Chapter 13

Supporting Literacy in Math and Science Classrooms: Building Teacher Self-Efficacy Across Content Areas

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ABSTRACT

Teacher self-efficacy is the belief a teacher holds that he or she can successfully influence student learning. It has been tied to both positive teacher practices and student achievement. This chapter explores the challenges of building teacher self-efficacy for literacy across the math and science disciplines. It then looks at how teachers can use content area and disciplinary literacy strategies to support student learning, and suggests how teacher preparation programs and school leaders can further encourage teacher and student growth in literacy. Finally, the chapter raises questions regarding future areas for research, including the curriculum design of teacher preparation programs and student assessment strategies.

INTRODUCTION

Teacher self-efficacy (TSE) is the belief a teacher holds that he or she can influence student learning outcomes, regardless of whether the student is difficult or unmotivated (Guskey & Passaro, 1994). Teachers with higher TSE tend to create learning environments and engage in practices that are likely lead to better student achievement (Ashton & Webb, 1986; Gibson & Dembo, 1984; Guo, Connor, Yang, Roehrig, & Morrison, 2012). According to Bandura (1977, 1986, 1997), TSE is context specific, meaning that a teacher can have high TSE for one content area, and low for another.

While building TSE for preservice and inservice teachers is important in each discipline, additional challenges arise for teacher educators and professional development facilitators when trying to develop TSE across multiple disciplines, especially when implementing new initiatives. Fullan (2001) describes an “implementation dip” (p. 40), or a decrease in confidence that often occurs as teachers put new programs into practice. Many math and science teachers are already struggling with the changes in instruction and
assessments expected in the Common Core State Standards (CCSS) for math and Next Generation Science Standards (NGSS). Thus, adding an additional layer of accountability, by asking teachers to also consider how they will include literacy instruction within their disciplines, may be especially challenging.

To assist teacher educators and professional development facilitators in thinking about how to support teachers and build TSE for literacy within the math and science disciplines, this chapter will begin by exploring TSE development. It will continue by exploring the issues and challenges of defining literacy for math and science. Next, the chapter will discuss some possible and promising practices for encouraging teacher growth in developing TSE for literacy in math and science, with the ultimate goal being improved student outcomes. Finally, the chapter will share ideas for future research and exploration.

BACKGROUND

TSE is a teacher’s belief that he or she can design, organize and carry out a plan of action that will result in desired effects on student learning (Tschanne-Moran, Woolfolk Hoy, & Hoy, 1998). Bandura (1977, 1986, 1997) suggests there are four influences on self-efficacy: mastery experiences, vicarious experiences, verbal persuasion, and physiological changes. For teachers, mastery experiences come from actual work with students. When teachers see student success as a result of their teaching, TSE increases. Vicarious experiences occur when teachers view an instructional model, either by observing another teacher in person or by watching a video. The more the teacher can identify with the model, the more likely the model will influence TSE. Verbal persuasion has roots in the comments others make regarding the teacher’s instructional practices. Remarks from colleagues, administrators, parents, students, and other stakeholders may be the source. Physiological changes are the physical changes teachers feel while teaching, such as sweating or an increased heart rate. With all four influences, those that are positive or related to student success are likely to raise TSE, while negative ones tend to lower TSE.

The development of TSE begins during teacher preparation, and continues to form as the teacher enters the classroom (Hoy & Spero, 2005.) However, once TSE beliefs are formed, they are resistant to change (Bandura, 1997; Hoy & Spero, 2005). Additionally, TSE is content specific, meaning a teacher can have high TSE for one content area, but low for another. Thus, working with preservice teachers to develop TSE across the different disciplines is important, especially for early childhood and elementary teachers who will teach multiple subjects.

Higher levels of TSE have been linked to positive teacher practices and student outcomes across disciplines, and as TSE is the perception of ability rather than an actual measure of ability (Tschanne-Moran et al., 1998), the most successful teachers are those who believe their ability to be slightly higher than it actually is (Bandura, 1997). Teachers with higher TSE tend to spend more time questioning a student following wrong answers, use new and varied instructional techniques more frequently, and spend more time on instruction (Ashton & Webb, 1986; Gibson & Dembo, 1984). They also offer more support and less criticism to students, which may lead to higher levels of student motivation and classroom participation. Additionally, teachers with higher levels of TSE tend to report greater levels of job satisfaction (Klassen et al., 2009), which in turn makes them more likely to report the intent to stay in the field (Rerrachione, Rosser, & Peterson, 2008). As some US states are beginning to have teacher shortages, growing TSE may be one important strategy to help build and maintain a high-quality professional teaching force.