SOCIALIZATION AS A PREDICTOR OF MATHEMATICAL ABILITIES OF MALES AND FEMALES

by

Euphrasia N. Manyenze

A Thesis Abstract presented in partial fulfillment of the requirements for the degree of Master of Science in the Department of Psychological Sciences
University of Central Missouri

May, 2013
ABSTRACT

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The purpose of this study was to predict both interest in mathematics-related careers and measured mathematical abilities of men and women using different types of socialization as the main predictor variables. The study sample included 74 participants from a local Midwestern university, 31 men and 43 women. Participants responded to a socialization survey and the mathematics subtest of the Wide Range Achievement Test 4 (WRAT 4). The data were analyzed using both correlational analyses and simultaneous multiple regression analysis. The results of the correlation analyses indicated non-significant relationships between socialization and math scores and between socialization and interest in math-related careers. The results of the simultaneous multiple regressions indicated that two of the predictors (socialization from parents and teachers) were significant predictors of interest in math-related careers and mathematics score on the WRAT 4. The study demonstrated that socialization from parents and teachers predicted interest in math-related careers and performance on a mathematics test and therefore we can conclude that individuals exposed to greater levels of socialization may lean towards math-related careers and perform better on a mathematics test.
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ACCEPTED:

Chair, Department of Psychological Science: Dr. David Kreiner

UNIVERSITY OF CENTRAL MISSOURI
WARRENSBURG, MISSOURI
ACKNOWLEDGEMENTS

This project would not have been possible without the support of many people. Many thanks to my adviser, Dr. David Kreiner, who read my numerous revisions and helped make sense of all the confusion. Also very many thanks to my committee members, Dr. Kim Stark and Dr. Jon Smith who offered guidance and support. And finally, thanks to my husband (Robin), and mostly my parents (Elizabeth and Cyril) and aunts (Adelina and Angellina) for having the courage to let me take this long journey away from home to complete my masters, my siblings and numerous friends who endured this long process with me, always offering support and love.
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CHAPTER 1
NATURE AND SCOPE OF THE STUDY

Purpose of the Study

The purpose of this study was to predict both interest in mathematics-related careers and measured mathematical abilities of men and women using socialization as the main predictor variable. In this thesis we examined socialization in terms of the main agents of socialization from parents, teachers, media, and how these aspects of socialization may be related to an individual’s interest in math-related careers. We also examined how socialization from parents, teachers and media may predict scores of men and women on a mathematics test.

Rationale

According to Zastrow and Kirst-Ashman (2007), “socialization is the process whereby children acquire knowledge about the language, values, etiquette, rules, behaviors, social expectations and all the subtle, complex bits of information necessary to get along and thrive in a particular society” (P.134). From this definition we can infer that socialization is the process whereby an individual acquires his/her own personal identity and it is extremely important during an individual’s formative years and continues throughout an individual’s life. Socialization is essential for the development of individuals who can participate and function within their societies, as well as for ensuring that a society's cultural features will be carried on through new generations (Zastrow & Kirst-Ashman 2007).

According to Zastrow and Kirst-Ashman (2007), although the family is the primary agent of socialization, it does not provide the only means of socialization for children. As children grow older they are exposed to other children (peers) as they play at school. They are also
Socialization as a predictor of mathematical abilities

Socialization begins during infancy as infants are treated differently from birth by virtue of their biological sex. According to Zastrow and Kirst-Ashman (2007), for instance, girls are typically wrapped in pink blankets while boys are wrapped in blue blankets. Gender role socialization begins at this point and continues throughout childhood, adolescence and adulthood (Zastrow & Kirst-Ashman, 2007). Parents generally treat boys and girls differently and encourage different behaviors from their children based on the child’s gender. For example, boys are discouraged from crying and are encouraged to be aggressive, while girls, on the other hand, are encouraged to talk calmly or act gently (Zastrow & Kirst-Ashman 2007). As children begin school, gender role socialization continues. Numerous studies have revealed that teachers give more attention to boys versus girls and they also tend to drive girls away from science, technology, and mathematics (Sadker & Sadker, 1997).

Chouinard, Karsenti and Roy (2007) reported that the attitudes of parents and teachers toward mathematics and viewing their children as learners of mathematics affected children’s perceptions of their own competence. These authors further concluded that the perception of parental support explained variables associated with the valuing of mathematics while the teachers’ support acted most on competence beliefs (Chouinard et al., 2007). In other words, parents exert a strong influence on their children’s values regarding mathematics while the nature of teachers’ influence exerts its impact on students’ self-perceptions (Chouinard et al., 2007). Chouinard et al. (2007) further indicated that women reported lower competence beliefs in mathematics than men, but they also indicated that women reported higher mastery goals and effort.
In the present study we examined how socialization from parents, teachers and media relate to the performance of men and women on a given mathematics test. We also examined whether the different types of socialization would predict interests of men and women in math related careers.
CHAPTER 2
REVIEW OF THE LITERATURE

The following chapter will review available literature on socialization and the studies that have been conducted on the different effects of socialization. First, a review of the different aspects of socialization will be offered. Following this, a summary of stereotype threat will be given including how it affects the performance of men and women on a mathematics test and hence their interest in math-related careers. Next, literature regarding cognitive abilities of men and women will be reviewed to determine whether they have any effect on performance of mathematics and interest in math-related careers. Finally, the proposed hypotheses of the present study will be introduced.

Effects of Socialization

Parental Influence

Research on gender differences in mathematics interest and abilities has a fairly recent scholarly history, starting in the last half of the twentieth-century. Ai (2002) showed a progression of ideas starting with Aiken’s (1976) research on gender differences in mathematics. Aiken believed that attitudinal explanations of the gender achievement gap in mathematics were not sufficient and that influences from parents, teachers, peers, and schooling must also be considered in understanding mathematical achievement.

Leedy, LaLonde, and Runk (2003) found that many parents expect their young sons to develop mathematical skills earlier than do parents of young girls. They also reported that parents of older children believe that their daughters must work harder to attain good grades in mathematics, whereas parents of boys place more emphasis on the importance of learning mathematics. From this the authors concluded that parents expect different things from their
male versus female children and parents’ attitudes and expectations are correlated with their children’s achievement in mathematics.

According to Scarpello (2007), the child’s educational context at home and at school can affect his/her attitude towards mathematics. Scarpello (2007) further stated that parents play an important role in their children’s selection of courses in school, especially during the student’s high school years because it is then that most students discuss their course enrollment options and career choices with their parents. While research supports the claim that girls have similar aptitude for mathematics as do boys, they are more susceptible to math anxiety due to their aversion to high stakes testing and social comparison (Haynes, Mullins, & Stein, 2004).

**Teacher Practices**

According to Eccles (1992), many teachers believe that girls’ achievement in mathematics is due to their hard work, whereas boys’ achievement is attributed to talent. These differing beliefs of teachers might lead to boys often receiving preferential treatment when it comes to mathematics. These attitudes might lead children to internalize their teachers’ attitudes so that they begin to believe what their teachers believe. As a result, girls tend to feel less confident about their answers on tests and often express doubt about their performance. As children progress through school, girls’ assessment of their enjoyment of mathematics falls much more drastically than does boys’ assessment (Eccles, 1992). These attitudes might shape children’s experiences as they are learning mathematics.

