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ABSTRACT

This study investigates the relationship between the mathematics attitudes of over 32,000 Hispanic and Asian students in the 1992 National Assessment of Educational Progress (NAEP) Mathematics Trial State Assessment, by gender and ethnicity, and by their mathematics performance scores. Descriptive inferential statistical procedures designed for NAEP secondary data analysis were used. Results show that Asian 8th grade females were the only female group that slightly outperformed their male Asian peers. At both grade levels, female and male Asian students' average math proficiency was at the basic achievement level established by the NAEP National Assessment Governing Board, whereas female and male Hispanic students at both grade levels were below the lower bound for this achievement level. Results also indicate that most of the attitude variables were significant predictors of Hispanic and Asian students mathematics achievement, with slight differences between Hispanic and Asian 4th grade students of both gender groups regarding attitudes to be important predictors of math achievement. A more discrepant profile was found for the 8th grade students by gender and ethnicity. Appendices include the variables used in statistical analysis. Contains 30 references. (Author/ASK)

Running head: ETHNICITY, GENDER, ATTITUDES AND MATH ACHIEVEMENT

Ethnicity, Gender, Attitudes and Mathematics Achievement:

The 1992 NAEP Trial State Assessment

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Abstract

This study investigates the relationship between the mathematics attitudes of over 32,000 Hispanic and Asian students in the 1992 National Assessment of Educational Progress (NAEP) Mathematics Trial State assessment, by gender and ethnicity, and their mathematics performance scores. Descriptive and inferential statistics procedures designed for NAEP secondary data analysis were used. Results show that Asian 8th-grade females were the only female group that slightly outperformed their male Asian peers. At both grade levels, female and male Asian students' average math proficiency was at the Basic achievement level established by the NAEP National Assessment Governing Board, whereas female and male Hispanic students at both grade levels, were below the lower bound for this achievement level. Results also indicate that most of the attitude variables were significant predictors of Hispanic and Asian students mathematics achievement, with slight differences between Hispanic and Asian 4th-graders of both gender groups regarding attitudes found to be important predictors of math achievement. A more discrepant profile was found for the 8th-graders, by gender and ethnicity.

Ethnicity, Gender, Attitudes and Mathematics Achievement: The 1992 NAEP Trial State Assessment[1]

Since 1969 the National Assessment of Educational Progress (NAEP) has surveyed the educational achievement of American students, and changes in their achievement over time (The NAEP Guide, 1991). All along, it has documented the mathematics under achievement of Hispanic students. For example, the last comprehensive NAEP survey of the mathematics and reading achievement of Hispanic, Asian, and Native American students, found that Asian students in 3rd-, 7th-, and 11th grade outperformed their Hispanic peers in mathematics achievement. The survey reported that ". . . [t]he variables that explained the largest proportion of the differential favoring Asians were, having positive school related attitudes (italics added), doing more homework and taking more rigorous course work" (Baratz-Snowden, Rock, Pollack, & Wilder, 1988).

The 1992 NAEP mathematics assessments reported that Asian and white students demonstrated higher average math proficiency than Hispanic students. In addition, female achievement was lower than that of males, and fewer than one-half of the Hispanic students surveyed demonstrated achievement at the proficient mastery level. (Executive Summary of the NAEP 1992 Mathematics Report Card for the Nation and the States, 1993). Although the mathematics performance of nine and 13-year-old Hispanics increased in the last 15 to 20 years, particularly during the 1970's, there has been little change in the gap between their mathematics scores and that of white 9-year-olds over this period (Findings from the Condition of Education 1995: the Educational Progress of Hispanic Students, 1995). As of 1992, the mathematics skills of Hispanic 13-year-old students were ". . . as much as two years behind that of their white peers

. . . a deficiency that they will carry with them into high school." (Ibid., p.5)

To understand these results, researchers have studied the relationship between certain demographic and background variables and mathematics achievement. Reyes (1984, in Reyes & Stanic, 1988) reported that confidence in learning mathematics has a significant positive correlation with mathematics achievement and that gender differences in confidence levels are usually associated with gender differences in mathematics achievement. Wolleat, Pedro, Becker, and Fennema (1980) found that male students attributed their success in mathematics to ability more frequently than female students; female students attributed their success to effort more often than male students. Although the differences are not large, female students were more likely than male students to associate their failure in mathematics to a lack of ability and to the difficulty of the task. In addition, the perceived usefulness of mathematics was identified as one of the most important variables in understanding sex-related differences in mathematics achievement and as an important predictor of student selection of optional mathematics courses (Fennema & Sherman, 1977, 1978; Meece et al., 1982; Perl, 1979). Although Travers and McKnight (1985, in Reyes & Stanic, 1989) reported that students generally do not view mathematics as a male domain, Fennema (1984, in Reyes & Stanic, 1988, p.35) suggested that "sex differences in the stereotyping of mathematics as a male domain may be an important factor in the differential mathematics course taking and achievement of male and female students."

Others have examined the role of self-efficacy, or individuals' expectations concerning their ability to successfully perform a given task, as a reliable predictor of whether the individual will attempt the task, and the amount of effort and perseverance that he or she will put forth in the face of unforeseen difficulties (Bandura, 1977, 1982, in Randhawa, Beamer, & Lundberg,

1993). Moreover, it has been reported that mathematics performance and self-efficacy measures are significantly and positively correlated with attitudes toward mathematics, and that self-efficacy is a stronger predictor of the choice of a mathematics-related major than mathematics achievement variables (Hackett and Betz, 1989, in Radhawa, et al., 1993).

Research investigating the role of mathematics attitudes of school-age youth, by ethnicity and gender is very limited in number. Creswell & Exezidis (1982) studied the role of gender and ethnic differences in the mathematics achievement of ethnically diverse students and found that the primary source of variance was ethnicity, although gender did not prove to be a significant factor. Another study explored the relationship between gender differences, sociocultural factors and the mathematics achievement of Hawaiian school-age students. It concluded that girls attained higher achievement levels than boys. Girls achieved their highest scores in mathematical computation whereas boys highest scores were in reasoning. (Brandon, Newton, Hammond, 1987). Findings from a cross-national study of 7th and 8th grade students suggested that attitudes toward mathematics may be related to "(a) majority and minority status within a culture, (b)ethnicity, and (c) a combination of sex and ethnicity." (Iben, 1991, p.149). Finally, a meta-analysis of gender differences examined attitudes and affect, and their relationship to mathematics achievement. It was found that females held more negative attitudes about mathematics than males. However, males held more stereotypical attitudes about mathematics as a male domain. (Hyde, Fennema, Ryan, Frost, Hopp, 1990).

