# AC 2010-1468: ATTITUDES TOWARDS AND SUPPORT PROVIDED FOR MATHEMATICS LEARNING REPORTED BY PARENTS OF STUDENTS INVOLVED IN A GK-12 PROGRAM

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# Attitudes Towards and Support Provided for Mathematics Learning Reported by Parents of Students Involved in a GK-12 Program

The goal of the RAMP-UP (Recognizing Accelerated Math Potential in Underrepresented People) program at North Carolina State University (NCSU) is to increase the number and diversity of students who enroll and succeed in higher-level mathematics courses. To achieve this goal, the RAMP-UP project places NCSU graduate engineering and undergraduate engineering and mathematics education students, and mathematics and computer science students from Shaw University (a historically black university) in local public schools. The placement of these university students (fellows) serves two purposes. One is to enrich the learning experiences of K-12 students by serving as role models and mentors to students and the other is to work with teachers collaboratively to create hands-on mathematics activities and experiments in order to cultivate an excitement for learning mathematics.

Even though school experiences can have a strong impact on students' attitudes towards and achievement in mathematics, it is also important to consider the important influence parents have on encouraging and supporting students' success in school. For example, one study conducted with Caucasian and Asian American $5^{th}$ and $6^{th}$ grade students found that parental variables accounted for 22% of the variation in students' mathematics achievement (Campbell & Mandell, 1990). In addition, attitudes of students towards mathematics also influence their decisions to pursue advanced mathematics courses in high school and college and these attitudes may be similar to and influenced by the attitudes of their parents (Yee & Eccles, 1988). These studies indicate parents have influence over their students' success in, attitude towards, and decision to pursue advanced courses in mathematics. Thus, if one the goals of the RAMP-UP program is to increase the number of students enrolled and succeeding in higher-level mathematics courses, then an awareness and understanding of the program participants' parents' beliefs and attitudes towards mathematics is needed. In addition, if the population of students taking these advanced mathematics courses is to become more diverse, then it may be helpful to analyze the parents' beliefs and attitudes towards mathematics by looking at factors that my influence this diversity including gender and ethnicity.

For each of the past five years, parents of RAMP-UP participants were asked to complete a survey, which included items that assessed their beliefs and attitudes toward mathematics. Questions asked parents to report on issues such as, the frequency with which they discuss mathematics with their children, the point at which they would be unable to assist their child in their mathematics homework, and their feelings toward mathematics. In addition, demographic data were collected that included the parent's level of education, career, gender, and race. The surveys were distributed to students in RAMP-UP classrooms who were asked to bring them home to a parent to complete and return to their teacher by a particular date. There were 987 surveys completed by parents during the five-year period. This paper begins with a description of the demographics of survey respondents and then analyzes parent responses' to questions related to communication about, assistance with, and attitudes towards mathematics.

*Demographics*. An overwhelming number of female parents (78%) completed the survey. However, it is interesting to note the proportion of females who completed the survey differed by race. An analysis of gender versus race (See Table 1 and Figure 1) indicates that of African American parents who responded, 91.4% of the surveys were completed by females while for Asian parents only 53.2% were returned by females.

Table 1. Number and percentage of survey respondents by ethnicity and gender

| | Male | Female | Total |
|---|---|---|---|
| African American | 12<br>8.6% | 127<br>91.4% | 139 |
| Asian | 59<br>46.8% | 67<br>53.2% | 126 |
| Caucasian | 82<br>20.7% | 314<br>79.3% | 396 |
| Hispanic | 17<br>37.0% | 29<br>63.0% | 46 |
| Other | 7<br>21.9% | 25<br>78.1% | 32 |
| Total | 177 | 562 | 739 |

