Unpacking the Male Superiority Myth and Masculinization of Mathematics at the Intersections: A Review of Research on Gender in Mathematics Education

Appendix

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APPENDIX

Table A1
Reviewed Publications for Achievement and Participation Perspectives

Perspective	Examples (* denotes representative studies highlighted in review)	Number of Citations	Source	Context	Analytical Focus	Study Participants
Achievement	Fennema & Sherman (1977)*	1,002	*American Educational Research Journal (AERJ)*	4 predominantly White high schools across U.S.	Sex differences in test scores and Fennema-Sherman Mathematics Attitude (FSMA) Scales	589 females and 644 males
	Guay & McDaniel (1977)	120	*Journal for Research in Mathematics Education (JRME)*	U.S. elementary schools	Sex differences in 4 researcher-developed tests on spatial ability	90 children between the ages of 14 and 16
	Fennema & Sherman (1978)*	552	*JRME*	Predominantly White, middle-class middle schools in Madison, Wisconsin	Sex differences in problem solving, vocabulary, spatial ability, and FSMA Test	1,320 sixth- to eighth-grade students representative of top 85% in math achievement
	Ethington & Wolfle (1984)	91	*JRME*	U.S.	Covariance-structures model of mathematics achievement and resulting sex differences	13,200 high school sophomore and senior student participants (7,115 females and 6,085 males) in NCES longitudinal study, High School and Beyond
	Fennema & Tartre (1985)	162	*JRME*	4 middle schools in Madison, Wisconsin	Sex differences in use of spatial visualization and mathematical problem solving performance	36 females and 33 males interviewed annually between sixth and eighth grades
	Ethington & Wolfle (1986)	78	*AERJ*	U.S.	Sex differences in latent-construct causal model for processes of mathematics achievement	16,555 respondents (8,912 females and 7,643 males) in NCES longitudinal study, High School and Beyond
	Brandon, Newton, & Hammond (1987)*	70	*AERJ*	4 public schools in Hawaii	Sex differences in norm-referenced mathematics achievement test performance across 4 grade levels	4 major ethnic groups (Caucasians, Filipinos, Hawaiians, and Japanese); 7,926 student participants (3,912 females and 4,014 males) in 1982 and 8,582 (4,155 females and 4,427 males) in 1983

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	Ferrini-Mundy (1987)	86	*JRME*	Medium-sized state university in the U.S.	Sex differences in spatial training on calculus achievement, spatial visualization ability, and use of visualization in problem solving	334 students (167 females and 167 males) preregistered for first-semester calculus
	Hanna (1989)*	66	*Educational Studies in Mathematics (ESM)*	20 countries between 1982 and 1983	"Gender differences" in test scores from Second International Mathematics Study (SIMS)	37,043 females and 37,410 males in eighth grade
	Marsh (1989)	185	*AERJ*	1,015 high schools in the U.S.	Sex differences in development of academic constructs of achievement, attitudes, and course selection in mathematics	14,825 respondents in a second follow-up to High School and Beyond study
	Battista (1990)	257	*JRME*	Middle-class, Midwestern community in the U.S.	"Gender differences" in geometry performance (achievement and problem solving) with consideration of teacher effects	148 high school geometry students (53 females and 75 males)

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	Ethington (1992)	77	*JRME*	U.S.	"Gender differences" in mathematics achievement using psychosocial model	746 eighth-grade student participants in SIMS
	Wainer & Steinberg (1992)	141	*Harvard Educational Research*	51 U.S. colleges and universities	Sex differences in Scholastic Aptitude Test (SAT) Mathematics performance	46,920 students (21,028 females and 25,892 males) matched by the same grade in first-year college mathematics course
	Stage & Kloosterman (1995)	111	*The Journal of Higher Education*	Public research university in Midwestern U.S.	"Gender differences" in beliefs and achievement in remedial college-level mathematics classroom	236 students (95 females and 141 males) enrolled in college remedial algebra course
	Tartre & Fennema (1995)	86	*ESM*	4 middle schools (Grades 6–8) in Midwestern U.S.	"Gendered differences" in relationships between mathematics achievement and cognitive and affective variables	60 students (32 females and 28 males) tested across eighth, 10th, and 12th grades