A study done by Sadker and Sadker (1997) in the District of Columbia found that boys vocally dominated the classroom and received more attention and encouragement from teachers than did girls. Sadkers’ research also demonstrated that teachers behaved differently when boys or girls called out in class without raising their hands. When boys answered without being called
on, teachers accepted their answers, but the same behavior from girls resulted in negative responses about raising their hands. This research indicates a subtle but powerful message that boys should be academically assertive and demand the teacher’s attention whereas girls should act “like ladies” and keep quiet. From this we can infer that boys are more vocally assertive in class than girls and when it comes to mathematics they do not shy away from asking questions when they do not understand a concept.

Feldhusen and Willard-Holt (1993), who were interested in understanding gender differences in student-teacher interactions, found that teachers unconsciously made males the center of instruction. They also gave males more frequent and focused attention than they did females. Although this attention was not necessarily wanted by the boys, or even noticed by the girls, it negatively impacted both boys and girls.

Streitmatter (1999) found that teachers’ questioning methods and praise differed substantially for girls and boys. She specifically found that girls tended to be praised simply for trying, whereas teachers tended to withhold praise from boys until they produced a correct answer. Because of this, both the male and female students in the classroom eventually recognize that the teacher expects more from the boys than the girls.

Campbell (1995) believed that not only are teachers failing to do things that lessen the gender gap in mathematics, but they are a large part of the cause of gender differences in mathematics abilities that exist today. Additionally, Fox, Brody, and Tobin (1985) found that teachers often tend to actively discourage girls from pursuing non-traditional (e.g., mathematical) interests. These actions by teachers are a major contributor to having fewer women majoring in mathematics related courses. According to Sadker and Sadker (1997), the majority of women who attend college choose to major in English, French, Spanish, music, drama, and dance,
whereas the majority of men choose computer science, physics, and engineering programs as their major.

A recent study of 14 school-to-work programs, conducted by the American Association of University Women Educational Foundation (2010), found that more than 90% of females cluster in a few traditional careers including health care, teaching and education, graphic arts, and office technology. In addition to focusing more of their attention toward the male students in their classes, teachers also tend to focus different types of attention on students based on their gender, and this increased attention contributes to enhanced student performance which in turn leads to girls losing out in mathematics (Sadker & Sadker, 1997).

*Media Exposure*

Sexual stereotyping regarding females exists throughout our society; one need only glance at a magazine, turn on a television, or read some popular children's books to be reminded of the differences in cultural expectations for males and females. The September, 1985 edition of *Psychology Today*, for example, features an advertisement on the back cover depicting a man using a telescope (caption: “he likes the planets”) and a woman reading a book about Hollywood (caption: “she likes the stars”). This stereotyping delivers powerful messages to bright young females about their roles in life, their own importance, and their worth as people (Janis & Eccles, 1985). When research is the focus of the popular press, the media are believed to have a strong influence on public opinions. In an empirical study conducted by targeting parents of adolescents to investigate the impact of media coverage, Janis and Eccles (1985) found evidence that research reported in the media can have an effect on the beliefs of people who are exposed to it. In other words if the media only portrays males as mathematics professors or engineers in any programs then people will tend to think that only males are qualified for these careers.
According to Steinke, Lapinski, Crocker, Zietsman-Thomas, Williams, Evergreen, and Kuchibhotla (2007), gender stereotypes in the mass media perpetuate traditional views of women that might influence children's perceptions of women in science, engineering, and technology. These authors conducted a study which used a randomized posttest-only control group design to determine the efficacy of media literacy training on middle school–aged children's perceptions of scientists. Participants were randomly assigned to one of three conditions which were discussion, discussion plus viewing of television and film clips that featured images of women, or a control group. They were asked to complete the Draw-A-Scientist Test and to write down the source of information for their drawings. After analyzing the results they concluded that across conditions, boys were more likely than girls to draw male scientists, and girls were more likely than boys to draw female scientists but the participants also listed media sources as the primary source of information for the drawings (Steinke et al., 2007).

Stereotype Threat

Stereotype threat was first introduced by Steele and Aronson (1995) when studying African American and Caucasian college students’ test performance. From their research, further investigations into stereotype threat were instigated. Researchers sought to understand and quantify the effects and implications of stereotype threat if and when they occurred. Some researchers tried to determine for whom stereotype threat was a high risk, while other research investigated outcomes of stereotype threat. Although stereotype threat is a relatively new educational field of study, there is a significant amount of research and interest in this area.

Research conducted by Good, Aronson and Harder (2008) indicated that stereotype threat can harm the performance of any individual for whom the situation invokes a stereotype based expectation of poor performance; for example stereotype threat has been shown to harm the
performance of females in mathematics. These authors further explained that high ability did not counteract the possibility of stereotype threat such that high ability individuals can also be susceptible to stereotype threat. For example, females who perform highly in mathematics when exposed to stereotype threat will tend to perform poorly. Further, females who have been brought up to believe that they are not suited to math-related careers because they are women may perform poorly on a mathematics test. According to Steele and Aronson (1995), stereotypes about female inferiority in mathematics stand in distinct contrast to the actual scientific data reported in previous studies and this discrepancy is particularly problematic because such negative stereotypes can impair math test performance and cause anxiety via stereotype threat.

The concept of stereotype threat, an important component of gender-gap research, is also controversial. According to Steele and Aronson (1995), stereotype threat generally refers to innate ability or disability of members of a distinct group of individuals to achieve or perform a given task. The primary controversy concerns whether or not stereotype threat exists, but other controversies center on stereotype threat and its effect on mathematical achievement. Does stereotype threat trigger emotions or beliefs that either hinder or encourage mathematical achievement? Another debate is whether gender stereotype threat affects all students, either positively or negatively. For example, one female student might feel challenged by the stereotype threat and do better (possibly to prove that a task can be done), but other female students might do worse under the same pressure, which would mean that other beliefs and not the stereotype threat itself are the cause of these gender differences. Another theory is that stereotype threat causes anxiety and affects people differently because of different reactions toward anxiety. Confirmation to norms, historic gender roles, innate ability beliefs, and socialization can all contribute to stereotype threat (Delgado & Prieto, 2007).
Delgado and Prieto (2007) stated, “stereotype lift has been assigned to the phenomenon consisting of a performance boost observed among non-stigmatized subjects who are aware of negative stereotypes targeted at stigmatized others.” (p. 635). This means that stereotype threat is a threat of poor achievement or performance for a specific population of students. Stereotype lift can enhance mathematical achievement for those not under the stereotype threat who know that the stereotype threat impacts a categorical population other than those to which they belong.

**Cognitive Abilities**

A study conducted on gender gaps in mathematics achievement and attitude, as measured by the National Assessment of Educational Progress (NAEP) from 1990 to 2003, showed that gender gaps in mathematics were generally small, but consistent across NAEP administrations. Gender differences were greatest in the areas of measurement, number and operations, and geometry. Gender differences tended to be concentrated in the upper-end of score distributions and were most consistent for white, high social economic status students, although there were also gender differences for Hispanic students (McGraw, Lubienski, & Strutchens, 2006). With the exception of Hispanic students, the number of mathematics courses taken by girls was similar to the number taken by boys (Coley, 2001). One study showed that math achievement predicted later achievement in attitudes toward math for both boys and girls (Ma & Xu, 2004).