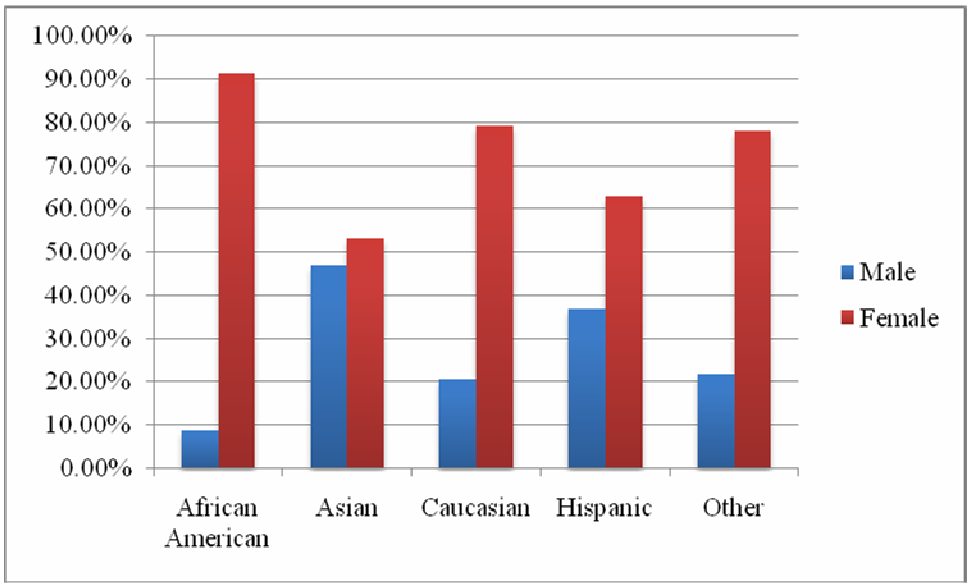


Figure 1. Proportion of males and females categorized by race who responded to the parent survey.

In addition to analyzing the race and gender of parents who responded, the highest level of education was also examined. Of those who responded to the survey, a large proportion of parents had completed at least an associate degree with a large proportion completing a bachelors or graduate degree. From this analysis (see Table 2 and Figure 2) it is interesting to note that most African American parents who responded had finished high school, most Caucasian parents completed a bachelors degree and most Asian parents had completed a graduate degree. The

extent to which the respondents to the survey are representative of the general population in the United States might be questioned. US Census data from 2008 indicates only 27% of the population has earned a bachelors degree or above (http://www.census.gov/population/www/socdemo/educ-attn.html).

Table 2. Number and percentage of respondents by ethnicity and highest level of education.

| | African American | Asian | Caucasian | Hispanic | Other |
|---|---|---|---|---|---|
| Middle School | 3<br>1.6% | 0<br>0.0% | 4<br>0.8% | 13<br>26.5% | 0<br>0.0% |
| High School | 83<br>45.6% | 3<br>2.0% | 61<br>12.2% | 13<br>26.5% | 9<br>22.5% |
| Associate's Degree | 28<br>15.4% | 6<br>4.1% | 70<br>14.0% | 4<br>8.2% | 7<br>17.5% |
| Bachelor's Degree | 45<br>24.7% | 39<br>26.5% | 249<br>49.7% | 10<br>20.4% | 14<br>35.0% |
| Graduate School | 23<br>12.6% | 99<br>67.3% | 117<br>23.4% | 9<br>18.4% | 10<br>25.0% |

