serve as filters or frames may appear less congruent with practice because of the influence of beliefs that function as guides. Moreover, at any point in this process, various internal (e.g., knowledge, value) and external (e.g., classroom context, administrative expectations, policy demands) factors may support or hinder the enactment of a belief, contributing to the apparent lack of relation between teachers' beliefs and practices.

We offer the following example to illustrate this process. Brown, Molfese, and Molfese (2008) examined characteristics of eight preschool teachers in relation to the literacy and numeracy skills of 138 at-risk students. Regression analyses revealed that teachers' beliefs about the importance of math skills predicted students' numeral recognition scores, but not their other mathematics skills scores (i.e., enumeration and cardinality). Moreover, teachers' beliefs in the importance of literacy skills were not predictive of students' literacy skills. We suggest that the type of beliefs assessed, importance beliefs, are more related to the function of framing the teaching problem than of guiding classroom practices. Thus, these teachers may have felt that mathematics and literacy skills were important but not have felt that they could enact a curriculum to teach those skills successfully. Brown et al. explained the lack of relation by referring to school districts' policies related to literacy and mathematics learning and assessment that may have prohibited teachers from acting on their beliefs.

Methodological issues may also contribute to the apparent lack of congruence between beliefs and practice. For instance, quantitative investigations tend to rely on small samples and look for correlations between self-report belief measures and observations or self-reported practice measures, which may obfuscate the complexity in the belief–practice relationship. Furthermore, the validity of some measures is questionable, particularly when used in new

cultural contexts (e.g., Kim, Kim, & Maslak, 2005). In the numerous mixed-method and qualitative studies that have been conducted, researchers have collected multiple forms of data from a small number of teachers via interviews, questionnaires, and classroom observations (e.g., Ng & Rao, 2008; Sztajn, 2003) and conducted detailed analyses to identify teachers' beliefs and examine them in relation to their practices. Given such detailed analyses, it is not surprising that some inconsistencies between beliefs and practices are identified, particularly when practices are determined from observations that range from one to two episodes (e.g., Wilcox-Herzog, 2002) to multiple observations over an extended period of time (e.g., Kwon, 2004).

Other reasons for the apparent lack of consistency between beliefs and practice may pertain to the level of specificity at which beliefs and practices are assessed (e.g., Volume 1, Chapter 1, this handbook; Sahin et al., 2002; Wilcox-Herzog, 2002) and the extent to which the beliefs are newly formed or in transition (see later discussion on developmental changes), as well as to inconsistencies in individuals' beliefs. Recall Bryan's (2003) finding that Barbara (the teacher in her case) possessed different nests of beliefs. Depending on which nest or set of beliefs a teacher is operating under at the time, and which beliefs are expressed in the belief assessment, beliefs and practice may appear more or less congruent. Also, one cannot ignore that teachers may express beliefs they do not hold or that they may not feel free to enact their beliefs in particular contexts (e.g., Stipek & Byler, 1997).

Internal Supports and Challenges to Belief Implementation

We identified numerous factors, both internal and external to the teacher, that support or hinder teachers' enactment of their beliefs. Teachers' knowledge was one important internal determinant of belief enactment (Akçay, 2007; Sahin et al., 2002). In addition to believing in the appropriateness or relevance of a particular practice or approach, teachers also need to understand the underlying theory and know how to enact it (Windschitl, 2002). Several studies demonstrated that teachers believed that they were implementing inquiry- or reform-based

practices but were in reality still using traditional methods of instruction (e.g., King, Shumow, & Lietz, 2001; Nathan & Koedinger, 2000). Akçay (2007) detailed a teacher who believed she was implementing inquiry practices in her science class before a professional development program designed to affect strategies and beliefs related to inquiry teaching. After participating in a year-long professional development program, the teacher's perception of her inquiry practices decreased, likely as a result of her deeper understanding of inquiry. Her actual use of inquiry practices increased, as noted in Akçay's observations as well as her students' perceptions.

Additionally, interactions among the different aspects of a teacher's belief system may support or challenge the enactment of other beliefs. For instance, Sztajn (2003) offered two case studies of teachers whose instantiated (enacted) beliefs about mathematics varied on the basis of the students' perceived needs. Both teachers perceived that students had different needs depending on their socioeconomic background, and their perceptions of these needs were related to how they instantiated their beliefs about mathematics and mathematics instruction. In particular, one teacher, Julie, noted using more projects to teach higher order thinking endorsed by the National Council of Teachers of Mathematics (i.e., constructivist, student-centered approaches to learning and instruction) with her current students from higher socioeconomic backgrounds because they could "handle it." Previously, when she taught students from lower socioeconomic backgrounds, she stated that she used projects but that she also had to place a heavy emphasis on basic knowledge and skills, including social skills.

