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GENDER AND RACIAL DIFFERENCES IN MATHEMATICAL PERFORMANCE

ABSTRACT. The authors examined gender and racial differences in mathematics performance among 5th- and 8th-grade students in the United States. *Math* performance was assessed by scores on the *math*-concepts and *math*-computation sections of the California Achievement Test (CTB/McGraw-Hill, 1986) given at the end of the previous year. There were no significant gender differences, but in both grades, the White students scored significantly higher than the Black students. The racial differences were more pronounced in the scores for concepts than in the scores for computation. Responses to a parent questionnaire showed significant relationships between parents' self-reported *math anxiety*, parents' most advanced *math* course, and parents' education level in relation to the child's *math* performance. Differences in these relationships suggest that, although parents' beliefs and attitudes about *math* influence their child's *math* performance, the relationship is complex and may vary with race.

MAJOR CONCERNS on the U.S. national agenda are the gender and racial gaps in *math* achievement. The research on gender and racial differences in mathematical performance suggests that by the end of high school, such differences are close to one standard deviation (Dorsey, Mullis, Lindquist, & Chambers, 1988; Entwisle & Alexander, 1990).

Racial Differences in Mathematics

Research on mathematics performance with specific groups is often problematic. Lockhead, Thorpe, Brooks-Gunn, Casserly, and McAloon (1985) reviewed 16 studies of race differences in mathematics performance spanning Grades 4 through 8 and found a clear pattern of performance differences among various student groups. Asian American students usually outperformed Caucasian students, Asian American students and Caucasian students performed better than Hispanic students, and all three groups outperformed African American students.

Gross (1988) suggested that the assumption that all students start out equally in mathematics may not necessarily be so. She found that Black and Hispanic students started to fall below grade level in the second grade in much larger numbers than did White and Asian American students. Paradoxically, White and Asian American students in the second grade started to advance in mathematics. When students' performance fell below grade level, students were not likely to ever catch up again (Gross). Thus, for each year in school, such students fall further behind as other students move further ahead, and the gap continues to widen.

Gross (1988) also found that although all racial groups were equal in their liking of mathematics in the early grades, significant differences emerged as students moved up in grade level. of all groups, Asian American students, followed by Caucasian students, continued to find *math* the most enjoyable; African American and Hispanic students found *math* the least enjoyable.

According to the National Assessment of Educational Progress (NAEP; U.S. Department of Education, 1982), a major vehicle for studying differences in achievement, racial differences in achievement are larger than gender differences among specific groups and in mathematical performance (Matthews, Carpenter, Lindquist, & Silver, 1984). The NAEP results have consistently shown that African American and Hispanic students are achieving at levels well below the national average; they have, however, shown improvements. In fact, African American and Hispanic students made greater gains in mathematical achievement than did Caucasian students between the second and third national assessments, completed in 1978 and 1982, respectively (Matthews et al.).

Gender Differences in Mathematics

Gender differences are present as well in mathematics achievement, especially as students move into higher grades. Hyde, Fennema, and Lamon (1990) did not find significant differences in mathematical achievement between boys and girls from elementary through junior high school; they did, however, report a steady upward trend for men to outperform women from high school through college. Horn (1990) suggested that although young women seem to have narrowed the gender gap in terms of taking *math* and science courses, they still lag behind men in taking more advanced *math* courses. Horn implied that young women may prematurely exclude themselves

from career opportunities by not completing college and university prerequisite *math* courses in high school. In Canada, Tsuji and Ziegler (1990) found that the gender gap had decreased in the fields of finance and medicine, but it continued in areas such as scientific research and engineering. In the United States, although women constituted 43% of the population, they occupied only 10% of the jobs in physical sciences, engineering, and *math* (Hewitt & Seymour, 1991).

Another variable that may contribute to gender differences in mathematics is difference in achievement-related beliefs. One such difference in beliefs may be the role of effort in success. In a comprehensive study of elementary and secondary students, Gross (1988) found that female students were less confident of their abilities to do *math* than were their male counterparts. She also found that girls asked for help more often on *math* problems, whereas boys tried to figure out the problems for themselves. The results of her research with elementary and secondary students suggested that when asked who does well in *math*, boys as well as girls were more likely to say that boys do better.

