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Sources of Self-Efficacy in School: Critical Review of the Literature and Future Directions

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The purpose of this review was threefold. First, the theorized sources of self-efficacy beliefs proposed by A. Bandura (1986) are described and explained, including how they are typically assessed and analyzed. Second, findings from investigations of these sources in academic contexts are reviewed and critiqued, and problems and oversights in current research and in conceptualizations of the sources are identified. Although mastery experience is typically the most influential source of self-efficacy, the strength and influence of the sources differ as a function of contextual factors such as gender, ethnicity, academic ability, and academic domain. Finally, suggestions are offered to help guide researchers investigating the psychological mechanisms at work in the formation of self-efficacy beliefs in academic contexts.

KEYWORDS: self-concept, motivation, self-efficacy, sources of self-efficacy.

Three decades ago, Albert Bandura (1977) theorized that the beliefs that people hold about their capabilities and about the outcomes of their efforts powerfully influence the ways in which they behave. According to Bandura's (1986) social cognitive theory, these *self-efficacy beliefs* help determine the choices people make, the effort they put forth, the persistence and perseverance they display in the face of difficulties, and the degree of anxiety or serenity they experience as they engage the myriad tasks that comprise their life. Self-efficacy has received ample attention in educational research, where it has been shown to predict students' academic achievement across academic areas and levels (see Pajares & Urdan, 2006). It has also been shown to predict students' college major and career choices (Brown & Lent, 2006), and it is associated with key motivation constructs such as causal attributions, self-concept, optimism, achievement goal orientation, academic help-seeking, anxiety, and value. Students who are confident in their academic capabilities monitor their work time more effectively, are more efficient problem solvers, and show more persistence than do equally able peers with low

self-efficacy. They also work harder, evaluate their progress more frequently, and engage in more self-regulatory strategies that promote success in school (Schunk & Pajares, 2005).

Woolfolk (see Shaughnessy, 2004) contended that teachers who seek to help students increase their academic and self-regulatory self-efficacy should first attend to the sources underlying these beliefs. Indeed, understanding the role that teachers, parents, and schoolmates play in the creation and development of students' academic confidence would inform academic practices aimed at fostering and nurturing these important self-beliefs. The purpose of the present review is to critically examine empirical investigations that have been conducted on the sources of self-efficacy in academic settings. To that end, we define and explain the theorized sources, identify key findings, critique operational and methodological decisions made in particular studies, and offer suggestions to help guide future research in this area.

We include in this review studies conducted from 1977, when the construct of self-efficacy was first introduced by Bandura (1977), to the present. Database search terms included *sources*, *antecedents*, *self-efficacy*, and *development* in various combinations. Article abstracts were scanned for relevance to Bandura's (1986) theorized sources in educational settings. The reference lists of each article obtained from our initial search were used to locate additional, relevant studies. We focus our attention on investigations conducted in school contexts. Because our search revealed both qualitative and quantitative studies that varied in quality, methodological rigor, and assessment, conducting a meta-analysis is premature. Consequently, we opted for a narrative approach that we believe is better suited to critically synthesizing and analyzing the available literature.

The Hypothesized Sources of Self-Efficacy

Bandura (1986, 1997) hypothesized that self-efficacy beliefs are created and developed as students interpret information from four sources, the most powerful of which is the interpreted result of their own previous attainments, or *mastery experience.* After students complete an academic task, they interpret and evaluate the results obtained, and judgments of competence are created or revised according to those interpretations. When they believe that their efforts have been successful, their confidence to accomplish similar or related tasks is raised; when they believe that their efforts failed to produce the effect desired, confidence to succeed in similar endeavors is diminished. Experienced mastery in a domain often has enduring effects on one's self-efficacy. Students who have earned top marks in science throughout school will typically believe themselves capable in this area for years to come.

Self-efficacy beliefs are most likely to change during skill development, when individuals are faced with novel tasks. Although failure may occur periodically, when students notice a gradual improvement in skills over time, they typically experience a boost in their self-efficacy. Mastery experiences prove particularly powerful when individuals overcome obstacles or succeed on challenging tasks (Bandura, 1997). However, the amount of effort required to accomplish a task can also be indicative of one's ability level. When students experience failure after having put forth great effort, their efficacy beliefs may be undermined. Similarly, success that can only be achieved with the help of others provides a weaker indication of one's personal ability than does success achieved on one's own.

In addition to interpreting the results of their actions, students build their efficacy beliefs through the *vicarious experience* of observing others. In many academic endeavors, there are no absolute measures of proficiency. Hence, students gauge their capabilities in relation to the performance of others. For example, a student who earns 8 out of 20 points on her first physics exam has little basis on which to interpret this score without knowing how her classmates performed. If she finds that most of them received fewer points, her self-efficacy will likely be raised. If, on the other hand, most of her classmates receive more points, she is likely to find her confidence shaken. Use of such normative comparisons is a common vicarious experience in school.

Social models play a powerful role in the development of self-efficacy, especially when students are uncertain about their own abilities or have limited experience with the academic task at hand. Students compare themselves to particular individuals such as classmates and adults as they make judgments about their own academic capabilities. Schunk and his colleagues have shown that *coping models*, those who struggle through problems until they reach a successful end, are more likely to boost the confidence of observers than are *mastery models*, those who respond to mistakes as though they never make them (Schunk, 1983, 1987; Schunk & Hanson, 1985, 1988). Modeling can also work to undermine an observer's confidence, particularly when the model fails at a task perceived as easy. Researchers have also suggested that models may play a more influential role during transitional periods such as the shift from elementary to middle school, during which time youngsters become more attuned to social comparative information (Eccles, Midgley, & Adler, 1984).

Students are most likely to alter their beliefs following a model's success or failure to the degree that they feel similar to the model in the area in question (Schunk, 1987). Watching a similar classmate succeed at a challenging mathematics problem, for instance, may convince fellow students that they too can conquer the challenge. Vicarious information gained from others perceived to be similar in ability yields the most influential comparative information, but the experiences of those perceived as having similar attributes (e.g., age, gender, ethnicity) are often powerful sources of self-efficacy information.

But perceived similarity is not necessarily indicative of the power of social models. As Bandura (1997) observed, "people are not about to discard information that makes them more efficacious just because it comes from a dissimilar source" (p. 101). In fact, students will seek out a model competent at tasks to which they aspire—particularly one with status, power, and prestige (Bandura, 1997). And, although vicarious experiences often occur between every day associates such as classmates or family members, the role of television and other media has brought *symbolic models* to students' fingertips (Bandura, 2004). Such models can convey attitudinal and enactive vicarious information to youngsters about how to approach school, peers, and parents. Individuals are also able to compare their own current and past performances either cognitively or through multimedia playback. In this sense, self-comparative information becomes another type of vicarious experience capable of altering people's self-efficacy. Although Bandura (1997) categorized self-modeling as a vicarious experience, such self-modeled experiences, particularly as regards modeling through multimedia playback, are certainly intertwined with the judgments students make of their mastery experiences.

The *verbal and social persuasions* that students receive from others serve as a third source of self-efficacy. Encouragement from parents, teachers, and peers whom students trust can boost students' confidence in their academic capabilities. When they are not yet skilled at making accurate self-appraisals, students often depend on others to provide evaluative feedback and judgments about their academic performance. Supportive messages can serve to bolster a student's effort and self-confidence, particularly when accompanied by conditions and instruction that help bring about success (see Evans, 1989).

Social persuasions may be limited in their ability to create enduring increases in self-efficacy, however. It may actually be easier to undermine an individual's self-efficacy through social persuasions than to enhance it, particularly in the formative years during which youngsters carefully attend to the messages they receive from those close to them (Bandura, 1997). Perhaps, as poet Stanley Kunitz (2000) wrote, "we learn, as the thread plays out, that we belong less to what flatters us than to what scars" (p. 103). To be effective, feedback should be framed appropriately so as to support students' sense of efficacy, particularly as their self-beliefs are developing (Schunk, 1984). Effective mentors encourage individuals to measure success in terms of personal growth rather than as triumphs over others.

Finally, self-efficacy beliefs are informed by *emotional and physiological states* such as anxiety, stress, fatigue, and mood. Students learn to interpret their physiological arousal as an indicator of personal competence by evaluating their own performances under differing conditions. Strong emotional reactions to school-related tasks can provide cues to expected success or failure. High anxiety can undermine self-efficacy. Students who experience a feeling of dread when going to a particular class likely interpret their apprehension as evidence of lack of skill in that area. Bandura (1997) suggested that people tend to function optimally when their physiological arousal is neither too high nor too low; that is, physiological arousal may be related curvilinearly to self-efficacy. In general, increasing students' physical and emotional well-being and reducing negative emotional states strengthens self-efficacy.

Negative physiological arousal may become more prevalent as children progress through school in part because of changing school practices. Eccles et al. (1984) observed that the shift to normative grading procedures in middle school often results in ability comparisons, which, when coupled with other grade-level changes such as increased homework and decreased teacher–pupil interaction, can induce greater levels of anxiety toward academic tasks. It bears noting that the self-efficacy beliefs students hold when they approach new tasks serve as a filter through which new information is processed. Those who lack confidence in their abilities may falsely interpret their anxiety as a sign of incompetence. Such an interpretation can lead to the very failure that students fear. Conversely, students who hold firm beliefs about their capabilities are untouched by routine fluctuations in physiological arousal. Students' emotional states also influence how they interpret their experiences. A pessimistic outlook leads individuals to misconstrue their mistakes as signs of inability, which in turn diminishes their self-efficacy (Seligman, 1990). A good mood, however, raises self-efficacy beliefs, motivation, and subsequent achievement, initiating a reciprocal process that enhances well-being.

Many factors influence the ways in which students weigh, interpret, and integrate information from these four sources as they make judgments about their academic capabilities. Bandura (1997) hypothesized that the integration rules

individuals use when weighting and interpreting efficacy-relevant information may be *additive* (the more sources available, the more efficacy beliefs are enhanced), *relative* (one source is stronger than another), *multiplicative* (two sources present an interactive effect), or *configurative* (the strength of one source depends on the presence of others), each of which depends largely on personal and contextual factors. As young people grow, they develop cognitive skills that help them process information relevant to their beliefs. Nonetheless, Bandura contended that individuals do not weigh or integrate multidimensional information particularly well, typically overrelying on information from certain sources and ignoring information from others.

Measuring the Sources of Self-Efficacy

In academic settings, researchers have measured the sources in markedly differing ways. In quantitative studies, items and scales have differed considerably across studies, and not all researchers have been attentive to issues related to construct validity or to theoretical guidelines related to the nature of the sources. Some researchers have investigated the sources using qualitative inquiry.

Quantitative Studies

Sample items from published scales that have been designed to measure the sources of self-efficacy are presented in Table 1. Most researchers have used adapted versions of the Sources of Mathematics Self-Efficacy Scale developed by Lent et al. (1991). Originally designed to assess the sources of mathematics self-efficacy of college students, the items have been adapted for use in both academic and social settings (Anderson & Betz, 2001; Britner & Pajares, 2006; Lopez & Lent, 1992; Smith, 2001; Usher & Pajares, 2006a, 2006b). Matsui et al. (1990) also designed a scale to measure the sources of college students' mathematics self-efficacy that has been adapted for use with middle school students (Klassen, 2004). Hampton (1998) developed the Sources of Academic Self-Efficacy scale, which was validated and subsequently used with students with learning disabilities (Hampton & Mason, 2003). Other researchers have relied on unpublished sources items (Bates & Khasawneh, 2007; Stevens, Olivárez, & Hamman, 2006) or have used alternative measures as proxies for one or more of the sources (Chin & Kameoka, 2002; Johnson, 2005). Below we offer a description and comment on measures used to assess each source.