It has been almost 10 years since NAEP conducted a comprehensive study of the mathematics achievement of Hispanic students, (Baratz-Snowden, et al., 1988). Findings have not been updated although Hispanics are the largest and fastest growing language minority in the

United States and their continued under achievement, particularly in math and the sciences, may have serious implications for the students as individuals and for the nation. Furthermore, research investigating the role of background variables, including attitudes, and the mathematics achievement of Hispanics is virtually nonexistent.

In this paper, I report results of a study that investigated the relationship between the mathematics attitudes of 4th- and 8th-grade Hispanic and Asian students' that participated in the 1992 NAEP Mathematics Trial State assessment[2] and their mathematics achievement. First, I create a profile of these students through background variables such as age, language other than English spoken in the home, English proficiency, and certain school and home variables. Second, I describe the students' attitudes represented by their answers to eight NAEP survey questions: a) I like math, b) I am good at math, c) I understand most of my math classes, d) math is mostly memorizing facts, d) math is used in jobs and for solving problems, e) math is more for boys than girls, and f) I would not study more math. Third, the average mathematics proficiency of Hispanics and Asian students, by gender and grade level is discussed. Fourth, the relationship between ethnicity, gender, attitudes towards mathematic and the Hispanic and Asian students' mathematics achievement, as measured by their NAEP National Assessment mathematics performance score is examined. Finally, I discuss the results and the educational and policy implications of the study findings.

Participants

For this study, the records of 32,009 4th. and 8th. grade Hispanic and Asian students were abstracted from the NAEP 1992 Trial State Assessment data set. The student sample included a similar percentage of males and females from both ethnic groups. Its distribution by

ethnicity and grade level is shown in Table 1.

[Insert Table 1]

Procedures

Descriptive and inferential statistical procedures designed for secondary data analysis with NAEP data sets were used to analyze the Hispanic and Asian students' data in the 1992 NAEP Trial State and National assessments[3]. These procedures included (a) the use of sampling weights to account for the unequal probability of student selection in the NAEP study design, (b) techniques for estimating sampling variance which take into account the clustering in the NAEP sample, (a) calculation of measurement error, (d) combination of the sampling and measurement error into overall variance estimates appropriate for testing statistical significance, and (e) adjustment of degrees of freedom (Johnson, 1989; Beaton & Zwick, 1992, Harka, McLaughlin, & Yin, 1994). These statistical procedures are needed due to the complex sampling design of the NAEP assessments which include the use of scaling models to summarize students' performance in mathematics and the unequal probability of their selection (NAEP Trial State Assessment Technical Manual, 1993). My work was facilitated by the training opportunities provided to me by the U.S. Department of Education in the use of software specially developed for NAEP secondary data analysis (Advanced Study Seminar on the Use of NAEP data, 1995; NAEP/SPSS Analysis Program Modules, Educational Testing Service, 1995).

Descriptive statistics were utilized to generate cross tabulations of students' background characteristics, including their attitudes toward mathematics and their average mathematics performance. Appendix A lists the descriptive analysis variables. Inferential statistics on eight attitude variables, by gender and ethnicity, tested the regressions on the NAEP mathematics

performance scores of the student sample. Appendix B lists the variables used in the inferential analysis component of the study.

Results

Who were the Hispanic and Asian students in the sample?

In this section I describe the place of birth of the student sample, their age and modal grade, their language status, English proficiency, and home and school characteristics. To obtain place of birth data, students were asked "Were you born in the United States, the District of Columbia or territories?". The data indicate that the 4th-, and 8th-grade Hispanic students were more likely to report being born in the United States, the District of Columbia, and territories than their 4th-grade Asian peers. Over 82 percent of the 4th-grade Hispanics and over 65 percent of the 4th-grade Asian students were born in the United States, the District of Columbia and territories. A similar profile emerges for the 8th-graders in the sample. Over 80 percent of the 8th-grade Hispanic students and over 50 percent of the 8th-grade Asian students were born in the United States, the District of Columbia and territories.

Furthermore, the data indicate that 94 percent of the 4th-grade Hispanic students and over 96 percent of the 4th-grade Asian students were either on modal grade or one year behind. A very small percentage of 4th-grade students of both ethnic groups reported ages from 11 to 19 years old. The data further indicate that 90 percent of the 8th-grade Hispanics and over 94 percent of the 8th grade Asians in the sample were on modal grade or a year behind. A small percentage of 8th-grade students reported ages from 15 to 21 years old.

The English proficiency of the students in the sample was determined by school personnel. The data indicate that 86 percent of the 4th-grade Hispanic and Asian students were

English proficient. In addition, 89 percent of the 8th-grade Hispanic students and 90 percent of the 8th-grade Asian students in the sample were considered English proficient. Over 13 percent of the 4th-grade Hispanic and Asian students and over 9 percent of the 8th-grade Hispanic and Asian students were limited in their English proficiency. Yet, both groups met criteria for participation in the TSA mathematics assessment.[4]

The language status of the Hispanic and Asian student sample was determined by students' responses to the question, "How often is a language other than English spoken in the home?". Table 2 indicates that the Hispanic and Asian students in the sample spoke a language other than English in the home, sometimes or always. Furthermore, over 78 percent of both Hispanic and Asian 4th-graders lived in households where English and a language other than English were used for communication sometimes or always. The 8th-grade students in the sample reported language use patterns at home similar to those of the 4th-graders. Over 82 percent of the Hispanic students and 84 percent of their Asian peers lived in households where a language other than English was spoken sometimes or always.

[Insert Table 2]

When I look at the characteristics of the schools attended by the Hispanic and Asian students in the sample, the data indicate that all Hispanic students in the sample were more likely to attend schools with high concentrations of students that receive subsidized lunch. The data show that 4th-grade Hispanics students were more likely than their Asian peers to attend schools that reported 51 percent to over 90 percent of the students on subsidized lunch benefits. In addition, the percentage of 4th-grade Hispanic students attending schools that reported 76 to 90 percent of students on subsidized lunch was about 40 percent higher than the percentage of 4th-

grade Asian students that attended comparable schools. Over 56 percent of the 4th-grade Hispanic students attended schools that reported from 26 to 90 percent of students on subsidized lunch.

A similar pattern emerges from the 8th-grade student data. Hispanic students were more likely to report that they attended schools with 26 to 90 percent of students on subsidized lunch, and Asian students more likely to report that they attended schools with 11 percent to no students on subsidized lunch.

[Insert Table 3]

What home educational supports were available to them?

In this section, I describe students' responses concerning how many parents lived at home, parental educational attainment, how often the students discussed their studies at home, and whether literacy-related items were available to them at home.

The data on Table 4 indicate that Asian students were more likely than Hispanic students to report that they lived with two parents at home. The percentage of two-parent homes decreased for the 8th-grade Hispanic students when compared to the Hispanic students and Asian students in both the 4th- and 8th-grades. The data showed that Hispanic students at both grade levels are more likely to live with one parent a home than Asian students at both grade levels.