Teachers' self-efficacy beliefs and personal identity beliefs are other factors that can support or challenge the implementation of their beliefs. Enyedy et al. (2006) provided a detailed analysis of two experienced teachers who participated in the same 4-day professional development session, expressed a similar understanding of science content, received similar levels of support, and held similar beliefs and values related to teaching. However, Enyedy et al. observed differences in the practices these teachers enacted. Through the analysis of

interview and videotaped observation data, they identified the teachers' identities as precursors to the goals, beliefs, and knowledge enacted in their classrooms. In particular, they noted that "these two teachers rely on their identities when they struggle to honor multiple, conflicting considerations in their teaching." (Enyedy et al., 2006, p. 85).

External Supports and Challenges to Belief Implementation

We also identified contextual factors that supported or challenged teachers' enactment of their beliefs. One prevailing force was the role of culture. For instance, several studies examined constructivist or developmentally appropriate beliefs in relation to teachers' practices in early childhood classrooms in Asian countries (e.g., Korea [Kim et al., 2005; Kwon, 2004]; China [Ng & Rao, 2008]). Researchers noted how a Confucian legacy that emphasized hierarchical human relationships based on obedience and order was at odds with some aspects of the constructivist and developmentally appropriate practices endorsed by Western countries, including the emphasis on the student choosing and exploring his or her interests and goals (e.g., Kim et al., 2005; Kwon, 2004). Instead, these teachers tended to be less constructivist or child centered than they claimed and were more teacher directed, placing an emphasis on practice, impulse control, and academic achievement (Ng & Rao, 2008). We would contend that these teachers have internalized the cultural values of their society and that these culture-laden beliefs now serve as filters that influence how they interpret reform efforts.

In addition to differences across culture, there may be larger sociohistorical shifts within a particular cultural context. Seaman, Szydlik, Szydlik, and Beam (2005) conducted a replication of a 1968 study examining the constructivist perspective of teacher education students from the United States in 1998. Students in 1998 reported stronger beliefs in favor of constructivist principles than did their 1968 counterparts. These authors contended that this difference may be the result of the greater use of constructivist teaching practicing in U.S. classrooms in recent years.

Teachers and researchers also noted district, state, or national policies that may influence the

extent to which teachers implement their beliefs (e.g., Kwon, 2004). In particular, the demands of a required or standardized curriculum and testing determined the skills and content teachers focused on in class, rather than their beliefs about teaching or the needs of the students (e.g., Brown et al., 2008; P. Crawford, 2004; Lim & Chai, 2008). Other factors at the district, state, or national level pertain to the available financial and human resources that influence availability of technology (e.g., Alger, 2009), teaching materials (e.g., Keys, 2005), and class size (e.g., Keys, 2005; Kwon, 2004). That is, teachers cited large class sizes or a lack of access to science kits as reasons for not enacting their beliefs in constructivist or collaborative forms of learning.

The perceived culture within a school (e.g., Barkatsas & Malone, 2005), as well as the actions of colleagues, coteachers, and mentor teachers, influence which beliefs teachers enact (e.g., McMullen et al., 2006). One teacher described her school's culture as resistant to innovation and noted a lack of recognition for attempts to improve practice as reasons for the inconsistencies between her constructivist beliefs and more traditional practices (Barkatsas & Malone, 2005). Another teacher, new to her school, chose to use more traditional elements in her computer-mediated instruction to be viewed as a team player (Lim & Chai, 2008). B. Crawford (2007) documented differences in the extent to which intern teachers implemented inquiry in teaching science based, in part, on the beliefs and support provided by their mentor teachers. Her analysis suggested that the interns' understanding of inquiry, as well as their perceptions of freedom to try new teaching approaches in their mentors' classrooms, contributed to whether inquiry-based practices were implemented. Still other researchers and participants noted the presence or absence of administrative support in terms of principal leadership (Enyedy et al., 2006) and opportunities for collaboration and professional development (e.g., Keys, 2005; Powers et al., 2006) as reasons why beliefs were or were not enacted.

Finally, factors in the immediate environment, such as issues of classroom control (e.g., Powers et al., 2006), as well as reactions from parents and students (e.g., Barkatsas & Malone, 2005) may support

or hinder teachers in acting on their beliefs. Powers et al. (2006) noted how the need to keep an organized classroom and manage student behavior detracted from teachers' use of individual scaffolding and authentic assessments, despite their developing beliefs about the importance of these practices in literacy instruction. Similarly, teachers may choose not to enact constructivist or child-centered practices because of perceived pressure from parents to teach the full curriculum and ensure that students achieve a high level of competence (as assessed through standardized tests; Ng & Rao, 2008). Moreover, students may react positively or negatively to teaching practices based on teachers' developing beliefs. For instance, Barkatsas and Malone (2005) featured a case study of one teacher who encountered resistance from students when she attempted to implement cooperative learning as a practice more congruent with her belief in constructivist approaches to teaching and learning mathematics.

Given the numerous factors that may support or hinder teachers' enactment of their beliefs, as well as the fact that all of these factors have not been considered together, it is difficult to discern which are most important or to offer a specific hierarchy of supports and challenges. Our call is for researchers to consider these factors before concluding that teachers' beliefs and practices are incongruent. School leaders are urged to consider these factors and work to alleviate the hindrances to beliefs that may be of avail for student outcomes. Teachers are challenged to identify and overcome these hindrances.