Mastery experience has been assessed in various ways. Researchers who follow models such as those put forth by Lent and his colleagues have assessed mastery experience by asking students to rate their past and current performance in the academic subject of interest. Scores from these items have shown strong reliability estimates (Britner & Pajares, 2006; Lent et al., 1991). One problematic practice, however, has been the use of students' objective performance as an indicator of mastery experience. For example, some researchers have asked participants to self-report previous grades obtained (Klassen, 2004; Matsui et al., 1990) or have used actual test scores and participation in extracurricular activities as the measure of mastery experience (Chin & Kameoka, 2002). Others have asked students to provide prior experience ratings ranging from *no experience* to *a lot of experience* (Johnson, 2005). Such assessments are not consistent with Bandura's (1997) description of mastery experiences as the *interpretations* individuals make

TABLE 1
Sample items from scales assessing the sources of self-efficacy

Mastery experience
I got a high grade in last year's math class. (Lent, Lopez, & Bieschke, 1991)
I received good grades in my high school math classes. (Lent et al., 1991)
I have always had a natural talent for math. (Lent et al., 1991)
I could put major points together when I read. (Hampton, 1998)
I knew how to solve math problems. (Hampton, 1998)
I have always done well on school assignments. (Usher & Pajares, 2006b)
Vicarious experience—peers
I had a close friend(s) whom I respected for math achievement. (Matsui, Matsui, & Ohnishi, 1990)
Students who were similar to me did well on exams. (Hampton, 1998)
Most of my friends read test questions carefully. (Hampton, 1998)
In mathematics class, I rarely get the answer before my classmates do. (Lent et al., 1991)[a]
My friends tend to avoid math assignments. (Lent et al., 1991)[a]
I feel confident when other kids in my class do well in math. (Klassen, 2004)
Vicarious experience—adults
My favorite teachers are usually math teachers. (Lent et al., 1991)
No one at home is any good at math. (Lent et al., 1991)[a]
Many of the adults I know have jobs that require good math skills. (Lent et al., 1991)
People I look up to [like parents, friends, or teachers] are good at math. (Lent et al., 1991)
People I admire are good at academic work. (Usher & Pajares, 2006b)
My career role models (those people I want to be like) are mostly people who went to college. (Usher & Pajares, 2006b)
Social persuasions
My teacher often encouraged me by praising my math ability. (Matsui et al., 1990)
My teachers said that I could put together ideas from different sources. (Hampton, 1998)
My classmates said that I understood everything taught in classes. (Hampton, 1998)
People often tell me that I am good at math. (Lent et al., 1991)
My teachers believe I can do well in math courses. (Lent et al., 1991)
I feel confident when my parents tell me I'm doing well at math. (Klassen, 2004)
Physiological state
I often felt blue when I thought of math. (Matsui et al., 1990)
I was always anxious about math. (Matsui et al., 1990)
I felt nervous when I had problems remembering how to spell a word. (Hampton, 1998)
I noticed my heart pounding when I took tests. (Hampton, 1998)
My mind goes blank and I am unable to think clearly when trying to do math. (Lent et al., 1991)
I lose confidence when I feel sick when I do math. (Klassen, 2004)

a. Indicates reverse-scored item.

of experienced events rather than as the objective performances themselves. Hence, the impact of academic performance attainments on efficacy beliefs depends on what students make of their performances. The same obtained grade can boost the confidence of one student but shake that of another. For example,

earning a B on a book report might lead a struggling young scholar to rejoice with pride, whereas the same B might devastate a student accustomed to earning As. Bandura noted that "the same level of performance success may raise, leave unaffected, or lower perceived self-efficacy depending on how various personal and situational contributions are interpreted and weighted" (p. 81). Indeed, researchers have found that perceptions of mastery are better predictors of self-efficacy than are objective results (Lane, 2002; Lopez, Lent, Brown, & Gore, 1997).

Vicarious experience is typically measured with items asking students to rate the degree to which they are exposed to peer or adult models who demonstrate competence in the academic subject of interest. Items typically refer to how students perceive the academic skills of career role models, close friends in class, parents, teachers, or older students. Lent and his colleagues assessed vicarious experience with items tapping both peer and adult modeling experiences (Lent et al., 1991; Lent, Lopez, Brown, & Gore, 1996; Lopez & Lent, 1992). Other researchers have limited their assessment of this source to peer-related items (Klassen, 2004) or to items reflecting modeling from adults (Hampton, 1998; Usher & Pajares, 2006a, 2006b). Still others have not made a clear distinction about how this source was measured or whether measures included items both from adults and from peers (e.g., Stevens et al., 2006). No researcher has attempted to measure the influence of other public social models such as renowned scientists, politicians, or athletes. Nor have investigators attempted to assess vicarious experiences from significant others who may have passed away.

With few exceptions, researchers have reported low to modest reliability coefficients for scores on items that have been used to assess vicarious experience (Gainor & Lent, 1998; Lent et al., 1991; Lopez & Lent, 1992; Matsui et al., 1990; Smith, 2001; Stevens et al., 2006; Usher & Pajares, 2006a, 2006b). This is likely a reflection of the multidimensional nature of this variable. Psychologists have documented that peers and adults exercise markedly different influences on students at different developmental stages (Harris, 1995; Pinker, 2002). Bandura (1997) has contended that peer models are more likely to influence students' self-efficacy beliefs than are adult models. Hence, findings obtained with measures in which only peer or adult modeling experiences are assessed (e.g., Hampton, 1998; Matsui et al., 1990; Usher & Pajares, 2006b) may provide incomplete insights about the nature of this source, and findings obtained with measures that combine vicarious experiences from peers and from adults (e.g., Britner & Pajares, 2006; Lent et al., 1991; Özyürek, 2005) may wash out important effects of efficacy-relevant information gained from either of these sources.

Vicarious experience has also been assessed in ways that are at odds with Bandura's (1997) conceptualization. In one study, students were asked to provide the highest educational degree earned by members of their family, but no assessment was made of students' interpretations of this vicarious influence (Chin & Kameoka, 2002). Other researchers have used only one item (i.e., "How often have you had a chance to watch people actually doing jobs in this area or talked to people about jobs in this area?") to assess this source (Panagos & DuBois, 1999, p. 28), which masks the complexity of this type of efficacy-building information.

To assess social persuasions, researchers typically ask students to rate whether they receive encouraging messages about their academic capabilities from significant others, such as peers, parents, teachers, and other adults (e.g., Lent et al., 1991;

Matsui et al., 1990). When they have assessed social persuasions in this way, most investigators have reported moderate to strong reliabilities for social persuasion scales. Some researchers have used measures inconsistent with Bandura's (1997) theoretical guidelines to assess this source. For example, some have assessed social persuasions with items tapping what students think others expect of them, such as "My teacher expects me to go to college" (Chin & Kameoka, 2002), or the directives students receive from others, such as "My teachers told me to read questions carefully before writing answers down while taking exams" (Hampton, 1998). Others have assessed this source by asking students to rate the extent to which their instructors provide them with "prompt and regular feedback" (Bates & Khasawneh, 2007, p. 181). Such items fail to account for the evaluative nature of the feedback.

Individuals tend to trust evaluations of their capabilities made by someone who is skilled in that particular activity or knowledgeable about what it takes to master it (Bandura, 1997). However, researchers have yet to include items tapping students' trust in those who try to convince them of their academic capabilities, nor have they separated messages received from same-age peers and those received from adults. Researchers have not used items that target the influence of messages sent to students from the broader culture at large, such as the school, community, public figures, or the media. Current measures of social persuasions that assess only the feedback students receive about their academic competencies without attending to these factors offer an incomplete picture of this source.

Physiological arousal has typically been assessed as students' anxiety toward a particular academic subject. Lent and his colleagues used the Fennema–Sherman Math Anxiety Scale revised by Betz (1978) to measure the physiological arousal of high school and college students (Gainor & Lent, 1998; Lent et al., 1991; Lent, Lopez, et al., 1996; Lopez & Lent, 1992). Anxiety items have been used by other researchers as well (Bates & Khasawneh, 2007; Britner & Pajares, 2006; Smith, 2001; Stevens et al., 2006; Usher & Pajares, 2006a, 2006b). Other items have asked students to rate how much they like a particular subject (Matsui et al., 1990), whether thinking of a subject makes them feel sick or depressed (Klassen, 2004), or how school affects their physiological functioning (Hampton, 1998). Recall that a number of factors can influence physiological and affective states, including mood, physical strength, and levels of distress or elation, and that heightened physiological arousal need not result in diminished self-efficacy. Students who experience success under a positive mood are more likely to increase their personal efficacy beliefs. Similarly, those who interpret their arousal as a challenge experience a boost in their self-efficacy (Bandura, 1997). Thus far, quantitative measures have not assessed the positive dimensions of physiological arousal.

Construct Validity

A number of approaches have been used to assess construct validity of the items used to measure the sources. Matsui et al. (1990) used factor analysis to examine 15 items, imposing a three-factor solution representing vicarious experience, social persuasions, and physiological arousal that fit the model relatively well. The authors provided little information on the factor analytic methods employed, however. Because mastery experience was equated with past performance, construct validity was established only for the three other sources. Klassen (2004) attempted to enhance the construct validity of Matsui et al.'s items by asking students to

assess the degree to which each item enhanced their self-efficacy (i.e., "Rate how each statement affects your confidence for doing math," p. 735). Again, construct validity was not established for perceived mastery experience.

Lent, Lopez et al. (1996) used confirmatory factor analysis (CFA) to identify the latent constructs underlying the sources items developed in earlier studies (Lent et al., 1991; Lopez & Lent, 1992). Four latent structure models were proposed. The two-factor model consisted of a direct experience factor (mastery experience, social persuasions, and physiological arousal) and a vicarious experience factor. In the three-factor model, mastery experience and social persuasions constituted the personal experience factor and vicarious experience and physiological arousal represented separate factors. The four-factor model represented the structure of the sources as hypothesized by Bandura (1986). In the five-factor model, the vicarious experience items loaded on two factors, one representing modeling from peers and one from adults. In a college sample, the four-factor model best fit the data. In a high school sample, the five-factor model provided the best fit, leading the authors to conclude that high school students may differentiate more between peer and adult influences than do college students. Interfactor correlations between mastery experience, social persuasions, and physiological arousal ranged from .66 to .92.

Exploratory factor analysis has been used to assess the latent structure of sources items adapted from Lent et al. (1991) for use with younger students. In one study, a five-factor model in which vicarious experience was separated into a peer factor and an adult factor also best represented the sources of self-efficacy for middle school students (Usher & Pajares, 2006b). Recall that low reliability of the vicarious experience from peers items did not support a valid measure of this source. Britner and Pajares (2006) also examined the factorial structure of the adapted sources items and reported that a four-factor model best fit the data in their sample of middle school science students.

Stevens et al. (2006) used a CFA measurement model to determine whether the aggregate scores from sources subscale items supported a latent factor representing the sources of mathematics self-efficacy. As a result of poor fit, the measurement model was revised such that only the combination of mastery experience, vicarious experience, and social persuasions formed the sources factor. Items assessing anxiety factor analyzed separately and with negative valence mathematics interest items to form a latent factor labeled *emotional feedback.* The negative wording in these items may likely have led to what Marsh (1996) referred to as "artifactors" blurring conceptual and theoretical distinctions in the variables. Moreover, likely because items were parceled, the researchers did not provide item-specific information for any of the 18 items used to assess the sources. When the factor structure of variables is unknown, particularly when the factor structure is multidimensional, as is likely the case with the sources, parceling items in this manner may result in a misspecified factor solution or in estimation bias (Bandalos, 2002).