According to Halpern, Benbow, Geary, Gur, Hyde, and Gernsbacher, (2007), boys tended to be better at visual-spatial tasks such as mental rotation, spatial perception, and spatial visualization and they were also better at quantitative problem solving and tasks that involved maintaining and manipulating a visual image in working memory. Halpern et al. further stated that girls tended to be better at verbal processing, which enables them to retrieve semantic and phonological information in their long-term memory and, as a result, girls tended to be better at
tasks that require rapid retrieval of information, such as learning mathematics skills (e.g., the multiplication table).

According to Rutter, Craspi, Fergusson, Horwood, Maughan, Moffitt, and Caroll, (2004), boys were more likely to be diagnosed as reading disabled than girls; however, the size of the gender gap varied across countries. Girls entered school with better literacy skills, and the gap increased slightly during the kindergarten year (Ready, Logerfo, Burkam, & Lee, 2005). Ready, Logerfo, Burkam, and Lee (2005), further concluded that the differences in approaches to learning among young children contributed to the gender gap. Young boys were rated by teachers as using fewer effective approaches to learning (e.g., attentiveness) and these lower ratings were associated with lower gains in literacy skills during kindergarten (Ready, Logerfo, Burkam, & Lee, 2005). According to Sokal, et al. (2005), in early childhood, boys and girls displayed similar attitudes toward reading, however, that gap in literacy attitudes and practices increased throughout elementary school. This trend may reflect the fact that boys’ reading interests were not being addressed in school. Boys reported disliking the kinds of things they had to read for school and preferring magazines, adventure, and scary stories. One study showed that high interest reading materials, but not the presence of a male teacher, were associated with improved reading performance in boys (Sokal et al., 2005).

Hypotheses

The hypotheses for the study were as follows:

Hypothesis 1

Individuals who have greater exposure to socialization statements by the main agents of socialization towards mathematics will portray lower interest in math-related careers. It was
expected that greater exposure to socialization statements by parents, teachers, and media would be related to lower interest in math-related careers for both males and females. Obtaining exposure to gender stereotypical statements should decrease their self-esteem and therefore orient females in particular away from mathematics. These constructs were measured using the socialization survey and interest in math-related careers survey included in the appendix respectively.

**Hypothesis 2**

Individuals who experienced greater exposure to socialization statements from their parents, teachers and media towards mathematics were hypothesized to perform worse on a test of mathematics. It was expected that both males and females who had greater exposure to socialization statements would perform worse in mathematics. These constructs were measured using the socialization survey and Wide Range Achievement Test 4 (WRAT-4, Makray & Hope, 2009).

**Hypothesis 3**

Exposure to socialization statements by parents, teachers and media towards mathematics was hypothesized to predict interest in math-related careers for males and females. Individuals who experienced greater exposure to socialization statements from their parents, teachers and media were hypothesized to display lower interests in math-related careers. Individuals who received less exposure to these statements were expected to pursue careers that were math-related because they were not intimidated by mathematics. This constructs were measured using the socialization survey included in the appendix.
Hypothesis 4

Exposure to positive and encouraging statements from parents, teachers and media towards mathematics was hypothesized to predict performance on a subtest of mathematics ability for males and females. Exposure to socialization statements from parents, teachers and media towards mathematics were expected to predict performance on a mathematics test. Individuals with less exposure to socialization statements were expected to experience a lesser degree of anxiety associated with mathematics because they would be more likely to have a belief in themselves that they could perform well in mathematics. These constructs were measured using the Wide Range Achievement Test 4 (WRAT-4, Makray & Hope, 2009) and the socialization survey included at the appendices respectively.
Participants

The participants were 74 undergraduate students (31 men and 43 women) from a regional Midwestern university. The sample ranged in age from 18 to 31 ($M = 20.25, SD = 2.23$) and included 41% male and 58% females. The participants also consisted of 27% African Americans, 4% Asians, 62% Caucasians, 1% Latino/Hispanic and 5% from other ethnic groups. Those currently enrolled in psychology courses received research participation credits for volunteering to complete the survey.

Materials

Socialization

The socialization variable was measured using a survey that assessed how an individual had been socialized towards mathematics. The survey was adopted from a questionnaire used in a thesis done by Bhatnagar (2008) at the University of Michigan. The survey is attached in the appendix and was altered to fit the particular aspects of socialization addressed in the present study. The survey consisted of questions regarding impressions that had been portrayed by parents, teachers or media regarding mathematics being a difficult subject and that boys are more capable of performing better in mathematics than are girls. The 21-item self report measure asked respondents to indicate, on a 5-point Likert type scale with “a” = strongly disagree and “e” = strongly agree, their level of agreement or disagreement with statements relating to parental influences, teacher classroom practices, and media attitudes towards mathematical abilities (e.g., “the teachers in my school give the impression that mathematics courses are more appropriate for boys than girls”). Higher scores on the socialization survey indicated that individuals reported
greater exposure to socialization statements from parents, teachers and media towards mathematics.

Mathematical Abilities

The variable of mathematical abilities was assessed using the Math computation subtest of the Wide Range Achievement Test (WRAT-4) which was first published in 1946 by Joseph Jastak. The latest revised edition, which is the WRAT-4, was first published in 2006 by Gary S. Wilkinson and Gary J. Robertson.

According to Makray and Hope (2009), “the WRAT-4 is a norm-referenced test that measures the basic academic skills of word reading, sentence comprehension, spelling, and math computation and the latest edition features an entirely new subtest, which is the sentence comprehension, which is used to enhance the scope of the content assessed and to meet the need for a measure of reading comprehension” (p. 49). According to Makray and Hope (2009), the new WRAT-4 has four subtests: (1) “Sentence Comprehension” (2) “Word Reading” (3) “Spelling” and (4) “Math Computation” (p. 50). For the purposes of this study, the researcher only used the Math Computation subtest. The administration time for each subtest is 30-45 minutes. The WRAT-4 is intended for use by professionals who need a quick, simple, psychometrically sound assessment of important fundamental academic skills (Makray & Hope, 2009).

According to Makray and Hope (2009), “reliability evidence for the WRAT4 is shown to be strong and includes information based on classical test reliability theory, including internal consistency range of .87-.93, alternate-form reliability (immediate and delayed retest stability) range of .86, standard error of measurement, and standard score confidence intervals, as well as IRT applications termed Rasch statistics” (p. 51). According to the authors the validity of any
test is a cumulative and ongoing process, and in particular the WRAT4 builds on processes
developed in the WRAT3 and its predecessors. The validity section includes both internal and
external validity evidence. The internal validity includes subtest inter-correlations, median inter-
correlations for all pairs of subtests and ranges between .56-.79 and a modest increase in
divergent validity from WRAT3 to WRAT4. The external validity includes moderate to high
correlations of WRAT4 subtests with other achievement tests like the WIAT-II: .49 - .92 and
WJ-III ACH: .54 - .85. Moderate to moderately high correlations of WRAT4 subtests with
cognitive ability indexes include WISC-IV Full-scale IQ: .50-.81 and SB-5 Full-scale IQ: .67-
.78. Clinical studies show ability of WRAT4 to identify students with learning disorders, low
cognitive ability, and high cognitive ability (Makray & Hope, 2009).