HOW AND WHEN TEACHERS' BELIEFS CHANGE

The second common trend in the teacher belief literature is the examination of belief change in preservice and practicing teachers. We have grouped these studies into three areas: developmental changes (referring to distinct changes experienced across a period of years and experiences), changes in preservice teachers' beliefs (typically related to teacher preparation), and changes in practicing teachers' beliefs (typically related to professional development).

Developmental Changes

Few studies examined developmental changes in teachers' beliefs. Conceptualizing belief change as an aspect of ongoing teacher development may provide insight into belief structures that are more open or resistant to change. The richness of this area of work is seen in qualitative studies of developing beliefs (e.g., Brownlee, 2003; Levin & Wadmany, 2006) and the potential for generalization in larger cross-sectional work (e.g., Alger, 2009; Simmons et al., 1999).

Levin and Wadmany (2006) qualitatively examined the beliefs and practices of six fourth- to sixth-grade Israeli teachers with 3 to 8 years of experience during the first 3 years of implementing a technology-rich environment. During this time, teachers' beliefs about learning and teaching evolved from simplistic, unitary understandings to complex, multidimensional perspectives. Although five of the six teachers demonstrated change in both their espoused beliefs and classroom practices, these changes did not involve major shifts in understanding. Frequently, beliefs changed within a perspective. For example, three teachers began the study with behavioral conceptions of learning and transmission conceptions of teaching. Three years later, these teachers demonstrated mixed perspectives that included behavioral and cognitive constructive beliefs about learning and maintained the transmission conception of teaching, with a focus on student understanding rather than content coverage. These teachers shifted their conception of learning by adding to their existing beliefs rather than engaging in integrated qualitative changes. Perhaps such integration takes more time than was afforded in this study.

Brownlee (2003) interviewed a group of 11 primary school teachers at the beginning and end of their teacher preparation program and again after their 3rd year of teaching with regard to their beliefs about knowing (i.e., personal epistemology). During each interview, there were shifts in how participants viewed the nature of knowing and the role of experts in knowledge construction. Initially, most participants reported mixed beliefs; at the end of the program, most reported constructivist beliefs, and after 3 years of teaching most (although fewer than at Time 2) reported constructivist beliefs. In contrast to the practicing teachers in Levin and Wadmany's

(2006) study, these preservice teachers began with less cohesive belief perspectives and were, perhaps, more susceptible to change during their preparation period, but this change was tentative and at risk of being lost in the face of classroom practice realities.

Simmons et al. (1999) offered a cross-sectional descriptive study of 69 novice teachers. Teachers with 1, 2, and 3 years' experience were compared with respect to their beliefs regarding a teacher-centered, student-centered, or concept-centered approach related to their philosophy of teaching, content understanding, view of self as teacher, and teacher actions (see Simmons et al., 1999, for rich descriptions of each). In addition, a fourth style emerged, wobbling, which referred to reports of teachers holding two perspectives evenly. The novice teachers with the most experience (i.e., 3 years) reported the most coherent beliefs regarding content understanding; however, they reported more wobbling beliefs about their philosophy of teaching and their view of self as a teacher than did the 1st- and 2nd-year teachers. Wobbling beliefs and teacher-centered beliefs regarding teacher action were most prevalent in all groups, with only small percentages (<10%) of participants reporting student-centered or conceptual beliefs. The idea of wobbling or mixed belief systems among novice teachers suggests they may be part of the process of developing a coherent belief system that includes information from coursework, colleagues, and classroom practice. Novice teachers may need to learn how to balance information from these sources to develop coherent belief systems.

P. Crawford (2004) provided a case study of a novice teacher who demonstrated changes in beliefs away from the constructivist paradigm supported in her teacher education program toward a more transmission- or teacher-centered approach. This study illustrates the potential vulnerability of the knowledge and beliefs held by novice teachers. This case described Marla, a nontraditional preservice teacher, from her elementary methods course through student teaching and the end of her 1st year of teaching (P. Crawford, 2004). Over time, Marla's perspective on literacy instruction shifted from a constructivist, developmentally appropriate perspective endorsed in her coursework and supported during student

teaching to a transmission perspective in which teaching literacy involved following the system outlined in a basal reading program. Marla moved from examining students' writing portfolios to gathering responses to test prompts and beginning all lesson planning with an examination of the unit test. Moreover, she came to understand that the suburban students from her fieldwork could handle constructivist teaching approaches, but her current students from a poor rural area needed the basal-based instruction. This shift reflects wobbling beliefs and illustrates the reciprocal relationship among teachers' personal beliefs, their classroom context, and teaching practices.