The limitations noted in the current and previous sections point to the need for researchers to develop more thorough measures that assess the multidimensionality of the hypothesized sources of self-efficacy. Factor analytic results and the consistently low reliability of scores on the vicarious experience subscales reported across studies suggest that measures used to assess this source have been inadequate. Furthermore, some researchers have not provided information about the construct validity of the sources items they have used, and in some cases, there has

been little correspondence between the actual items used and the theorized sources. As we discuss below, findings from such studies can offer few insights about the development of academic self-efficacy.

Qualitative Studies

Researchers have used a variety of qualitative methods to assess how students form their academic confidence, the most popular of which has been the use of interviews. A list of sample questions included in qualitative protocols is provided in Table 2. Because few qualitative investigations have been conducted with students, we also provide sample questions used in two studies of teacher self-efficacy (i.e., Milner & Woolfolk Hoy, 2003; Palmer, 2006). Some researchers have offered participants questions that address each specific source. For example, Zeldin and Pajares (2000) asked women how pursuing careers in mathematics, science, and technology made them feel (physiological arousal); what others said to them about their career pursuits (social persuasions); and what experiences prompted their pursuits in these careers (mastery and vicarious experiences). Unlike self-report items that fail to capture the development of an individual's academic self-perceptions, a semistructured interview format invites participants to elaborate on those experiences that have been most salient to them over time.

Some researchers have employed less traditional methods. Lent, Brown, et al. (1996) asked college undergraduates to report their self-efficacy to make a grade of B or higher in five typical college mathematics courses. After rating their self-efficacy, students were asked to rank order the factors they considered when judging their mathematics capabilities. Responses were then categorized and the frequencies of efficacy-relevant information tabulated. Borrowing this framework, Hutchison et al. (2006) asked first-year college engineering students to list the factors that contributed to their beliefs that they could succeed in an introductory engineering course.

Contrary to typical theory-driven approaches, these thought-listing methods leave responses open-ended. Students are asked to recall the reasons for their efficacy judgments without any guidance from researchers. But measuring the sources solely by tapping individuals' recollections offers a limited perspective on the actual information students use when judging their self-efficacy. This is because, when recalling the influences on their self-efficacy beliefs, individuals can underestimate critical factors and overestimate factors that actually had modest or even little influence. Participants in thought-listing analyses are likely to have difficulty rendering judgments of their capabilities in courses they might face in some hypothetical future.

Analyses of the Sources of Self-Efficacy

Researchers have employed a number of analytic techniques to investigate the sources of self-efficacy, their correlates, their causal influence, their multidimensionality, and the contextual factors that may moderate them. In this section, we describe the ways in which they have analyzed the sources. We first focus on commonly used correlational approaches and then turn to more sophisticated structural models that have been used. We also briefly review an experimental study in which the sources were manipulated and their effects measured. Finally, we describe the analytic approaches used in qualitative research.

TABLE 2
Sample items from qualitative studies of the sources of self-efficacy

Think about the things you considered in making your confidence ratings on the previous page. Write down everything that comes to mind. Go back and rank order [your] entries in terms of how *important* each factor you mentioned was in influencing your confidence ratings. (Hutchison, Follman, Sumpter, & Bodner, 2006; Lent, Brown, Gover, & Nijjer, 1996)
Tell me one memorable story that would really help me understand how you came to do what you do. (Pajares & Zeldin, 1999)
What experiences contributed to your decision to pursue your occupation? (Zeldin & Pajares, 2000)
What did people say to you as you were pursuing mathematics? (Zeldin & Pajares, 2000)
How did pursuing mathematics make you feel? (Zeldin & Pajares, 2000)
How [has your] self-efficacy for teaching evolved over the years? (Milner & Woolfolk Hoy, 2003)
What was it like to be one of three African American teachers at this school? (Milner & Woolfolk Hoy, 2003)
What sources contributed most to [your] sense of efficacy? (Milner & Woolfolk Hoy, 2003)
What sources undermined [your] sense of efficacy? (Milner & Woolfolk Hoy, 2003)
Write something that stands out as being a useful or valuable aspect of the course in giving you more confidence to teach science. (Palmer, 2006)

Although Bandura (1986, 1997) theorized that the sources exercise a causal influence on self-efficacy beliefs, most studies have been correlational and conducted at one time point. Nonetheless, when discussing findings researchers typically infer the causality that Bandura posited. In most statistical models, the four hypothesized sources are the only independent variables predicting self-efficacy (Britner & Pajares, 2006; Hampton, 1998; Klassen, 2004; Matsui et al., 1990; Usher & Pajares, 2006b). Some researchers have included a quadratic term for physiological arousal to examine whether this source may be curvilinearly related to self-efficacy (Usher & Pajares, 2006a, 2006b). Others have included covariates such as ability when investigating the relationships between the sources and self-efficacy (Gainor & Lent, 1998; Lent et al., 1991; Lopez et al., 1997; Lopez & Lent, 1992; Stevens et al., 2006). Including a previous ability score as a covariate reduces the predictive utility of the sources and of mastery experience in particular, as this source tends to be highly correlated with academic performance indexes.

Some researchers have created stepwise or hierarchical regression models in which the sources are entered according to what the researchers refer to as their order of "relative potency" (Hampton, 1998; Lent et al., 1991; Lopez & Lent, 1992; Matsui et al., 1990). In such cases, mastery experience is entered first, with vicarious experience, social persuasions, and physiological state following, in that order. This methodological choice is made even when the magnitudes of the correlations between the sources do not match this presumed order. Entering variables in that order into a multiple regression model has no theoretical support. Although Bandura (1997) contended that interpreted mastery experience is typically the most powerful source of efficacy-building information, he made no claims about the

relative contribution of the other three sources nor has he suggested that they be entered in this order in statistical models. Rather, he argued that "generalizations about the relative power of different modes of efficacy influence must be qualified by the sway of interacting influences" (p. 88). Information from one source can alter the effects of any other source. Problematic methodological practices have made it difficult to sift out the independent contribution that each source makes to the prediction of self-efficacy and have worked to ensure that mastery experience takes up the lion's share of the variance.

Path models have also been created (Johnson, 2005; Lopez et al., 1997). Gainor and Lent (1998) tested one in which mathematics ability and the four sources predicted students' mathematics self-efficacy and outcome expectations, which in turn predicted interest, enrollment intentions, and major choice. Hampton and Mason (2003) used structural equation modeling (SEM) to investigate the effects of gender and learning disability status on the sources, learning self-efficacy, and achievement. The sources were represented in the model as an aggregate score of the four sources subscales, thus the specific contribution of each source was not obtained. In a similar SEM analysis conducted with high school students, one variable representing the combined influence of mastery experience and social persuasions and another representing physiological arousal reflected a latent sources variable that, in turn, was used to predict mathematics self-efficacy (Özyürek, 2005).

Such a configuration appeared in a similar analysis in which combined scores from mastery experience, vicarious experience, and social persuasions formed a single factor predicting the mathematics self-efficacy of students in Grades 4 through 12 (Stevens et al., 2006). Anxiety was included as a separate predictor of self-efficacy in the structural model. This analysis was performed despite an ill-fitting measurement model. A similar model was later used to investigate the sources of middle school students' self-efficacy (Stevens, Wang, Olivárez, & Hamman, 2007). One notable shortfall with these methods is that sound underlying measures of the sources have not yet been established. Byrne (2006) warned that the "application of CFA [including structural modeling] procedures to assessment instruments still in the initial stages of development represents a serious misuse of this analytic strategy" (p. 119). And, as mentioned earlier, results from studies that have used an aggregate score from two or more sources yield little practical information, as combining sources prevents an understanding of how students interpret each source independently.

Experimental designs have also been used. In their examination of the factors influencing the mathematics and science efficacy beliefs of college freshman, Luzzo, Hasper, Albert, Bibby, and Martinelli (1999) provided students with a mastery experience and/or vicarious experience. Students in the mastery experience condition were asked to solve a mathematics numbers series task; students in the vicarious experience treatment condition watched a video of two recent university graduates who pursued math and science majors and careers. Analysis of covariance was used to determine treatment and control group differences in self-efficacy when controlling for pretreatment measures of interest, self-efficacy, career aspirations, major, and perceptions of math/science relatedness. In this case, only two of the four sources were manipulated, and only the mastery experience intervention proved to alter students' self-efficacy.

In their qualitative analysis of the sources, Zeldin and her colleagues employed a cross-case analytic approach to examine interview transcripts of the men and women in their studies (Pajares, 1994; Pajares & Zeldin, 1999; Zeldin, Britner, & Pajares, in press; Zeldin & Pajares, 2000). They followed guidelines set forth by Miles and Huberman (1994) by developing start codes from which pattern codes were derived to represent the data. Hutchison et al. (2006) used a phenomenographical focus to examine results from their thought-listing analysis, which permitted students to express varying perceptions of the factors influencing their confidence to succeed in an entry-level engineering class. A similar analytic procedure was used by Lent, Brown et al. (1996). Despite these initial efforts, qualitative studies have been limited to college-aged and adult participants, and none have addressed the developing efficacy beliefs of students in elementary, middle, or high school.

Findings in Studies of the Sources of Self-Efficacy

Table 3 presents a synthesis of key findings from studies of the sources of academic self-efficacy included in this review. Before we report these findings, a caution is in order. As self-efficacy theorists have pointed out, self-efficacy's explanatory and predictive power diminishes when these self-beliefs are assessed at broad levels of specificity and when they do not correspond faithfully with the outcome with which they are compared (Bandura, 1997; Pajares, 1997). The sources of self-efficacy also function best at appropriate levels of specificity, and when they correspond with the self-efficacy outcome they are designed to predict. It makes little sense, for example, to compare the sources of general academic self-efficacy with students' mathematics-specific efficacy judgments. Similarly, assessing the sources at too general a domain level would offer little help in predicting students' subject-specific self-efficacy. Bandura (1997) argued that "the weights assigned to different types of efficacy information may vary across different domains of functioning" (p. 114). A student praised as a writer may receive no praise for her mathematics capabilities. Consequently, asking students to report how often they receive praise for their school work in general may reveal little about their beliefs in their capabilities in a specific academic domain.

In some studies, the sources assessed do not correspond with the self-efficacy measure with which they are compared, which serves to confound results. A number of factors have contributed to this lack of correspondence. Studies that have used too few items to assess each source fail to capture its multidimensional nature (e.g., Panagos & DuBois, 1999). As we have described elsewhere, researchers have also used measures that do not faithfully reflect the complex hypothesized nature of the sources. In some cases, researchers neither provide sample items nor carefully describe newly created scales, making it difficult to discern whether guidelines regarding specificity and correspondence were followed (e.g., Bates & Khasawneh, 2007; Özyürek, 2005; Stevens et al., 2006). Others measure only two or three of the sources (e.g., Bates & Khasawneh, 2007; Chin & Kameoka, 2002; Johnson, 2005) or do not include a measure of self-efficacy in their investigation (Smith, 2001). Findings from such studies must be interpreted with these limitations in mind.