Interest in Math-Related Careers Variable

The interest in math related career variable was measured using a survey that was
designed to assess interest in math-related careers. The survey consisted of a list of 14 math-
related careers and was based on the work of Kouba, n.d. The survey is attached at the appendix.
The 14-item self- report measure asked respondents to indicate, on a 5-point Likert type scale
with “a”=1 and “e”=5, their degree of interest in each career. Higher scores indicated that
exposure to socialization statements from parents, teachers and media predicted an individual’s
interest in math-related careers.

Procedure

Participants were made aware of the study via the Sona system, the electronic research
participation system used by the Department of Psychological Science at the University of
Central Missouri. Students interested in participating registered for a group administration time
and, as allowed by individual instructors, were offered course credit through various courses in the department. Prior to participation in the study, participants read an informed consent form and were informed of the purpose of the study. The participants then completed the Socialization Survey and the mathematics computation subtest of the Wide Range Achievement Test 4. Completion of the packet was entirely voluntary and anonymity was ensured as forms did not request any personal identifying information. The completed measures were then collected by the researcher along with the consent forms.

The researcher calculated a parental socialization score by adding up the responses on the 7 items on parental influence with “strongly agree” scored as 5 points and “strongly disagree” scored as 0 points. The researcher then calculated a teacher socialization score by adding up the responses on the 7 items on the teacher influence items with “strongly agree” scored as 5 points and “strongly disagree” scored as 0 points. The researcher then calculated a media socialization score by adding up the responses on the 7 items on the media influence items with “strongly agree” scored as 5 points and “strongly disagree” scored as 0 points. The researcher also calculated an interest in math-related careers score by adding up the scores on the 14 careers listed on the math-related careers survey with “strongly agree” scored as 5 points and “strongly disagree” scored as 0 points. Before analyzing any differences in scores of individuals on the mathematics computation subtest of the Wide Range Achievement Test and career interest rating, the researcher first established whether the three types of socialization were predictors of mathematics performance or career interest. The researcher first conducted a correlation analyses to determine whether there was any relationship between the socialization variables and the two criterion variables, which were interest in a math-related career and performance on a mathematics test. Then a simultaneous multiple regression analysis was conducted with scores
from socialization from parents, teachers and media as a predictor of mathematics scores and a second simultaneous multiple regression with scores from socialization from parents, teacher and media predicting interest in math-related careers.
CHAPTER 4

RESULTS

The data were analyzed using both correlation analyses and simultaneous multiple regression analysis. The correlation analyses were computed separately according to gender. The correlation analysis was conducted to determine if relationships existed between the three socialization variables (parents, teachers, and media socialization) and mathematics performance, as measured by the mathematics subtest score of the Wide Range Achievement Test 4 (WRAT 4). Another correlation analysis was done to determine whether a relationship existed between the three socialization variables and interest in math-related careers, as measured by the interest in math-related career survey. Two multiple regression analyses were done using the socialization variables and gender as predictors to determine which agent was a better predictor of interest in math-related careers and which one was a better predictor of performance on a mathematics test.

Descriptive Analysis

The means, standard deviation and ranges for male and female participants on all scores from measures are displayed in Table 1 and Table 2 respectively.
### Table 1

*Descriptive Statistics for Male Participants*

<table>
<thead>
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<th>SD</th>
<th>MIN</th>
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<tr>
<td>Score on Mathematics test</td>
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<td>29.84</td>
<td>6.20</td>
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<td>Parent Socialization Score</td>
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<td>Media Socialization score</td>
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<td>21.41</td>
<td>6.95</td>
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<td>Career Interest scores</td>
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<td>30.19</td>
<td>8.40</td>
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### Table 2

*Descriptive Statistics for Female Participants*

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<th>Variables</th>
<th>Total Sample (N=43)</th>
<th>M</th>
<th>SD</th>
<th>MIN</th>
<th>MAX</th>
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<td>2.47</td>
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<td>31</td>
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<tr>
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<td>6.59</td>
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<tr>
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<tr>
<td>Teacher Socialization score</td>
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<td>11</td>
<td>34</td>
</tr>
<tr>
<td>Media Socialization score</td>
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<td>6.79</td>
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<td>33</td>
</tr>
<tr>
<td>Career Interest scores</td>
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<td>26.45</td>
<td>9.94</td>
<td>14</td>
<td>56</td>
</tr>
</tbody>
</table>
Correlations of Socialization Variables with Career Interest Scores

The assumptions associated with correlation coefficients are that the variables are measured at the ratio or interval data, independent observations of the scores, the variables are normally distributed and there is a linear relationship between the variables (Field, 2009). There was no violation of the assumptions of correlations because the variables were measured at the ratio/interval level, all the scores were measured independently, and the variables were approximately normally distributed as determined by the examination of the frequency distribution of each variable.

Hypothesis 1 stated that individuals who had greater exposure to socialization statements by the main agents of socialization towards mathematics would portray decreased interest in math-related careers. It was expected that greater exposure to socialization statements by parents, teachers, and media would be related to decreased interests in math-related careers for both males and females.

Correlations of Socialization Variables with Career Interest Scores for the Male Participants

Three different Pearson r correlations were computed to assess the relationships between the career interest variable and the three socialization variables (parent, teacher and media) for the male participants. A Pearson r correlation was computed to assess the relationship between the parent variable and interest in math-related careers. The results indicated a non-significant positive correlation between the two variables, \( r(29) = .042, p = .822 \). A further Pearson r was computed to assess the relationship between the teacher variable and interest in math-related careers. The results indicated a non-significant positive correlation between the two variables, \( r(29) = .152, p = .413 \). A third Pearson r correlation was computed to assess the relationship
between the media variable and interest in math-related careers. The results indicated a non-significant positive correlation between the two variables, \( r(29) = .194, p = .296 \).

**Correlations of Socialization Variables with Career Interest Scores for the Female Participants**

Three different Pearson \( r \) correlations were computed to assess the relationships between the career interest variable and the three socialization variables (parent, teacher and media) for the female participants. A Pearson \( r \) correlation was computed to assess the relationship between the parent variable and interest in math-related careers. The results indicated a non-significant negative correlation between the two variables, \( r(40) = -.038, p = .809 \). A further Pearson \( r \) was computed to assess the relationship between the teacher variable and interest in math-related careers. The results indicated a non-significant positive correlation between the two variables, \( r(40) = .149, p = .345 \). A third Pearson \( r \) correlation was computed to assess the relationship between the media variable and interest in math-related careers. The results indicated a non-significant positive correlation between the two variables, \( r(40) = .048, p = .762 \).

**Correlations of Socialization Variables with Mathematics Scores**

Hypothesis 2 stated that individuals who experienced greater exposure to socialization statements from their parents, teachers and media towards mathematics would perform worse on a test of mathematics. It was expected that both males and females who had greater exposure to socialization statements would perform worse in mathematics.
Correlations of Socialization Variables with Mathematics Scores for Male Participants

Three different Pearson $r$ correlations were computed to assess the relationships between the three socialization variables (parent, teacher, media) and mathematics test scores for the male participants.