[Insert Table 4]

Regarding the attainment level of parental education, Table 5 shows that Asian parents were more likely than Hispanic parents to have graduated from college and Hispanic parents

more likely than Asian parents not to have finished high school or to have finished high school as a terminal degree. The 8th-grade Hispanic students reported a higher percentage of parents who did not finish high school and the 8th-grade Asian students reported a higher percentage of parents who have a college degree than those reported by the 4th-grade Hispanic and Asian students. However, these data should be interpreted with care given the large proportion of missing information, particularly in the 4th-grade students' data.

[Insert Table 5]

The Hispanic and Asian students were asked to report whether literacy-related items were available to them at home. An encyclopedia, subscriptions to a newspaper and magazines, and 25 books or more books classified as literacy-related items. Hispanic students were more likely to report that they had up to 2 types of literacy-related items at home and Asian students more likely to report that they had 3 to 4 literacy-related items in their homes. Conversely, about one-third of the Hispanic and Asian students in the sample reported 3 types of literacy-related items in their homes.

When the students were asked how often they discussed their studies at home, a larger percentage of 4th-grade students than 8th-grade students reported that they discussed their studies on a daily basis. By a slightly higher percentage than their Asian peers, Hispanic students reported that they discussed their studies at home almost every day. Finally, by a larger percentage than their Asian peers, Hispanic students, particularly 4th-graders, said they never or hardly ever discussed their studies at home.

What were the Hispanic and Asian Students' Attitudes Toward Mathematics

Hispanic and Asian students were asked to agree or disagree with eight statements regarding their attitudes toward mathematics. Table 6 and 7 display the 4th- and 8th grade students' answers to the statements: I like mathematics, I am good at mathematics, and, I understand most of the mathematics class. Table 8 and 9 describe the 4th- and 8th-grade students responses to the statement: mathematics is more for boys than girls and I would not study more mathematics. Finally, Table 10 and 11 include the 4th- and 8th-grade students' answers to: mathematics is mostly memorizing facts, people use mathematics in jobs, and mathematics is used for solving problems.

By a small percentage, the data in Table 6 indicate that 4th-grade Asian students are more likely than their Hispanic peers to report that they like mathematics, are good at it, and that they understand most of the mathematics class. Over 72 percent of the Hispanic 4th graders agree that they like math, only over 55 percent agree that they are good at math and over 69 percent agree that they understand math. Although the difference is present, the discrepancy between responses to these three statements is less dramatic for Asian 4th graders. Over 78 percent of the 4th grade Asian students agree that they like math, over 62 percent agree that they are good at math, and over 76 percent state that they understand math.

[Insert Table 6]

A similar yet more discrepant profile emerges for 8th graders in terms of the differences in the responses from the Hispanic and Asian students in regards to these three variables. Table 7 indicates that over 75 percent of the 8th grade Hispanic students and over 65 percent of the Asian students agree or strongly agree that they like math. Yet, when asked whether they are

good at math, over 64 percent of the Asian students and only over 50 percent of the Hispanic students agree or strongly agree with this statement. Finally, a larger percentage of Asian students as compared to Hispanic students agree or strongly agree that they understand most of the math class.

[Insert Table 7]

As Table 8 indicates, over 65 percent of the 4th-graders disagree with the statement "Math is more for boys than girls". However, by a larger percentage, Asian students disagree with the statement "No more math". Furthermore, the data indicate that by a small yet higher percentage than their 4th-grade Asian peers, 4th-grade Hispanic students agreed or were undecided that they would not take more math in school.

[Insert Table 8]

The data in Table 9 indicates that both 8th-grade Asian and Hispanic students almost equally disagree or strongly disagree that math is more for boys than for girls. This belief is reflected in 76 percent of Hispanics and over 75 percent of Asians. When compared with the 4th-grade students, the data indicates a moderate increase in the percentage of 8th-grade students of both ethnic groups that disagree or strongly disagree with the stereotypical attitude towards math which defines math as a male domain. As with their Hispanic 4th-grade peers, by a slight yet higher percentage than their Asian peers, Hispanic 8th-graders agreed or were undecided that they would not take more math in school.

[Insert Table 9]

By similar percentages, Table 10 shows that 4th-grade Hispanic and Asian students agree or are undecided about whether mathematics is for memorizing, is used in jobs, or is utilized in solving problems. Although, a slightly higher percentage of 4th-grade Hispanic students agree that math is for memorizing. Yet, by slightly higher percentage, Asian 4th-grade students agree that math is used in jobs and math solves problems.

[Insert Table 10]

Again, a similar profile emerges with the 8th-grade data. Table 11 reveals that by a small but higher percentage than their 8th grade Asian peers, 8th-grade Hispanic students agree or strongly agree that math is for memorizing. The data further indicates that by a small yet higher percentage than their 8th grade Hispanic peers, 8th-grade Asian students agree or strongly agree that math is used in jobs and that math is used in solving problems.

[Insert Table 11]

The Mathematics Achievement of Hispanic and Asian Students

In this section I report on the mathematics achievement of the 4th- and 8th-grade Hispanic and Asian students who participated in the 1992 NAEP Trial State Assessment, by gender and ethnicity. Findings are reported under three achievement levels: basic, proficient, and advanced on a mathematics proficiency scale of 0 to 500. The standards to interpret NAEP data were established by the National Assessment Governing Board (NAGB). The Board states that

> [t]he Basic level denotes partial mastery of the knowledge and skills fundamental for Proficient work at each grade. Proficient, the central level, represents solid academic performance and demonstrated competence over challenging subject matter. *This is the achievement level the Board has determined all students should reach.* [italics added]. The

> Advanced level signifies superior performance beyond Proficient.
> (Executive Summary of the NAEP 1992 Mathematics Report Card
> for the Nation and the States, 1993, p.6)

The NAEP mathematics assessments measured (a) numbers and operations, (b) measurement, (c) geometry, (d), data analysis, statistics, and probability, and (d) algebra and functions (Interpreting NAEP Scales, 1993). The overall average mathematics proficiency scores of the 4th- and 8th-grade Hispanic and Asian students in the sample is compared to the national average proficiency scores for 4th- and 8th-grade males, females, Hispanics and Asian/Pacific Islanders in the 1992 NAEP national math assessment (Executive Summary of the NAEP 1992 Mathematics Report Card for the Nation and the States, 1993) which are shown in Table 12.[5]

[Insert Table 12]

Scale-score cut points for the proficiency scale of 0 to 500 established by the NAGB for 4th- and 8th-grade students is shown, in achievement levels, in Table 13. These levels represent the "...lower bounds for the three [achievement] levels" (Interpreting NAEP Scales, 1993, p.46).