As Bandura (1997) hypothesized, mastery experience consistently emerges in empirical studies as the most powerful source of self-efficacy across domains. There are, however, variations both in the relations between the sources themselves and in their predictive utility, particularly as a function of contextual factors such

(text continued on p. 772)

TABLE 3
Review of findings from investigations of the sources of self-efficacy

Authors	Participants	Correlates	Relevant findings
Matsui et al. (1990)	163 Japanese undergraduates	Math self-efficacy, locus of control	Mastery experience, vicarious experience, and physiological indexes predicted self-efficacy. Gender: No mean differences in the sources.
Lent et al. (1991)	138 Undergraduates	Math self-efficacy, math ACT scores, gender	Mastery experience and ACT score predicted self-efficacy. Gender: No difference in strength of relationship between the sources and self-efficacy.
Lopez and Lent (1992)	50 High school algebra students	Math self-efficacy, academic self-concept, interest, perceived usefulness of math, math grade	Mastery experience, physiological indexes, and semester grades predicted self-efficacy. Gender: Girls had stronger social persuasions.
Pajares (1994)	4 Undergraduates	Writing self-efficacy, writing ability, invitations	Social persuasions influenced the development of self-efficacy. Invitations created and increased self-efficacy; disinvitations destroyed or diminished it.
Lent, Brown et al. (1996)	103 Undergraduates	Math self-efficacy, career aspirations	Mastery experience was the most often cited basis for self-efficacy. No one reported that social persuasions enhanced self-efficacy. Mastery experience and interest listed as most influential sources of self-efficacy. Gender: Women had stronger physiological reactions. No differences in how influential students considered each source.

(continued)

TABLE 3 (continued)

Authors	Participants	Correlates	Relevant findings
Lent, Lopez et al. (1996)	Study 1: 295 undergraduates	Math self-efficacy	Four-factor model fit the data best. Gender: Men had stronger mastery experiences and weaker aversive physiological indexes. No gender differences in the relationship between the sources and self-efficacy.
	Study 2: 481 high school students	Math self-efficacy	A five-factor model, in which vicarious experiences from peers and from adults were separate factors, fit the data best. Gender: Girls had stronger vicarious experiences and social persuasions. No gender differences in the relationship between the sources and self-efficacy.
Lopez et al. (1997)	151 High school geometry students 145 Advanced algebra students	Math self-efficacy, Stanford achievement scores, outcome expectations, interest, course grade	Mastery experience, not objective ability, predicted self-efficacy in both groups. Social persuasions predicted self-efficacy of algebra students. Gender: Girls in algebra had stronger vicarious experience and social persuasions.
Gainor and Lent (1998)	164 Black undergraduates	SAT reasoning, outcome expectations, math interests, math enrollment and choice intentions, racial identity attitudes	Math SAT scores, social persuasions, and physiological indexes predicted math self-efficacy; mastery experience and vicarious experience did not.

(continued)

TABLE 3 (continued)

Authors	Participants	Correlates	Relevant findings
Hampton (1998)	Study 1: 146 high school students (59 LD, 87 non-LD)	Lent et al.'s (1991) sources of math self-efficacy, self-esteem, locus of control	Positive (.41 to .53) correlations between all sources. Ability: Learning disabled students had stronger mastery experience, vicarious experience, and social persuasions and weaker negative physiological indexes.
	Study 2: 50 LD high school students	Self-efficacy for self-regulated learning	Mastery and vicarious experience predicted self-efficacy for self-regulated learning.
Luzzo et al. (1999)	94 Undergraduates	Math/science ACT scores, math/science self-efficacy (3 measures), career interests, career aspirations	Mastery experience treatment significantly contributed to gains in self-efficacy; vicarious experience treatment did not alter self-efficacy. Social persuasions and physiological indexes not measured. No gender differences were found in any of the variables.
Pajares and Zeldin (1999)	15 Women who have careers in math, science, or technology		Invitations and verbal persuasions were instrumental sources of self-efficacy. Invitations from others reemerged as self-invitations that enhanced self-efficacy.
Panagos and DuBois (1999)	96 LD high school students	Career aptitude and interest, career self-efficacy, outcome expectations	Physiological indexes did not correlate with self-efficacy. None of the sources predicted career self-efficacy, but an aggregate sources score did.
Zeldin and Pajares (2000)	15 Women with careers in math, science, or technology		Verbal persuasions and vicarious experiences were critical sources of women's self-efficacy beliefs.

(continued)

TABLE 3 (continued)

Authors	Participants	Correlates	Relevant findings
Smith (2001)	210 College students		Self-efficacy was not measured in the study. Gender: Men had stronger social persuasions and lower physiological indexes, but effects were nonsignificant when ethnicity was included with gender in an ANOVA. Ethnicity: White students had stronger mastery experiences and social persuasions and lower physiological indexes.
Chin and Kameoka (2002)	107 Inner-city Hispanic students in Grades 5 and 6	Educational self-efficacy, occupational self-efficacy and expectation, neighborhood resources and safety	Previous reading score predicted educational self-efficacy. Social persuasions, assessed as peer and parental expectations, predicted occupational self-efficacy. Vicarious experience, assessed as family educational and occupational attainment, not predictive. Physiological indexes not measured.
Hampton and Mason (2003)	278 High school students (128 LD, 150 non-LD)	Self-efficacy for self-regulated learning, math, and English semester grades	The sources collectively predicted self-efficacy; no individual analysis conducted to assess the contribution of each source. Gender: Boys had stronger mastery. Ability: Students with LD had stronger mastery, vicarious experience, and social persuasions and weaker physiological indexes.

(continued)

TABLE 3 (continued)

Authors	Participants	Correlates	Relevant findings
Klassen (2004)	270 Students in Grade 7 (112 Anglo-Canadian, 158 Indo-Canadian)	Math self-efficacy, math self-concept, fear of failure, perceived parental value of academics, father's level of education, math performance	For Anglo-Canadians, past performance and physiological indexes predicted self-efficacy. For Indo-Canadians, all four sources were predictive. Gender: No mean differences. Ethnicity: Indo-Canadian students had stronger vicarious experience and social persuasions.
Özyürek (2005)	292 Turkish high school students with science focus	Self-efficacy for being selected to nonpopular and popular majors, math self-efficacy, interest, math opinions, math course preferences	Mastery experience and social persuasions scores combined because of high correlation. Mastery experience/social persuasions and physiological indexes predicted a latent source variable, which in turn predicted self-efficacy. Vicarious experience was not predictive of the latent source variable.
Britner and Pajares (2006)	319 Students in Grades 5 to 8	Science grade self-efficacy, science self-concept, self-efficacy for self-regulation, science achievement	Only mastery experience predicted self-efficacy. Gender: Boys had stronger mastery experiences and weaker physiological indexes.
Hutchison et al. (2006)	436 First-year college engineering students	Engineering self-efficacy	Understanding/learning course material, drive and motivation, and teaming were reported most frequently and ranked highest as sources of self-efficacy.

(continued)

TABLE 3 (continued)

Authors	Participants	Correlates	Relevant findings
			Gender: Women reported more often than men that an understanding of course material and the availability of help were key sources of self-efficacy.
Stevens et al. (2006)	666 Students in Grades 4 to 12	Math problem-solving self-efficacy, intrinsic motivation, interest, self-reported math grades, general mental ability, standardized math achievement	Mastery experience, vicarious experience, and social persuasions collectively predicted self-efficacy. No individual analysis was conducted to assess the contribution of each of these three sources. Anxiety also predicted self-efficacy. Ethnicity: White students reported stronger mastery experiences, social persuasions, and anxiety than did Hispanic students. Hispanic students reported more vicarious experiences than did White students.
Usher and Pajares (2006a)	468 Students in Grade 6	Academic and self-regulatory self-efficacy, invitations of self and others, academic achievement	Invitations, mastery experience, and physiological state predicted the efficacy beliefs of boys and of girls. Social persuasions also predicted girls' self-efficacy. Invitations, mastery experience, and social persuasions predicted the self-efficacy of African American students. Invitations and the four sources predicted self-efficacy for White students.
Usher and Pajares (2006b)	263 Students in Grade 6	Academic self-efficacy, self-efficacy for self-regulation, academic achievement	Mastery experience, social persuasions, and physiological indexes predicted academic self-efficacy; all four sources predicted self-efficacy for self-regulation.

(continued)

TABLE 3 (continued)

Authors	Participants	Correlates	Relevant findings
			Gender: Girls had stronger vicarious experiences and social persuasions. Mastery experience and social persuasions predicted boys' and girls' self-efficacy; physiological indexes also predicted boys' self-efficacy. Ethnicity: African American students had stronger physiological indexes. Mastery experience and social persuasions predicted academic self-efficacy of African American students; mastery experience and physiological indexes predicted academic and self-regulatory self-efficacy of White students.
Bates and Khasawneh (2007)	288 University students (66% undergraduate; 33% graduate)	Online learning self-efficacy, outcome expectations, fixed/acquired ability, perceptions of initial course training	Past mastery experiences with online learning and anxiety were positive predictors of self-efficacy. Quality of instructor feedback (used as a proxy for social persuasion) was a negative predictor of self-efficacy. Vicarious experience was not assessed.
Pajares, Johnson, and Usher (2007)	1,256 Students (296 elementary, 497 middle, 463 high)	Writing self-efficacy, writing competence	Mastery experience accounted for the greatest proportion of variance in self-efficacy. Social persuasion and physiological indexes also predicted self-efficacy. Gender: No difference in the relationship between the sources and self-efficacy.

(continued)

TABLE 3 (continued)

Authors	Participants	Correlates	Relevant findings
			Academic level: Mastery experience and physiological indexes predicted self-efficacy of elementary and middle school students; mastery and social persuasions predicted self-efficacy of high school students.
Stevens et al. (2007)	438 Students in Grades 8 and 9	Future math course enrollment intentions, math self-efficacy, math interest, standardized math achievement	In a structural equation model, mastery experience, vicarious experience, and social persuasions were combined to account for 18% of the variance in self-efficacy for boys, 15% for girls. Gender: No mean differences in boys' and girls' reported mastery experience, vicarious experience, or social persuasion. Physiological indexes were not assessed.
Zeldin et al. (in press)	10 Men with careers in math, science, or technology		Personal accomplishments, natural ability, or talents served as sources of men's self-efficacy. Modeling and verbal messages were described as informative but not persuasory to men's efficacy judgments.

Note. LD = learning disability.

as group membership. We now outline key findings and highlight the role that contextual variation has played in influencing how efficacy information is weighed and interpreted.

Relationship Between the Sources and Self-Efficacy

A mastery experience is the most influential source of the information that students use to create and develop their self-efficacy beliefs because this experience contains the most authentic evidence as to whether students can master subsequent tasks in related domains. Students' reported mastery experiences consistently predict their self-efficacy across domains (Britner & Pajares, 2006; Hampton, 1998; Klassen, 2004; Lent et al., 1991; Lopez & Lent, 1992; Lopez et al., 1997; Pajares et al., 2007; Usher & Pajares, 2006a, 2006b). Table 4 shows correlations obtained between each of the sources and the self-efficacy outcomes used in studies reviewed here. For mastery experience, correlations range from .29 to .67 (median $r = .58$). Unlike with any other source, correlations between mastery experience and self-efficacy are significant in every investigation.

Mastery experience consistently predicts self-efficacy in regression analyses in which researchers have tested the simultaneous predictive utility of each of the four sources. Only in one study did mastery experience not predict self-efficacy (Gainor & Lent, 1998). In this study of the mathematics beliefs of Black undergraduates, mastery experience was highly correlated with social persuasions ($r = .70$), which were predictive of self-efficacy and thus likely tapped into the same source of variance as mastery experience.