A Pearson $r$ correlation was computed to assess the relationship between the parent socialization variable and mathematics test score. The results indicated a non-significant negative correlation, $r(29) = -.208, p = .261$. A further Pearson $r$ correlation was computed to assess the relationship between the teacher socialization variable and the mathematics test score. The results indicated a non-significant negative correlation, $r(29) = -.049, p = .792$. A third Pearson $r$ correlation was computed to assess the relationship between the media socialization variable and the mathematics test score. The results indicated a non-significant positive correlation, $r(29) = .155, p = .406$.

Correlations of Socialization Variables with Mathematics Scores for Female Participants

Three different Pearson $r$ correlations were computed to assess the relationships between the three socialization variables (parent, teacher, media) and mathematics test for the female participants.

A Pearson $r$ correlation was computed to assess the relationship between the parent socialization variable and mathematics test score. The results indicated a non-significant negative correlation, $r(41) = -.159, p = .309$. A further Pearson $r$ correlation was computed to assess the relationship between the teacher socialization variable and the mathematics test score. The results indicated a non-significant negative correlation, $r(41) = -.058, p = .198$. A third Pearson $r$ correlation was computed to assess the relationship between the media socialization variable and
the mathematics test score. The results indicated a non-significant positive correlation, $r(41) = .117$, $p = .456$.

**Regression Analysis Predicting Interest in Math-Related Careers**

Simultaneous multiple regressions allows the researcher to determine a portion of the variance explained by each predictor variable with the others statistically controlled (Field, 2009). The assumptions for multiple regression analysis are variables measured at quantitative or dichotomous levels, independent observations of the scores; linear relationships among the variables, homoscedasticity, independent errors, and normality of errors (Field, 2009). The data did not indicate violation of the assumptions. Normality of errors was determined by looking at the histogram of the residuals which indicated a bell shaped curve. There was no violation of homoscedasticity because an examination of the scatter plot indicated that all the data was approximately the same width for all the values of the predicted dependent variable.

Hypothesis 3 stated that exposure to socialization statements by parents, teachers and media towards mathematics would predict lower interest in math-related careers for males and females. Scores on the three variables (parent, teacher and media socialization) and gender of participants were used to predict interest in math-related careers as measured by the math-related careers survey. Results for the simultaneous multiple regressions are displayed in Table 3. The regression model accounted for a significant amount of the variance in interest in math-related careers, $F(4,68) = 2.41$, $p = .06$, $R^2 = .12$. The results indicated that three of the predictors (parent, teacher and gender of participant) were significant predictors of interest in math-related careers.

Further simultaneous multiple regressions were computed according to the gender of the participants to assess if the three socialization variables (parent, teacher and media) were
predictors of interest in math related careers as measured by the interest in math-related careers survey. The results for the multiple regression analysis for male participants are displayed in Table 4. The regression model did not account for a significant amount of the variance in interest in math-related careers, $F(3,27) = .73, p = .55, R^2 = .08$. The results indicated that none of the three predictors were significant predictors of interest in math-related careers for male participants.

A further simultaneous multiple regression analysis was computed for the female participants to assess if the three socialization variables (parent, teacher and media) were predictors of interest in math-related careers as measured by the interest in math-related careers survey. The results for the multiple regression analysis for the female participants are displayed in Table 5. The regression model accounted for a significant amount of the variance in interest in math-related careers, $F(3,38) = 2.12, p = .11, R^2 = .14$. The results indicated that two of the predictors (parent and teacher) were significant predictors of interest in math-related careers for female participants.

Table 3

<table>
<thead>
<tr>
<th>Measure</th>
<th>B</th>
<th>SE</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
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<td>5.32</td>
<td>6.59</td>
<td>.001</td>
</tr>
<tr>
<td>Parent scores</td>
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<td>.41</td>
<td>-2.21</td>
<td>.031</td>
</tr>
<tr>
<td>Teacher scores</td>
<td>.99</td>
<td>.42</td>
<td>2.36</td>
<td>.021</td>
</tr>
<tr>
<td>Media scores</td>
<td>-.02</td>
<td>.20</td>
<td>-.08</td>
<td>.935</td>
</tr>
<tr>
<td>Gender of participant</td>
<td>-5.36</td>
<td>2.25</td>
<td>-2.39</td>
<td>.020</td>
</tr>
</tbody>
</table>
Table 4

Summary of Regression Analysis Predicting Interest in Math-Related Careers for Male Participants

<table>
<thead>
<tr>
<th>Measure</th>
<th>B</th>
<th>SE</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>24.68</td>
<td>5.88</td>
<td>4.20</td>
<td>.001</td>
</tr>
<tr>
<td>Parent scores</td>
<td>-.59</td>
<td>.60</td>
<td>-.98</td>
<td>.335</td>
</tr>
<tr>
<td>Teacher scores</td>
<td>.72</td>
<td>.71</td>
<td>1.01</td>
<td>.320</td>
</tr>
<tr>
<td>Media scores</td>
<td>.19</td>
<td>.26</td>
<td>.73</td>
<td>.472</td>
</tr>
</tbody>
</table>

Table 5

Summary of Regression Analysis Predicting Interest in Math-Related Careers for Female Participants

<table>
<thead>
<tr>
<th>Measure</th>
<th>B</th>
<th>SE</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
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<td>6.37</td>
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</tr>
<tr>
<td>Parent scores</td>
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<td>.59</td>
<td>-2.29</td>
<td>.028</td>
</tr>
<tr>
<td>Teacher scores</td>
<td>1.41</td>
<td>.57</td>
<td>2.47</td>
<td>.018</td>
</tr>
<tr>
<td>Media scores</td>
<td>-.28</td>
<td>.29</td>
<td>-.95</td>
<td>.349</td>
</tr>
</tbody>
</table>

Regression Analysis Predicting Mathematics Scores

Hypothesis 4 stated that exposure to socialization statements from parents, teachers and media towards mathematics would predict lower performance on a subtest of mathematics ability for males and females. Scores on the three socialization variables (parent, teacher and media)
and gender of participants were used to predict performance on the mathematics subtest WRAT 4. Results for the simultaneous multiple regression analysis are displayed in Table 6. The regression model accounted for a significant amount of the variance in the WRAT 4 mathematics subtest score, $F(3,70) = 3.47, p = .02, R^2 = .13$. The results indicated that the two of the predictors (parents and teachers) were significant predictors of math scores.

Further simultaneous multiple regressions were computed according to the gender of the participants to assess if the three socialization variables (parent, teacher and media) were predictors of performance in a mathematics subtest WRAT 4. The results for the multiple regression analysis for male participants are displayed in Table 7. The regression model did not account for a significant amount of variance in the WRAT 4 mathematics subtest score, $F(3,27) = 1.66, p = .20, R^2 = .16$. The results indicated that none of the predictors were significant predictors of math scores for the male participants.