[Insert Table 13]

Table 14 shows that the average mathematics proficiency level for the 4th-grade male Hispanic students is 200.6. This falls below the national average proficiency for 4th grade males of 218. An average proficiency of 200.6 places the 4th-grade male Hispanic students below the lower bound for the Basic achievement level, 211, established by the NAGB (Ibid). The 4th-grade male Hispanic students are slightly above the national mathematics proficiency level for Hispanics reported at 199. On the other hand, the average mathematics proficiency level for 4th-grade Asian males is 226, higher than the national average for 4th-grade males at 218 placing

these students at the Basic level of mathematics attainment but below the 232 national average mathematics proficiency level for Asians.

The average mathematics proficiency level for the 4th-grade female Hispanic students in the study is 199 which places them below the lower bound for the Basic achievement level and the national average mathematics proficiency for females of 216. However, female Hispanics are at the national average proficiency level for Hispanics. The average mathematics proficiency level for 4th-grade female Asian students in the study is 225, slightly lower than their male Asian peers. This score places them at the Basic achievement level and above the national average proficiency for females of 216, but below the 232 national average proficiency level for Asians.

[Insert Table 14]

Table 15 shows the average mathematics proficiency level for the 8th-grade male Hispanic students is 244, below the scale-score cut points for the Basic achievement level, which denotes "partial mastery of the knowledge and skills fundamental for Proficient work ..." (Executive Summary of the NAEP Mathematics Report Card for the Nation and the States, 1993, p.6). This score places the 8th-grade male Hispanic students below the national average mathematics proficiency for males (266), and about at the proficiency level for Hispanics nationally (245).

On the other hand, the average mathematics proficiency level for the 8th-grade male Asian students is 277, which places them at the Basic achievement level, higher than the national average mathematics proficiency for males (266), but lower than the national average mathematics proficiency for Asians (287).

The average mathematics proficiency level for the 8th-grade female Hispanic students

was 244, below the lower bounds for the Basic achievement level , lower than the national average mathematics proficiency for females (267) and close to the national average mathematics proficiency for Hispanics (245). Lastly, the average mathematics proficiency level for 8th-grade female Asian students is 280, at the Basic achievement level, higher than the national mathematics proficiency level for females (267) but lower than the national average mathematics proficiency for Asians (287).

[Insert Table 15]

Ethnicity, Gender, Attitudes and Mathematics Achievement

In this section, results regarding the relationship between the attitudes of the male and female 4th and 8th Asian and Hispanic students in the sample and their mathematics achievement in average mathematics scores are presented. The negative coefficients in Tables 16 and 17 indicate a positive correlation between the attitude variable and the average mathematics scores. On the other hand, the positive coefficients signal a negative correlation between the attitude variable and the average mathematics scores.[6] Because the regression coefficients are standardized, higher coefficient absolute values, either positive or negative, indicate that the particular attitude variable is a more important predictor of the mathematics achievement of the Hispanic and Asian students in the sample.

Table 16 shows the standardized regression coefficients of two gender groups of 4th grade Hispanic and Asian students. Concerning both gender groups of 4th grade Hispanic students, the data indicate that a majority of the attitude variables are significant predictors of their mathematics achievement with the exception of " like math" and "memorizing math." The higher math achievers of both gender groups agree that they are good at math, understand most

of math class, people use math in their jobs and math is useful in solving everyday problems. On the other hand, lower achievers tend to agree that math is more for boys than girls and they would prefer not to study more math. Besides, "good at math" and "understand math" are important predictors for both gender groups of 4th grade Hispanic students.

[Insert Table 16]

Examining the gender groups of 4th grade Asian students, most of the attitude variables are significant predictors of their math achievement with the exception of the statements, "like math" and "solving problems." The higher achievers of both male and female 4th grade Asian students tend to agree that they are good at math, understand most of math class, and people use math in their jobs. On the other hand, the lower achievers tend to agree that math is more for boys than girls, math is mostly memorizing facts, and they would prefer not to study more math. In addition, "understand math" and "good at math" are very important predictors for Asian male and females, mathematics achievement. In addition, Table 16 also indicates that there are no clear gender differences between the mathematics achievement of Hispanic and Asian 4th graders and their attitudes towards mathematics and slight differences between the two ethnic groups.

Table 17 shows the standardized regression coefficients of two gender groups of 8th grade Hispanic and Asian students. For the two gender groups of 8th grade Hispanic students, using math in jobs" and "solving problems" are nonsignificant. The other five attitude variables, "like math," "good at math," "understand math," "math for boys," and "memorizing math," are significant for both Hispanic gender groups. The higher achievers of both gender groups of 8th grade Hispanic students tend to comment that they are good at math and understand most of

math class. On the other hand, the lower achievers of both groups agree that they like math, math is more for boys than girls, and math is mostly memorizing facts. In addition, male lower achievers tend to answer that they prefer to study no more math. The data further indicate that "good at math" and "math for boys" are important predictors for both gender groups of 8th grade Hispanic students. As with the 4th grader data, Table 17 indicate no clear differences between the mathematics achievement of Hispanic 8th grade males and females and their attitudes towards mathematics, with the exception of "no more math" which is significant for the males only.

[Insert Table 17]

For the two gender groups of 8th grade Asian students, "using math in job" and "solving problems" are nonsignificant. However, the other four attitude variables, "good at math," "understand math," "memorizing math," and "no more math," are significant for both groups. The higher achievers of both gender groups of 8th grade Asian students tend to answer that they are good at math and understand most of math class. On the other hand, the lower achievers of both groups tend to agree that math is mostly memorizing facts and they would prefer not to study more math. In addition, the lower math achieving females in this group tend to say that they like math and math is more for boys than girls. Besides, "good at math" and "memorizing math" are important predictors for both gender groups of 8th grade Asian students. For females, "like math" and "math for boys" are important predictors of math achievement, whereas these variables are not significant for males.

Discussion and Conclusions

This study compared the mathematics achievement of Asian and Hispanic students who

participated in the 1992 NAEP Mathematics Trial State assessment. It also examined the relationship between the mathematics attitudes the Hispanic and Asian students, by gender and ethnicity, and their achievement as measured by their performance scores in the 1992 NAEP National Mathematics Assessment.

The profile of the target students that emerges from the descriptive analysis of selected background information variables is that the majority of Hispanic and Asian students were born in the United States, the District of Columbia and territories. In addition, a majority of these students were English proficient by school personnel standards in the schools that they attended, except for 13 percent who were identified to be limited English proficient (LEP)[7] students by their teachers. Currently, NAEP guidelines for exclusion are carried out by school personnel (See note 4). However, there is evidence that schools' assessment and definition of what constitutes limited English proficiency vary widely from state to state making it difficult to interpret the inclusion or exclusion of LEP students in the survey.