Belief Change in Preservice Teachers

Researchers have examined changes in preservice teachers' beliefs as influenced by student teaching or field experiences (e.g., Brownlee & Chak, 2007; Fives, Hamman, & Olivarez, 2007; Knoblauch & Hoy, 2008) and coursework (e.g., Doppen, 2007; Isikoglu, 2008; Olson & Jimenez-Silva, 2008). A common practice in this body of research is to examine the influence of structured reflection (typically required course assignments) on preservice teachers' beliefs when participating in course work or field experience or during student teaching (e.g., Kyles & Olafson, 2008). This practice frequently offers mixed results in terms of achieving the desired belief change. Yerrick and Hoving (2003) found that although some preservice teachers' beliefs about teaching science to low-track students changed when they enrolled in a field-based science inquiry course, others did not and were described as deflecting efforts to shift their beliefs. Preservice teachers who reflected on their practice and made adjustments to their beliefs about how to teach science were identified as producers and engaged in a shift from an ego-centric perspective on teaching to a learner-centered perspective. In contrast, preservice teachers who deflected changes were characterized as reproducers, who re-created their own learning experiences and defended their actions and choices in written and oral reflections despite contradictory evidence from their teaching experiences (Yerrick & Hoving, 2003).

Kyles and Olafson (2008) engaged in a mixed-methods analysis of 15 preservice teachers' beliefs

regarding self-efficacy, diversity, and hope. Although they found no significant differences in their quantitative data after one semester in a field-based diversity course, the qualitative findings suggested that these participants were beginning the belief change process by uncovering their existing beliefs and biases with respect to teaching students with diverse backgrounds. Preservice teachers with prior experiences of multicultural settings in their own life were more likely to uncover their beliefs about diversity than were preservice teachers without these experiences. Thus, some did not move beyond belief recognition to “deconstruct or reconstruct” their beliefs, which would have led to deeper belief commitment (Kyles & Olafson, 2008, p. 511).

Across these studies, the relevance of reflection for understanding beliefs becomes evident and is echoed in much of the research. Notably, these structured reflections are required and supervised elements of degree and certification programs. To what extent might this context influence participants’ responses? If reflection has the best potential as a means for belief change, how can this process be facilitated and encouraged beyond the preservice phase of a teacher’s career, when the stakes get higher and espousing the “correct” belief can influence important aspects of teachers’ professional lives?

Belief Change in Practicing Teachers

Studies investigating change in practicing teachers’ beliefs have typically examined belief change in response or relation to professional development or inservice programs designed to influence specific beliefs and practices. Research of this type has reported belief changes, to varying degrees, at the conclusion of the professional development program regardless of the length of the program (3 hours [Beswick, 2007–2008] to 2 years [Magos, 2006]). Moreover, content-related beliefs (e.g., beliefs about mathematics and mathematics teaching; Beswick, 2007–2008) were more changeable than general or overarching beliefs (e.g., beliefs about otherness; Magos, 2006).

Two salient features of programs that report adaptive belief change in teachers are (a) a task or strategy focus and (b) the development of a community of practice among participants (e.g., Beswick,

2007–2008). For instance, Barlow and Cates (2006) described a year-long in-service program to help 61 teachers incorporate problem posing into their elementary mathematics classes. Over the course of the year, teachers read about, discussed, implemented, and reflected on the variety of ways in which the problem-posing strategy could be incorporated into their current teaching practices. The teachers created a professional learning community wherein they shared ideas, frustrations, and student work. Moreover, when used in the classroom, the nature of the strategy, asking students to create their own math problems, gave the teachers’ new insights into their students’ understanding of mathematic concepts. After the inservice program, these teachers reported significantly stronger support for beliefs aligned with National Council of Teachers of Mathematics standards than they reported before the in-service.

This body of research suggests that practicing and preservice teachers’ beliefs may change throughout the course of their careers and in response to specific experiences. However, the extent of change is conditioned on a number of factors, including the target beliefs and the length and nature of the experience, as well as individual and contextual factors.

CONCLUSIONS AND RECOMMENDATIONS

On the basis of our reading of the literature and consideration of the existing empirical work, we put forward several conclusions and offer specific recommendations to researchers, teacher educators, school leaders, and teachers. Our recommendations are not exhaustive of what the field could suggest but reflect the themes that are most prevalent and that seem most relevant to each group. We provide an overview of these conclusions and recommendations in Table 19.2.

Teachers’ Beliefs Are Complex, Multifaceted, and Varied

A common refrain throughout the literature is the complexity of teacher beliefs. This complexity is evident in the host of belief topics that have served as inspiration for empirical study, as well as studies of

