Building Self-Efficacy for Self-Efficacy Builders: A Workshop Summary

Gary Harris*  
Mathematics and Statistics  
Texas Tech University  
Lubbock, TX USA  
gary.harris@ttu.edu

Tara Stevens  
Educational Psychology  
Texas Tech University  
Lubbock, TX USA  
tara.stevens@ttu.edu

Abstract

Mathematics teacher preparation and continuing education programs in the United States (US) focus on pedagogical skills and mathematical knowledge to prepare teachers for the classroom. Although the need for such a focus is obvious, teacher training must also include knowledge of how students approach mathematical learning if teachers are going to be successful in teaching mathematics to diverse groups of students. Students’ beliefs concerning their ability to use their knowledge and skills to successfully solve mathematical problems, mathematics self-efficacy, varies with those high in self-efficacy typically outperforming those with low self-efficacy (Pajares & Kranzler, 1995). Students’ mathematics efficacy and achievement can improve when teachers provide opportunities for students to positively experience the sources of self-efficacy (Siegle & McCoach, 2007). Unfortunately, US teachers typically do not receive training in self-efficacy and, therefore, do not have a high degree of confidence in their ability to improve the self-efficacy beliefs of their students. In other words, mathematics teachers are often not efficacious efficacy builders. The purpose of the proposed workshop is to present a program that teaches teachers how to build the mathematics self-efficacy of their students through a process that also serves to build the teachers’ efficacy.

Theoretical Framework

Mathematics Self-Efficacy of Students. At first glance, mathematics self-efficacy could simply be a reflection or outcome of students’ achievement. However, empirical evidence indicates that self-efficacy is actually a predictor of achievement (Pajares & Kranzler, 1995; Stevens, Olivárez, Lan, & Tallent-Runnels., 2004), and develops from sources beyond students’ mastery experiences, including feedback from others, vicarious learning experiences, and physiological feedback. In general, self-efficacy refers to students’ beliefs that they can use their knowledge and skills successfully to succeed in specific tasks (Bandura, 1986). Bandura (1986) further described self-efficacy as domain specific, which means that self-efficacy in one academic domain, such as reading, differs from self-efficacy in another domain, such as mathematics. Self-efficacy tends to be highly predictive of academic outcomes (Bandura, 1993; Zimmerman & Bandura, 1994). This connection can be explained through the positive cognitive strategies that are encouraged when one’s self-efficacy is high. For example, students with high levels of self-efficacy tend to persist when confronted with challenging problems, likely because they believe that they can succeed in the end (Bandura, 1993). Furthermore, students high in self-efficacy tend to use more advanced cognitive strategies and perform better on exams (Pintrich & DeGroot, 1990).

Mathematics self-efficacy has been shown to mediate the relationship between students’ ability and their mathematics performance (Stevens et al., 2004). If a student’s ability is high but his/her self-efficacy is low, then his/her mathematics achievement will be lower than expected. Likewise, if a student’s ability is low but his/her self-efficacy is high, then his/her mathematics
achievement will be higher than expected. This finding reveals the importance of attending to students’ self-efficacy beliefs as they can either undermine one’s achievement or facilitate it.

Although students’ ability is not easily manipulated, self-efficacy beliefs are malleable. Self-efficacy arises from four sources, including mastery experiences, feedback, vicarious experiences, and physiological feedback (Bandura, 1986), and teachers can ensure that students have access to these sources in the mathematics classroom. After providing minimal self-efficacy training to teachers, Siegle and McCoach (2007) found that teachers did modify their instruction, which contributed to higher levels in students’ mathematics self-efficacy.

Teaching Self-Efficacy. “Teacher efficacy is the teacher’s belief in his or her capacity to organize and execute courses of action required to successfully accomplish a specific teaching task in a particular context” (Tschannen-Moran, Woolfolk Hoy, & Hoy, 1998, p. 233). Although teacher efficacy has been defined and measured with some variation over the past 30 years, research has consistently supported its positive relationship to the effective behavior and learning of students (Woolfolk & Hoy, 1990). Higher levels of teacher self-efficacy have been associated with higher students’ standardized test scores and achievement (Ross, Hogaboam-Gray, & Hannay, 2001), motivation (Midgley, Feldlaufer, & Eccles, 1989), and self-efficacy (Anderson, Greene, & Loewen, 1988).