A further simultaneous multiple regression analysis was computed for the female participants to assess if the three socialization variables (parent, teacher and media) were predictors of performance in a mathematics subtest WRAT 4. The results for the multiple regression analysis for the female participants are displayed in Table 8. The regression model accounted for a significant amount of the variance in WRAT 4 mathematics subtest score, $F(3,39) = 2.40, p = .08, R^2 = .16$. The results indicated that two of the predictors (parent and teacher) were significant predictors of math scores for the female participants.
### Table 6

**Summary of Regression Analysis Predicting Mathematics Scores**

<table>
<thead>
<tr>
<th>Measure</th>
<th>B</th>
<th>SE</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
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<td>9.35</td>
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<td>-3.14</td>
<td>.002</td>
</tr>
<tr>
<td>Teacher scores</td>
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<td>.29</td>
<td>2.24</td>
<td>.028</td>
</tr>
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<td>Media scores</td>
<td>.10</td>
<td>.13</td>
<td>.78</td>
<td>.440</td>
</tr>
<tr>
<td>Gender of participant</td>
<td>-1.74</td>
<td>1.48</td>
<td>-1.17</td>
<td>.246</td>
</tr>
</tbody>
</table>

### Table 7

**Summary of Regression Analysis Predicting Math Scores for Male Participants**

<table>
<thead>
<tr>
<th>Measure</th>
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<th>SE</th>
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<tbody>
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<td>Constant</td>
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<td>7.09</td>
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<td>Parent scores</td>
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<td>Teacher scores</td>
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<td>.50</td>
<td>1.13</td>
<td>.270</td>
</tr>
<tr>
<td>Media scores</td>
<td>.21</td>
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<td>1.15</td>
<td>.259</td>
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</tbody>
</table>
Table 8

Summary of Regression Analysis Predicting Math Scores for Female Participants

<table>
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</tr>
</thead>
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<td>Constant</td>
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<td>7.79</td>
<td>.001</td>
</tr>
<tr>
<td>Parent scores</td>
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<td>.32</td>
<td>-2.56</td>
<td>.014</td>
</tr>
<tr>
<td>Teacher scores</td>
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<td>.38</td>
<td>2.07</td>
<td>.045</td>
</tr>
<tr>
<td>Media scores</td>
<td>-.02</td>
<td>.19</td>
<td>-.11</td>
<td>.911</td>
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</table>

Cronbach’s Reliability for all the items on the Socialization and Career Interest Surveys

Cronbach’s alpha is a statistic used as a measure of internal consistency or reliability of a psychometric instrument (Field, 2009). Cronbach's alpha will generally increase as the inter-correlations among test items increase, and is thus known as an internal consistency estimate of reliability of test scores. The Cronbach’s alphas are displayed in Table 9 for the Socialization and Career Interest surveys. The reliabilities for both surveys were reasonably high.

Table 9

Cronbach’s Alphas for the Socialization and Career Interest Surveys

<table>
<thead>
<tr>
<th>Variables</th>
<th>Cronbach’s Alpha</th>
<th>N of items</th>
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<td>7</td>
</tr>
<tr>
<td>Teacher Items</td>
<td>.81</td>
<td>7</td>
</tr>
<tr>
<td>Media Items</td>
<td>.87</td>
<td>7</td>
</tr>
<tr>
<td>Career Items</td>
<td>.82</td>
<td>14</td>
</tr>
</tbody>
</table>
CHAPTER 5
DISCUSSION

The purpose of this study was to predict both interest in mathematics-related careers and measured mathematical abilities of men and women using socialization as the main predictor variable. In this study we examined socialization previously identified as parents, teachers, and media in terms of how these aspects of socialization would be related to males and female interest in math-related careers. We also examined how socialization would predict scores of males and females on a mathematics test.

Four hypotheses were tested in the present study. The first hypothesis was that individuals who had greater exposure to socialization statements by the main agents of socialization towards mathematics would portray lower interest in math-related careers. It was expected that lower levels of exposure to socialization statements by parents, teachers, and media would be related to greater interests in math-related careers for both males and females. Three different Pearson $r$ correlations were computed to assess the relationships between the career interest variable and the three socialization variables (parent, teacher and media) for the male participants. The results for both male and female participants indicated non-significant correlations between the three aspects of socialization (parent, teacher and media) and interest in math-related careers. These findings were not in agreement with those findings of Scarpello (2007) who stated that parents and teachers play an important role in their children’s selection of courses especially during the student’s high school years because it is then that students discuss their course enrollment options and career choices with their parents. This may have been because the socialization survey was designed to address females’ socialization rather than that of males. This may have been why the results were non-significant.
A further three Pearson $r$ correlations were computed to assess the relationships between the career interest variable and the three socialization variables (parent, teacher and media) for the female participants. The results of the first Pearson $r$ correlation indicated a negative non-significant correlation between the parent variable and interest in math-related career. These findings were not consistent with the findings of Scarpello (2007) who stated that parents play an important role in their children’s selection of courses in school. The results for the other two Pearson $r$ correlations indicated positive non-significant correlations between the teacher and media socialization variable and interest in math-related careers. The practical implications of the results indicated that there was no significant relationship between parent, teacher and media socialization and interest in math-related careers for female participants. The hypothesis was not confirmed for either gender.

Hypothesis 2 stated that individuals who experienced greater exposure to socialization statements from their parents, teachers and media towards mathematics would perform worse on a test of mathematics. It was expected that both males and females who had greater exposure would perform worse in mathematics. Three Pearson $r$’s were computed to assess the relationship between socialization statements from parents, teachers and media and performance on a mathematics test for male participants. There was a non-significant negative correlation between socialization statements that individuals received from their parents and teachers and performance on the mathematics test. These results were not consistent with the findings of Scarpello (2007), who reported that the child’s educational context at home and at school can affect his/her attitude towards mathematics and performance on a mathematics test positively as the correlations in the present study were not significant. The results were also not consistent with the results of Chouinard, Karsenti and Roy (2007) who reported that the attitudes of parents
and teachers towards mathematics and viewing their children as learners of mathematics affected children’s perceptions of their own competence. The results of the other Pearson $r$ correlation computed between socialization statements from media and performance on mathematics test indicated non-significant positive correlations between socialization from media and performance on the mathematics test for male participants. These results were not consistent with the findings of Scarpello (2007), who reported that the child’s educational context at home and at school can affect his/her attitude towards mathematics and performance on a mathematics test.

A further three Pearson $r$’s were computed to assess the relationship between exposure to socialization statements from parents, teachers and media and performance on a mathematics test for the female participants. The results for the first Pearson $r$ indicated a negative non-significant correlation between socialization statements from parents and performance on a mathematics test. These results were not consistent with the findings of Scarpello (2007), as the correlations of the present study were not significant. The results were also not consistent with the results of Chouinard, Karsenti and Roy (2007) who reported that the attitudes of parents and teachers towards mathematics and viewing their children as learners of mathematics affected children’s perceptions of their own competence.

Hypothesis 3 stated that exposure to socialization statements by parents, teachers and media towards mathematics would predict lower interest in math-related careers for males and females. The results indicated that three of the predictors (parent, teacher, and gender of participant) were significant predictors of interest in math-related careers. These findings were in agreement with those findings of Scarpello (2007) who stated that parents and teachers play an important role in their children’s selection of courses especially during the student’s high school years because it is then that students discuss their course enrollment options and career choices.
with their parents. A further simultaneous multiple regression was computed for the male participants using exposure to socialization statements by parents, teachers and media as predictors of interest in math-related careers. The results indicated that none of the three predictors were significant predictors of interest in math-related careers for male participants. These findings were not in agreement with those findings of Scarpello (2007) who stated that parents and teachers play an important role in their children’s selection of courses especially during the student’s high school years because it is then that students discuss their course enrollment options and career choices with their parents. This may have been because the socialization survey was focused on female students.