The majority of Hispanic and Asian students in the sample lived in households where English and a language other than English were used for communication sometimes or at all times. This finding, and the fact that the majority of the Hispanic and Asian students in the sample were found to be English proficient, suggests that the majority of these students had attained a level of bilingualism. Research on the relationship between bilingualism and achievement reports mixed results. A number of studies have reported that bilingualism constitutes an advantage for school achievement (Nielsen & Lerner, 1982, in Baratz-Snowden, et al., 1988). Others have reported that there is little or no consistent relationship between achievement outcomes and frequency of use of a non-English language in the home (Baratz-

Snowden, et al., 1988), and that frequent use of a language other than English is negatively associated with achievement (Fernandez & Nielsen 1986, in Baratz-Snowden, et al., 1988). Although the study of the relationship between bilingualism and mathematics achievement is outside the scope of this study, the fact these students, particularly Asians, exhibited high levels of mathematics achievement, yet lived in and interacted with others in bilingual home environments, indicates that we need to continue to study the interaction between bilingualism, contextual variables, and mathematics outcomes for bilingual language minority students.

In this study, I found that Asian students were more likely to have more types and amount of literacy-related items in their homes than Hispanic students. I also found that Asian students had higher mathematics achievement scores than their Hispanic peers. This finding support Baratz-Snowden, et al., (1988) conclusion that mathematics achievement is significantly related to the types and amount of literacy-related items in the home. Finally, when I looked at the poverty level of the schools attended by the students in the sample, I found that Hispanic students attend schools with a higher percentage of students on subsidized lunch benefits than Asian students, confirming reports that attest to the growing isolation of Hispanic students and their over representation in schools with these characteristics (The Condition of Education 1995: The Educational Progress of Hispanic Students, 1995).

Regarding the mathematics achievement of Hispanic and Asian students, this study verifies earlier NAEP surveys that report the dismal mathematics performance of Hispanic youth over time (Executive Summary of the NAEP 1992 Mathematics Report Card for the Nation and the States, 1993; The Condition of Education 1995: the Educational Progress of Hispanic Students, 1995, among others). Of serious concern is my finding that male 4th and 8th grade

Hispanic students' scores (both female and male), are below the lower bounds for the Basic achievement level, which places them below the lowest standards of math achievement established by the NAGB. In addition, the results confirm that, by the 4th grade, Hispanic female students are already slightly behind their male peers, and their mathematics proficiency level is slightly lower than the national average mathematics proficiency level for females. By the 8th-grade, both female and male Hispanic students are at the same low level of mathematics achievement.

Furthermore, this paper confirms earlier NAEP reports that Asian students outperform Hispanic --and white students-- in mathematics achievement. The 4th and 8th grade Asian male students average mathematics proficiency level is higher than the national average for 4th and 8th grade males. Female and male Asian students at both grade levels are at the Proficient level of mathematics performance established by the NAGB which is ". . . the achievement level the Board has determined all students should reach." (Executive Summary of the NAEP 1992 Mathematics Report Card for the Nation and the States, 1993, p.6). Yet, the mathematics achievement of the Asian students in our sample, both female and male, and in the 4th- and 8th-grade levels, is below the national average for Asian males. However, by the 8th grade, the female Asian students' average mathematics proficiency level is slightly higher than that of their male Asian peers. Although the difference in the average mathematics achievement between male and female Asian 8th graders is small, it indicates a trend that is not present in the national female mathematics achievement as compared to male achievement (Executive Summary of the NAEP 1992 Mathematics Report Card for the Nation and the States, 1993).

The descriptive analyses of the attitudes of Hispanic and Asian students in the sample

indicate that by a slight percentage, more Asian 4th graders than their Hispanic peers believe they are " good at math" and that they " understand math". By the 8th grade, a more discrepant profile emerges between Hispanic and Asian students. By a moderate percentage, more Asian students believe that they are "good at math" and "understand math". In this study, these two attitudes were found to be correlated with higher mathematics achievement at both grade levels. In addition, by a larger percentage than their Asian peers, Hispanic students agree that they like math. However, inferential analyses suggest that "like math" is not a significant predictor of mathematics achievement for 4th graders of both ethnic groups, and for 8th-grade Asian males. In addition, "like math" is correlated with the lower mathematics achievement of male and female Hispanic students, and 8th-grade Asian females. This finding may signal that students may have an affinity for mathematics but that liking mathematics does not necessarily reflect students' self-assessment of how good they are in mathematics nor their judgment about their understanding of mathematics instruction.

Reyes (1984) reported that confidence in learning mathematics had a significant positive correlation with mathematics achievement and that differences in confidence levels were usually associated with gender differences in mathematics achievement. If being good at mathematics and understanding mathematics are dimensions of confidence in learning mathematics, then our findings corroborate his results. In addition, I found that there was a moderate increase in the percentage of 8th-graders who disagree or strongly disagree with the stereotypical attitude that defines mathematics as a male domain. Over three fourths of the 8th graders from both ethnic groups and over four fifths of the 4th graders of both ethnic groups disagreed or strongly disagreed with this statement. In addition, I found that agreement with the statement "math is

more for boys than for girls" is related to low mathematics achievement for both male and female Asian and Hispanic 4th-grade and 8th-grade Hispanic students, and for 8th-grade female Asian students. This attitudinal change over time may be related to changes in socialization practices both at home and in school contexts. In addition, this finding supports findings from others that students do not generally view mathematics as a male domain (Travers and McKnight, 1985) and that gender differences in attitudes about mathematics as a male domain may be an important factor in the achievement of male and female students (Fennema, 1984).

Previous studies have identified the perceived usefulness of mathematics as one of the most important variables in understanding gender-related differences in mathematics achievement (Fennema & Sherman, 1977, 1978; Meece, at al., 1982; Perl, 1979). In this study, three attitude variables can be said to represent dimensions of mathematics usefulness. These are "math is mostly memorizing facts", "math is used in jobs", and "math is for solving problems". I found that "math is mostly memorizing facts "is a significant predictor of low mathematics achievement for both male and female 8th-grade Hispanic and Asian students. However, this variable is not significant for 4th-grade Hispanic students of both gender groups but it is a significant predictor of low mathematics achievement in 4th-grade Asian male and female students.

The statements "math is used in jobs" is a significant predictor of higher mathematics achievement of 4th-grade Hispanic and Asian students of both gender groups. However, "math is for solving problems" is a significant predictor for female and male Hispanic students but not for Asian students of both gender groups. For 8th-grade Hispanic and Asian students of both gender groups, these two variables are not significant. Therefore, findings regarding the

perceived usefulness of mathematics as represented by the above three variables are not clear. More research is needed in this area, particularly related to language minority students.