Sax (1994) suggested that a woman's *math* achievement is tied closely to both her self-confidence and exposure to *math*. Mathematical self-concept as well as performance on *math* achievement tests is a positive predictor of persistence in *math* (Catsambis, 1994; Huang & Waxman, 1993). Caporrino (1990) suggested that women lack confidence in their *math* abilities because they have been taught that they are not good in *math*. Even when women perform better than men on tests of *math* ability, the men still express high levels of *math* self-confidence. Drew (1992) found that women who have high abilities in *math* are more likely than men with high abilities to understate their *math* abilities.

Family Influences on Gender and Racial Differences in Mathematics

Family influence affects both gender and racial differences in *math* performance. Eccles (1993) found strong evidence that parents' perceptions about their child's ability and interest in academic subjects are related to the child's attitudes and academic performance. Eccles suggested that parents form impressions of their child's interest and abilities in general on the basis of their own biases. Parents communicate their beliefs and attitudes about *math* and its utility through their individual practices. Entwisle and Alexander (1988) found parents' psychological support to be the most influential of all the variables they considered. Psychological support is represented by the parents' expectations for their child's first-grade experience and their estimate of the child's general ability to do school work. Parental expectations for mathematical performance are powerful for both Black and White students.

Researchers in gender and racial differences (Gross, 1988; Horn, 1990; Sax, 1994) thus have suggested several potential explanations for differences in mathematical performance. In the present study, we examined whether gender and racial differences were present at the middle grade levels. In addition, we assessed family variables influencing mathematics performance, including parents' perceptions of their own mathematical ability, in relation to the child's actual *math* performance at school.

Method

Participants

Participants were 74 fifth- and eighth-grade students (general ages = 10 and 13 years, respectively) enrolled in a public school district in the southeastern United States. We chose Grades 5 and 8 because those students had taken the California Achievement Test (CAT; CTB/McGraw-Hill, 1986) in Grades 4 and 7 the preceding spring. (Not all students in all grades were given the standardized test.) We were particularly interested in those ages and grades because they represent the end of elementary school and the year before high school; they also correspond closely to the ages (9, 13, and 17 years) assessed by the NAEP (U.S. Department of Education, 1982). There were 35 Caucasians and 39 African Americans; 38 boys and 36 girls. We limited the participants to students in the regular education program who were not currently receiving and had never been referred for special education services. We obtained data during the 1994-1995 academic school year; the participants' scores on the CAT were based on end-of-year testing for the 1993-1994 academic year.

Instruments

The CAT (CTB/McGraw-Hill, 1986), used to assess mathematical abilities, is a standardized achievement test designed to provide valid measurements of basic academic skills. It consists of seven subparts: reading vocabulary, reading comprehension, language mechanics, language expression, mathematics computation, mathematics concepts and application, and spelling. For this study, we used the mathematics-computation and mathematics-concepts and applications sections.

Norms for the CAT were established (CTB/McGraw-Hill, 1986) for 300,000 pupils in grades K through 12 in the fall of 1984 and the spring of 1985. The sampling design stratified public schools on the basis of geographic region, community type (rural, suburban, urban), district size, and a measure of district socio-economic class. The norming sample featured characteristics similar to those in the 1983 U.S. census data (CTB/McGraw-Hill).

The content validity of an achievement test or test battery rests ultimately on the tester's judgment of the match between test content and the local curriculum. The 20 Kuder-Richardson within-level internal consistency reliabilities for the subtest and total test score generally are high. Above the level of the kindergarten and early first-grade test, in which smaller numbers of test items produced reliabilities in the high .60s and high .70s, the internal consistency reliabilities are typically in the high .80s and middle .90s. Equivalent forms reliability for levels 13 to 20 has median values across subtests around .85 for the mathematics tests (Airasian, 1989).

In addition to using the participants' scores on the mathematics section of the CAT, we developed a parent questionnaire, which assessed parents' self-reported *math anxiety*, perceptions of their own *math* skills, highest completed level of mathematics course, education level, and occupational status (blue collar, white collar, unemployed).

Procedure

We sent informed consent forms home with the fifth- and eighth-grade students along with the parental questionnaire. The parents' informed consent allowed the experimenters access to the students' school records to obtain the scores from the mathematics sections of the CAT. Of the 100 consent forms and questionnaires sent home with the participants, 74 were returned.

