

Table 1
Girls and Science Review Theme 1- Equity and Access

Author and year	Purpose of study	Participants and Setting	Methods/Methodology	Major Findings
Baker & Leary (1995)	To qualitatively examine the reasons behind girls' choices of science	Volunteer sample of 40 girls, Grades 2, 5, 8 and 11	Semi-structured interviews responding as girl and as boy	Girls were positive and confident about science and felt strongly about gender equity issues; they preferred interactive, hands-on learning in science, and their choices of science careers were tied to people in their lives and a desire to help
Evans, Whigham, & Wang (1995)	To evaluate the impact of a 3-day role model intervention program on attitudes towards careers in science, math and technology	964 Grade 9 students in 57 classrooms in 10 Iowa schools	Pre-post testing of control group, coed intervention group, and all-girls intervention group	Girls' and boys' attitudes improved more in intervention than in control groups, and girls' attitudes improved on more survey measures than boys'
Catsambis (1995)	To examine gender differences in science attitudes and achievement of a large, multi-ethnic sample of students	24,500 Grade 8 students from 1,052 US schools, nationally representative sample	Analysis of survey data from NELS (National Educational Longitudinal Study) of 1988 by gender and race/ethnicity	Girls of all ethnic groups had more negative science attitudes and fewer science experiences than boys but achieved at equal or higher levels
Jones & Young (1995)	To examine how students' science perceptions and attitudes over time relate to gender and school-type	962 Year 7, 1,107 Year 8, and 1,173 Year 9 students from 14 public and private schools in Australia	Longitudinal design using closed-response survey questionnaires over 3 years	Boys had more positive science attitudes than girls in Years 8 and 9
Weinburgh (1995a)	To analyze the literature on gender differences in science attitudes and the relationship between attitudes and achievement	18 studies with 6,753 total subjects	Meta-analysis of literature between 1970 and 1991	Boys had more positive science attitudes than girls, but high-performing girls had more positive attitudes than boys, and no patterns emerged over time; attitude was correlated more with achievement for girls than for boys
Scantlebury (1995)	To illustrate and critique the gender-blindness of preservice science teachers	NA	Fictional "likely story" of a female preservice science teacher, theoretical discussion	Teacher education programs should actively challenge gender-blindness and prepare gender-sensitive teachers
Greenfield (1995a)	To examine gender differences in participation and project choices in a state science fair over time	8,150 Grades 7-12 science fair participants in Hawaii	Analysis of 30 years of state science fair records	Rate of girls' participation increased more than boys' over time, but girls did fewer experimental and fewer physical/earth science and math projects than boys