TABLE 19.2

Conclusions and Recommendations

Conclusion	Recommendations for			
	Researchers	Teacher educators	School leaders	Preservice and practicing teachers
Teachers hold complex and multifaceted beliefs about a wide range of people and structures.	Clearly define the construct and use that definition to guide their study and discussion of beliefs.	Address multiple aspects of teachers' beliefs about teaching, themselves, and the world as part of teacher education.	Support the coconstruction of beliefs via opportunities for collaboration.	Be aware of their beliefs, be willing to reflect on them, and examine the basis for them.
Different belief systems may function in different ways, as filters, frames, or guides.	Explore the mechanisms by which beliefs are related to practice (e.g., filter, frame, and guide).	Beliefs influence how reform efforts are interpreted (filtered) and implemented (guide). Effective implementation of reforms may require changes to related belief systems.		Actively consider the influence of belief functions in the examination of new reforms, teaching approaches, and students.
Beliefs have a reciprocal relationship with context and experiences.	Consider the reciprocal nature of beliefs and experience in their work and devise methods for conceptual understanding and empirical investigation.	Provide the resources (structural and human) to support belief enactment and construction.		Develop sensitivity to how beliefs shape and are shaped by the context.
Teachers' beliefs are related to their practices and student outcomes, but enactment of beliefs may be hindered by individual and contextual constraints.	Examine the larger context in which research activities are situated to consider the multiple influences on teachers' belief enactment.	To affect change in beliefs and practices, a variety of beliefs must be addressed and teachers need extensive knowledge of the practices to be enacted.	Recognize the specific constraints that may hinder the implementation of beliefs and work to alleviate them.	Identify ways beliefs and practices are or are not congruent. Recognize the need for additional knowledge and professional development to effectively implement new practices.
There is great diversity in how teachers' beliefs are studied and conceptualized that both supports and hampers the development of the field.	Recognize and account for the strengths and limitations of different methodological paradigms.	Ensure that future teachers have the tools needed to become resourceful and critical consumers of educational research.	Model ethical, effective, and appropriate use of educational research as part of practice.	Engage in lifelong professional development that recognizes the multiple ways in which knowledge is developed in the field.

the relations of beliefs to practice and belief change. Moreover, a quick review of the topics addressed in this chapter underscores multiple ways in which the construct of teachers' belief may be conceptualized for research, application, and intervention.

Researchers must address these issues in every empirical endeavor. We cannot emphasize enough the need for clarity in characterizing the specific belief or belief system under investigation. Teacher educators and school leaders need to recognize the

complexity of these beliefs to support teachers' education and professional growth. We also challenge teachers to be aware of their beliefs, reflect on them, and consider the basis for them.

Belief Systems Serve Different Functions

Different belief systems may function in different ways, as filters, frames, or guides. Some beliefs are content or domain specific, but the underlying principles and processes that use belief systems may transcend specific domains. The psychological functions of beliefs require further empirical testing and conceptual development by researchers. Moreover, systems of beliefs need to be examined as functioning within and among teachers. Thus, instead of examining beliefs in isolation, researchers should consider the belief system as likely related to the phenomena of interest and consider the roles that different beliefs fulfill.

Teacher educators and school leaders need to consider how and what beliefs or belief systems influence teachers' interpretation (filter), application (frame), and implementation (guide) of new pedagogical approaches and reforms. Effective implementation of desired teaching practices may require belief change at multiple levels of belief, and change at one level (e.g., filters or frames) may not ensure successful belief enactment. Marshall and Drummond's (2006) work examining teachers' beliefs and practice in relation to the implementation of Assessment for Learning highlights this recommendation. Although all teachers implemented elements of the new practice, Marshall and Drummond found that some teachers embodied the spirit of the practice (i.e., "the underpinning principle is promoting pupil autonomy"; p. 137), and others merely conformed to the letter of it (i.e., performed specific procedures). Some teachers integrated conceptual and practical components of the practice into their belief systems, whereas others focused narrowly on specific strategies (e.g., no hand raising) without recognizing how the technique is an integrated component of a larger teaching approach.

Beliefs Have a Reciprocal Relationship With Context and Experiences

Beliefs have a reciprocal, interactive relationship with contexts and experiences (e.g., Bandura, 1997;

Muijs & Reynolds, 2002; Skott, 2001). Beliefs are not solely the cause of teachers' actions; their actions and experiences can result in belief change. Researchers need to consider the reciprocal nature of beliefs, experience, and context in their work and devise methods for conceptual understanding and empirical investigation.

The studies we reviewed indicated that interventions and professional development can lead to change in beliefs and practices, but other individual and contextual factors, as we discuss in the next section, also need to be addressed. Thus, if teacher educators and school leaders intend to change teachers' beliefs, they need to have resources available, both structural and human, to support belief construction and enactment. Evidence has suggested that belief change is more likely if experiences, including coursework, fieldwork, and professional development programs, offer opportunities for practice, reflection, and support. For instance, preservice teachers who perceived support from cooperating teachers were more likely to enact constructivist beliefs in their teaching (Haney & McArthur, 2002). Teachers also need to be aware of the influence their beliefs have on the classroom context, instructional decisions, and automatic actions within classrooms. Methods to address this include ongoing reflection on teaching and participation in communities of practice.

Belief Enactment May Be Constrained by Individual and Contextual Factors

Teachers' beliefs are related to their practices and student outcomes, but individual and contextual constraints may hinder the enactment of their beliefs, and therefore beliefs and practice may not always be congruent. Researchers examining consistency between beliefs and practices need to consider the larger context in which the teacher is situated as well as the multiple aspects of the teacher's belief system that may impinge on which beliefs are enacted at particular moments. Teacher educators and school leaders are in a unique position to address the factors that may support or hinder the enactment of beliefs. For instance, teacher educators need to remember that to effect change in practices, they must also address a variety of beliefs. Wilcox-Herzog (2002) and Windschitl (2002) noted the need for a strong theoretical foundation to

support teachers' beliefs and practices. It is not enough to teach specific practices; teachers also need to understand their foundation and why they are effective.