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	Bielinksi & Davison (1998)	52	*AERJ*	U.S.	"Gender differences" in item difficulty interactions on basic skills, multiple-choice tests	10,321 eighth-grade students
	Fennema, Carpenter, Jacobs, Franke, & Levi (1998)*	250	*Educational Researcher*	3 elementary schools in U.S.: • Rural, predominantly White with 4% free or reduced lunch • Predominantly White with 26% free or reduced lunch • Predominantly White with 8% free or reduced lunch	"Gender differences" in mathematics strategy use on researcher-developed problem solving test	38 females and 44 males (89% White, 11% free or reduced lunch)
	Carr, Jessup, & Fuller (1999)	87	*JRME*	2 schools (10 first-grade classrooms) in suburban Atlanta and 3 schools (13 first-grade classrooms) in small towns in Georgia, U.S.	Parent and teacher influences on "gender differences" in first-grade students' mathematics strategy use	92 children; 2 females and 2 males per classroom across 23 first-grade classrooms (21% African American, 74% Caucasian, 4% other groups [mainly Asian])
	Davis & Carr (2001)	46	*Learning and Individual Differences (LID)*	2 suburban elementary schools (5 classrooms) in the U.S.	"Gender differences" in temperament influence on mathematics strategy use	84 first-grade students (42 females and 42 males); 51% White, 15.2 % African American, 5.4% Asian, 8.7% Hispanic, and 8.7% multiracial
	Ai (2002)	82	*Mathematical Thinking and Learning (MTL)*	Randomly selected 52 public schools in the U.S. (Longitudinal Study of American Youth)	"Gender differences" in growth in mathematics achievement related to psychosocial influences (e.g., mathematical attitudes, self-esteem, parental encouragement, teacher expectations, peer influences)	Nationally representative sample of 3,116 students traced between Grades 7 through 10
	Birenbaum & Nasser (2006)	35	*Learning and Instruction*	Israel	Ethnic and "gender differences" in mathematics achievement (National Assessment Test in Mathematics) and dispositions (attitudes, parental expectations, effort, and help)	Nationally representative sample of 2,332 eighth-grade students: 1,585 Jewish (824 girls and 761 boys) and 747 Arab (344 girls and 403 boys)

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	McGraw, Lubienski, & Strutchens (2006)	162	*JRME*	U.S. National Assessment of Educational Progress (NAEP) between 1990 and 2003	"Gender gaps" in mathematics achievement and affect	Large, representative sample of U.S. students in Grades 4, 8, and 12
	Carr, Steiner, Kyser, & Biddlecomb (2008)	54	*LID*	7 schools (38 classrooms) in northeastern Georgia, U.S.	Predictors of "gendered differences" in mathematical competency (including strategy use, fluency, accuracy, spatial ability, and confidence)	241 second-grade students (123 females and 118 males); 71% White, 24% African American, 3% Asian, 2% Latin@
	Penner & Paret (2008)	111	*Social Science Research*	Public and private schools in U.S.	"Gender differences" in mathematics achievement between first and fifth grades	Nationally representative sample of kindergarten students from Early Childhood Longitudinal Study, Kindergarten Class 1998–1999 (ECLS-K)
	Robinson & Lubienski (2011)	116	*AERJ*	Public and private schools in U.S.	"Gender achievement gaps" in mathematics and reading via cognitive assessments and teacher ratings	7,075 students traced across kindergarten and eighth grade in ECLS-K

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	Lubienski, Robinson, Crane, & Ganley (2013)	12	*JRME*	ECLS-K	"Gender differences" in mathematics achievement, affect, and experiences	Nationally representative sample of 21,000 U.S. students traced between kindergarten and Grade 8 across 1,277 schools
Participation ***Sex-Based***	Sherman & Fennema (1977)	207	*AERJ*	U.S.	Sex differences in test scores (mathematics, verbal ability, spatial ability) and 8 FSMA Scales and relationships with high school mathematics course enrollment intent	716 10th- and 11th-grade students
	Wolleat, Pedro, Becker, & Fennema (1980)	117	*AERJ*	10 Midwestern U.S. high schools in urban, suburban, and rural communities	Sex differences in patterns of causal attributions for mathematics performance	647 female and 577 male secondary school students (over 7% non-White) enrolled in college preparatory algebra and geometry courses