Greenfield (1995b)	To examine sex differences in attraction to science museum exhibits	Upper elementary and middle school children and adults visiting science museums in Hawaii	Observations of people at exhibits	More boys than girls actively participated in exhibits, and boys monopolized computer exhibits; girls chose more puzzle and life science exhibits and boys more computer and physical science exhibits
Guzzetti & Williams (1996)	To qualitatively explore gender disparities in classroom interactions and the extent to which students are aware of gender inequities	55 students in 1 honors and 1 regular class of high school physics in town just outside southwestern US city, 85% European American, high socioeconomic status	Case study using field notes from daily observations for 8 months, questionnaires, semi-structured and informal interviews, and collection of documents	Students, particularly girls, were aware of gender inequities that existed in the classrooms, despite teacher being unaware
Hines & Mussington (1996)	To describe a field experience where preservice science teachers did a gender equity research study	9 preservice science teachers enrolled at a US university	Description of university course and field-based experience	Doing research benefited preservice teachers in many ways and made them aware of gender equity issues
Scantlebury et al. (1996)	To examine how training cooperating science teachers in gender-sensitivity impacts student teachers' equitable practices	15 cooperating teachers and 15 student teachers majoring in science at a US university	75 hours of comparative classroom observations using quantitative coding form	Student teachers who worked with gender-sensitive cooperating teachers asked questions more equitably and asked more higher-order questions than other student teachers
Greenfield (1996)	To assess the impact of gender and ethnicity on science enrollment, achievement, and attitudes	Grades 3-12 students from Hawaii's 4 major ethnic groups (Caucasian, Japanese-American, Hawaiian, Filipino-American), achievement data for 15,044, attitudes data for 1,149 and enrollment data for 179,652 students	Closed-response survey questionnaires, analysis of Stanford Achievement Test (SAT) scores and State Department of Education enrollment records	Ethnicity impacted achievement and attitudes more than gender, but boys had more physical science experiences and stronger views of science as a male domain; girls were more likely than boys to enroll in advanced math and science courses
Jones, Porter, & Young (1996)	To examine how students' science perceptions, attitudes, and participation over time relate to gender and school-type	866 Year 10, 214 Year 11, and 474 Year 12 students from 14 public and private schools in Australia	Longitudinal design using closed-response survey questionnaires over 6 years (3 years reported here)	Gender differences in perceptions and attitudes persisted but varied over time, and fewer girls than boys enrolled in higher level math, physics, and chemistry courses
Ramey-Gassert (1996)	To discuss parts of the literature on gender issues in informal science settings, particularly science museums	NA	Overview of research	Further research is needed on the influence of gender on informal science learning

Whiteley (1996)	To examine the gender fairness of Jamaican science textbooks over time	Jamaica	Analysis of 12 textbooks used in Jamaican high schools	Despite some improvement over time, most textbooks were still male-biased and supported gender stereotypes
Greenfield (1997)	To examine how students' science attitudes and participation varies by gender and grade	2,800 students in 1 elementary, 1 middle, and 1 high school in Hawaii, ethnically mixed population	Closed-response survey questionnaires, classroom observations using 2 protocols that categorize and quantify specific behaviors	Girls and boys had similar science attitudes, although boys had more physical science experiences and stronger views of science as a male domain, and attitudes became more negative with age, particularly for girls; girls got less attention from teachers than boys but engaged equally with science equipment
Panizzon & Levins (1997)	To examine the role of peers in supporting female science students	100 Year 11 female students taking physics and biology in 5 high schools in Australia	Closed-response survey questionnaires, interviews with 6 students	The role of peer support was similar across science subjects but varied depending on the school context
McEwen, Knipe, & Gallagher (1997)	To examine students' taking of A-level science in 1995 as compared to 1985	1,600 students ages 14-19 in Northern Ireland in a range of single-sex, coeducational, Protestant, and Catholic schools	Closed-response survey questionnaires	Girls took more science A-levels in 1995 than 1985 and boys took fewer; boys took more science A-levels than girls overall in 1995, but girls performed better than boys
Huffman, Lawrenz, & Minger (1997)	To examine students' perceptions of science learning environments by sex and race	1,800 Grade 9 science students from 13 high schools across the US	Closed-response survey questionnaires	Girls perceived classes as more difficult and perceived themselves as more involved than boys in the same classes; on 4 other measures perceptions were similar
Bullock (1997)	To examine the effectiveness of the Gender and Ethnic Equity in Science Education (GEESE) program for preservice science teachers	5 female and 1 male preservice secondary science teachers enrolled in student teaching practicum at a southwestern US university	Case study drawing upon 2 individual interviews, tape-recorded group sessions, and teachers' reflective journals	Teachers' initial enthusiasm for GEESE program and equity issues waned when faced with obstacles related to resources and student performance; they felt program should happen earlier in their training
Tunncliffe (1998)	To examine differences in girls' and boys' talk at animal exhibits	141 classes from 114 elementary schools in the UK	Tape recordings of 1,288 student conversations at a museum and zoo	Content of girls' and boys' conversations was similar, but girls-only groups' comments were more emotional, while boys-only groups' comments were more factual