Results and Discussion

We computed Pearson product-moment correlations between each child's CAT scores in *math* calculation, *math* concepts, and total *math* and the following parental variables: parents' self-reported *math anxiety*, perceptions of their own skills, highest completed level of *math* course, education level, and occupations. We computed the correlations for the overall group (Table 1), for White students only (Table 2), and for Black students only. For the overall group, we found significant positive correlations among the three CAT scores as expected, accounting for 53% to 83% of the variances.

For the total group, we found significant negative correlations between all three *math* scores for the child and the parents' self-reported levels of *anxiety* about their own *math* skills. The less *anxiety* the parents reported about their *math* performance, the higher the child's scores were on the CAT *math* sections. Although those correlations were significant, the actual variance accounted for was only between 6% and 18% for these variables. We found positive correlations, however, between all three *math* scores for the child and (a) the most advanced *math* courses completed by the parents and (b) the parents' education. Parental exposure to higher level *math* courses as well as parental education level was positively correlated with their child's *math* performance on the CAT. Parental attitudes about their liking for and the importance and utility of mathematics seemed extremely influential in the student's performance in *math*; our results support previous research findings (Catsambis, 1994; Eccles, 1993; Gross, 1988; Huang & Waxman, 1993). Eccles found strong evidence that parental perceptions about their child's ability and interest in academic areas are related to the child's attitudes and academic performance. Parents appear to form their impressions of their child's interests and abilities in general on the basis of their own biases and to communicate their beliefs about *math* and its utility through their individual practices.

The parents' most advanced *math* course and their education level were negatively correlated with their negative attitudes toward *math*. The parents with more advanced *math* courses and higher education levels tended to have less negative feelings about their own *math* abilities. That attitude seemed also to influence their children's opinions of their own self-efficacy (belief about one's own performance capabilities) in mathematics. Parental occupation was not significantly correlated with any of the other variables. In this study, the parents' perceptions of their own *math* skills were not correlated with their children's *math* performance.

When we sorted the data by race and calculated Pearson correlations for White and Black students separately, the results were much more variable than they had been initially for the total group. For the Black students, only five correlations reached significance: (a) Their scores on *math* concepts and *math* calculation demonstrated a significant correlation of .69; (b) their

scores on *math* concepts were significantly correlated with their scores for total *math*, $r = .89$; (c) their scores on *math* calculations were significantly correlated with their scores for total *math*, $r = .95$; (d) parents' education level was significantly correlated with parents' perceptions of their own *math* skills, $r = .34$; and (e) parents' education level was significantly correlated with their most advanced *math* course completed, $r = .62$. Among Black students, none of the parental variables were significantly correlated with the children's academic performance.

When we ran correlations for White students only, there were again significant positive correlations among the *math* scores (*math* calculation, *math* concepts, and total *math*). However, parental *math anxiety* was significantly and negatively correlated with scores for total *math* and *math* concepts among White students (*math* calculation was not significant), whereas among Black students, there were no significant correlations between any of the students' *math* scores and parental *anxiety*. Parents' highest level *math* course and parents' education level were both negatively correlated with *math anxiety* among White students but were not significant among Black students. Parents' most advanced *math* course completed and education level were significantly and positively correlated with the children's scores on all three *math* measures among the White students, but none of the correlations among those measures reached significance among the Black students. Although parents' perceptions of their *math* ability and their children's scores on measures of mathematical achievement did not reach significance among the Black students, there was a significant and positive correlation between parents' perceptions of their own *math* abilities and the child's scores on *math* calculations among the White students.

Although Eccles (1993) found strong evidence that parents' perceptions about their child's ability and interest in academic areas are related to the child's academic performance in those areas, the relation between parents' perceptions of their own abilities and their child's actual performance seems much more complex and may involve racial differences. Such differences may well be related to disidentification factors (the process whereby individuals devalue those experiences that negatively affect their self-concepts (Crocker & Major, 1989; Osborne, 1994; Steele, 1992). There is strong evidence (Steele, 1992) that individuals protect their self-esteem as much as possible. If a threat of stereotype exists in a certain domain (i.e., mathematical performance), then it should be beneficial to a person's self-esteem to render that domain's evaluative power ineffective. Once domain disidentification is achieved, the stereotype would hold little threat. If disidentification does occur among Black children in a particular achievement domain, they should be far less likely as adults to pass on the importance of that domain to their own children. Steele (1997) investigated this particular area of study by varying the extent of stereotype threat, which is a strong consideration among college students.