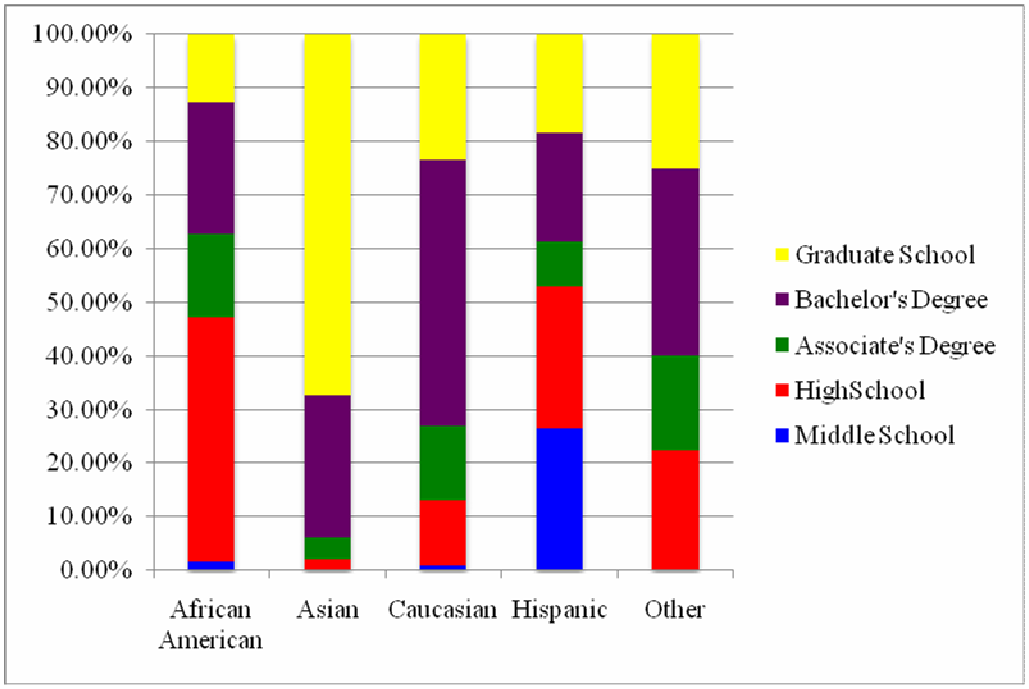


Figure 2. Highest degree completed by parents of different races.

One similarity to the academic achievement of the US population was noted. The proportion of females and males whose highest level of education attainment was a bachelors degree was slightly higher for females (female parents – 39.4%; male parents – 34.8%).

From this demographic analysis, we can summarize that parents who responded to the survey were typically Caucasian, female, and had earned at least a bachelor's degree.

*Communication with teacher*. It is critical for parents and teachers to work together to provide children the best possible education. Communication between parents and teachers is important to assure both are informed about what children are learning and doing both inside and outside of the classroom. Also, parent-teacher communication is important to the child's success in school. In their meta-analysis, Fan and Chen (2001) indicate that academic achievement and parental involvement (including parent-teacher-communication and parent-child communication) are positively correlated. In addition to improving students' academic achievement, positive parent-teacher communication may have other benefits as well. Adams and Christenson (2000) indicate improving home–school communication was identified as a primary way to enhance trust between teachers and parents. There are a variety of methods that parents and teachers may use to communicate with each other.

In this survey, parents were asked to indicate how they communicate with their child's teacher. The answer choices for this question were telephone, meeting at school, website, email, send a note, and the student's agenda. Many times, a parent would circle more than one response. For these instances, an additional category, multiple means of communication, was created. The results, as shown in Table 3, indicate that many parents use multiple means to communicate with their child's teacher (34.3%). Of those parents that only selected one of the choices, meeting at school (26.8%) and email (21.2%) were the two most popular ways parents communicate with the teacher.

Table 3. Methods of communicating with teachers as reported by parents.

| | Parent Response |
|---|---|
| Telephone | 25<br>3.2% |
| Meeting at School | 207<br>26.8% |
| Website | 10<br>1.3% |
| Email | 164<br>21.2% |
| Send Note | 52<br>6.7% |
| Agenda | 49<br>6.4% |
| Multiple | 265<br>34.3% |

The ways in which parents communicate with their child's teacher may vary depending on the type of school in which the students was enrolled. As Table 4 indicates, parents of elementary school students are more likely to communicate with the teacher in a face-to-face setting at school (35.2%) than parents of middle school students (14.1%). However, middle school parents

are more likely to use internet-based technologies (website and email) to communicate with the teacher (31.0%) than parents of elementary school students (16.9%). It is worth noting that the highest percentage in both groups was the multiple means of communication.

Table 4. Methods of communicating with teacher versus type of school in which student is enrolled.

| | Elementary School | Middle School |
|---|---|---|
| Telephone | 9<br>1.9% | 16<br>5.2% |
| Meeting at School | 164<br>35.2% | 43<br>14.1% |
| Website | 2<br>0.4% | 8<br>2.6% |
| Email | 77<br>16.5% | 87<br>28.4% |
| Send Note | 22<br>4.7% | 30<br>9.8% |
| Agenda | 21<br>4.5% | 28<br>9.2% |
| Multiple | 171<br>36.7% | 94<br>30.7% |

Even though the ways in which parents communicate with teachers provides insight into how schools can best foster this relationship, the frequency at which they communicate may be related to the students' academic success. The responses regarding the frequency of communication between parents and teachers about mathematics varied by the level of academic attainment of the parent as well as by the type of school in which the student was enrolled.