Because of the dialectical relation between beliefs and practices, teacher educators should model belief implementation and provide opportunities for pre-service and practicing teachers to implement practices and experience success with them as a means to bring about a change in beliefs. Such experiences may help teachers to see the relevance of a particular practice as well as provide mastery experiences that will support their sense of efficacy. However, they could also backfire and provide evidence for the irrelevance of a practice or approach. Thus, proper support, guidance, and time for reflection are needed.

School leaders should recognize the specific constraints that may hinder the implementation of beliefs and work to alleviate them. They need to provide teachers the time, opportunities, and resources for professional development, ongoing support, and collaboration. Additionally, school leaders should work toward creating a supportive school climate, help teachers understand how national or district policies can be met (e.g., need for testing) while still enacting practices that are congruent with beliefs (e.g., use of inquiry in science), and think carefully about how to best support new teachers (e.g., carefully match new teachers with similarly minded mentor teachers, if the mentors' beliefs and practices are appropriate).

Teachers must also take an active role in increasing the congruence between their beliefs and practices. Teachers should identify the ways their beliefs and practices are or are not congruent and engage in continued professional development. Also, teachers have a responsibility to make their needs known to school leaders (e.g., desire for a professional learning community, specific materials or forms of professional development).

Diversity of Research Methods Supports and Hinders Developments in the Field

Although the use of diverse methods can support the development of the understanding of teacher beliefs, methods used in the existing research present specific limitations. We appreciate the case studies and qualitative approaches that have been conducted, but we

are concerned by how few authors relate findings back to the empirical or theoretical literature or attempt to move the field forward in a meaningful way. Moreover, many of the measures used to study beliefs were developed and validated with small samples and poorly described methods. The field would undoubtedly benefit from larger, representative samples and less reliance on small samples of convenience, as well as more attention to reviewing the literature thoroughly for appropriate measures to be used or adapted before developing new ones.

The breadth of research in this field can be daunting. Research literacy is essential to fully understand the complexities in the research. Teacher educators and school leaders are charged with the task of modeling effective, ethical application of educational research to help teachers best meet the needs of their students. Teachers are encouraged to engage in life-long professional development that includes an understanding of their own beliefs and how these perspectives are understood in the research. Researchers must strive to provide coherent investigations that can be used to facilitate these goals.

QUESTIONS FOR CONSIDERATION

Whose Beliefs Are Best?

Many beliefs are value laden. Thus, any attempt to alter beliefs is an ethical decision and endeavor. Currently, an emphasis is placed on constructivist approaches to and views of teaching and learning. However, 50 years ago, a different view was stressed, and, most likely, in another 50 years an alternative view will prevail. Educational researchers, school leaders, and teacher educators must think carefully before attempting to change beliefs to determine whether the new beliefs are indeed more advantageous for teachers in their contexts. When deciding to change beliefs on the basis of prior research, the context of those research findings must also be considered. Results from diverse settings may not apply because of the values and beliefs in the larger social and cultural context (see Klassen et al., 2008).

Where Did the Emotion Go?

Early conceptions of belief in teacher education research recognized that beliefs encompassed both

logical and cognitive factors as well as emotional and affective components. Yet the absence of recognition of the latter in current research is shocking. Even studies that examine emotive topics such as diversity or student discipline lack an emotional component. Scant attention is paid to the emotional nature of beliefs that may be part of the resistance to belief change. Despite early conceptions of beliefs as including or reflecting emotions, the study of beliefs has turned coldly cognitive and may be missing an important element. Perhaps the reason for teachers' multiple incoherent belief systems is the result of the enforcement of logic on beliefs when they are based on or deeply related to feelings and affective memories (Gates, 2006).

Do Changes in Teachers' Beliefs Follow a Developmental Trajectory?

Finally, we endorse a view in which beliefs are never finished because humans are continually in the process of changing and becoming. Notably, not all change requires a massive qualitative shift in paradigms. Rather, belief change can be conceptualized as changes in complexity of beliefs related to a richer schema based on experiences and increasing connections made across belief systems. Evidence has suggested that teachers' beliefs change over time and in response to specific experiences. Still, we

were surprised by the lack of longitudinal, developmental studies of teachers' beliefs in relation to their knowledge and practice. The most lengthy longitudinal study of teachers' beliefs we identified was a qualitative study conducted over approximately 3 years by Brownlee (2003). Her work suggests that teachers' beliefs undergo changes throughout their early professional careers. However, to more effectively enact change and understand the development of teachers, we need to understand the mechanisms of belief change and development and the variables of interest that are affected by those changes. Some research has been done in this area (e.g., Gregoire, 2003), but more is needed.