Next, we used a multivariate analysis of variance (MANOVA) to analyze the data for gender and racial differences (see Table 3). Gender and race were the independent variables, and scores on the *math* calculation and *math* concepts portions of the CAT were the dependent variables. Results of the MANOVA indicated no significant gender differences in mathematical performance, $F(2, 69) = 0.61$, $p = .55$. The scores represented the performance of students in the fifth and eighth grades combined. Our findings support the position that mathematical performance is essentially equal for boys and girls up to the middle school years (Armstrong, 1985; Gross, 1988; Hyde et al., 1990).

Results of the MANOVA indicated a significant racial difference in mathematical performance, however, $F(2, 69) = 7.63$, $p = .001$. Follow-up univariate analyses indicated that the White students scored significantly higher than the Black students in both mathematical calculations and mathematical concepts. There was no interaction effect for gender and race, $F(2, 69) = 1.32$, $p = .28$.

In addition to the standard follow-up univariate tests on the data, we used an additional test to determine if any relationship existed between the dependent variables, given the strong correlations found earlier with the Pearson product-moment calculations (Bock & Haggard, 1968; Roy, 1958). Although results of the univariate F tests showed significant race differences for *math* calculations and *math* concepts, the results of the Roy-Bargman Stepdown test (SPSS, 1990) indicated that mathematical calculations were no longer significantly different when mathematical concepts were partialled out. The skill in mathematical calculation did not differ between the races. (For means and standard deviations for Black students and White students, see Table 4.) The highest level of significant difference between the races occurred in mathematical concepts. Our findings support those of Entwisle and Alexander (1989), who reported a small but significant difference favoring White students in concepts (reasoning) and no difference in computation for primary students just beginning school. After controlling for the effects of prior academic achievement, House (1993) also reported no significant racial differences in mathematical performance; however, there was a significant main effect for academic self-concept and mathematical performance.

Why, then, might race influence concepts but not necessarily computations? Computation is a relatively straightforward task and, therefore, may be much less influenced by such variables as disidentification. Concepts, however, imply in-depth understanding and may be much more susceptible to self-efficacy variables. Steele (1997) discussed the impact of societal stereotyping on minority students as well as on female college students. His research showed that the effects of negative school performance and underachievement were significantly reduced by steps as simple as modifying perceptions of tasks and focusing on the students' high potential. Steele's concepts certainly warrant exploration at the elementary and secondary levels.

Summary

Although we found significant differences for race but not for gender, we assessed only fifth- and eighth-grade students. Previous researchers (Entwisle & Alexander, 1992; Hyde et al., 1990) found (a) that slight racial differences occurred when children entered school and increased thereafter but (b) that significant gender differences did not seem to occur until the end of junior high and during high school. Although Blank and Gruebel (1995) indicated that between 1982 and 1992, scores for minority students improved at a higher rate than those of White students, a serious gap still existed. The stereotype threat for women may come from higher level *math* courses, whereas it may be a consideration in all *math* courses for Blacks. The "wise school," a "design that secures these students in the belief that they will not be held under the suspicion of negative stereotype about their group" (Steele, 1997, p. 624), seems to hold promise for reducing the threat of stereotypes and subsequent discrepancies in achievement performance. Given the results of the correlations when sorted by race, a reidentification--a change in attitude whereby individuals value those experiences that they previously devalued--with certain achievement

domains by the current generation of students may hold promise not only for them but for their children as well.

TABLE 1 Correlation Coefficients for All Students' California Achievement Test (CAT) Scores (N = 74) and Parental Variables

Legend for Chart:

- A - Item
- B - Total
- C - Calculation
- D - Concepts
- E - **Anxiety**
- F - Perceptions
- G - **Math** course
- H - Education
- I - Occupation

A	B F	C G	D H	E I
Total	-.03	.91(*) .45(*)	.87(*) .31(*)	-.34(*) .06
Calculation	.07	.40(*)	.73(*) .27(*)	-.25(*) -.04
Concepts	-.03	.42(*)	.29(*)	-.43(*) .21
Anxiety	.15	-.38(*)	-.42(*)	-.02
Perceptions		.00	.11	-.01
Math course			.68(*)	.06

Note. Total = student's total **math** score. Calculation = student's **math**-calculation score. Concepts = student's **math**-concepts score. **Anxiety** = parents' **math anxiety**. Perceptions = parents' perceptions of their own **math** abilities. **Math** course = parents' most advanced **math** course. Education = parents' level of formal education. Occupation = parents' occupations.