Parents were asked to respond to the question, how often do you communicate with your child's teacher. The response choices were Daily, Weekly, Monthly, and Rarely. Looking at the parent's responses sorted by the type of school in which their child is enrolled, we notice parents of children in elementary school communicated more frequently about mathematics with teachers than parents of children in middle school (see Table 5 Figure 3).

Table 5. Frequency of communication with teachers versus the type of school in which student is enrolled.

| | Daily | Weekly | Monthly | Rarely |
|---|---|---|---|---|
| Elementary School | 32<br>5.6% | 63<br>10.9% | 125<br>21.7% | 356<br>61.8% |
| Middle School | 7<br>2.0% | 21<br>6.0% | 42<br>12.1% | 278<br>79.9% |

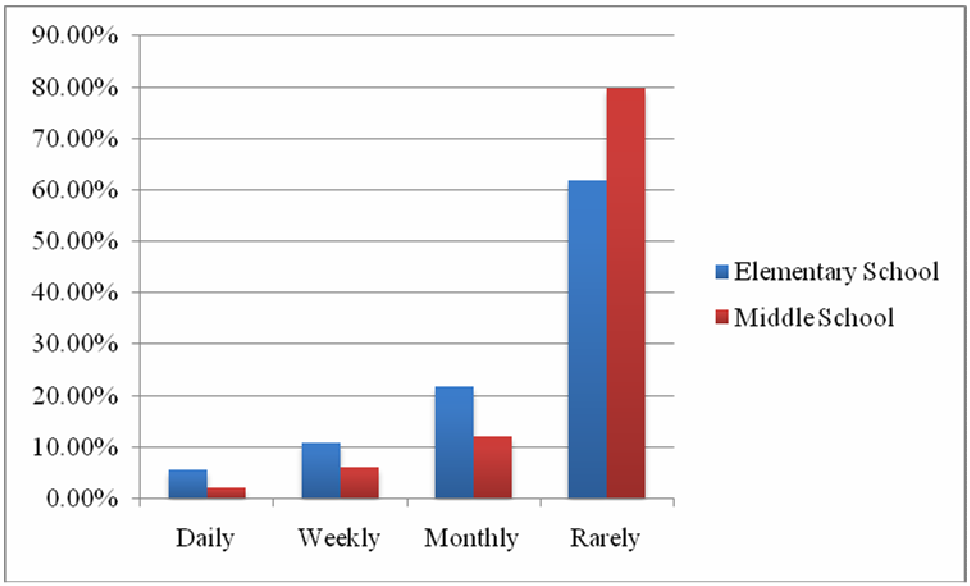


Figure 3. Frequency of communication between parents and teachers sorted by the type of school the student is enrolled.

Looking at the parents' responses to this question sorted by the highest degree completed, it was noted that as the academic attainment of the parent increased, the frequency of communication with the teacher about mathematics decreased (see Figure 4).

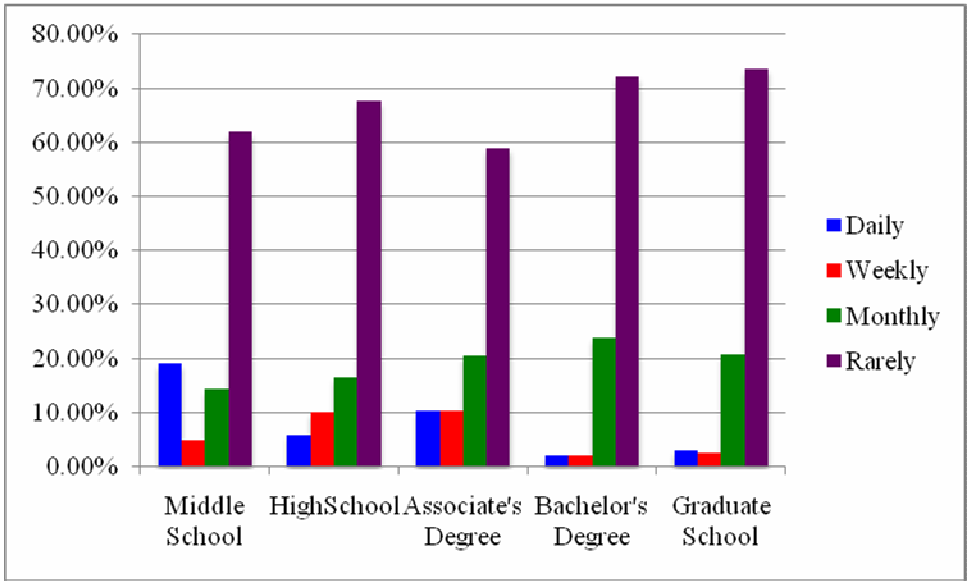


Figure 4. Frequency of communication between parents and teachers sorted by the parent's highest degree completed.