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	Armstrong (1981)	204	*JRME*	Women in Mathematics Project (WMP; Education Commission of the States) and 1977–1978 NAEP mathematics assessment	Sex-based comparisons of achievement scores to document persistence of differences when controlling for mathematics course taking	452 13-year-old and 1,788 17-year-old WMP respondents; 75,000 students for NAEP (including 9-year-olds, 13-year-olds, and 17-year-olds)
	Becker (1981)*	265	*JRME*	3 U.S. high schools: • 2 schools in an urban–suburban area with well-educated and relatively affluent population • 1 school in a rural area near city located 50 miles from large metropolitan area	Sex differences in mathematics teacher treatment using Brophy-Good Teacher-Child Dyadic Interaction System	10 high school geometry teachers (7 females, 3 males)
	Pedro, Wolleat, Fennema, & Becker (1981)	121	*AERJ*	9 high schools across urban, suburban, and rural communities in 2 midwestern U.S. states (3 urban schools with 11–37% non-White students; other schools were predominantly White)	Sex-based variation in attributions and attitudes in election of mathematics courses	633 female and 572 male students enrolled in high school algebra and geometry
	Benbow & Stanley (1982)	217	*AERJ*	Maryland schools in the U.S.	Persistence of sex difference in mathematical reasoning ability in relation to achievement and participation	2,188 student participants (61% male) in the Study of Mathematically Precocious Youth
	Pallas & Alexander (1983)	233	*AERJ*	24 public high schools across 15 U.S. communities	Relationship of sex difference in quantitative SAT performance and high school mathematics coursework pattern	6,119 students from ETS Study of Academic Prediction and Growth

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	Eccles, Adler, Futterman, Goff, Kaczala, Meece, & Midgley (1985)	116	*Women and mathematics: Balancing the equation* [Book chapter]	Not specified	Sex differences in mathematics course enrollment decisions related to self-perceptions, task perceptions, and socializing influences	339 students in Grades 5–11 in Year 1 and control group of 329 in Year 2
	Peterson & Fennema (1985)	231	*AERJ*	15 schools in a rural area or small towns near large U.S. cities; predominantly White and middle class	Sex differences on low and high NAEP item performance as well as (non-)engagement in classroom activities (competitive, cooperative, social, off-task)	6 randomly-selected females and 6 randomly-selected males across 36 fourth-grade mathematics classes (3 female teachers, 33 male teachers)
	Hart (1989)	97	*JRME*	Spring 1980 in the U.S.	Sex differences in mathematics teacher–student interactions across confidence levels using modified Brophy-Good Dyadic Observation System	93 seventh-grade mathematics students (20 high-confidence females, 25 low-confidence females, 24 high-confidence males, 24 low-confidence males); 6 teachers with 5–10 target students in each class

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	Fennema, Peterson, Carpenter, & Lubinski (1990)*	231	*ESM*	24 U.S. elementary schools	Sex differences in teachers' attributions and beliefs of student mathematical ability	38 first-grade, female teachers; 314 females and 368 males
	Dick & Rallis (1991)	225	*JRME*	9 high schools with socioeconomic variation in Rhode Island	"Gender differences" in perceived factors and influences on academic and career choices (including a focus on students academically well prepared in mathematics and science)	2,213 high school seniors (1,124 women and 1,089 men)
	Bornholt, Goodnow, & Cooney (1994)	86	*AERJ*	Coeducational government high school in Sydney, Australia	Influence of "gender stereotypes" on "gender differences" in perceptions of mathematics achievement	663 students followed across first 4 years of high school
	Seegers & Boekaerts (1996)	127	*JRME*	20 middle-class schools in urban region of Leiden, the Netherlands	"Gender-related differences" in mathematics performance in relation to self-referenced cognitions and task-specific appraisals	96 girls and 90 boys between 11 and 12 years old

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	Boaler (1997)	168	*Gender & Education (G&E)*	2 school sites in England of working-class status (Amber Hill and Phoenix Park)	Sex differences in mathematics learning between traditional and reform mathematics teaching approaches	Students between ages 13–16 across all ability tracks (Sets 1–4) at Amber Hill and all 5 mixed-ability tracks in Phoenix Park
	Tiedemann (2000)	97	*ESM*	Area in and around a north German city	Influence of "gender-related beliefs" among elementary school teachers on students' mathematics achievement	52 third- and fourth-grade teachers (5 men) with 5–21 years of teaching experience; 312 students
	Casey, Nuttall, & Pezaris (2001)	125	*JRME*	Middle-class, predominantly White, and suburban middle school in northeastern U.S.	Spatial-mechanical reasoning skills and mathematics self-confidence as mediators of "gender differences" in mathematics test item performance	187 eighth-grade students (96 females, 91 males)