(*) Significant at .05 level or less.

TABLE 2 Correlation Coefficients for White Students' California Achievement Test (CAT) Scores (n = 35) and Parental Variables

Legend for Chart:

- A - Item
- B - Total
- C - Calculation
- D - Concepts
- E - **Anxiety**
- F - Perceptions
- G - **Math** course
- H - Education
- I - Occupation

A	B F	C G	D H	E I
Total	.01	.84(*) .43(*)	.79(*) .29	-.44(*) .05
Calculation	.35(*)	.36(*)	.68(*) .25	-.33 -.08
Concepts	-.04	.36(*)	.19	-.49(*) .22
Anxiety	-.03	-.39(*)	-.36(*)	-.10
Perceptions		-.05	.08	-.34
Math course			.63(*)	.05

Note. Total = student's total **math** score. Calculation = student's **math**-calculation score. Concepts = student's **math**-concepts score. **Anxiety** = parents' **math anxiety**. Perceptions = parents' perceptions of their own **math** abilities. **Math** course = parents' most advanced **math** course. Education = parents' level of formal education. Occupation = parents' occupations.

(*) Significant at .05 level or less.

TABLE 3 Univariate Follow-Up and Stepdown Test for the Effects of Race on Mathematical Performance

Legend for Chart:

- A - Variable
- B - Hypothesized MSC - Univariate F
- D - Univariate p
- E - Stepdown F
- F - Stepdown p

	A	B	C	D	E	F
Mathematical calculations(a)		35,131.59	9.94	.002(*)	9.94	.002(*)
Mathematical concepts(a)		37,552.92	15.08	.000(*)	4.78	.032
Mathematical concepts(b)		37,552.92	15.08	.000(*)	15.08	.000(*)
Mathematical calculations(b)		35,131.59	9.94	.002(*)	0.32	.573

(a) Calculations were partialled out in stepdown procedure,

(b) Concepts were partialled out in stepdown procedure.

(*) Significant at .05 level or less.

TABLE 4 Mean California Achievement Test (CAT) Scores for Total Math, Math Concepts, and Math Calculations, by Race and Gender

Legend for Chart:

- A - **Math** score
- B - M
- C - SD
- D - N

	A	B	C	D
Total				
Boys				
White		725.17	42.86	18
Black		669.84	52.69	20
Girls				
White		710.77	61.32	17
Black		671.24	59.01	19

Concepts

Boys

White	715.67	42.81	18
Black	673.95	50.43	20

Girls

White	714.29	61.18	17
Black	665.74	44.09	19

Calculations

Boys

White	734.67	42.90	18
Black	677.85	54.95	20

Girls

White	707.24	61.46	17
Black	676.74	73.91	19

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REFERENCES

- Airasian, P. W. (1989). Review of the California Achievement Test. In J. C. Conoley & J. J. Kramer (Eds.), *The tenth mental measurements yearbook* (pp. 126-128). Lincoln, NE: Buros Institute of Mental Measurements.
- Armstrong, J. M. (1985). A national assessment of participation and achievement of women in mathematics. In S. F. Chipman, L. R. Brush, & D. M. Wilson (Eds.), *Women and mathematics: Balancing the equation* (pp. 59-94). Hillsdale, NJ: Erlbaum.
- Blank, R. K., & Gruebel, D. (1995). *State indicators of science and mathematics education 1995: State-by-state trends and new indicators from the 1993-94 school year*. Washington, DC: Council of Chief State School Officers.
- Bock, R. D., & Haggard, E. A. (1968). The use of multivariate analysis of variance in behavioral research. In D. K. Whitla (Ed.), *Handbook of measurement and assessment in behavioral science* (pp. 100-142). Reading, MA: Addison-Wesley.
- Caporrimo, R. (1990, August). Gender, confidence, *math*: Why aren't the girls "Where the boys are?" Paper presented at the annual meeting of the American Psychological Association, Boston.
- Catsambis, S. (1994). The path to *math*: Gender and racial-ethnic differences in mathematics participation from middle school to high school. *Sociology of Education*, 67, 199-215.
- Crocker, J., & Major, B. (1989). Social stigma and self-esteem. The self-protective properties of stigma. *Psychological Review*, 96, 608-630. CTB/McGraw-Hill. (1986). *The California Achievement Test*. Monterey, CA: Author.
- Dorsey, J. A., Mullis, I. V., Lindquist, M. M., & Chambers, D. L. (1988). *The mathematics report card: Are we measuring up?* (NAEP Report No. 17-M-01). Trends in achievement based on the 1986 national assessment. Princeton, NJ: Educational Testing Service.
- Drew, D. E. (1992, April). Affective and behavioral components of undergraduate science education. Paper presented at the annual meeting of the American Educational Research Association, San Francisco, CA.
- Eccles, J. S. (1993). School and family effects on the ontogeny of children's interests, self-perceptions, and activity choices. In J. E. Jacobs (Ed.), *Nebraska symposium on motivation: Vol. 40. Developmental perspectives on motivation* (pp. 145-208). Lincoln: University of Nebraska Press.
- Entwisle, D. R., & Alexander, K. L. (1988). Factors affecting achievement test scores and marks received by Black and White first graders. *Elementary School Journal*, 88, 449-471.