Parents whose highest academic attainment was middle school, high school, or an associates degree communicated more daily and weekly while parents who completed bachelor's or graduate school degrees communicated less frequently about mathematics. It might be expected that parents who have completed more education are more familiar with the mathematics that

their children are learning and therefore do not feel the need to communicate about mathematics with the teacher as frequently.

*Communication with students*. As previously discussed, parent-child communication about mathematics can have a positive impact on student achievement. However, parents are not always comfortable discussing mathematics with their children. In particular, some parents may not feel comfortable assiting their child with their homework when a child reaches a certain grade level. This notion was analyzed by examining responses to a question that asked parents to report at what point (elementary school, middle school, high school, college) they would not feel comfortable assisting their child with mathematics (See Table 6 and Figure 5). A small proportion of parents reported that they would feel uncomfortable assisting their child with mathematics in elementary school and this proportion increased steadily through middle school, high school and college.

Table 6. Level at which parents would feel uncomfortable assisting students with mathematics versus level of educational attainment of parent.

| | Elementary School | Middle School | High School | College |
|---|---|---|---|---|
| Middle School | 2<br>10.0% | 4<br>20.0% | 11<br>55.0% | 3<br>15.0% |
| High School | 24<br>15.5% | 33<br>21.3% | 71<br>45.8% | 27<br>17.4% |
| Associate's Degree | 14<br>13.1% | 27<br>25.2% | 37<br>34.6% | 29<br>11.1% |
| Bachelor's Degree | 16<br>5.0% | 51<br>16.0% | 140<br>43.9% | 112<br>35.1% |
| Graduate School | 17<br>7.7% | 39<br>17.6% | 75<br>33.8% | 91<br>41.0% |

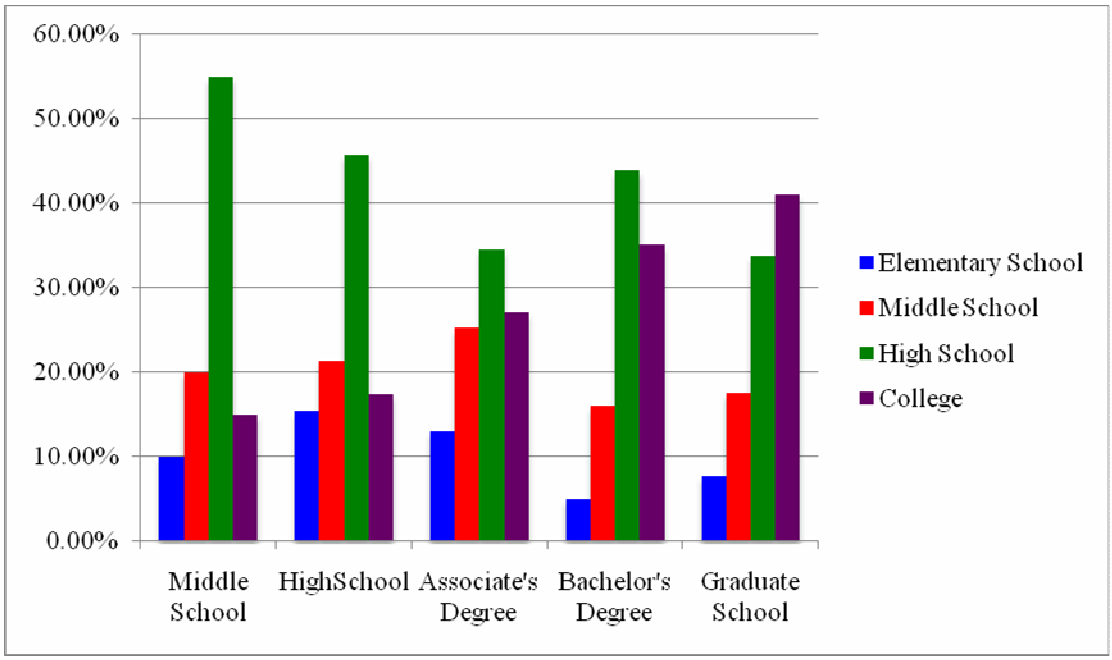


Figure 5. The proportion of parents uncomfortable assisting students with mathematics at each level determined by educational attainment of parent.

