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## Abstract

Special educators are uniquely challenged to be content experts in all curricular areas, including mathematics, since students in their case loads may require academic instruction in any area. However, special educators with math phobia may be limited in their ability to provide effective instruction to their students with mathematical deficits and/or needs, and may experience additional challenges in their professional and personal lives. This qualitative study sought to better understand the nature of math phobia in two special educators through extensive interviews, journaling, and observations in math experiences, with a number of primary themes identified. Several potential resolutions for the issues emerging from math phobia in special educators are identified and discussed.

Keywords: mathematics, math phobia, special educators

In the middle grades through high school (sixth through twelfth grade), teachers are frequently able to teach primarily or exclusively within the content areas in which they have some interest, aptitude, or both. For example, English or writing teachers often teach language arts because it was their favorite or strongest subject in school, social studies teachers teach civics because they enjoy the dynamics of government and society, and so on.

What about the special education teacher? Do aspiring special education teachers share a common favorite subject from high school or college? If so, it seems unlikely that this subject was special education. Did these future special educators receive special education services as students themselves during their K–12 educations? This possibility again seems unlikely for most. The lack of content-area identification with their work is a potentially noteworthy difference between special educators and their general education counterparts.

Special educators (and most teachers in K–3 settings) are typically expected to teach in all content areas that are included in the school's curriculum, because students with disabilities may require instructional or behavioral support in any curricular area. However, unlike their K–3 general education counterparts, many special educators are certified on a K–12 basis, and, thus, they are expected to teach sophisticated academic content to students in secondary schools. This reality may pose difficulties for some special educators, because many have had only minimal exposure to upper-level mathematics coursework in their teacher preparation programs. For a variety of reasons, teachers may lack confidence in their ability to teach mathematics knowledge and skills (Kopp 2006).

*Math phobia* has been defined as a condition characterized by feelings of panic, helplessness, paralysis, and/or mental disorganization that arises when an individual faces mathematical reasoning or calculation (Tobias & Weissbrod 1980). What happens when a special education teacher experiences math phobia? How might this condition affect their professional and personal lives, the quality of their instruction, and their students' mathematical competence? How do math-phobic special educators view their experiences in instructing mathematics and how do they respond when faced with tasks involving mathematics? Can a special educator be effective in mathematics instruction when he or she feels uncomfortable or even incompetent in that content area?

This qualitative study sought to produce insights about and understanding of special educators who experience math phobia. Questions included how these teachers remembered and perceived their own experiences in mathematics, and how they currently perceive the impact of their math phobias on their provision of educational services to students with disabilities.

## Methodology

### *Participants and Setting*

In 2006, Dr. Humphrey cotaught a university course entitled *Mathematics and Content Area Learning for Students with Disabilities*. This course was part of a graduate-level program that culminated in teacher certification in special education. Dr. Humphrey identified a total of eight graduate students from two sections of this course (out of a total thirty-five students from both sections) who made comments consistent with math phobia, including aversion to mathematics and mathematics-based activities and histories of struggle with mathematical tasks and demands.

After the course ended and final grades were recorded, these eight individuals were contacted and invited to participate in a study on math anxiety in special educators. When informed of the nature of proposed investigation, a common response was a sigh or a muttered "Oh . . ." Given that even talking about mathematics might be difficult for self-described math phobics, it is not surprising that few were willing to participate. Only two of the eight students, "Angela" and "Athena," self-identified as math phobic and agreed to participate.

Angela and Athena both possessed a bachelor's degree, and each was pursuing certification and a master's degree in special education. Angela's undergraduate degree was in psychology. She had taught special education for three years under a state emergency license. At the time of this study, she was working in a special education resource room setting at an elementary school. Athena had a bachelor's in social work and had formerly worked as a school social worker. She began her career as a special educator at a public school through the state's emergency licensure program, and, at the time of the study, she was teaching middle school students with learning, emotional, and behavioral disorders in inclusive settings.

### *Data Collection*

All data were collected over a three-month period. During that time, Dr. Humphrey conducted three in-depth, private, individual interview sessions with each participant. Each session lasted approximately 45 to 60 minutes. Each participant was questioned about her past experiences with mathematics, loosely following the interview script outlined in appendix A.

Each participant was also given a mathematics journal (see appendix B) and asked to record her experiences and feelings before or after mathematics-related activities during the study. In addition, toward the end of the three-month period, each participant was asked to perform timed algorithms that were at roughly an eighth-grade algebra level (see appendix C). Each participant was then asked to describe her perception of that math experience and to recall and comment on similar experiences from her past.

All sessions took place in empty classrooms or conference rooms and were scheduled according to each participant's preferences. Each of the two women participated in two to three hours of interviews. The interviews were concluded when no new information emerged after fifteen minutes during an interview session. Each participant also completed five to twelve journal entries.

Finally, Dr. Humphrey also kept a weekly journal of his experiences and perceptions during the course of the study. This record proved to be a valuable source of insight into themes that emerged over the course of the study.