Entwisle, D. R., & Alexander, K. L. (1989). Beginning school *math* competence: Minority and majority comparisons (Report No. 34). Baltimore, MD: Center for Research on Elementary and Middle Schools.

Entwisle, D. R., & Alexander, K. L. (1990). Beginning school *math* competence: Minority and majority comparisons. *Child Development*, 61, 454-471.

Entwisle, D. R., & Alexander, K. L. (1992). Summer setback: Race, poverty, school composition, and mathematics achievement in the first two years of school. *American Sociological Review*, 57, 72-84.

Gross, S. (1988). Participation and performance of women and minorities in mathematics: Vol. II. Findings by gender and racial/ethnic group. Washington, DC: National Science Foundation.

Hewitt, N. M., & Seymour, E. (1991). Factors contributing to high attrition rates among science and engineering undergraduate majors (unpublished report). New York: Alfred P. Sloan Foundation.

Horn, L. (1990, April). Trends in high school *math* and science course taking: Effects of gender and ethnicity. Paper presented at the annual meeting of the American Educational Research Association, Boston.

House, J. D. (1993). Achievement related expectancies, academic self-concept, and mathematics performance of academically underprepared adolescent students. *The Journal of Genetic Psychology*, 154, 61-71.

Huang, S. L., & Waxman, H. C. (1993, May). Comparing Asian- and Anglo-American students' motivation and perceptions of the learning environment in mathematics. Paper presented at the annual conference of the National Association for Asian and Pacific American Education, New York.

Hyde, J. S., Fennema, E., & Lamon, S. J. (1990). Gender differences in mathematics performance: A meta-analysis. *Psychological Bulletin*, 107, 139-155.

Lockhead, M., Thorpe, M., Brooks-Gunn, J., Casserly, P., & McAloon, A. (1985). Sex and ethnic differences in middle school mathematics, science, and computer science: What do we know? Princeton, NJ: Educational Testing Service.

Matthews, W., Carpenter, T., Lindquist, M., & Silver, E. (1984). The third national assessment: Minorities and mathematics. *Journal for Research in Mathematics Education*, 15, 165-171.

Osborne, J. (1994). Academics, self-esteem, and race: A look at the underlying assumption of the disidentification hypothesis. *Personality and Social Psychology Bulletin*, 21, 449-455.

Roy, J. (1958). Step-down procedure in multivariate analysis. *Annals of Mathematical Statistics*, 29, 1177-1187.

Sax, L. J. (1994). Mathematical self-concept: How college reinforces the gender gap. *Research in Higher Education*, 35, 141-166. SPSS. (1992). *SPSS advanced user's guide*. Chicago: Author.

Steele, C. M. (1992, April). Race and the schooling of Black Americans. *The Atlantic Monthly*, 68-78.

Steele, C. M. (1997). A threat in the air: How stereotypes shape intellectual identity and performance. *American Psychologist*, 52, 613-629.

Tsuji, G., & Ziegler, S. (1990). What research says about increasing the numbers of female students taking *math* and science in secondary school. Toronto, Ontario, Canada: Toronto Board of Education Research Department.

U.S. Department of Education. (1982). *National assessment of educational progress*. Washington, DC: Author.

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