Looking at these results, two trends emerge. One, the percentage of parents who selected elementary and middle school mathematics as the points at which they would not feel comfortable assisting their child decreased as the parent's level of education increased. Second, the percentage of parents that selected college level mathematics as the point at which they would not feel comfortable assisting their child increased as the parent's level of education increased. One might expect a relationship between the parent's comfort assisting their child with mathematics and the frequency with which they talk to their child about and assist their child with mathematics.

Parents were asked to respond to the question, how often do your kids ask you for help with mathematics? The response choices were Daily, Weekly, Monthly, and Rarely. The responses to this question were analyzed based on the parent's ethnicity and differences among the frequencies with which children ask parents for help with mathematics were noted. In particular, African American parents report their children ask for assistance more often daily while Hispanic, Asian, and Caucasian parents report their children ask for assistance with mathematics weekly most often (see Table 7).

Table 7. Frequency with which children ask parents for assistance with mathematics versus race.

| | Daily | Weekly | Monthly | Rarely |
|---|---|---|---|---|
| African American | 61<br>34.5% | 58<br>32.8% | 16<br>9.0% | 42<br>23.7% |
| Asian | 36<br>25.5% | 65<br>45.5% | 6<br>4.2% | 36<br>25.2% |
| Caucasian | 93<br>18.8% | 235<br>47.6% | 47<br>9.5% | 119<br>24.1% |
| Hispanic | 6<br>12.2% | 22<br>44.9% | 4<br>8.2% | 17<br>34.7% |
| Other | 11<br>28.2% | 12<br>30.8% | 5<br>12.8% | 11<br>28.2% |

Parents were also asked to indicate whether they were comfortable discussing mathematics with their child. Responses to this question were Yes, Somewhat, and No. Analyzing the responses to the question by educational attainment indicates parents with higher levels of educational attainment are more comfortable talking about math with their child (see Table 8).

Table 8. Parents' comfort with discussing mathematics versus level of educational attainment.

| | Yes | Somewhat | No |
|---|---|---|---|
| Middle School | 6<br>33.3% | 10<br>55.6% | 2<br>11.1% |
| High School | 96<br>59.3% | 52<br>32.1% | 14<br>8.6% |
| Associate's Degree | 69<br>64.5% | 37<br>34.6% | 1<br>0.9% |
| Bachelor's Degree | 291<br>86.1% | 47<br>13.9% | 0<br>3.2% |
| Graduate School | 211<br>86.5% | 30<br>12.3% | 3<br>1.2% |

The responses to this question were also analyzed by race. Findings indicate Asian parents are most comfortable discussing mathematics with their children than parents of other races (see Table 9).

Table 9. Parents' comfort with discussing mathematics versus race.

| | Yes | Somewhat | No |
|---|---|---|---|
| African American | 111 | 47 | 7 |
| | 67.3% | 28.5% | 4.2% |
| Asian | 129 | 9 | 0 |
| | 93.5% | 6.5% | 0.0% |
| Caucasian | 365 | 93 | 11 |
| | 77.8% | 19.8% | 2.3% |
| Hispanic | 28 | 17 | 1 |
| | 60.9% | 37.0% | 2.2% |
| Other | 27 | 8 | 0 |
| | 77.1% | 22.9% | 0.0% |

*Attitudes towards mathematics.* Because a parent's attitude toward mathematics can impact student's attitudes, it was important to assess the attitudes of parents of RAMP-UP students towards mathematics. In the survey, parents were asked to respond to the question, what is the first feeling you have when you think about math? The responses were Fear, Anticipation, Dislike, Don't Care, Like, and Excitement. The responses to this question were analyzed by gender (see Table 10.). It is interesting to note, that by gender, male and female parents like mathematics about the same (Male: 48.95; Female: 47.3%). However, Males are more excited about mathematics (Male: 24.2%; Female: 14.7%) and less fearful (Male: 5.6%; Female: 11.6%).