Finally, results indicate that a majority of the attitude variables were significant for both ethnic groups, by grade and gender, but the differences in attitudes toward mathematics were slight at the 4th grade level, and more discrepant at the 8th grade level. At the 4th grade level, the differences were more inter-ethnic than between genders. For Hispanics, "like math" and "memorizing math" were not significant, whereas for the Asian 4th graders, "like math" and "solving problems" were not significant.

At the 8th grade level, "using math in jobs" and "solving problems" were not significant for Hispanic males. However, in addition to these two non-significant variables, "no more math" was not significant for the female Hispanic students. For the Asian students, "using math in jobs" and "no more math" was not significant for the female 8th graders. However, in addition to these non-significant variables, "like math" and "math for boys" were not significant for the male Asian students.

This study confirms the importance of eight attitudes variables and mathematics achievement, and slight to moderate variation regarding their significance for Hispanic and Asian students, by gender. Furthermore, my findings corroborate the work of others, particularly as it related to those attitudes related to confidence and perceived usefulness of mathematics. However, this study did not find a clear difference in the attitudes of male and female Hispanic and Asian students, although moderate differences were found at the 8th-grade level. There is a need to continue the study of the effects of exposure to two languages at home and math achievement. If NAEP is going to be "the nation's report card" it has to find a way to include

limited English proficient students who, although LEP, may have the content knowledge to be included in these national math assessments, among others. Furthermore, a national definition for limited English proficiency should be pursued, as mandated by recent legislation so that the NAEP criteria for exclusion may be more generalizable and valid.

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Appendix A

Variables used in the Descriptive Analysis by Grade Level

LANGHOM	How often other language is spoken in home (4th & 8th graders)
LEP	Limited English proficiency (4th & 8th graders)
C032001	What percent of students receive subsidized lunch (4th & 8th graders)
SINGLEP	How many parents live at home (4th & 8th graders)
PARED	Parents' education (4th & 8th graders)
HOMEEN2	Home environment - articles (of 4) in home (4th & 8th graders)
B007401A	How often studies discussed at home (4th & 8th graders)
M811101B	I like math (4th graders)
M810701B	I like math (8th graders)
M811103B	I am good at math (4th graders)
M810703B	I am good at math (8th graders)
M811106B	I understand most of math class (4th graders)
M810707B	I understand most of math class (8th graders)
M811104B	Math is more for boys than girls (4th graders)
M810704B	Math is more for boys than girls (8th graders)
M811107B	Math is mostly memorizing facts (4th graders)
M810708B	Math is mostly memorizing facts (8th graders)
M811102B	People use math in jobs (4th graders)
M810702B	People use math in jobs (8th graders)
M811105B	Math is used for solving problems (4th graders)

M810705B	Math is used for solving problems (8th graders)
M811108B	I would not study more math (4th graders)
M810706B	I would not study more math (8th graders)

Appendix B

Variables Used in The Multiple Regression Analyses by Grade Level

Fourth Grade Variables

M811101B I like math

M811103B I am good at math

M811106B Understand most of math class

M811104B Math is more for boys than girls

M811107B Math is mostly memorizing facts

M811102B People use math in jobs

M811105B Math is used for solving problems

M811108B I would not study more math

MRPCM1 to MRPCM5 Plausible NAEP math value #1 to #5 (Composite)

Eight Grade Variables

M810701B I like math

M810703B I am good at math

M810707B I understand most of math class

M810704B Math is more for boys than girls

M810708B Math is mostly memorizing facts

M810702B People use math in jobs

M810705B Math is used for solving problems

M810706B I would not study more math

MRPCM1 to MRPCM5 Plausible NAEP math value #1 to #5 (Composite)

Notes

[1] I am grateful to Anne Buu, graduate assistant, who provided valuable statistical computing assistance for the study. Ms. Buu was trained in the use of SPSS-based statistical software specifically developed for use with the NAEP data sets and used these software to do the job (The NAEP/SPSS Cross tabulation Program Module, and the NAEP Data Extraction Program, Education Testing Service, 1995)

[2] The 1992 Mathematics Trial State Assessment (TSA) is one of two national assessments carried out by the National Assessment of Education Progress (NAEP). The TSA surveyed a representative sample of 220,000 4th- and 8th-graders attending public schools in 41 states plus the District of Columbia, Guam, and the Virgin Islands. The TSA collected student background data, including language status, ethnicity, home and parental information, their attitudes toward mathematics and their mathematics achievement in each participating jurisdiction.

[3] Methodological and other technical information about the 1992 NAEP Mathematics assessments have been widely documented (Technical Report of the NAEP 1992 Trial State Assessment Program in Mathematics, 1993, NAEP 1992 Trial State Assessment Program in Mathematics Secondary-use Data Files: User Guide, 1993).

[4] Language minority students, such as Hispanic and Asian, were excluded from participation in the TSA if they were native speakers of a language other than English, had been enrolled in an English-speaking school for less than 2 years, and were judged by school personnel to be "incapable of taking part in the assessment" (NAEP 1992

Report Card for the Nation and the States, 1993, p.347).

[5] The 1992 average mathematics proficiency levels in the TSA have been reported on a regional and state basis and differ from the average mathematics proficiency levels in the 1992 National Assessments (Executive Summary of the NAEP 1992 Mathematics Report Card for the Nation and the States, 1993).

[6] The NAEP response coding for the 4th grade attitude variables was, 1 = agree, 2 = undecided, and 3 = disagree. For the 8th grade attitude variables, it was, 1 = strongly agree, 2 = agree, 3 = undecided, 4 = disagree, and 5 = strongly disagree.

[7] The legislation, Improving America's Schools Act recommends that a national definition of limited English proficiency be developed. So far, there has not been much enthusiasm on the part of the states to engage in the development of such a definition (March 25, 1996 conversation with Edith McArthur, Office of Educational Research and Improvement, U.S. Department of Education, Washington, D. C.).

Tables

Table 1

1992 NAEP Trial State Assessment Student Sample by Ethnic Group and Grade Level

	Fourth Grade	Eighth Grade
Hispanics	12,396	10,228
Asians	4,727	4,658
Total	17,123	14,886

Table 2

Fourth & eighth grade Hispanic and Asian students: Speak a Language other than English at Home

	Fourth-Grade		Eighth-Grade	
	Hispanic	Asian	Hispanic	Asian
	percent (SE)	percent (SE)	percent (SE)	percent (SE)
Never	21.14 (0.63)	15.50 (1.17)	17.01 (0.65)	14.56 (0.83)
Sometimes	58.16 (0.79)	59.78 (1.51)	47.66 (0.84)	44.66 (1.30)
Always	20.38 (0.75)	24.33 (1.75)	34.81 (1.02)[5]	40.45 (1.69)
Total responses	12364	4710	10224	4653

Note. Percentages and standard errors are weighted.