Correlations between vicarious experience and self-efficacy have been inconsistent, ranging from .09 to .58 (median $r = .34$), with lower values emerging from several studies (Lent et al., 1991; Lopez & Lent, 1992; Matsui et al., 1990; Stevens et al., 2007). This is not surprising given the low alpha reliabilities (typically in the .50s and .60s) reported for items used in these studies. In some studies, vicarious experience does not predict self-efficacy in multiple regression models that include the other sources (Gainor & Lent, 1998; Lent et al., 1991; Pajares et al., 2007; Usher & Pajares, 2006b). Indeed, this source is the least likely to predict self-efficacy across studies, reflecting the difficulty researchers have had creating an adequate measure with which to assess it.

Some investigators have reported a significant relationship between vicarious experience and self-efficacy for specific groups of students, including those with learning disabilities (Hampton, 1998) and of Indo-Canadian descent (Klassen, 2004). This source also predicted the academic and self-regulatory self-efficacy beliefs of Grade 6 boys and of students who were placed above grade level in reading (Usher & Pajares, 2006b) and of the academic self-efficacy beliefs of White, but not of Black, middle school students (Usher & Pajares, 2006a). In a qualitative investigation, women successful in mathematical, scientific, and technological careers reported that exposure to competent models fostered their belief in their own capabilities to pursue careers in those fields (Zeldin & Pajares, 2000). It seems clear that these contextual factors in part mediate the influence of vicarious experiences on self-efficacy. Less clear is whether these factors are specific to a given sample or to the particular sources measures used in each study.

Correlations between social persuasions and self-efficacy have ranged from −.05 to .62 (median $r = .39$). Only four nonsignificant correlations ($r = -.05$,

TABLE 4
Correlations between the sources and self-efficacy assessments

Study	Self-efficacy measure	Mastery experience	Vicarious experience	Social persuasions	Physiological indexes
Matsui et al. (1990)[a]	Mathematics	.42*	.19	.37*	−.27*
		.56*	.39*	.57*	−.47*
Lent et al. (1991)[a]	Mathematics	.59*	.10	.52*	−.46*
		.67*	.23*	.57*	−.53*
Lopez and Lent (1992)	Mathematics	.57*	.26	.34*	−.23
Lopez et al. (1997)[b]	Mathematics	.64*	.41*	.58*	−.57*
		.63*	.19*	.35*	−.57*
Gainor and Lent (1998)	Mathematics	.58*	.28*	.58*	−.57*
Hampton (1998)—Study 1	For learning	nr	nr	nr	nr
Hampton (1998)—Study 2	For learning	.58*	.53*	.16	.19
Panagos and DuBois (1999)	Career	.38*	.34*	.36*	−.09
Chin and Kameoka (2002)	Educational and occupational	nr	nr	nr	nr
Hampton and Mason (2003)[c]	For tasks in classroom	.55*	.40*	.21	.20
		.66*	.58*	.29*	.25*
		.50*	.58*	.30*	.41*
		.67*	.47*	.44*	.18
Hampton and Mason (2003)[c]	For organizing school related activities	.46*	.31*	.10	−.08
		.64*	.53*	.25*	.08
		.29*	.39*	.32*	.25*
		.62*	.43*	.41*	.12
Klassen (2004)[d]	Mathematics	.36*	.27*	.22*	−.17*
		.44*	.28*	.23*	−.33*

(continued)

TABLE 4 (continued)

Study	Self-efficacy measure	Mastery experience	Vicarious experience	Social persuasions	Physiological indexes
Johnson (2005)	Computer	.38*	nr	nr	−.26*
Britner and Pajares (2006)	Science	.55*	.34*	.42*	−.40*
Stevens et al. (2006)	Mathematics	.46*	.15*	.36*	.23*
Usher and Pajares (2006a)[e]	Academic and self-regulatory	.67*	.36*	.62*	−.53*
		.60*	.45*	.50*	−.27*
		.66*	.29*	.53*	−34*
		.59*	.40*	.53*	−.43*
Usher and Pajares (2006b)	Academic	.57*	.39*	.45*	−.39*
Usher and Pajares (2006b)	Self-regulatory	.63*	.44*	.51*	−.44*
Bates and Khasawneh (2007)	Online learning	.48*	nr	−.05	−.56*
Pajares et al. (2007)	Writing	.61*	.22*	.44*	−.35*
Stevens et al. (2007)[a]	Mathematics	.44*	.15*	.23*	nr
		.39*	.09	.31*	nr
Median correlation		.58	.34	.37	.33

Note. Sign of each correlation is reported as it was in the study from which it was obtained. Median correlations were calculated using absolute values. nr = correlation not reported and/or not measured; LD = learning disability.

a. Coefficients for girls are reported above those for boys.

b. Coefficients for students in advanced algebra are reported above those for students in geometry.

c. Coefficients from top to bottom are: LD girls, non-LD girls, LD boys, and non-LD boys.

d. Coefficients for Indo-Canadian students are reported above those for Anglo-Canadian students.

e. Coefficients from top to bottom are: girls, boys, African American students, and White students.

*$p < .05$.

.10, .16, and .21) have been reported, each of which can be explained by the measures used. Bates and Khasawneh (2007) used as a proxy for social persuasions students' descriptions of whether their course instructors provided them with prompt and regular feedback about their performance using online technology. Although the specific items used to assess this source were not provided, the variable measured does not appear to have included the evaluative component of social persuasions hypothesized. The other low correlations (Hampton, 1998; Hampton & Mason, 2003) can be explained by the items used in the investigations. More than half asked students to rate how often teachers or parents encouraged them to engage in self-regulatory learning behaviors (e.g., "My teachers encouraged me to listen carefully in class," "My parents encouraged me to memorized what had been taught in class"; see Hampton, 1998). Recall that the hypothesized nature of this source is such that the *evaluative feedback* of others is a critical component. One would expect little correlation between a teacher's or parent's plea for a student to listen in class and a student's sense of competence in that class.

Despite consistent correlations with self-efficacy, when included in regression analysis with the other sources, social persuasions have not proven predictive of self-efficacy across all contexts. Lopez et al. (1997) found that social persuasions predicted mathematics self-efficacy for students in advanced algebra but not for those in geometry. Social persuasions have predicted the academic and self-regulatory efficacy beliefs (Usher & Pajares, 2006a, 2006b) but not the writing efficacy beliefs of middle school students (Pajares et al., 2007).

Correlations between the variable used to measure emotional and physiological state have ranged from −.08 to −.57 (median $r = .33$). Results from studies in which the relationship is not significant (Hampton, 1998; Hampton & Mason, 2003; Lent & Lopez, 1992; Panagos & DuBois, 1999) should be interpreted with caution given the nature of the samples and measures used. Participants in three of the four studies were students with a learning disability, and in all cases participants numbered less than 100 (i.e., Hampton, 1998; Hampton & Mason, 2003; Panagos & DuBois, 1999). In one study, a single item was used to assess this source (Panagos & DuBois, 1999). Physiological state has been found to negatively predict self-efficacy in mathematics, writing, computer science, and in general academics (e.g., Johnson, 2005; Klassen, 2004; Pajares et al., 2007; Usher & Pajares, 2006a, 2006b).

Relationship Between the Sources

Significant correlations between the sources are typically obtained, which is not surprising given the agentic bonds between them (see Table 5). A student who writes an excellent essay will likely earn top marks, receive praise from others, and experience positive feelings toward writing. Excellent writers are also influenced by models proficient at writing. As a consequence, such students will likely approach the task of composition with a strong sense of efficacy gained from the combined effects of the information these sources provide. Mastery experience correlates with vicarious experience (median $r = .42$), social persuasions (median $r = .63$), and physiological state (median $r = .59$). The correlations between mastery experience and social persuasions—greater than .60 in more than half of the studies—warrant attention, as it may be that items do not sufficiently differentiate between these constructs. Some researchers have handled such high correlations

by combining items into one variable (Özyürek, 2005), a problematic practice that yields no useful information about either source.

In a few cases, significant correlations have not been obtained. Matsui et al. (1990) reported a nonsignificant correlation of .19 between mastery experience and vicarious experience, but mastery was problematically operationalized as previous semester grades, and the sample size ($N = 97$) curtailed statistical power. Hampton and Mason (2003) similarly obtained nonsignificant correlations between the mastery experience and social persuasions of girls with no learning disability ($r = .18$), as well as between mastery and physiological indexes of boys with no learning disability ($r = .24$) and girls with learning disability ($r = .19$). Group sizes were not provided, but it seemed clear that there were approximately 30 to 70 students in each group and the social persuasions items were inconsistent with the hypothesized nature of this source. In some cases, items used to assess physiological state have failed to correlate with vicarious experience (Hampton & Mason, 2003; Panagos & DuBois, 1999; Usher & Pajares, 2006a), likely a result of the problematic nature of the vicarious scales used (recall that scores on these subscales consistently demonstrated low internal consistency). In some cases, physiological state has not correlated with social persuasions (Bates & Khasawneh, 2007; Hampton & Mason, 2003; Smith, 2001). As we have explained, problematic measures of social persuasions that stray from the hypothesized conceptualization have likely led to such low estimates.

Group and Domain Differences

In this section, we offer a critical summary of findings from studies that have investigated the sources of self-efficacy as a function of variables such as gender, ethnicity, or academic level, as well as by academic domain. As these findings and those reported above suggest, group differences and other contextual factors play a part in determining how students come to perceive their scholastic capabilities.

Researchers have investigated whether the relationship between the sources and self-efficacy differs as a function of gender and/or whether the reported strength of a particular source differs for male and female students. On the first point, most researchers have reported no gender differences in the strength of the relationship between the sources and self-efficacy (Britner & Pajares, 2006; Lent et al., 1991; Lent, Lopez, et al., 1996; Pajares et al., 2007). As regards the mean strength of the sources, some have detected no gender differences (Klassen, 2004; Matsui et al., 1990; Stevens et al., 2007). When gender differences in the reported strength of the sources are found, there is evidence to suggest that they may be a function of the academic domain in which they are measured. For example, boys report stronger mastery experiences and lower anxiety in the areas of mathematics (Lent, Lopez et al., 1996) and science (Britner & Pajares, 2006), but girls report greater mastery experiences and lower anxiety in writing (Pajares et al., 2007). Some researchers have also detected mean differences favoring girls on social persuasions and vicarious experiences in mathematics (Lopez et al., 1997), writing (Pajares et al., 2007), and general academics (Usher & Pajares, 2006b).