Table 10. Parents' attitudes towards mathematics as reported by gender.

| | Fear | Anticipation | Dislike | Don't Care | Like | Excitement |
|---|---|---|---|---|---|---|
| Male | 10 | 14 | 12 | 12 | 87 | 43 |
| | 5.6% | 7.9% | 6.7% | 6.7% | 48.9% | 24.2% |
| Female | 64 | 47 | 68 | 31 | 261 | 81 |
| | 11.6% | 8.5% | 12.3% | 5.6% | 47.3% | 14.7% |

This question was also analyzed by ethnicity (see Table 11). It is interesting to note that more parents, regardless of race, like mathematics than dislike mathematics.

Table 11. Parents' attitudes towards mathematics differentiated by race.

| | Fear | Anticipation | Dislike | Don't Care | Like | Excitement |
|---|---|---|---|---|---|---|
| African American | 20 | 18 | 20 | 10 | 95 | 12 |
| | 11.4% | 10.3% | 11.4% | 5.7% | 54.3% | 6.9% |
| Asian | 5 | 6 | 3 | 5 | 58 | 67 |
| | 3.5% | 4.2% | 2.1% | 3.5% | 40.3% | 46.5% |
| Caucasian | 47 | 40 | 68 | 37 | 246 | 51 |
| | 9.6% | 8.2% | 13.9% | 7.6% | 50.3% | 10.4% |
| Hispanic | 5 | 5 | 6 | 2 | 24 | 9 |
| | 9.8% | 9.8% | 11.8% | 3.9% | 47.1% | 17.6% |
| Other | 11 | 5 | 2 | 1 | 13 | 6 |
| | 28.9% | 13.2% | 5.3% | 2.6% | 34.2% | 15.8% |

*Discussion.* In this analysis, the analyzed parent survey questions fall into three categories, communication about mathematics with their child's teacher, communication about mathematics with their child, and the parents' attitude towards mathematics. Results from the 987 parents of program participants who returned the survey indicate that parents with higher levels of education are more comfortable discussing mathematics with their child and are more likely to be able to assist their children with primary, middle, and secondary level mathematics. Parents of elementary school students discuss mathematics more frequently with their child's teacher than parents of middle school students and this discussion is more likely to happen face-to-face. Middle school parents are more likely to use internet-based technologies to communicate with the teacher. African-American parents who responded to the survey are more likely to be asked daily by their child for help with mathematics homework than other ethnicities, but are less comfortable discussing mathematics than these other ethnicities. This may be due to their attitudes toward mathematics where they had a high percentage of responses that encompassed fear and anticipation compared to the other ethnicities. Hispanic parents who responded to the survey, overall, had less education than other ethnicities, were the least comfortable discussing mathematics with their students, and were less likely to be able to help their child with mathematics when they reach high school. Male and female respondents both liked mathematics at similar percentages, but males had more excitement towards mathematics while females had more fear.

As previously discussed, Fan and Chen (2001) indicate that children's academic achievement and parental involvement are positively related. The more involved a parent is in his or her child's education, the more likely the child is to academically succeed. Thus, if children are to take and succeed in higher-level mathematics courses, an understanding of the ways in which parents are involved in their children's learning mathematics is needed. And, if the diversity of those taking these higher-level mathematics courses is to increase, then an analysis of the parental involvement is needed. While the results discussed in the paper add to knowledge base and reaffirm some notions about the relationship between a parent's demographics and their involvement in their child's mathematics development, this survey is by no mean comprehensive. Other factors that were not requested on the survey may have contributed to the noted differences among the gender, ethnic, and education background factors for the

communication about mathematics with their child's teacher, communication about mathematics with their child, and the parents' attitude towards mathematics categories (e.g. number of children in the household, parents' income, parents' work schedule, number of adults in the household). In addition to these unexplored factors, questions still remain regarding the ways in which parents assist their child with their homework, whether a parent's career field (STEM versus Non-STEM) affects their communication about mathematics with the parent and the child and attitudes towards mathematics, and whether the parent's involvement with the school in other ways (e.g. PTA, volunteering) affects these notions.

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