A further simultaneous multiple regression analysis was computed for the female participants to assess if exposure to statements by the three socialization variables (parent, teacher and media) were predictors of interest in math-related careers as measured by the interest in math-related careers survey. The more exposure to socialization statements that females received from their parents in relation to math-related careers the more negative they perceived these careers to be. Similarly, the more exposure to socialization statements that females received from their teachers in relation to math-related careers the more positively they perceived these careers to be. The results indicated that two of the predictors (parent and teacher) were significant predictors of interest in math-related careers for female participants. These findings were in agreement with those findings of Scarpello (2007) who stated that parents and teachers play an important role in their children’s selection of courses especially during the student’s high school years because it is then that students discuss their course enrollment options and career choices with their parents.
Hypothesis 4 stated that exposure to socialization statements from parents, teachers and media towards mathematics would predict performance on a subtest of mathematics ability for males and females. Hypothesis 4 was partially supported from the results of the simultaneous multiple regression analyses.

Scores on the three socialization variables (parent, teacher and media) and gender of participants were used to predict performance on the mathematics subtest WRAT 4. The results indicated that the two of the predictors (parents and teachers) were significant predictors of math scores. The regression model accounted for a significant amount of the variance in the WRAT 4 subtest score. These results were consistent with the findings of Chouinard, Karsenti and Roy (2007), who reported that the attitude of parents and teachers toward mathematics and viewing their children as learners of mathematics affected the children’s own perceptions of their own competence. They further concluded that the perception of parental support explained variables associated with the valuing of mathematics while the teachers’ support acted most on competence beliefs (Chouinard, Karsenti & Roy, 2007). In other words, parents exert a strong influence on their children’s values regarding mathematics while teachers influence students’ self-perceptions suggesting that individuals who had greater exposure to socialization statements will perform better on a mathematics test. Furthermore, the regression weight for parents was negative indicating that the more exposure individuals received from their parents the more poorly they performed in mathematics. The regression weight for the teachers was positive indicating that the more exposure individuals received from their teachers the better they performed in mathematics. A further simultaneous multiple regression analysis was computed for the male participants to assess if exposure to the three socialization variables (parent, teacher and media) were predictors of performance in a mathematics subtest WRAT 4. The regression
model did not account for a significant amount of variance in the WRAT 4 mathematics subtest score and indicated that none of the predictors were significant predictors of math scores for the male participants. These results were not consistent with the findings of Leedy, LaLonde, and Runk (2003) who reported that many parents expect their young sons to develop mathematical skills earlier than girls and placed more emphasis on the importance of learning mathematics for boys.

A further simultaneous multiple regression analysis was computed for the female participants to assess if exposure to statements by the three socialization variables (parent, teacher and media) were predictors of performance in a mathematics subtest WRAT 4. The regression model accounted for a significant amount of the variance in WRAT 4 mathematics subtest score and the results indicated that two of the predictors (parent and teacher) were significant predictors of math scores for the female participants. These results indicated that the more exposure to socialization statements females received from their parents regarding mathematics the more likely they were to perform poorly on a mathematics test. In contrast, the more exposure to socialization statements they received from teachers the more likely they were to perform better on a mathematics test. These results were consistent with the finding of Chouinard, Karsenti and Roy (2007). The results were also consistent with the findings of Streitmatter (1999) who reported that teachers’ questioning methods and praise differed substantially for girls and boys. She specifically found that girls tended to be praised simply for trying, whereas teachers tended to withhold praise from boys until they produced a correct answer. Because of this, both the male and female students in the classroom eventually recognize that the teacher expects more from the boys than the girls.
Limitations

One of the limitations of the study is the lack of an existing validated survey measuring the three aspects of socialization. Although the validity of the surveys could not be established, the present study supports the internal consistency reliability of the surveys. The survey was edited from a newly developed survey and therefore, validity of the survey could not be determined. Another limitation was that socialization variables were measured using a self-report survey. Respondents may not have accurately reported how they were socialized as children to make them look better or may have not accurately remembered how they were socialized.

Another limitation of the study was that the study sample was selected for convenience from one college in the Midwest; therefore, it is not a representation of all college students. Therefore, the findings cannot be generalized to the whole population.

Further, some participants who may have wanted to participate may have had some anxiety associated with mathematics; therefore, they opted not to participate in the study. This may have caused the researcher not to have as many participants as anticipated because of the anxiety they associated with a mathematics test. Notably, those students who participated may have been less anxious about mathematics.

Implications

The reasons for gender disparities in mathematics have been the subject of long-standing debate. In particular, the interest in mathematics of boys versus girls has been scrutinized by many researchers like Scarpello (2007), Sadker & Sadker (1997) and Eccles (1992). In the past, girls had been thought to dismiss math-related careers because these careers did not “help people” and did not require “creativity and imagination” or “social interaction” (Farmer, Wardrop, & Rotella, 1999; Sherman, 1983). The lack of these attributes was attached to a
negative career image. However, the present results provide support for the idea that socialization from parent and teacher statements can predict performance on a mathematics test. It is therefore important for parents and teachers to carefully examine their own perceptions and biases towards mathematics and refrain from projecting their own views but encourage students to have their own individual interests.

The present findings support the need not only for greater clarity in communicating mathematics to the individuals. There are subtle and probably unintentional messages that teachers and parents seem to be conveying to highly impressionable children’s decisions about intended college majors. The choices that individuals make must be based upon a realistic assessment of their abilities and interests and should not be influenced by biased messages that could undermine their self-confidence.

Socialization from parents, teachers and media plays a crucial role in an individual’s life. Therefore, it is important for parents, teachers and the media to ensure that there is no gender bias in the way mathematics is being communicated to students if we want more students to consider math-related careers. Teachers can also work on boosting the students’ self-confidence by presenting mathematics as a fun activity rather than a difficult one. They can also work on providing information about the available job options for mathematics-related majors, so that the students are not left with the stereotypical image of mathematics being only appropriate for males and not for females.

Future Research

A need for additional research remains and includes collecting data from randomly selected and larger samples to validate the results obtained in this research. Also a better survey
could be developed to include all the agents of socialization and questions that have been tailored to fit the particular survey and then tested on its validity and reliability before being used to collect data.

Also it may be useful to make comparisons between different nations and cultures like a first world country and a third world country. According to Randel, Stevenson, and Witruk, (2000), cultural standards for math achievement; in nations where math achievement is highly valued and where there is access to high-level math classes, students perceived math as being difficult and less enjoyable. They further went on to give an example of Japanese students outperforming German students in math achievement and still holding higher standards for themselves and feeling more negative about math than the German students.