Note. Among fourth graders, 32 Hispanic and 17 Asian students who omitted this question were excluded.

Note. Among eighth graders, 34 Hispanic and 16 Asian students who omitted this question were excluded from this Table.

Table 3

4 & 8 Grade Schools' Reports: Percent of Students that Receive Subsidized Lunch

	Fourth Grade		Eighth Grade	
	Hispanic	Asian	Hispanic	Asian
	percent (SE)	percent (SE)	percent (SE)	percent (SE)
None	0.31 (0.16)	0.58 (0.19)	0.20 (0.06)	1.17 (0.63)
	3.62 (0.50)	12.37 (1.90)	5.33 (0.86)	16.88 (2.35)
5.9	6.33 (0.88)	10.71 (1.53)	7.38 (1.16)	16.00 (3.57)
10.75	15.85 (1.56)	22.71 (3.11)	16.84 (1.71)	30.32 (3.38)
25.5	20.21 (1.30)	26.36 (3.15)	22.82 (2.06)	16.80 (1.96)
50.25	19.87 (2.13)	12.40 (2.17)	22.81 (2.17)	8.38 (1.89)
75.1	16.56 (1.82)	9.83 (1.27)	11.16 (1.68)	1.65 (0.31)
Over 90%	14.33 (2.22)	3.24 (0.77)	9.39 (1.84)	3.17 (1.57)
Total responses	12044	4595	10123	4340

Note. Percentages and standard errors are weighted.

Note. Among fourth graders, 217 Hispanic and 94 Asian students' schools which omitted this question were excluded from this Table.

Note. Among eighth graders, 438 Hispanic and 436 Asian students' schools which omitted this question were excluded from this Table.

Table 4

4 & 8 Grade Hispanic and Asian students Report on How Many Parents Lived at Home

	Fourth Grade		Eighth Grade	
	Hispanic	Asian	Hispanic	Asian
	percent (SE)	percent (SE)	percent (SE)	percent (SE)
2 parents at home	72.57 (0.70)	81.48 (1.36)	57.21 (1.03)	72.10 (1.41)
1 parent at home	21.05 (0.64)	12.92 (1.13)	21.04 (0.60)	15.15 (1.19)
Neither at home	5.88 (0.32)	5.33 (0.66)	3.88 (0.28)	4.16 (0.90)
Total responses	12353	4717	10228	4658

Note. Percentages and standard errors are weighted.

Note. Among fourth graders, 43 Hispanic and 10 Asian students who omitted this question were excluded.

Note. Among eighth graders, 1703 Hispanic and 725 Asian students who omitted this question were excluded.

Table 5

4 & 8 Grade Hispanic and Asian Students' Parental Education

	Fourth Grade		Eighth Grade	
	Hispanic percent (SE)	Asian percent (SE)	Hispanic percent (SE)	Asian percent (SE)
Did not finish high school	8.48 (0.53)	2.15 (0.36)	21.60 (0.77)	4.76 (0.61)
Graduated from high school	12.22 (0.39)	4.76 (0.52)	23.26 (0.75)	12.10 (0.90)
Some educ. after high schl	7.03 (0.45)	4.15 (0.55)	14.20 (0.61)	10.95 (1.08)
Graduated from college	25.79 (0.70)	39.42 (1.60)	21.18 (0.68)	52.89 (2.12)
Did not know or omitted	46.48 (0.75)	49.52 (1.84)	19.76 (0.73)	19.31 (1.80)

Total responses	12396	4727	10228	4658

Note. Percentages and standard errors are weighted.

Table 6

4th.Grade Hispanic and Asian Students Attitudes toward Mathematics - 1

	Like math		Good at math		Understand math	
	Hispanic Percent (SE)	Asian Percent (SE)	Hispanic Percent (SE)	Asian Percent (SE)	Hispanic Percent (SE)	Asian Percent (SE)
Agree	71.72 (0.83)	78.37 (1.19)	55.62 (0.94)	62.33 (1.72)	69.24 (0.84)	76.46 (1.56)
Undecided	14.19 (0.57)	12.52 (0.75)	29.22 (0.82)	27.78 (1.74)	19.08 (0.65)	15.52 (1.10)
Disagree	11.87 (0.47)	6.82 (0.77)	12.20 (0.50)	7.33 (0.77)	7.53 (0.38)	4.75 (0.72)
Total	12137	4614	12070	4594	11937	4558

Note. Percentages and standard errors are weighted.

Note. 259, 326, and 459 Hispanic students who omitted questions 1, 2, and 3 respectively, were excluded.

Note. 113, 133, and 169 Asian students who omitted questions 1, 2, and 3 respectively, were excluded from this Table.

Table 7

8th.Grade Hispanic and Asian Students Attitudes toward Mathematics - 1

	Like math		Good at math		Understand math	
	Hispanic Percent(SE)	Asian Percent (SE)	Hispanic Percent (SE)	Asian Percent (SE)	Hispanic Percent (SE)	Asian Percent (SE)
Strongly agree	17.81 (0.61)	23.29 (1.38)	11.32 (0.52)	16.45 (1.29)	17.57 (0.55)	26.59 (1.24)
Agree	40.31 (0.87)	42.20 (1.52)	39.52 (0.86)	47.97 (1.66)	54.75 (0.87)	55.58 (1.46)
Undecided	17.65 (0.63)	19.09 (1.31)	24.52 (0.70)	25.13 (1.41)	11.99 (0.52)	10.21 (0.87)
Disagree	13.02 (0.63)	9.91 (0.90)	15.24 (0.59)	6.13 (1.06)	7.99 (0.49)	3.78 (0.49)
Strongly disag.	8.92 (0.46)	4.26 (0.63)	6.28 (0.42)	2.64 (0.52)	2.26 (0.22)	1.08 (0.33)
Total resp	10228	4658	10228	4658	10228	4658

Note. Percentages and standard errors are weighted.

Note. 198, 265, and 458 Hispanic students who omitted questions 1, 2, and 3 respectively, were excluded.

Note. 96, 124, and 218 Asian students who omitted the question 1, 2, and 3 respectively were excluded from this table.

Table 8

4th. Grade Hispanic and Asian Students Attitudes toward Mathematics - 2

	Math more for boys		No more math	
	Hispanic Percent (SE)	Asian Percent (SE)	Hispanic Percent (SE)	Asian Percent (SE)
Agree	12.56 (0.59)	10.81 (0.85)	10.65 (0.47)	7.03 (0.82)
Undecided	15.76 (0.51)	19.65 (1.18)	14.55 (0.46)	12.23 (0.64)
Disagree	65.76 (0.83)	65.66 (1.58)	64.92 (0.97)	74.82 (1.31)
Total responses	11756	4494	11365	435

Note. Percentages and standard errors are weighted.