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	Forgasz & Leder (2001)	24	*Sociocultural research on mathematics education: An international perspective* [Handbook chapter]			
	One study: • Forgasz, Leder, & Barkatsas (1998)	9	*Vinculum*	• 8 coeducational schools in Victoria, Australia	• Sex differences in beliefs of mathematics as a gendered domain	• 536 students between seventh and 10th grades (255 females, 281 males)
	Tiedemann (2002)	86	*ESM*	Predominantly White, middle-class German town and country schools	"Gender differences" in mathematics teacher perceptions of students	48 teachers; 288 third- and fourth-grade students

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	Forgasz, Leder, & Kloosterman (2004)	61	*MTL*	Victoria, Australia; urban independent school as well as middle and high schools in Midwestern U.S. rural district	Sex and country differences in perceptions of mathematics as a gendered domain via Mathematics as a Gendered Domain and Who and Mathematics instruments	Approximately 400 female and 400 male students in Grades 7–10 in Australia; 61 females and 62 males in Midwestern urban school in U.S.; 200 females and 184 males in rural middle and high schools in U.S.
	Brandell & Staberg (2008)	45	*G&E*	17 compulsory schools (2 classrooms) and 6 upper secondary schools (4 classrooms) across 3 regions of Sweden	Perceptions of mathematics as a female, male, or gender-neutral domain	1,300 students (15- or 17-year-olds)
Gender-Based	Barnes (2000)*	20	*Multiple perspectives on mathematics teaching and learning* [Edited book chapter]	Independent coeducational school in Australia	Gendered collaborative learning experiences in accelerated mathematics class	22 students aged between 15–16 years old in accelerated Year 10 mathematics class

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	Forgasz & Leder (2001)	24	*Sociocultural research on mathematics education: An international perspective* [Handbook chapter]			
	Three studies: • Forgasz (1998)		*Australian Association for Research in Education* [Conference paper presentation]	Australia	• Students' motivations and experiences as gendered influences on tertiary mathematics studies	• 21 mature-age (over 21 years old) participants enrolled in mainstream postsecondary mathematics courses
	• Leder & Forgasz (1997)		*The Australian Educational Researcher*	Australia	• Gendered patterns of cognitive and affective engagement with mathematics as predictors of future mathematics involvement	• 5 seventh-grade students (3 girls and 2 boys)

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	• Not specified in handbook chapter			• Outer suburban government primary school in middle-class area in Australia	• Students' attitudes toward gender in and out of the classroom and any influences from school community members (e.g., parents, teachers)	• 8 fourth-grade students, 7 sixth-grade students, 6 teachers, and 4 parents
	Mendick (2003)	21	*Which way social justice in mathematics education?* [Edited book chapter]	3 postsecondary schools in England: • Ethnically diverse, working class (Grafton) • Ethinically diverse, middle class with academic curriculum (Westerburg) • International, nontraditional student population with vocational, part-time curriculum (Sunnydale)	Gendered experiences with postsecondary mathematics subject choice	43 postsecondary students aged between 16 and 19 pursuing mathematics

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	Shapka & Keating (2003)	100	*AERJ*	2 public high schools in Ontario, Canada: target school with single-sex program and control school with coeducational program	Effects of single-sex mathematics and science classes on girls' achievement, course enrollment, mathematical attitudes, and engagement and performance in coeducational program	786 students (85 girls in all-girl classes, 319 girls and 382 boys in coeducational program) from middle- to upper-middle-class White families living in suburban area
	Vale & Leder (2004)	87	*ESM*	Lower- to middle-class coeducational secondary school in metropolitan area of Melbourne, Australia	Gendered variation in girls' and boys' perceptions of computer use in mathematics classes	49 eighth- and ninth-grade students (17 girls and 32 boys)

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	Mendick (2005a)	125	*G&E*	3 postsecondary schools in England: • Ethnically diverse, working class (Grafton) • Ethnically diverse, middle class with academic curriculum (Westerburg) • International, nontraditional student population with vocational, part-time curriculum (Sunnydale)	Gendered experiences with postsecondary mathematics subject choice	43 postsecondary students aged between 16 and 19 pursuing mathematics
	Solomon (2012)	20	*ESM*	United Kingdom (U.K.)	Narratives of success for creating identities of the "female self" in mathematics	Two undergraduate women studying mathematics at two different U.K. universities