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**Girls vs. Boys in Mathematics:
Test Scores Provide One Interpretation
Girls' Narratives Suggest a Different Story**

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Abstract

This study seeks to provide a data based critique of the claims of gender equity in mathematics. Specifically, this paper is an analysis of the personal well-remembered events (WREs) told and recorded by women who are in the first course of their preservice teaching professional sequence. Importantly, these are women who are on the professional track to teach mathematics. Using a narrative based methodology, the writings provide another angle of the intricate pieces of equity (i.e. test results say both genders are just as capable, stories of females say otherwise). These themes center around the safe zones, struggles, embarrassment, competition, and self-fulfilling prophecies. From these stories, we see subtle illustrations of existing gender inequities in mathematics.

Purpose

The purpose of this study is to examine the equity issue in mathematics from perspectives not traditionally included in equity claims. This study offers a close up view of personal experiences that preservice candidates have encountered in their own journey as students of mathematics, especially as they learn to teach. This transition time is important to study, as preservice candidates make the switch from student to teacher. It is vital to understand how critical these stories are, as new female teachers take on the important role of mathematics teachers. What these narratives do is capture the impact of

personal experiences in mathematics to a developing professional identity through the personal well-remembered events (WREs) which require telling, analyzing, and drawing implications.

The different themes that arise in this issue of mathematics equity were examined. These themes include the safe zones in mathematics, the struggles that occur in mathematics, the feelings of embarrassment, the competition, and the self-fulfilling prophecies. These data-derived themes will be expanded and discussed in greater detail in the larger paper.

Theoretical Framework

Huebner 's (2009) study, *Encouraging Girls to Pursue Math and Science*, notes that the mathematics achievement gap between boys and girls has all but disappeared. Huebner's research reveals that the differences in mathematics achievement between boys and girls are insignificant. Boaler's (2008) study, *What's Math Got to Do With It?* supports this view by claiming national statistics in mathematics show that presently, girls do very well in mathematics, achieving at equal or higher levels than boys. Huebner (2009) makes the statement that there is great optimism for girls in mathematics.

Some data suggests the equity issue in mathematics between boys and girls is solved. However, Boaler's (2008) study reveals another important component in the equity issue in mathematics between boys and girls. Boaler's (2008) work reminds us that we cannot underestimate the power of stereotypes that still exist suggesting that boys are stronger in mathematics than girls. These stereotypes occur in family, school, and society (Tobias, 1993). Teachers often overestimate boys' potential in mathematics whereas they underestimate it in girls (Goodell and Parker, 2001). Gavin and Reis (2003)

argue that girls often believe they are not expected to excel in mathematics. This notion comes from some parents, teachers, and peers. This leads to a detrimental affect on girls in mathematics classes.

Huebner, (2009), Boaler, (2008), Meehan, (2007), and Tobias (1993) agree that girls' often view themselves as having inferior mathematical abilities when compared to boys. Huebner's (2009) longitudinal study found that from an early age, girls rate their mathematical ability lower than boys, despite there being no actual difference in achievement. This is significant, as students with more confidence in their mathematics ability are more likely to take classes that lead to careers in this field. Meehan's (2007) work reveals that some girls still carry a script in their head that says not only are they not good in math, they shouldn't like it as well. This results in some girls believing that math is too hard and boring and that math is a highly intellectual field to which they do not have access. It is important, therefore, to understand more fully the issue of gender inequity in mathematics and the variables that revolve around it.

Data Sources

The present paper is a report of findings from the first year of a five-year research initiative at a large Research I University in the Southwestern United States. The sample for the present study is 60 students enrolled in three sections of an introductory teacher education course. The students in the study were all female with both elementary and secondary teaching majors represented. The majority were students who were traditional undergraduates in their early twenties, with the rest being older female students returning to school for teacher preparation and/or degree completion.