These differences have also been detected qualitatively. Zeldin and Pajares (2000) asked women who excelled at careers in mathematics, science, and technology to describe the people, events, and situations that influenced their career paths. Vicarious experience and social persuasions powerfully influenced women's confidence in these male-dominated fields. The messages women received from those

TABLE 5
Intercorrelations among the sources of self-efficacy

Study	*N*	Mastery experience × Vicarious experience	Mastery experience × Social persuasions	Mastery experience × Physiological indexes	Vicarious experience × Social persuasions	Vicarious experience × Physiological indexes	Social persuasions × Physiological indexes
Matsui et al. (1990)	Women = 67	.22*	.67*	−.37*	.35*	−.29*	−.61*
	Men = 97	.19	.68*	−.41*	.42*	−.23*	−.43*
Lent et al. (1991)	Full sample = 138	.26*	.75*	.76*	.35*	.20*	.66*
Lopez and Lent (1992)	Full sample = 50	.38*	.48*	.60*	.57*	.39*	.47*
Lent, Lopez et al. (1996)	Undergraduates = 1,295	.24*	.91*	.85*	.45*	.19*	.77*
	High schoolers = 481	.50*	.85*	.92*	.71*	.47*	.66*
Lopez et al. (1997)	Girls = 145	.48*	.74*	.82*	.59*	.39*	.61*
	Boys = 151	.36*	.63*	.83*	.54*	.39*	.55*
Gainor and Lent (1998)	Full sample = 164	.45*	.70*	.72*	.48*	.44*	.58*
Hampton (1998)—Study 1	Full sample = 146	.62*	.36*	.31*	.46*	.33*	.23*
Hampton (1998)—Study 2	Full sample = 50	nr	nr	nr	nr	nr	nr
Panagos and DuBois (1999)	Full sample = 96	.58*	.70*	−.28*	.61*	−.08	−.07
Smith (2001)	Full sample = 210	.22*	.28*	−.62*	.42*	−.16*	−.09
Chin and Kameoka (2002)	Full sample = 107	nr	nr	nr	nr	nr	nr
Hampton and Mason (2003)	LD girls = nr	.31*	.34*	.24	.32*	.35*	.05
	Non-LD girls = nr	.70*	.18	.40*	.30*	.41*	.12
	LD boys = nr	.64*	.24*	.28*	.27*	.36*	.21
	Non-LD boys = nr	.55*	.53*	.19	.54*	.20	.43*

(continued)

TABLE 5 (continued)

Study	*N*	Mastery experience × Vicarious experience	Mastery experience × Social persuasions	Mastery experience × Physiological indexes	Vicarious experience × Social persuasions	Vicarious experience × Physiological indexes	Social persuasions × Physiological indexes
Klassen (2004)	Full sample = 270	nr	nr	nr	nr	nr	nr
Britner and Pajares (2006)	Full sample = 319	.63*	.73*	−.66*	.73*	−.39*	−.44*
Stevens et al. (2006)	Full sample = 666	.42*	.64*	.64*	.42*	−.28*	−.14*
Usher and Pajares (2006a)	Girls = 238	.42*	.61*	−.59*	.42*	−.27*	−.41*
	Boys = 230	.43*	.58*	−.23*	.42*	.01	−.04
	African Americans = 165	.36*	.56*	−.37*	.47*	−.09	−.21*
	Caucasians = 263	.40*	.65*	−.66*	.37*	−.10	−.19*
Usher and Pajares (2006b)	Full sample = 263	.50*	.57*	−.44*	.45*	−.20*	−.18*
Bates and Khasawneh (2007)	Full sample = 288	nr	.20*	−.62*	nr	nr	−.02
Pajares et al. (2007)	Full sample = 1,256	.33*	.62*	−.45*	.48*	−.12*	−.26*
Stevens et al. (2007)	Girls = 237	.47*	.65*	nr	.45*	nr	nr
	Boys = 201	.40*	.64*	nr	.39*	nr	nr
Median correlation		.42	.63	.59	.44	.28	.26

Note. Sign of each correlation is reported as it was in the study from which it was obtained. Median correlations were calculated using absolute values. nr = correlation not reported and/or not measured; LD = learning disability.

*$p < .05$.

whose opinions they held in high regard served as important contributors to women's personal efficacy beliefs. In a follow-up investigation, Zeldin et al. (in press) investigated the sources of men's self-efficacy beliefs in these domains and found that men relied on their personal accomplishments when describing the basis for their confidence. They spoke of their natural abilities, inclinations, or talents in mathematics, science, and technology. The modeling experiences men reported were informative to their careers, but not persuasory. Although vicarious experiences helped show men how to approach mathematics-related careers, these experiences did little to convince men of their capabilities to succeed. Men also recalled passing moments when they received support from significant others, but these persuasions did not influence their self-efficacy directly. When men did speak of their interactions with the significant people in their lives, they did so in a passive manner quite different than did the women. Other researchers reported that when they asked college students to list the sources of their confidence in higher-level mathematics and engineering, neither men nor women listed social persuasions as central (Hutchison et al., 2006; Lent, Brown, et al., 1996).

Results of some quantitative analyses support these findings. Usher and Pajares (2006b) investigated the sources of middle school students' academic self-efficacy beliefs and reported that social persuasions accounted for 17% of the variance in girls' academic self-efficacy whereas mastery experience accounted for only 4%. Social persuasions were not related to the efficacy beliefs of boys when included with the other three sources in a regression model. In a similar study, Usher and Pajares (2006a) found that, although mastery experience and physiological state predicted the academic efficacy beliefs of middle school students, only vicarious experience predicted boys' self-efficacy and only social persuasions predicted girls' self-efficacy. The authors concluded that boys may be more apt to define their developing identity in terms of their academic accomplishments whereas girls may rely more on information gained from their relationships with others. Girls' academic efficacy beliefs, they suggested, may be more strongly informed by the messages they receive from significant others than by their actual academic accomplishments. As a result of low item reliability, neither of the studies was able to address whether vicarious experience from peers was related to boys' and girls' self-efficacy.

Ethnic background may also be a factor in how students interpret the sources. Klassen (2004) found that ethnicity played a role in how Grade 7 students interpreted the sources in the area of mathematics. Indo-Canadian immigrant students reported receiving more information from vicarious influences and social persuasions than did their Anglo-Canadian peers, which, Klassen suggested, may indicate that immigrant students experience a more *other-oriented* than *self-oriented* formation of academic confidence. A regression analysis revealed that vicarious experience and social persuasions were significant predictors of the mathematics self-efficacy of Indo-Canadian students but not of their Anglo-Canadian counterparts. In another study, Mexican American students in Grades 4 through 11 reported more vicarious experiences but fewer mastery experiences and social persuasions than did their White counterparts (Stevens et al., 2006). Mexican American students also reported greater anxiety toward mathematics. Because sources information was combined into one latent factor in SEM analysis, the relationship between each source and self-efficacy was not reported.

Usher and Pajares (2006b) found that African American students reported greater physiological arousal than did their White peers. They also found that, for African American students, only mastery experience and social persuasions predicted academic self-efficacy, whereas each of the sources predicted the self-efficacy of White students (also see Usher & Pajares, 2006a). In a study of how sociocognitive factors influence Black college freshmen's mathematics-related career interests and choices, only mathematics ability, social persuasions, and physiological arousal predicted self-efficacy (Gainor & Lent, 1998). The low reliability of the vicarious experience items ($\alpha = .55$) limited the interpretability of these findings. In addition, the unusually high correlations between social persuasions, physiological sources, and self-efficacy may have led to problems of multicollinearity that likely obscured the nature of the relationship between the sources and self-efficacy. Additional research is required to investigate whether the pathways to confidence traveled by White students are similar to those traveled by African American students or by students of other ethnicities.

There is evidence that students at different levels of academic ability report different degrees and types of efficacy-building information. On average, students who have a learning disability or who are enrolled in below-level classrooms report weaker mastery experience, vicarious experience, and social persuasions, as well as higher anxiety, than do students enrolled in regular education or above-level classes (Hampton, 1998; Hampton & Mason, 2003; Usher & Pajares, 2006b). These differences are expected. Students who experience academic success typically receive more recognition from others, are exposed to more competent models, and approach their work with less anxiety than do those who struggle academically.

The relationships between the sources and self-efficacy have also been shown to differ as a function of academic ability, but methodological problems make findings difficult to interpret. Because Hampton and Mason (2003) used one variable purportedly encompassing each of the sources in their structural model investigating the effects of gender and learning disability status on the sources, learning self-efficacy, and achievement, the independent contribution of each source could not be determined. A similar aggregated sources score was used in a study of the career self-efficacy beliefs of 96 high school students diagnosed with a learning disability (Panagos & DuBois, 1999). Hierarchical regression analysis revealed that, though none of the sources proved predictive individually, their combined effect accounted for a significant portion of the variance in self-efficacy. Only one item was used to assess each source, however.

Other researchers have examined how the sources differ as a function of students' placement in their academic classes. Usher and Pajares (2006b) investigated the sources of self-efficacy of students below, at, or above level in reading. Mastery experience, vicarious experience, and physiological state each predicted the academic and self-regulatory efficacy beliefs of students reading above level; only mastery experience and social persuasions predicted the self-efficacy of on-level students. No source predicted the academic self-efficacy beliefs of the below-level students, and only physiological state predicted below-level students' self-regulatory efficacy beliefs.

Synthesis

As Bandura (1986, 1997) hypothesized, mastery experience consistently predicts students' self-efficacy across academic domains and levels. Students who interpret

their past performances as successful are likely to have their self-efficacy beliefs buttressed. Findings for the other three sources have been less consistent, typically the result of methodological problems such as poor reliability of items on a particular scale, aggregated scores that mask information from any one source, or multicollinearity between the sources. Contextual factors at work across studies partly determine how the sources have functioned in diverse academic settings. Differences in the predictive value of the sources depend on the domain in which the constructs are assessed, and both their magnitude and their relationship with self-efficacy are influenced by students' group memberships or academic ability indexes. It is yet too early to make general observations about the part played by these contextual factors, but initial findings make evident the need for future investigators to sort out the diverse forces with which students contend when forming their self-efficacy beliefs.

Directions for Future Research

In this final section, we turn our attention to future research on the sources of self-efficacy and offer suggestions that we hope will chart directions for further inquiry. We do this not only with an eye toward how researchers might better illuminate self-efficacy's developmental process but also to offer practitioners some thoughts about how they can foster and nurture students' budding self-beliefs. Though we believe the time is ripe for researchers to broaden their examination of the sources to teachers' self-efficacy beliefs and to the collective efficacy beliefs of both student and teacher groups, we limit our present recommendations to the sources of students' self-efficacy beliefs.

Refining the Measurement of the Sources

Perhaps the greatest limitation of research conducted on the sources is the manner in which they have been measured. In making this observation, we assume that researchers who endeavor to pursue this line of inquiry will do so in accordance with the tenets of Bandura's (1986) social cognitive theory. There are several reasons why the quantitative measures used thus far should be viewed as preliminary. First, there has been little consistency across studies in the items used and, consequently, in the findings reported. Interpretations of the findings from these studies should be made cautiously and with these limitations in mind. Second, low reliabilities have plagued vicarious experience items, likely because of the complex nature of this source. Third, high correlations between sources indicate a need for greater discrimination between the items used to measure them. Perhaps most important, some measures that have been used are at odds with the hypothesized nature of the sources, thus findings offer little information regarding their presumed influence. No statistical test or analysis, however sophisticated, can inform the theoretical tenets if measures and operational definitions of constructs do not accurately reflect those tenets. Below we offer directions for how quantitative measures can be altered so as to capture more fully each hypothesized source.

Bandura (1997) wisely observed that "information that is relevant for judging personal capabilities . . . is not inherently enlightening" (p. 79). More instructive, he emphasized, is how individuals cognitively process and interpret efficacy-relevant information, as this helps illuminate the developmental pathways to students' confidence. Empirical assessments that quantify the sources require scales well tuned to the cognitive appraisals students make of efficacy-building information.

As we noted in the introduction, people interpret the results of their actions and of the actions of others. Consequently, it is unwise to use actual performance measures as an assessment of mastery experience. Objective indexes mask the *meaning* that students make of their performances. Imagine two students who earn a B on an important exam. How will receiving such a grade affect a particular youngster? In and of itself, a B has no inherent meaning, and certainly no causal properties. A student accustomed to receiving As on exams in this particular class and subject and who worked hard throughout the term and studied for the exam will view the B in ways quite dissimilar from that of a student accustomed to receiving Ds and who worked equally hard. An appropriate assessment of mastery experience as a source of self-efficacy belief requires items that reflect how students make meaning of the efficacy-building information that comes their way.