FINAL THOUGHT

In 1992, Pajares noted how Fenstermacher (1979) "predicted that the study of beliefs would become the focus for teacher effectiveness research" and that Pintrich (1990) "suggested that beliefs ultimately will prove the most valuable psychological construct to teacher education" (Pajares, 1992, pp. 307–308). Although today the teacher belief literature could hardly be characterized as scarce, as it was by Pajares in 1992, the systematic and wide-reaching emphasis on teacher beliefs needed to bring these predictions to fruition has yet to be seen.

APPENDIX 19.1: TOPICS OF INTEREST AND SPECIFIC CONTENT OF VARIOUS STUDIES ABOUT TEACHERS' BELIEFS

Study	Belief topic			Beliefs about ...
	Self Context	Specific practices	Teaching approach	
Abrami, Poulsen, & Chambers (2004)		X		Expectancy, value, and cost of implementing cooperative learning
Akçay (2007)		X		Inquiry in math and science
Alger (2009)			X	Metaphors: teacher centered/student centered
Barkatsas & Malone (2005)		X ^a		^a Mathematics
Barlow & Cates (2006)		X ^a	X ^b	^b Constructivism vs. transmission view of teaching math ^a Mathematics ^c Student learning
Basturkmen, Loewen, & Ellis (2004)		X		Focus on form in teaching English as a second language
Beswick (2005)		X ^a	X ^b	^a Mathematics ^b Content focus-performance, content focus-understanding, learner focus
Beswick (2007-2008)			X ^b	^c Passive, active, autonomous ^a Math teaching ^b Students with learning disabilities
Brown, Molfese, & Molfese (2008)		X		Importance of (a) math numeracy skills and (b) literacy skills
Brownlee (2003)		X		Epistemology
Brownlee & Chak (2007)			X	Children's learning
Bryan (2003)	X ^a	X ^b	X ^d	^a Teacher's role ^b Value of science; nature of science ^c Instructional goals and classroom control in science classes ^d Learning science; student's role
Buehl & Fives (2009)		X		Source and stability of pedagogical knowledge
Burton (1992)	X			Family involvement
Chen (2008)		X		Technology integration

(Continued)

Belief topic

Study	Self			Specific			Teaching			Beliefs about ...
	Context	Content	practices	approach	Students	Context	Content	practices		
B. Crawford (2007)	X ^a		X ^b							^a Professional relationships ^b Teaching science as inquiry
P. Crawford (2004)				X						Constructivist vs. transmission; pedagogy and role of instructional tools
DeCorte, Verschaffel, & Depaepe (2008)		X ^a	X ^b							^a Mathematics ^b Teaching mathematics
Doppen (2007)			X							Teaching and learning social studies
Enyedy, Goldberg, & Welsh (2006)	X ^a	X ^b			X ^c					^a Teacher identity ^b Value of science; nature of science ^c Nature of learning
Fives & Buehl (2008)	X ^a	X ^b								^a Implicit ability beliefs for learning to teach ^b Pedagogical knowledge
Fives, Hamman, & Olivarez (2007)	X ^a	X ^b								^a Self-efficacy; burnout ^b Perceived support from university supervisor; perceived relationship with cooperating teacher
Gates (2006)		X ^a		X ^b						^a Mathematics ^b Ideological frameworks for teaching
Gill & Hoffman (2009)		X ^a		X ^b	X ^c					^a Subject matter ^b Teaching ^c Student thinking
Gooya (2007)			X ^a		X ^b					^a Math teaching ^b Student learning
Hancock & Gallard (2004)				X						Student-centered vs. teacher-centered
Haney & McArthur (2002)	X ^a			X ^b						^a Perceived support of preservice teachers from mentors ^b Central beliefs about constructivist or traditional practices: stated and enacted. Peripheral beliefs about constructivist or traditional practices: stated but not enacted
Hermans, van Braak, & Van Keer (2008)				X						Developmental vs. transmission
Holt-Reynolds (1994)		X ^a	X ^b		X ^c					^a English ^b Reading to learn ^c Learning processes