Methods

This study involves a long-term qualitative analysis of approximately 60 narrative stories prepared by a diverse group of elementary and secondary preservice teacher education students. These students were enrolled in a course entitled “Classroom Processes and Instruction.” In these narratives, termed “well-remembered events, the preservice candidates were asked to describe and analyze a particularly salient mathematics event from their own experiences as students in K-12. This genre of personal narrative was derived from Carter’s (1993, 1994) work on well-remembered events as windows into the understandings preservice teachers have of teaching. The task consists of a 2-3 page paper organized around the following parts (1) the selection of a particularly salient mathematics event from one’s past experiences in mathematics as a K-12 student; (2) a detailed description of the event; (3) an explanation of why the mathematics event was memorable; and (4) a statement of what impact this mathematics event might have on the writer’s understanding of what it means to be a teacher. Career studies imply that teachers can often recall in considerable detail specific incidents that have been especially critical in their development (Sikes, Measor, and Woods, 1985). This suggests that having preservice candidates focus on specific well-remembered events may be useful in understanding gender equity issues in mathematics that may still exist.

The analysis of these narratives involved an iterative and sustained qualitative analysis designed to identify the basic story structures (characters, sequence, plot, pattern of action) embedded in the texts. Attention was then turned to the detailed documentation of themes in the mathematics stories (e.g. safe zones, struggles,

embarrassment, competition, and self-fulfilling prophecies) and the meanings the preservice candidates assign to these themes.

Results

The preliminary results of this analysis strongly suggest that in regards to mathematics, female preservice teachers did not feel like capable or confident mathematics students. When asked to recall an experience that occurred sometime during their K-12 schooling years in mathematics, the experience or the “well-remembered event” was overwhelmingly a negative one. The recalled experiences centered around themes of operating in a safe zone in mathematics (i.e. not taking chances or be willing to take chances), struggles to understand mathematical content, feelings of embarrassment, dealing with continuous competition from others (especially boys), and dealing with self-fulfilling prophecies of being unable to be successful in mathematics. The analysis at this point is in the first stages of development. A more in-depth and detailed evaluation is currently in process.

A significant number of the participants in the study wrote their well-remembered events in a manner in which the salient event came immediately to mind. The memories tended to be accompanied by strong feelings of pain, embarrassment, and/or anger. The stories seemed to be written as if they had happened only yesterday. The typical structure of the struggles to understand the mathematics content being taught or feelings of embarrassment involved incidents in which the teacher made it public that the writer was not successful in that moment of time in mathematics.

Other incidents chosen by the writers focused on the boys in the class competing to get the answers to the mathematics problems posed by the teacher the fastest as well as

competing to complete the most correct problems as quickly as possible. This also resulted in the boys receiving praise and kudos from the teacher.

Participants also wrote about incidents where they felt like there were not viewed as strong mathematics students by others (teachers, parents, other students) and therefore would never be good in mathematics. These stories focused on negative experiences in mathematics heaped on their past weak histories in mathematics.

Some participants' stories focused on positive experiences in mathematics and attributed these experiences to having a strong mathematics teacher who believed in them or encouraged them to excel in mathematics. This encouragement was supported by extra help from the teacher, a firm belief by the teacher that the student was indeed capable of being a strong mathematics student, or a push to enroll in a higher level mathematics course than the student had initially planned on taking. These stories were accompanied by feelings of great joy and accomplishment by the students.

Scholarly Significance of the Study

Boaler (2008) and Huebner (2009) agree that the mathematics achievement gap between boys and girls has just about disappeared. However, the preliminary findings of this study call into question the notion that the gender equity issue in mathematics is solved. In the midst of current claims of gender equity in mathematics, this study comes along with data obtained through narrative methodology that suggest these claims should not be taken totally at face value. There is great optimism for girls in mathematics (Huebner, 2009). However, we need to pay attention to the personal themes that come directly from women who are going to be teaching. These themes (safe zones, struggles, embarrassment, competition, and self-fulfilling prophecies) question the belief that

gender equity exists in mathematics. We must continue to explore methods which voice those young women still struggling to see themselves as capable in the area of mathematics.

Tobias (1993) points to sex-role stereotypes in families, schools, and societies as a major culprit in girls viewing themselves as being less capable in mathematics. Gavin and Reis (2003) and Meehan (2007) are in agreement with this statement and add that as a result, girls themselves may believe they are not expected to excel in mathematics. More work needs to be done in this area to ascertain the affect that sex-role stereotypes continue to have in the area of girls and mathematics. The results of this preliminary study suggest that these stereotypes still exist and may possibly be surfaced through alternate modes of inquiry.

Campbell (1992) and Hanson (1992) talk about the importance of teachers not passing on to girls any negative feelings that may have about mathematics as well as taking on the responsibility to encourage capable females to excel in this area. This is a crucial point based on the preliminary results of this study.

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