These positive associations with student outcomes are likely due to the relationship between teacher self-efficacy and higher levels of flexibility and exploration in teaching (Allinder, 1994). Efficacious teachers demonstrate resilience when faced with classroom challenges. For example, efficacious teachers less frequently use criticism in response to student errors (Ashton & Webb, 1986) and less frequently refer struggling students for special education services (Podell & Soodak, 1993). With such important benefits, researchers have become increasingly interested in teacher self-efficacy and how it can be developed through teachers’ educational and professional experiences, and professional development specifically designed to increase teachers’ self-efficacy has been shown to be successful (Ross & Bruce, 2007; Stevens et al., 2013).

Building Self-Efficacy for Self-Efficacy Builders

Based on the aforementioned theory and research base supporting the importance of self-efficacy for both students and teachers, the Building Self-Efficacy for Self-Efficacy Builders program was developed. The program was designed to teach teachers how to facilitate the mathematics self-efficacy of their students in such a manner that would promote teachers’ successes and beliefs in their ability to support their students in this new way. This workshop presents a self-efficacy building program which focuses on the elements described below.

Self-Efficacy Defined. When the concept of self-efficacy is introduced to US teachers, they typically think of self-esteem. Therefore, the first element in the Building Self-Efficacy for Self-Efficacy Builders workshop is to clearly define self-efficacy and differentiate it from self-esteem through the presentation of examples and case studies. First, self-efficacy is a belief, whereas self-esteem is a value. Second, self-esteem is typically based on outcomes and results in positive or negative feelings concerning one’s performance. In contrast self-efficacy forms through four specific sources and relates to more accurate estimates of one’s abilities. “Self-efficacy questions are concerned with capabilities to execute specific tasks, or courses of action, the outcomes of which may or may not have any bearing on self-esteem” (Lane, Lane, & Kyprianou,
Therefore, self-efficacy tends to be a good predictor of performance, whereas self-esteem functions poorly in this role. More, Baker, & Jeffries (1995) found that not only was self-efficacy a strong predictor of academic outcomes but that the relationship between self-esteem and academic outcomes was not statistically significant. Thus, self-esteem is a consequence of academic achievement, not a requirement of it (Burr & Christensen, 1992: Young, 1993).

**Strategies for Providing the Four Sources of Efficacy.** The second element of the workshop presents specific, practical classroom strategies that promote sources of self-efficacy. The strategies in Table 1 will be presented through discussion and role playing during the workshop.

<table>
<thead>
<tr>
<th>Mastery experiences—The student succeeds in a task</th>
<th>Breaking down tasks/assignments into smaller, attainable units.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Identifying specific goals and objectives and helping students to monitor their progress.</td>
</tr>
<tr>
<td></td>
<td>Encouraging students to make self comparisons when monitoring progress.</td>
</tr>
<tr>
<td>Persuasion and feedback – the student receives specific information concerning aspects of his/her performance and understanding.</td>
<td>Using persuasion and feedback in a genuine, sincere manner.</td>
</tr>
<tr>
<td></td>
<td>Recognizing that feedback occurs within a context.</td>
</tr>
<tr>
<td></td>
<td>Avoiding the viewpoint that feedback is only a reinforcer in fact, when used as a reinforcer, it can be harmful to intrinsic.</td>
</tr>
<tr>
<td></td>
<td>Understanding that feedback that is used to praise, reward, or punish tends to be least effective. Feedback should be informational.</td>
</tr>
<tr>
<td></td>
<td>Understanding that feedback that provides information concerning a task and how to improve upon the task is most effective.</td>
</tr>
<tr>
<td></td>
<td>Understanding that feedback is most effective when focused on successful rather than unsuccessful responses.</td>
</tr>
<tr>
<td></td>
<td>Understanding that feedback works best when specific goals are set.</td>
</tr>
<tr>
<td></td>
<td>Understanding feedback is more effective when it is focused on underlying processes rather than traits.</td>
</tr>
<tr>
<td></td>
<td>Recognizing that the effectiveness of feedback various across groups (e.g., girls may prefer process praise to person praise and boys may prefer person praise to process).</td>
</tr>
<tr>
<td>Vicarious learning – students have the opportunity to learn from peers’ successes and failures.</td>
<td>Utilizing collaborative and cooperative group-work designs that emphasize personal responsibility and interdependence related to group outcomes.</td>
</tr>
<tr>
<td></td>
<td>Creating groups of students with similarities,</td>
</tr>
</tbody>
</table>
although some may be slightly further ahead in their studies.