As described by Bandura (1986, 1997), the interpretation of vicarious experiences is a multidimensional and highly contextualized cognitive event. For example, students are likely to adjust their confidence after watching a model succeed to the degree that they feel similar to the model. But how do children define similarity? Individuals who typically attend to models with similar attributes tend to do so according to age, gender, and ethnicity (Bandura, 1997; Fiske, 1992). Hence, a third grade African American girl is more likely to compare herself to her female African American classmates than to a White male student in an upper grade. The students whom she perceives to be similar to her will be those most likely to influence her self-efficacy judgments. It is also possible that she will attend to models who are similar to her in ability, regardless of their other attributes. Items that tap both sorts of comparisons are likely to prove more informative and valid as measures of vicarious experience.

Because there is good reason to believe that peer models serve a different role in guiding students' self-efficacy than do adult models, vicarious experience items should tease out this distinction. Harris (1995) put forth a group socialization theory of development that contends that peers, not parents or teachers, are most influential in guiding children's self-perceptions, personality, and behaviors. She argued that "children find out what kind of people they are—quick or slow, pretty or plain, leader or follower—by comparing themselves to [their peers]" (p. 473). If this is the case, the social modeling experiences to which students are exposed with their peers may prove more important to understanding the development of students' academic self-efficacy than will social modeling experiences drawn adults (see also Pinker, 2002).

It may be that the learning environments in which competition is fostered lead students to make frequent comparisons of how their ability compares with that of others. Likewise, students are differently susceptible to peer influences at different times in their lives. Adolescents are more likely to succumb to peer pressure during middle school than during high school or college (Harris, 1995). Items could also be included that tap the symbolic modeling experiences likely to be encountered by adolescents, such as the influence of models in the media, in pop culture, or in sports.

Cognitive self-modeling—visualization of one's self coping in diverse situations and under challenging circumstances—is considered one type of vicarious experience. Students can find satisfaction and confidence when they visualize themselves mastering progressively more challenging academic tasks and activities

(Bandura, 1997). This has led some to hypothesize that *imaginal experience* is a fifth source of self-efficacy altogether (Maddux, 2005). Sports psychologists have reported that the process of imaginal experience is instrumental in guiding athletes' confidence (Feltz & Lirgg, 2001). Preservice science teachers who receive practical, hands-on teaching suggestions report feeling more confident because they are better able to visualize how they might conduct similar lessons in the future (Palmer, 2006). Source measures could include items tapping the benefits that students may gain from envisioning their own academic success.

Another useful avenue of inquiry would focus on the processes through which social persuasions influence the development of self-efficacy. Bandura (1997) suggested that the influence of these persuasions "is apt to be only as strong as the recipient's confidence in the person who issues them" (p. 105), adding that the effect of persuasory messages depends on how they are framed and on how much disparity exists between what the appraiser and the student believe the student is capable of. If peers exercise a powerful influence, persuasive messages from competent peers may carry more weight during late childhood and adolescence than messages from adults. And, as with vicarious influences, the import students give to the social messages they receive from others may differ as a function of age and experience. Answers to other questions will also yield useful insights. How do students select, attend to, and recall the "persuaders" who exercise the deepest formative influence on them? What rules do students use when determining the credibility and expertise of those whose opinions they hold in such high regard? And what are the characteristics of the messages that serve to optimize self-efficacy? Designing items to tap these multifaceted dimensions will provide insights into how parents, teachers, and school practitioners can help young people develop an accurate and healthy self-view. Items asking students to rank the importance of the messages they receive should also prove informative, as would discovering how some messages become internalized and rehearsed whereas others are downplayed or soon forgotten.

In addition to the persuasions students receive from others, eliciting from students the persuasive messages they send themselves provides another dimension of this source. Although self-talk has received attention from self-efficacy researchers in areas such as athletic functioning (see Feltz & Magyar, 2006), it has scarcely been explored in the academic domain. Chase (1998) interviewed 24 elementary and middle grades students to examine the sources of their efficacy beliefs for engaging in athletic activities and reported that persuasions in the form of self-talk were vital sources of confidence. She urged teachers and coaches to help young people develop effective strategies to self-monitor their thoughts in a manner that boosts their confidence.

Physiological arousal comprises students' interpretations of their physical and emotional states, including their mood and their attentional biases to these states. Items currently used to assess students' physiological arousal have been designed to assess little more than the anxiety students experience when confronted with academic tasks. The inconsistent findings pertaining to this source are less likely a result of a nonexistent relationship between physiological state and self-efficacy than of measures that do not provide students with sufficient differentiating information relevant to this multidimensional source. More informative items would tease out the multiple physiological and somatic factors that influence students' perceptions of their academic capabilities. These might include asking students to

describe how their moods affect their academic confidence or how their feelings get in the way of or enhance their thinking. Researchers should also be attentive to how students interpret other somatic factors related to academic work, such as emotional and physical responses to task demands (see, e.g., Pekrun, 2006). In particular, gaining insight into the positive construal some students make of their physiological arousal would certainly provide an invigorating alternative to the more typical view of arousal as debilitating.

Social psychologists have suggested that an individual's tendency to ruminate in response to stressors is related to a host of negative psychological outcomes (see Nolen-Hoeksema, 2000). College students who ruminate report increased negative thinking, impaired problem solving, and lower confidence than do nonruminating students (Ward, Lyubomirsky, Sousa, & Nolen-Hoeksema, 2003). Younger students who tend to ruminate about their academic shortcomings can convince themselves that they do not possess what it takes to succeed in school, and girls may be particularly susceptible to this response style (Nolen-Hoeksema, 1994). Physiological state measures that include an assessment of students' ruminative tendencies would help capture this important dimension.

Fostering New Methods of Inquiry

New methodological techniques can be employed to investigate the complex ways in which people integrate information from multiple sources when they form their self-efficacy beliefs. Structural equation models can capture the relative weight given to each source, which of course should be included separately in a model. Studies could also investigate the theoretical contention that the sources can operate additively, such that the more indicants of one's efficacy there are, the more the corresponding efficacy belief is altered. Investigating the interactive effects of two or more sources could also prove new insights.

Qualitative investigations hold great promise for providing a rich understanding of the genesis of students' self-efficacy beliefs, as they have the potential to describe the heuristic techniques students use to attend to, weigh, and appraise the degree of influence the sources have on their self-efficacy. As Bandura (1997) noted, "the inferential processes that govern the self-appraisal of efficacy are better elucidated by analyzing how people select and integrate multidimensional efficacy information than by having them rate the relative weight they give to a few preselected factors" (p. 84). Qualitative inquiry provides a phenomenological lens through which the development of efficacy beliefs can be viewed, and it can capture the personal, social, situational, and temporal conditions under which students cognitively process and appraise their beliefs and experiences.

We can all call to mind people who excel in a particular academic domain but whose lack of confidence hinders their success. Despite succeeding and receiving encouragement from others, such individuals continue to harbor self-doubts about their capabilities. Other individuals continue to believe in their own capabilities even in the face of failure and discouragement. Qualitative approaches such as grounded theory, ethnography, classroom observations, interview techniques, and case studies, particularly when conducted over time, would offer new perspectives about the low or high self-efficacy beliefs students come to hold. How, we might ask, does adversity affect youngsters differently, such that one student's self-efficacy recovers and the other's wears thin? Gardner (1997) observed that one indicator of

extraordinariness in individuals is the ability to frame experiences in favorable ways. He argued that "framers of experience make a positive ally out of their asynchronies and thereby advance where others might fall by the wayside" (p. 85). Qualitative investigations that demonstrate how some students manage to make positive allies out of their academic hardships may be particularly instructive.

Additional Sources of Self-Efficacy

Social cognitive theorists have suggested that psychological processes other than those initially hypothesized may be at work in the formation of self-efficacy (Bandura, 1997; Pajares, 1997; Schunk & Pajares, 2005), and discovering the nature of these processes is an important next step. One especially prominent candidate emanates from the *invitational approach* (Purkey, 2000; Purkey & Novak, 1996), which can be traced to a perceptual tradition in psychology that maintains that the beliefs people develop about themselves and about others help form the perceptual lens through which people view the world and interpret new experiences. According to this approach, the messages, or *invitations*, that people send and receive play an important role in creating self-beliefs, as they serve as filters through which individuals make meaning of their experiences (Purkey & Novak, 1996).

Pajares (1994) suggested that the tenets of self-efficacy theory and those of the invitational approach complement each other, and he provided a model showing how invitations influence self-efficacy beliefs. In their interviews of women who were successful in mathematical, scientific, and technological careers, Pajares and Zeldin (1999) found that the invitational messages that the women sent themselves about their academic capabilities were instrumental in the development and maintenance of their self-efficacy beliefs throughout adolescence and into adulthood.

In their quantitative investigation, Usher and Pajares (2006a) sought to determine whether the invitations students send serve as sources of self-efficacy. They asked students to rate how often they send and receive invitations (e.g., "I pay attention to my own needs," "I congratulate myself on my successes," "I forgive others for their mistakes," and "I am impressed with the abilities of other people"; see Valiante & Pajares, 1999, p. 36). In a regression analyses with the hypothesized sources, these invitations predicted the academic self-efficacy of each participant subgroup: boys, girls, White students, and African American students. The researchers also suggested that invitational messages serve as an additional source of self-efficacy. Invitations are typically measured at a domain-general level and may not remain predictive of self-efficacy in specific academic domains. Future studies could examine whether subject-specific invitational messages serve as a source of domain-specific self-efficacy.

Many researchers have reported the numerous benefits of maintaining an optimistic outlook (e.g., Carver & Scheier, 2005; Seligman, 1990). Social cognitive theory posits that optimistic individuals are equipped with the self-enhancing bias needed to sustain resilient efficacy beliefs in the face of difficulty. Students who believe that an academic outcome is within reach will successfully handle negative experiences because they are certain that the outcome is still attainable. Conversely, students with a realistic appraisal of their academic competencies closely calculate their odds for success and more easily fall victim to setbacks or discouragement, forsaking academic challenges that may well have been within their reach. Investigating whether a sense of academic optimism strengthens

students' beliefs in their competencies independent of the hypothesized sources would yield valuable insights. In so doing, it is important to keep in mind Bandura's (1997) caution that "the same individual may be unwaveringly optimistic in some activities but self-doubting in others" (p. 75). Hence, domain-specific measures of optimism are most appropriate.

Understanding the *explanatory or attributional style* students typically use to describe their successes and failure may also provide insights regarding the origins of efficacy beliefs. Although social cognitive theorists have pointed to the persuasive power of the attributional feedback significant others provide (Bandura, 1997; Schunk, 1984), little attention has been given to how youngsters' explanatory style influences their self-efficacy in school. Researchers have suggested that one's explanatory style is fostered by sources similar to those hypothesized to foster self-efficacy and that the style used by parents, teachers, and other caregivers to make it through life's challenges serves as a vicarious experience and social persuasion for how children should handle their own experiences (Seligman, Reivich, Jaycox, & Gillham, 1995). The explanations significant others give to youngsters about their success or failure become the ways in which youngsters explain success or failure to themselves. Frome and Eccles (1998) found that mothers' perceptions of their sixth graders' ability and effort predicted their children's self-concept of ability and expectancies for success even better than did students' past performances in mathematics. Assessing how students explain their own successes and failures may yield important information about how confident students will feel when they approach their school work.

There are no doubt other sources that contribute to the formation of academic self-efficacy beliefs. What role, for example, do the media, government, religious organizations, or the neighborhood play in nurturing students' self-efficacy? An ecological approach to investigating the sources of self-efficacy will pay heed to these multidimensional factors rather than assume that only a handful of factors operating in isolation are sufficient to explain how these important beliefs take root. Such an integrative approach promises to help tailor academic practices and policies that will foster students' academic confidence and well-being.