## Data Analysis

The authors conducted a realist thematic analysis, a qualitative research method that seeks to factually report on the experiences, meanings, and reality of participants (Braun and Clarke 2006) as a way to identify, analyze, and report emergent patterns or themes from a variety of data sources. Triangulation of the data was based on multiple data sources, including (a) interviews, (b) journal entries recorded by each participant over a two-week period, (c) observation of each participant's engagement during a timed mathematics performance evaluation, and (d) a

subsequent debriefing of each participant after that mathematics experience (Creswell 1998; Merriam 1998). Dr. Humphrey reviewed the interview transcripts with each participant, collected and analyzed each participant's journal entries, and observed and interviewed each during and after the mathematics evaluation to learn more about her affective and behavioral responses to that mathematics task. Four primary themes emerged from this cumulative pool of information. These themes were:

- teachers' own mathematics struggles as students,
- teachers' instructional issues with mathematics in school,
- teachers' students' competence in mathematics, and
- teachers' engagement with mathematics outside of school.

#### *Teachers' Own Mathematics Struggles as Students*

Recollections of their own mathematical experiences as students often seemed difficult and unpleasant for both participants. Neither reported taking any mathematics courses voluntarily beyond high school. Considering her own precollege educational experiences in mathematics, Athena recalled:

I wasn't really math-oriented at all. I took a computer class [that] we were able to take as a required math course. I wouldn't have passed a math class, or I didn't think I would have passed. I don't know, but I guess at that time in my life, I didn't want to do the math because I was always doing badly in it, you know, so why would I want to do something that would be a lot harder on myself?

Similarly, Angela said that she only took the minimum math courses required for high school graduation, and that she avoided mathematics courses as much as possible throughout her undergraduate program.

The required mathematics course in the graduate certification program dramatically impacted both women. Athena reported, "I did not have an easy time with that class. I was worried that I wasn't on the right track. I was upset that I wasn't going to pass, and I thought I was going to fail." Angela said, "I always used to make a lot of mistakes. I used to dread going to class and had a minor panic attack when I got my assignments back all marked up with the red pen. I'm glad I took that course, even though I was freaking out because it had to do with math."

In general, many of this study's discussions centered on the participants' self-perceived math phobia and deficits in math. Angela said, "I've never been a math person, but I can't have my children or students ever know that. I am really good at finding someone to help me, or explain the problem to me before I try and help my kids." Similarly, Athena recounted her experiences in receiving mathematics tutoring in high school as a result of her struggles in that area and reported that her parents were unable to help her with her mathematics homework.

#### *Teachers' Instructional Issues with Mathematics*

Special educators are often responsible for providing direct mathematics instruction to students with disabilities, ranging from basic number concepts in the primary grades to algebra and geometry at the secondary level. Angela blamed the poor performance of her students in math on her own lack of knowledge and skills, bluntly saying, "I don't think I should be here. I don't understand this material." She described feelings of anxiety, lack of confidence, and fear of failure when she attempted to teach mathematics.

Angela adaptively dealt with these feelings, however, by reaching out to other school professionals for assistance. She reported being comfortable with finding other teachers to help her when the level of mathematics for which she had instructional responsibilities became too challenging. She explained that she worked very closely with the mathematics teachers in her building: "I go to them all the time and ask them for the material that they are going to be going over next week so I can prepare myself for next week's lessons."

Both participants felt that mathematics was an important skill that their students should possess. Angela said, "I think math is as important as reading. Everything you do as an adult is somehow involved with money, and if you can't calculate your funds, you struggle being a responsible adult."

### *Teachers' Students' Competence in Mathematics*

When Athena and Angela were asked about the overall mathematical performance of their students, both reported that their students struggled in the classroom as well as on standardized assessments. Angela explained, "Not many of my students enjoy math. They would rather do something else than complete a test or a mathematic assignment."

Discussing her mathematics lessons for her students with disabilities, Athena said, "I had them do a lot of math puzzles, and [I] pulled stuff off the Internet." When asked how her students had performed on a recent statewide standardized assessment of mathematics, Athena rolled her eyes, looked down at the table, then said:

My students bombed all the [mathematics] assessments. They weren't engaged. Most of them guessed. I think it has something to do with the test. They didn't understand a lot of the questions because they weren't very evolved in their critical thinking.

In reviewing her students' struggles with mathematics, Athena blamed her students' poor performance on several nonteacher factors, including the test itself and her students' lack of critical-thinking skills. Notably, she did not significantly address her own math issues as a potential contributor to her students' struggles in mathematics.

When queried as to how mathematics instruction might be improved for their students, neither participant referred to increased teacher competence. Athena suggested that one approach that may have potential is standards-based education. She noted that "the standards are there to guide the instruction." Athena also expressed her concern with the mathematics instructional materials provided to her special education students in a previous high school setting: "We had the textbooks that were stored in the basement. They were out of date and were poor quality."