Recognizing that the effectiveness of feedback varies across groups (e.g., girls may prefer process praise to person praise and boys may prefer person praise to process).

<table>
<thead>
<tr>
<th>Physiological feedback – the student experiences a moderate and manageable level of arousal when presented with mathematics problems.</th>
<th>Deemphasizing examinations and emphasizing learning.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deemphasizing examinations and emphasizing learning.</td>
<td>Encouraging thoughtful or “sufficient” answers rather than correct answers.</td>
</tr>
<tr>
<td>Presenting interesting tasks that maintain student attention.</td>
<td></td>
</tr>
</tbody>
</table>

### Strategies for Implementation

The third and final element of the workshop is to share an intervention plan and related materials (the program manual is provided at [http://www.wtmsmp.math.ttu.edu/](http://www.wtmsmp.math.ttu.edu/) for incorporating self-efficacy building strategies into the classroom. Much has been written concerning teachers’ resistance to implementing classroom interventions (e.g., Nastasi & Truscott, 2000), and teachers must find the program acceptable before they will make changes in their classroom practice. However, a high level of teacher acceptability does not necessarily ensure “treatment integrity” or the degree to which the intervention is implemented in the manner intended (Allen & Blackston, 2003). For example, in one study, teachers rated they were implementing the intervention 54% of the time, when independent observers recorded that the intervention was implemented as intended only 4% of the time (Wickstrom et al., 1998).

To provide teachers with the support necessary to be successful in changing their classroom practice, the Building Self-Efficacy for Self-Efficacy Builders program includes an implementation schedule that identifies a small change at each step. Teachers are also provided with specific instructions and worksheets to record their behavior so that their progress can be monitored. These worksheets provide specific examples for each strategy. Refer to Table 2 for an excerpt.

**Table 2. Implementation worksheet examples.**

<table>
<thead>
<tr>
<th>Encourage thoughtful or “sufficient” answers rather than correct ones.</th>
<th>Teacher states, “Don’t be afraid to share your answer. Even responses that aren’t exactly right can show that you are learning.”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Teacher states, “Incorrect answers give us something interesting to talk about so that we can learn.”</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Use persuasion and feedback in a genuine, sincere manner (i.e., mean what you say or avoid saying it).</th>
<th>A student earns a “B” on an assignment when she typically would have earned an “A.” The teacher wants to encourage the student to put more effort forth on the next assignment, but stops herself from saying “good job” because</th>
</tr>
</thead>
</table>
she does not mean it. Instead, the teacher focuses on the aspect of the assignment that was completed without error and states, “You must have really thought about the first five problems as you didn’t make any of the errors that most new learners make.”

Research Supporting Self-Efficacy Building

Building Self-Efficacy for Self-Efficacy Builders was initially developed as part of a National Science Foundation funded project, the West Texas Middle School Math Partnership (WTMSMP), which was designed to promote teachers’ efficacy in building students’ mathematics self-efficacy as teachers completed graduate coursework in the conceptual understanding of fundamental mathematics. Two cohorts of teachers completed the self-efficacy workshop, which was presented over one afternoon, a period of four hours, in the teachers’ first year of WTMSMP participation. Participants’ self-efficacy growth was regularly assessed through self-report, and preliminary results revealed consistent increases at each year of participation (Stevens, Aguirre-Munoz, Harris, Higgins & Liu, 2013). Additionally, students’ ratings of volunteering participants indicated that the teachers were incorporating their self-efficacy training into practice and their increased use of self-efficacy building strategies was positively associated with the mathematics self-efficacy of their students (Stevens, Harris, & Higgins, 2013).

Conclusion

The workshop, Building Self-Efficacy for Self-Efficacy Builders, is a theoretically based, empirically supported program designed to coach teachers in developing specific classroom strategies and teaching efficacy to build the mathematics efficacy of their students. The workshop presenters will use lecture/discussion, case studies, role playing, and a manual that includes implementation materials.

Acknowledgement. The work reported in this proposal was supported by the National Science Foundation Math-Science Partnerships program under Award No. 0831420. The opinions expressed herein are those of the authors and do not reflect the views of NSF.

References


