

The effects of educators mathematical knowledge and anxiety level on student repo...

[Profession](#), [Student](#)



Part I: Mathematical Anxiety and Defining “ Good Teaching”

Anxiety in mathematics is a long-studied field of educational psychology, and is a problem that has many suggested causes. To understand the issues that arise for many people when confronting mathematics, it is important first to understand what the psychological concept of “ mathematical (math) anxiety” is. Math anxiety is a perceived notion, defined by Ashcraft and Kirk (2001) as: “ a feeling of tension, apprehension, or fear that interferes with math performance” (Ashcraft and Kirk, 2001). Notably, math anxiety or math phobia is not an actual inability to do mathematics; it is the perceived inability to do mathematics. This observation and the resulting research led to the suggestion that math anxiety is not an intellectual failing but rather a product of cultural and sociological factors that shape the emotional state of the individual learning (Betz, 1978).

Because of the prevalence of math anxiety in women, Harper and Daane (1998) suggest that many elementary school teachers enter their teaching careers with anxieties about teaching mathematics, and that they hold ideas or teaching philosophies that are directly at odds with the accepted methods for teaching mathematics to elementary school students (Harper and Daane, 1998). To alleviate this anxiety, Harper and Daane (1998) postulate that mathematics methods courses can be used to properly educate young childhood educators on mathematics and the proper ways to teach mathematics. This education serves to reduce math anxiety and lessen the chance that educators will inadvertently pass their mathematics anxiety on to their young students (Harper and Daane, 1998).

Stevens, Harris, Aguirre-Munoz, and Cobbs (2009) suggest that the problem of math anxiety is systemic, and that poor education on the part of teachers can be problematic when it comes to math anxiety in children. To properly teach mathematics to children, Stevens, Harris, Aguirre-Munoz and Cobbs (2009) suggest that confidence and self-efficacy must be built in educators, particularly general educators for elementary and middle school students. Stevens et al. (2009) note that these years are formative for students, and elementary and middle school years are the foundation upon which students' education is later built. Educators, then, must be free from math anxiety to avoid passing on said anxiety to their students (Stevens, Harris, Aguirre-Munoz and Cobbs, 2009).

Bursal (2006) demonstrated that there is a statistical correlation between an educator's confidence to teach mathematics at an elementary-school level and their confidence level in their personal mathematical skills. This is an important statistical finding, as there is no reason why an educator who has completed the necessary schooling to become certified to teach should be anything less than confident in their ability to teach elementary school mathematics and sciences; however, Bursal (2006) demonstrated that there is, indeed, a significant statistical correlation between the two issues.

Franklin (2009) suggests that a teacher's confidence-- or lack of confidence-- can be easily communicated to young students, and female students are particularly prone to influence by female teachers. This suggests that the cycle of math anxiety, particularly math anxiety in female students, is a self-perpetuating cycle (Franklin, 2009).

Another problem closely associated with mathematical anxiety is the issue of

avoidance. Teachers who have anxiety when it comes to teaching mathematics-- or even a certain subsection of mathematics-- may inadvertently avoid the topic, or teach the topic incompletely (Franklin, 1990). When teachers teach a topic or subtopic within mathematics incompletely, it can adversely affect students and their learning further down the line in their education. Small inconsistencies in education tend to build up as students progress, setting students further and further back and compounding the problem of anxiety in learning.

Excellent educators are capable of both motivating their students to learn and imparting age and level-appropriate knowledge and skills in their charges (Witt, Goode, and Ibbett, 2013). These skills are used most effectively when the educator is confident in the material that he or she is teaching. According to Witt et al. (2013), even the educator with the most potential can be sidetracked by anxieties about teaching. Witt et al. (2013) write: "Anxiety about mathematics is very real and, for some trainees, may dominate the mathematical part of their preparation for teaching. Inevitably, this spills into all the other areas of their mathematical preparation trainees whose thinking is dominated by anxiety may fail to learn pedagogical skills." Successful educators, then, are those who are well-versed in the material and highly confident in their ability to teach it. Confidence in the material is the underlying thread that links successful students and successful educators.

Part II: Mathematical Anxiety, the Elementary Classroom, and Implementation Solutions

Because research has long accepted that the problem of mathematical anxiety is cultural and sociological rather than a true intellectual failing on the part of the individual, the problem of math anxiety does have workable solutions. The first step to alleviating the problem of mathematics anxiety in elementary school classrooms is noting the breadth and depth of the problem, particularly for teachers of young students. As previously noted, it has been suggested that gender differences and internalized sexism play a role in math anxiety, particularly for female educators that grew up in an environment that did not encourage female participation in math or sciences (Chavez and Widmer, 1982).

Stevens, Harris, Aguirre-Munoz, and Cobbs (2009) suggest that to reduce the levels of math anxiety in teachers of middle-school students, professional education programs must be established for educators. These programs may take many forms, but according to Stevens, Harris, Aguirre-Munoz and Cobbs (2009) the most effective way to educate teachers is to provide them with teaching practice. Stevens et al. (2009) write:

Research has consistently revealed strong positive correlations between students' self-efficacy and subsequent academic performance, especially mathematics performance. Teacher education research has consistently acknowledged that teacher learning is best when it is situated in real-world teacher practice. Evidence is mounting that the case method can be an effective way of communicating the detailed, interrelated processes necessary to unpack the multidimensional nature of what students and

teachers do in classrooms Case-based instruction emphasizes the transformation of theoretical knowledge into theoretically informed practice (Stevens, Harris, Aguirre-Munoz and Cobbs, 2009).

Professional programs designed to support the educator and reduce levels of stress that surround performing and teaching mathematics, then, must conform to these formulas to be most effective.

Dunkle (2010) suggests that the problem of math anxiety in teachers can be addressed before the teachers step in front of a classroom; Dunkle's (2010) research suggested that individuals who display mathematical anxieties can be assisted by participating in remedial classes on mathematics. These classes ostensibly gave educators confidence in their abilities to teach mathematics, as well as providing them with the tools necessary to teach mathematics to struggling students (Dunkle, 2010). Because one of the hallmarks of math anxiety is avoidance of mathematics, teachers who exhibit math anxiety also often pass up opportunities for enrichment in the classroom when mathematics can be applied to other subjects (Dunkle, 2010). Providing special educational opportunities for educators before they are expected to set foot in a classroom provides these educators with the skills, confidence, and self-efficacy they need to teach mathematics and enjoyment of mathematics to elementary-level students (Dunkle, 2010). It should be noted that many educators are aware of their own anxieties regarding mathematics, and many are determined to break the cycle of mathematics anxiety in children, particularly girls (Chavez and Widmer, 1982). Creating an open and inviting environment for children to learn mathematics, ask questions, and progress at their own rate is fundamentally

important for the reduction of math anxiety in children. Research suggests that creating an open environment in which learning mathematics is a fun and rewarding experience can do wonders for the confidence levels of the children in the class (Chavez and Widmer, 1982).

In addition, allowing children to progress slowly without pressure is important to the overall development of the child and his or her mathematical skills in the future (Franklin, 1990). Allowing children to use manipulatives or other concrete objects in the pursuit of mathematical knowledge can be rewarding for children who are having difficulty grasping more abstract concepts (Franklin, 1990). Pushing children too quickly into abstract or more difficult forms of quantitative thinking will lead to frustration and anxiety on the part of the child, especially if the child feels that the educator also has anxieties about his or her own mathematics skills (Franklin, 1990).

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