Isikoglu (2008)			X		Constructivist vs. traditional
Johnson (1994)		X			Images of teaching English language learners
Keys (2005)		X			Science education
Kim, Kim, & Maslak (2005)			X		Developmentally appropriate practice
King, Shumow, & Lietz (2001)			X		Constructivist vs. transmission
Klassen et al. (2008)	X				Collective efficacy
Knoblauch & Hoy (2008)	X ^a	X ^b			^a Self-efficacy ^b Collective efficacy, perceived cooperating teachers' efficacy beliefs
Kwon (2004)			X		Child-centered philosophies
Kyles & Olafson (2008)	X ^a			X ^b	^a Hope; self-efficacy; intrinsic-extrinsic motivation for teaching ^b Diversity
La Paro, Siepak, & Scott-Little (2009)		X ^a		X ^b	^a Classroom practices (instruction and management) ^b Children
Leavy, McSorley, & Boté (2007)			X	X	Teaching and learning metaphors: behaviorist, constructivist, situated, and self-referential
Lee, Baik, & Charlesworth (2006)			X		Developmentally appropriate or developmentally inappropriate practice
Levin & Wadmany (2006)		X ^a	X ^b	X ^c	^a Technology as stable or unstable knowledge ^b Teacher centered (knowledge transmission) vs. learner-centered (facilitation of learning) ^c Learning as behaviorist, cognitive constructivist, or radical constructivist
Lim & Chai (2008)			X		Constructivist vs. Transmission
Magos (2006)				X	Otherness
Mansour (2008)	X ^a			X ^b	^a Religious; identity; teacher's role ^b Teaching science
Marshall & Drummond (2006)		X			Assessment for learning as autonomy promoting
McAlpine, Eriks-Brophy, & Crago (1996)	X		X	X	Interconnected systems of three teachers
McMullen et al. (2006)			X		Developmentally appropriate practices
Mitchell & Hegde (2007)			X		Developmentally appropriate practices
Moseley, Reinke, & Bookout (2002)	X				Self-efficacy

(Continued)

Belief topic

Study	Self			Beliefs about ...		
	Context	Content	Specific practices	Teaching approach	Students	Beliefs about ...
Muijs & Reynolds (2002)	X ^a			X ^b		^a Self-efficacy ^b Connectionist, Discovery, and Transmission
Nathan & Koedinger (2000)				X		Constructivist vs. transmission
Ng & Rao (2008)			X ^a	X ^b		^a Math teaching ^b Constructivist or instructivist pedagogies
Noyes (2006)		X ^a		X ^b	X ^c	Metaphors for: ^a Mathematics ^b Mathematics teaching ^c Mathematics learning
Oliver (1953)				X	X	Modern education: Good teaching recognizes and provides for individual differences; development is continuous, learning is based on experience, learning proceeds best when related to learners' interests and experiences
Olson & Jimenez-Silva (2008)	X ^a		X ^b		X ^c	^a Confidence in knowledge and skills to teach English language learners ^b Ways to teach ^c English language learners
Osioma & Moscovici (2008)			X ^a		X ^b	^a Teaching science ^b Learning science
Pečjak & Košir (2004)		X ^a	X ^b			^a Importance of reading ^b Importance of reading goals in the curriculum
Powers, Zippay, & Butler (2006)		X ^a	X ^b			^a Literacy ^b Literacy instruction and assessment
Rimm-Kauffman et al. (2006)			X ^a		X ^b	^a Classroom practices, discipline and behavior management practices ^b Interpersonal beliefs about children (e.g., belief in child's desire to learn, likability), how children learn
Sahin, Bullock, & Stables (2002)			X			Questioning
Seaman, Szydli, Szydlik, & Beam (2005)		X ^a		X ^b		^a Mathematics ^b Constructivist vs. formal approaches to teaching mathematics

Simmons et al. (1999)	X ^a	X ^b	X ^c	X ^d	X ^e	^a Self as teacher ^b Educational environment ^c Science; Epistemology ^d Nature of teaching: teacher centered vs. student centered vs. content centered ^e Role of students (teacher centered or student centered)
Skott (2001)	X ^a	X ^b	X ^c	X ^d	X ^e	^a “School mathematics images”: an integration of beliefs about mathematics, mathematics as a school subject, and teaching and learning of mathematics ^b Views of mathematics ^c Teaching ^d Teaching <i>in</i> practice ^e Student learning
Skott (2009)	X ^a	X ^b	X ^c	X ^d	X ^e	^a Goals for instruction, position on retention policies ^b Child-centered vs. basic skills orientation ^c How children learn
Stipek & Byler (1997)	X ^a	X ^b	X ^c	X ^d	X ^e	^a Mathematics education ^b Needs of students based on their socioeconomic status ^c Mathematics ^d Mathematics learning
Sztajn (2003)	X ^a	X ^b	X ^c	X ^d	X ^e	^a Nature of science ^b Teaching science: teacher-centered and constructivist models ^c Specific students in teacher's class; Learning science
Tzur et al. (2001)	X ^a	X ^b	X ^c	X ^d	X ^e	Importance of varying types of teacher–child interactions
Verjovsky & Waldegg (2005)	X ^a	X ^b	X ^c	X ^d	X ^e	Knowledge
Wilcox-Herzog (2002)	X ^a	X ^b	X ^c	X ^d	X ^e	^a Science knowledge ^b Science teaching ^c Teacher centered vs. learner centered ^d Lower track students
Yadav & Koehler (2007)	X ^a	X ^b	X ^c	X ^d	X ^e	^a Science knowledge ^b Science teaching ^c Teacher centered vs. learner centered ^d Lower track students
Yerrick & Hoving (2003)	X ^a	X ^b	X ^c	X ^d	X ^e	^a Science knowledge ^b Science teaching
Yerrick, Parke, & Nugent (1997)	X ^a	X ^b	X ^c	X ^d	X ^e	^a Science knowledge ^b Science teaching

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