Note. 640 and 1031 Hispanic students who omitted questions 1 and 2 respectively were excluded.

Note. 233 and 370 Asian students who omitted questions 1 and 2 respectively were excluded.

Table 9

8th. Grade Hispanic and Asian Students Attitudes toward Mathematics - 2

	Math more for boys		No more math	
	Hispanic Percent(SE)	Asian Percent (SE)	Hispanic Percent (SE)	Asian Percent (SE)
Strongly Agree	1.92 (0.21)	1.08 (0.23)	6.34 (0.43)	3.74 (0.67)
Agree	3.16 (0.31)	2.85 (0.51)	10.04 (0.52)	6.27 (0.67)
Undecided	12.23 (0.44)	16.99 (1.17)	18.71 (0.62)	16.98 (0.94)
Disagree	30.03 (0.71)	25.42 (1.29)	37.14 (0.86)	39.04 (1.47)

Strongly Disagree	46.37 (0.82)	50.52 (1.52)	23.68 (0.72)	32.35 (1.57)
Total responses	10228	4658	10228	

Note. Percentages and standard errors are weighted.

Note. 554 and 349 Hispanic students who omitted questions 1 and 2 respectively were excluded.

Note. 270 and 159 Asian students who omitted questions 1 and 2 respectively were excluded.

Table 10

4th. Grade Hispanic and Asian Students Attitudes toward Mathematics -3

	Memorizing		Use in jobs		Solve problems	
	Hispanic	Asian	Hispanic	Asian	Hispanic	Asian
	Percent (SE)	Percent (SE)	Percent (SE)	Percent (SE)	Percent (SE)	Percent (SE)
Agree	57.26 (0.83)	51.95 (1.19)	58.60 (0.88)	62.73 (1.56)	54.11 (0.71)	58.00 (1.80)
Undecided	23.04 (0.59)	28.15 (1.29)	21.32 (0.65)	23.61 (1.32)	21.79 (0.58)	23.54 (1.32)
Disagree	11.78 (0.49)	14.46 (0.98)	11.69 (0.47)	8.29 (0.80)	14.66 (0.44)	12.76 (0.96
Total resp	11578	4437	11511	4414	11397	4377

Note. Percentages and standard errors are weighted.

Note. 818, 885, and 999 Hispanic students who omitted the question 1, 2, and 3 respectively are excluded.

Note. 290, 313, and 350 Asian students who omitted question 1, #2, and 3 respectively are excluded from this Table.

Table 11

8th Grade Hispanic and Asian Students Attitudes toward Mathematics -3

	Memorizing		Use in jobs		Solve problems	
	Hispanic Percent(SE)	Asian Percent (SE)	Hispanic Percent (SE)	Asian Percent (SE)	Hispanic Percent (SE)	Asian Percent (SE)
Strongly agree	11.79 (0.49)	10.11 (1.24)	41.02 (0.91)	46.25 (1.69)	34.48 (0.95)	35.89 (1.22)
Agree	38.75 (0.71)	34.45 (1.91)	40.19 (0.88)	38.32 (1.59)	37.31 (0.76)	38.77 (1.46)
Undecided	23.94 (0.57)	25.52 (1.48)	6.82 (0.43)	7.32 (0.80)	12.63 (0.55)	14.23 (1.07)

Disagree	13.71 (0.59)	20.53 (1.67)	2.75 (0.29)	2.48 (0.73)	5.02 (0.36)	5.28 (0.86)
Strongly disag.	3.94 (0.30)	5.76 (0.68)	1.08 (0.18)	1.07 (0.40)	1.59 (0.16)	0.87 (0.27)
Total resp	10228	4658	10228	4658	10228	4658

Note. Percentages and standard errors are weighted.

Note. 692, 747, and 839 Hispanic students who omitted questions 1, 2, and 3 respectively were excluded.

Note. 330, 369, and 403 Asian students who omitted questions 1, 2, and 3 respectively were excluded from this Table.

Table 12

1992 NAEP National Mathematics Assessment: Hispanic and Asian/Pacific Islander Students Proficiency Levels by Gender and Grade Level

	Male	Female	Hispanic	Asian/Pacific Islander
Fourth grade	218	216	199	232
Eight grade	266	267	245	287

Table 13

1992 National Mathematics Proficiency: Scale-Score Cut points for Each Achievement Level, Grades 4 and 8

Grades	Advanced	Proficient	Basic
4	280	248	211
8	331	294	256

Note. Executive Summary of the NAEP 1992 Mathematics Report Card for the Nation and the States, 1993, p. 7

Table 14

4th. Grade Hispanic and Asian: Average Mathematics Proficiency in Achievement Scores by Gender

	Hispanic mean (SE)	Asian mean (SE)
Male	200.61 (0.88)	226.12 (1.60)
Female	198.92 (0.78)	224.70 (1.42)
Total responses	12396	4727

Note. Means and standard errors are weighted.

Table 15

8th. Grade Hispanic and Asian Students': Math Performance in Achievement Levels by Gender

	Hispanic mean (SE)	Asian mean (SE)
Male	243.72 (1.24)	276.90 (1.78)
Female	243.80 (0.77)	280.04 (2.03)
Total responses	10228	4658

Note. Means and standard errors are weighted.

Table 16

4th grade Hispanic & Asian students by gender: Regressions of math achievement on math attitudes

	Hispanic		Asian	
	Male	Female	Male	Female
Like Math	0.04	0.03	-0.00	0.07
Good at Math	-0.19*	-0.18*	-0.16*	-0.20*
Understand Math	-0.21*	-0.17*	-0.18*	-0.21*
Math for Boys	0.15*	0.18*	0.08*	0.21*
Memorizing Math	0.03	0.03	0.15*	0.11*

Using Math in Job	-0.15*	-0.14*	-0.13*	-0.12*
Solving Problems	-0.08*	-0.05*	-0.05	-0.05
No More Math	0.13*	0.13*	0.16*	0.12*

Note. *$p < .05$

Table 17

8th grade Hispanic & Asian students by gender: Regressions of math achievement on math attitudes

	Hispanic		Asian	
	Male	Female	Male	Female
Like Math	0.08*	0.09*	-0.00	0.23*
Good at Math	-0.25*	-0.26*	-0.20*	-0.32*
Understand Math	-0.12*	-0.07*	-0.17*	-0.13*
Math for Boys	0.17*	0.25*	0.07	0.20*
Memorizing Math	0.12*	0.18*	0.22*	0.23*
Using Math in Job	-0.02	-0.03	-0.02	0.03
Solving Problems	-0.01	-0.03	0.00	0.04
No More Math	0.12*	0.04	0.10*	0.14*

Note. *p < .05

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