Investigating Transformative Experience in the Formation of Self-Efficacy

Particular moments in one's life can serve as fortuitous events in its trajectory. These *chance events*, over which people have more control than they believe, can serve to powerfully influence self-belief and action (Bandura, 1998). Seligman et al. (1995) observed that such events can change a "child's theory of who he is and what he is worth" (p. 109). Many of us can likely recall a momentous experience or event that altered the furniture of our minds in such a way that our beliefs about our capabilities changed dramatically. Pajares (see Madewell & Shaughnessy, 2003) has spoken about how these transformative experiences can alter a young person's life in profound ways and how "the actions of significant individuals—perhaps a teacher who came our way at just the right time—helped instill self-beliefs that influence the course and direction our lives take" (p. 377). Examining these transforming experiences by asking students to share pivotal self-efficacy-enhancing (or deflating) moments would lead to a better understanding of how self-efficacy is

formed and provide parents and school practitioners with information regarding potentially effective ways of interacting with the young people in their care so as to foster and nourish their self-beliefs.

Clarifying the Role Played By Gender

Research findings on gender differences in self-efficacy typically show that girls hold lower competence beliefs than do boys on tasks perceived as masculine (Meece, 1991). Boys and girls report similar confidence in their mathematics ability during the elementary years, but differences begin to emerge following children's transition to middle or junior high school (Midgley, Feldlaufer, & Eccles, 1989; Pajares, 2005). Gifted girls are especially likely to be underconfident about their mathematics capabilities (Pajares, 1996). These findings suggest that boys and girls differently interpret and use self-efficacy information.

One factor that may be responsible for gender differences in self-efficacy deals with the nature of the self-belief that may be undergirding those differences. Researchers have found that some gender differences in social, personality, and academic variables may be a function of *gender orientation*—the stereotypic beliefs about gender that students hold—rather than of gender (see Eisenberg, Martin, & Fabes, 1996). Eccles's (1987) model of educational and occupational choice postulates that cultural milieu factors such as students' gender role stereotypes are partly responsible for differences in confidence beliefs and perceived value of tasks and activities. Students typically view areas such as mathematics, science, and technology as male domains (Eisenberg et al., 1996). In these areas, a masculine orientation is associated with confidence and achievement because masculine self-perceptions are imbued with the notion that success is a masculine imperative (Eccles, 1987). Language arts is typically associated with a feminine orientation because writing is viewed by most students as a female domain. A feminine orientation is associated with motivational beliefs related to success in writing. Examining the influence of the hypothesized sources through the lens of students' gender orientation would clarify the nature of gender differences in self-efficacy.

Gender differences may also arise as a function of home, cultural, educational, and mass media influences. Developmental research shows that parents often underestimate their daughters' academic competence and hold lower expectations for daughters (Phillips & Zimmerman, 1990). Parents also act differentially with respect to mathematics and science, often portraying them as male domains (Meece & Courtney, 1992). Researchers have noted that children experience a *gender-role intensification* as they progress through adolescence, particularly as regards their achievement-related beliefs (Hill & Lynch, 1983; see also Wigfield, Eccles, & Pintrich, 1996). As girls enter junior and senior high, the perception of mathematics as a masculine domain may further weaken their interest in it. Investigating the influence of these explicit and implicit social messages on self-efficacy would help explain the manner in which girls and boys come to form their confidence in school.

Conducting Culturally Attentive Research

As is the case with educational research in general, the majority of investigations focusing on self-efficacy have used participants who are White and middle class. The cultural landscape of American schools is changing dramatically, and the

academic motivation of students is a function of their cultural, ethnic, educational, and socioeconomic backgrounds. Over a decade after Graham's (1994) admonition that educational researchers should investigate the factors influencing the academic motivation of African American youth, relatively little motivation research has been conducted with these and other students of color or national background (Fryer & Levitt, 2005).

Some researchers have observed that African American students' beliefs about themselves and about their schooling have historically profited from the persuasive messages sent to students by members of the African American community—teachers and parents in particular. Walker (2000) noted that, historically, African American schools were driven by many forms of interpersonal and institutional caring that conveyed to students that they were capable to achieve, despite the negative messages those students received in the larger world. In other words, the positive social persuasions operating at a local level may have served to immunize such students against the negative messages they received from the broader culture. Indeed, preliminary evidence suggests that African American students attend more to the social persuasions they receive than do their White counterparts. It would indeed be instructive to discover how African American students select, attend to, and recall the "persuaders" who exercise the deepest formative influence on them.

Research on *stereotype threat* suggests that when a student's social identity is tagged with a negative stereotype the student tends to underperform in a manner consistent with the stereotype (see Aronson & Steele, 2005). Less research has focused on the processes through which such stereotypes operate, particularly as regards students' self-efficacy beliefs. Individuals often assume that characteristics such as educational and socioeconomic level, race, and ethnic designation are accurate indicants of academic capabilities, even when individuals within these groups vary widely in their performance capabilities (Bandura, 1997). When young people form such preconceptions, they are likely to pay more attention to vicarious influences or to social persuasions than to information from other sources.

Some students whose social identities are attached to the negative stereotypes others hold about their academic abilities choose to "disidentify" with, or shift their self-perceptions away from, academic tasks (Steele, 1999). For these students, avoiding school work is the only way to safeguard against being seen as inferior. As Steele noted, however, "disidentification is a high price to pay for psychic comfort" (p. 46). This psychic distance could be one explanation for Graham's (1994) finding that African American students retain markedly optimistic self-beliefs "even in the wake of achievement failure" (p. 95). Another plausible explanation is that sources other than mastery experience nourish these students' academic self-efficacy. Steele (1999) has suggested that the level of trust in the learning environment plays a critical role in Black students' achievement. In our view, creating a safe psychological niche involves a better understanding of how minority students attend to the sources underlying their academic confidence. Such investigations are part of a *culturally attentive approach* to understanding the sources of students' self-efficacy beliefs (Pajares, 2007), the fruits of which will help engender culturally relevant pedagogical practices characterized by teachers who are sensitive to their students' growth and development, as well as to the needs, beliefs, interests, learning preferences, and abilities of the students in their care (Irvine, 2001).

Understanding the Development of the Sources as a Function of Age and Schooling

How students perceive their capabilities depends on their age and maturity (see Schunk & Pajares, 2002; Wigfield et al., 1996). Young children are not able to integrate efficacy-building information in terms of their collective experiences over time (Bandura, 1997). Consequently, they attend more to the most recent experience, which may bias the base from which they make efficacy judgments. They make little use of social comparative information and interpret the praise they receive for routine performances as an indicant of exceptional capability. As individuals mature physically, cognitively, and emotionally, they acquire skills that help them appraise information related to their capabilities with greater accuracy.

Most investigations of the sources of self-efficacy have focused on high school and college students, and none has examined the sources of self-efficacy longitudinally, attending to the developmental trajectories that young people follow as they interpret and evaluate their efficacy-building experiences. Transitional periods in school lead to changes in how efficacy-relevant information is weighted and interpreted. As children progress through school, evaluative school practices cause them to compare their competence and progress with that of other children (Bandura, 1997). A closer look at the transitional periods from elementary to middle school and from middle to high school would provide information regarding the manner in and the degree to which vicarious experiences or social persuasions feed the academic self-efficacy beliefs of children and of adolescents. This would include longitudinal designs that chart changes in students' sources of self-efficacy over time.

Clarifying the Generalizability of the Sources

Self-efficacy shares kinship with other competence-related motivation constructs such as academic self-concept and expectancy beliefs (Bong & Skaalvik, 2003; Pajares & Schunk, 2005). The conceptual ties between academic self-efficacy and academic self-concept suggest that some of the same sources that lead students to feel self-efficacious may be similarly responsible for nurturing a healthy academic self-view. Self-concept researchers have identified the "big fish, little pond effect," which describes how students form their academic self-beliefs in part by comparing their academic ability with the perceived abilities of other students in their reference group. Self-concept increases when one views oneself as more capable than one's peers but, conversely, diminishes when others are viewed as more capable (Marsh, 1993). Interventions aimed at lowering the competitive orientation of a classroom and school are more likely than traditional, competitive structures to increase both students' confidence and perceptions of self-worth (Moriarty, Douglas, Punch, & Hattie, 1995). Investigating whether the sources of self-efficacy serve as antecedents of related motivation constructs would reveal the degree to which the sources generalize to other self-beliefs.

Sources of Self-Efficacy in Context

Understanding the sources that create and nourish self-efficacy beliefs requires attending to factors that precede those sources. Even before students begin to interpret self-efficacy information, their *preconceptions* guide the ways in which they experience that information. As Bandura (1986) noted,

> Perceptions are guided by preconceptions. Observers' cognitive competencies and perceptual sets dispose them to look for some things but not others. Their expectations not only channel what they look for but partly affect what features they extract from observations and how they interpret what they see and hear. (p. 53)

These filters influence the sources students attend to, what they retrieve, and how they select and integrate efficacy-relevant information.

There are few things sadder to a teacher or parent than being faced with capable young people who, as a result of previous demoralizing experiences, self-imposed mind-sets, or mind-sets imposed before birth, have come to believe that they cannot succeed at a task or activity when all objective indicators show that they can. Preconceptions lead to predispositions, and much time and patience are required to overcome the predispositions toward perceived incompetence that come to imprison these young minds. A predisposition can be inborn or environmentally imposed (Bandura, 1986; Pinker, 2002). When it is the cause of environmental factors and these factors can be discovered, its influence on self-beliefs can more easily be detected and, if necessary, altered. If it is inborn, the task of redirecting it can be an imposing one.

When preconceptions and predispositions are native to the individual, conditioned existence is not determined existence. Indeed, awareness of conditioned existence is a prelude to breaking free of such conditioning. As Freire (1998) wrote, "I like to be human because in my unfinishedness I know that I am conditioned. Yet conscious of such conditioning, I know that I can go beyond it, which is the essential difference between conditioned and determined existence" (p. 26). William James (1892) forcefully contended that "our self-feeling is in our power" (p. 55). Awareness of such power prompted Bandura (1997) to declare that "people are at least partial architects of their own destinies" (p. 8). This, after all, must be the long-term aim of any investigation of the sources of self-efficacy—to help students make the best of the efficacy-relevant information that comes their way, to help them become agents of their own psychological health. Though we may be predisposed to certain outlooks, we need not be imprisoned by them. Studies of the sources of self-efficacy will be enriched by attending to students' habits of thinking—their predispositions toward viewing the world and their preconceptions about school, learning, and their academic selves.

Knowledge, competence, and various forms of self-knowledge and self-belief act in concert to provide adequate judgments and interpretations of efficacy-building information. Without considering the role that each of these factors may play in human decision making and functioning in a given context, research will always fall short of a satisfying explanation. As we have described, the rich and often complex interplay among the sources of self-efficacy and between the sources and other environmental contingencies may create situations in which any given source is neither most influential nor especially predictive of self-efficacy in a particular context or with a particular group. Some students may be frequently verbally persuaded by their teachers. If, however, their perception is that their ability is "fixed" (Dweck, 2000; Molden & Dweck, 2006), they are unlikely to reap the benefits of the persuasions. In prejudicially structured systems, even a strong sense of efficacy may not result in the expected benefits that self-confidence typically provides, which suggests that the sources will influence self-efficacy differentially in such contexts.

We began this review with the now well-established finding that self-efficacy beliefs are critical determinants of human motivation and behavior. In academic settings, they influence motivation, self-regulation, and achievement. If Bandura (1986) is correct that self-efficacy beliefs constitute the key factor of human agency, and we believe he is, investigating the genesis of these beliefs and the factors that either nurture or deteriorate them is warranted. Findings from this line of inquiry will make substantive contributions to educational theory, thinking, practice, and policy.

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