In conclusion, it is important to underscore that there are more men in math-related careers than women (McGraw, Lubienski & Strutchens 2006); therefore it is useful to consider ways to counter this disparity. Ultimately the best way to achieve equity or at least provide a level playing field is through education. Choice of math-related majors in college forms an important component of this larger narrative. Perceptions have the power to shape future goals and aspirations, and, more importantly, negative perceptions can limit these options and even prevent students from considering math-related majors. If our schools and the education system are in any way reinforcing a negative perception of mathematics among their students, then remedial measures become necessary. It is especially important to explore these trends in the light of the gender gap that exists to this day in math-related professions.
References


Fox, L. H. (1982). The study of social processes that inhibit or enhance the development of competence and interest in mathematics among highly able young women. (Final Report). Baltimore, MD: Johns Hopkins University. (ERIC Document Reproduction)


APPENDIX A

SURVEY

Gender
[ ] Female    [ ] Male

Ethnicity
[ ] African American   [ ] Native American
[ ] Asian           [ ] Latino/Hispanic
[ ] Caucasian       [ ] Other____________

Age ___________

Please CIRCLE the option that best matches your opinion:

SECTION A: For this section please circle the answer that best matches your opinion about how your parents or guardian influenced your perceptions or opinions on mathematics and math-related careers throughout your life.

1. My parents gave the impression that mathematics courses were more appropriate for boys than girls. (parent variable)
   (a) Strongly disagree (b) Somewhat disagree (c) Neutral (d) Somewhat agree (e) Strongly agree

2. My parents gave the impression that boys should pursue math-related careers more so than girls should. (parent variable)
   (a) Strongly disagree (b) Somewhat disagree (c) Neutral (d) Somewhat agree (e) Strongly agree

3. My parents gave the impression that women are better at non-technical jobs, particularly ones that deal directly with people such as a psychologist or social worker. (parent variable)
   (a) Strongly disagree (b) Somewhat disagree (c) Neutral (d) Somewhat agree (e) Strongly agree

4. My parents gave the impression that I was in control of my career goals and choices. (parent variable)
   (a) Strongly disagree (b) Somewhat disagree (c) Neutral (d) Somewhat agree (e) Strongly agree
5. My parents gave the impression that women were likely to have a different perspective on mathematics because women have different viewpoints from men. (parent variable)

(a) Strongly disagree (b) Somewhat disagree (c) Neutral (d) Somewhat agree (e) Strongly agree

6. My parents gave the impression that boys know more about mathematics than girls do.

(parent variable)

(a) Strongly disagree (b) Somewhat disagree (c) Neutral (d) Somewhat agree (e) Strongly agree

7. My parents gave the impressions that boys are more interested in mathematics than girls are.

(parent variable)

(a) Strongly disagree (b) Somewhat disagree (c) Neutral (d) Somewhat agree (e) Strongly agree

SECTION B: For this section please circle the answer that best matches your opinion about how teachers or professors influenced your opinion on mathematics and math-related careers since you started school.

1. My teachers gave the impression that mathematics courses were more appropriate for boys than girls. (teacher variable)

(a) Strongly disagree (b) Somewhat disagree (c) Neutral (d) Somewhat agree (e) Strongly agree

2. My teachers gave the impression that boys should pursue math-related careers more so than girls should. (teacher variable)

(a) Strongly disagree (b) Somewhat disagree (c) Neutral (d) Somewhat agree (e) Strongly agree

3. My teachers gave the impression that women are better at non-technical jobs, particularly ones that deal directly with people such as a psychologist or social worker. (teacher variable)

(a) Strongly disagree (b) Somewhat disagree (c) Neutral (d) Somewhat agree (e) Strongly agree

4. My teachers gave the impression that I was in control of my career goals and choices.

(teacher variable)

(a) Strongly disagree (b) Somewhat disagree (c) Neutral (d) Somewhat agree (e) Strongly agree
5. My teachers gave the impression that women were likely to have a different perspective on mathematics because women have different viewpoints from men. (teacher variable)
   (a) Strongly disagree (b) Somewhat disagree (c) Neutral (d) Somewhat agree (e) Strongly agree
6. My teachers gave the impression that boys know more about mathematics than girls do. (teacher variable)
   (a) Strongly disagree (b) Somewhat disagree (c) Neutral (d) Somewhat agree (e) Strongly agree
7. My teachers gave the impression that boys are more interested in mathematics than girls are. (teacher variable)
   (a) Strongly disagree (b) Somewhat disagree (c) Neutral (d) Somewhat agree (e) Strongly agree

SECTION C: For this section please circle the answer that best matches your opinion about how the media in influenced your perceptions or opinions on mathematics and math-related careers throughout your life. (media here includes T.V programs, internet, newspapers, journals, books, movies)
1. The media gave the impression that mathematics courses were more appropriate for boys than girls. (media variable)
   (a) Strongly disagree (b) Somewhat disagree (c) Neutral (d) Somewhat agree (e) Strongly agree
2. The media gave the impression that boys should pursue math-related careers more so than girls should. (media variable)
   (a) Strongly disagree (b) Somewhat disagree (c) Neutral (d) Somewhat agree (e) Strongly agree
3. The media gave the impression that women are better at non-technical jobs, particularly ones that deal directly with people such as a psychologist or social worker. (media variable)
   (a) Strongly disagree (b) Somewhat disagree (c) Neutral (d) Somewhat agree (e) Strongly agree
4. The media gave the impression that I was in control of my career goals and choices.
   (a) Strongly disagree (b) Somewhat disagree (c) Neutral (d) Somewhat agree (e) Strongly agree
5. The media gave the impression that women were likely to have a different perspective on mathematics because women have different viewpoints from men. (media variable)
(a) Strongly disagree (b) Somewhat disagree (c) Neutral (d) Somewhat agree (e) Strongly agree

6. The media gave the impression that boys know more about mathematics than girls do. (media variable)
(a) Strongly disagree (b) Somewhat disagree (c) Neutral (d) Somewhat agree (e) Strongly agree

7. The media gave the impressions that boys are more interested in mathematics than girls are. (media variable)
(a) Strongly disagree (b) Somewhat disagree (c) Neutral (d) Somewhat agree (e) Strongly agree

SECTION D: For this section please circle on a scale of 1-5 your level of interest in each career with 1 being not at all interested and 5 being very interested.

1. Actuary
   (a) 1 (b) 2 (c) 3 (d) 4 (e) 5

2. Accountant
   (a) 1 (b) 2 (c) 3 (d) 4 (e) 5

3. Statistician
   (a) 1 (b) 2 (c) 3 (d) 4 (e) 5

4. Physician
   (a) 1 (b) 2 (c) 3 (d) 4 (e) 5

5. Research scientist
   (a) 1 (b) 2 (c) 3 (d) 4 (e) 5

6. Computer scientist
   (a) 1 (b) 2 (c) 3 (d) 4 (e) 5
7. Inventory strategist
   (a) 1   (b) 2   (c) 3   (d) 4   (e) 5

8. Staff systems air traffic control analyst
   (a) 1   (b) 2   (c) 3   (d) 4   (e) 5

9. Cryptologist
   (a) 1   (b) 2   (c) 3   (d) 4   (e) 5

10. Attorney
    (a) 1   (b) 2   (c) 3   (d) 4   (e) 5

11. Economist
    (a) 1   (b) 2   (c) 3   (d) 4   (e) 5

12. Mathematics professor
    (a) 1   (b) 2   (c) 3   (d) 4   (e) 5

13. Engineer
    (a) 1   (b) 2   (c) 3   (d) 4   (e) 5

14. Ecologist
    (a) 1   (b) 2   (c) 3   (d) 4   (e) 5