### *Teachers' Engagement with Mathematics Outside of School*

Both participants reported that they preferred not to engage in math outside of their professional work. Both said they avoided such common adult mathematical tasks as balancing a checkbook. Angela said, "I don't do the bills. I let my husband take care of that." Athena reported, "I'm good with a budget. I don't really balance my checkbook very much, but I really don't write many checks. I use the debit card or American Express or credit cards. I always have enough money [so that] I never come up short." Nevertheless, she concluded that skill in mathematics "is an important skill that I expect my students or children to be able to do. I would not be comfortable if my daughter didn't balance her checkbook, but she's not really good with money."

Both Athena and Angela were asked—and initially agreed—to participate in a timed mathematic performance evaluation that was designed to provide additional insight into and perspectives on their math phobia. However, when the time for the evaluation arrived, Athena flatly refused to participate. She declined to comment extensively on this; instead, she simply stated, "I don't like doing math in front of other people."

After seeing the task, Angela said that she felt uncomfortable using a laptop computer to record her answers to single-digit addition and multiplication problems. She complained about the placement of the keys on the laptop's standard full-size keyboard. During the evaluation, she appeared very nervous and read each problem aloud. When presented with four algebra problems, she exclaimed in a fearful tone, "Oh my God, I don't know how to do this." Dr. Humphrey prompted her to guess from the multiple-choice answers, but after completing two problems, she stopped, saying, "This is stupid."

When asked why she stopped, she said that she does not perform well under pressure, and then asked, "Are you trying to upset me?" She was reassured that the purpose of this component of the study was simply to ascertain how mathematics tasks affected her. She responded by stating that she doesn't agree with high-stakes testing and added, "I just feel sorry for those students of mine that feel like this on a day-to-day basis."

## Discussion

Many adults experience math phobia. Often, the roots of this condition date from early school experiences (Li 2003; Pan and Tang 2005). Similarly, Angela and Athena both recalled that their math phobias originated early in their school careers. Each woman reported that this fear caused them to avoid tasks that involved mathematics whenever possible throughout their elementary and secondary education programs. Each also described how math phobia caused significant issues in their work as special educators.

Perhaps the most major professional issue associated with math phobia in special educators is how this condition affects their ability to carry out their professional responsibilities, including the effective delivery of mathematical instruction to students with disabilities. Special educators with math phobia may respond to this challenge in several ways, two of which emerged in this initial study. The first is simple avoidance and denial. Athena reported that for her mathematics instruction, she “pulled stuff off the Internet” and asked students to complete math puzzles as an alternative to delivering instruction based on the school’s rigorous standards-based mathematics curriculum. This approach might allow the math phobic teacher to largely evade professional and personal feelings of frustration and anxiety about math. Although avoidance might momentarily assuage a teacher’s math phobia, it does not resolve the issue in the long term. More important, when teachers avoid mathematics instruction, students are shortchanged and shackled by their teachers’ inability to deliver critical instruction in this domain.

A second and more functional approach to math phobia is collaboration with a skilled colleague or partner. For example, Angela reported that her husband did the mathematical tasks in their household. In the schools, the equivalent would be professional collaboration. When two or more educators with distinct and complementary sets of professional skills work with each other, the outcome is a potentially powerful instructional package (e.g., Hourcade and Bauwens 2001). Angela specifically referred to such an approach when she noted her comfort and ease in asking other teachers for assistance in preparing mathematics lessons for her students. Significantly, she specifically sought out help from mathematics teachers, who presumably possessed high levels of knowledge and skills in the very area in which she most struggled.

A third general approach is to resolve the fundamental issue of the math phobia. The professional literature provides a number of useful strategies to help minimize or avoid math phobias in elementary and secondary students. For example, Woolfolk (2007) suggests that teachers help their students by (a) reducing or eliminating competitive aspects of performance in mathematics, (b) ensuring that instructions are clear, and (c) minimizing or eliminating time and other pressures in mathematics-related activities.

Adults with math phobias may profit from short-term or long-term math tutoring. In addition, starting with small mathematical achievements (such as adding a column of figures on a grocery receipt or calculating a restaurant tip with a calculator) can generate initial successes that may help change long-standing and maladaptive feelings about mathematics (Knapp 2008).

Every educator has a professional obligation to be at least minimally competent in those content areas in which he or she teaches. For special educators, this curricular obligation may be doubly challenging, because (a) special educators typically teach in all areas of the curriculum, depending upon individual student needs; and (b) the students with disabilities to whom the special educator provides services are especially vulnerable to the impact of inadequate levels of teacher content knowledge and instructional skills. Thus, special educators have especially powerful professional and ethical obligations to identify their own areas of content and instructional weakness—especially the common weakness in mathematics—and then take direct and substantial steps to resolve this problem.

Extrapolation of the results of this initial study of math phobia in special educators must be limited, given that only two participants were willing to engage in this examination. Subsequent investigations should target larger sample sizes and might seek empirical verification of the potential impact of math phobia on the professional performance of special educators, especially the acquisition of mathematics skills by their students with disabilities.

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