Adamson, Foster, Roark, & Reed (1998)	To examine gender differences in young children's science fair projects	489 Grades 1-6 students in a mostly middle and upper-middle class progressive private school, 20% minorities (mostly African American)	Evaluation and categorization of 268 science fair projects over 2 years, parent surveys about projects	Girls did more projects in biological and social sciences and boys in physical sciences for both years at all grade levels
Jovanovic & Steinbach King (1998)	To examine whether girls and boys participated equally in hands-on science activities in performance-based classrooms	165 Grades 5-8 students in 6 US classrooms, 76% Euro American, 5% African American, 4% Latino(a), 3% Asian American, 12% other	Classroom observations using checklist protocol over school year, closed-response survey questionnaires	Active-leading behaviors were equal for boys and girls and led to better science attitudes, but boys were more likely to manipulate equipment than girls; girls' perceptions of their ability decreased over the school year
Jacobs, Finken, Lindsley Griffin, & Wright (1998)	To examine the impact of social, attitudinal, and educational factors on rural adolescent girls' career preferences	220 science-talented rural girls ages 15-18, 95% European-American	Closed-response survey questionnaires mailed to girls and parents	Science interest, previous science experiences, peer support, and, to a lesser extent, mothers' attitudes influenced girls' science career plans
Woodward & Woodward (1998)	To examine differences in girls' and boys' science attitudes since inclusion of science in national primary school curriculum	360 primary school students from 12 schools in Wales	Closed-response survey questionnaires, individual interviews in 1991, 1993, and 1995	Girls and boys had positive science attitudes, but girls preferred biological topics and boys' preferences were broader; these patterns were unaffected by introduction of science in National Curriculum
Farenga & Joyce (1999)	To examine gender differences in students' choice of science courses for themselves and members of the opposite gender	427 Grades 4-6 students from 28 classes in 2 mostly White, middle class US suburban schools	Closed-response course selection surveys where students chose for themselves and for opposite gender	Boys chose more science courses overall and more physical science courses than girls, and when choosing for the opposite gender, stereotypical patterns were even stronger, particularly when boys chose for girls
Åberg-Bengtsson (1999)	To examine gender differences in performance on the diagrams, tables, maps subtest of a national achievement test	34,099 students age 19 in Sweden	Analysis of achievement data on the Swedish Scholastic Aptitude Test using structural equation modeling	Gender differences favored males for quantitative questions involving diagrams, tables, and maps
Stark (1999)	To examine gender differences in students' preferences for science topics and activities	Students ages 8/9, 11/12, and 13/14 in Scotland, nationally representative sample	Closed-response survey questionnaires	Girls had stronger and more lasting preferences for biological topics than boys; girls and boys had similar preferences for activity types, and both had neutral or negative attitudes towards most activities

Andre, Whigham, Hendrickson, & Chambers (1999)	To examine students' and parents' attitudes and beliefs about science as compared to other subjects	437 Grades K-6 students and 347 parents from mostly European American schools in Iowa	Closed-response survey questionnaires	Girls liked reading more but science as much as boys, and both genders, but more so boys, viewed science jobs as male-dominated; parents saw science as more important for boys, saw boys as more competent, and had higher expectations of boys in science
Bailey, Scantlebury, & Johnson (1999)	To examine how collaboration with cooperating teachers impacts preservice science teachers' equitable practices	59 student teachers from a US university	Comparative classroom observations using quantitative coding tool and qualitative notes over 3 years, interviews	Student teachers regularly observed by cooperating teachers demonstrated more equitable interactions with students than those observed only by university supervisors
Preece, Skinner, & Riall (1999)	To examine gender differences in performance on a national science achievement test	2,300 students ages 13-14 from 46 schools in England and Wales	Analysis of achievement data on national Key Stage 3 science tests	Gender differences favored males for higher-level and physics questions
She (1999)	To examine students' verbal communication and physical engagement in different gender composition groups	36 target students in 3 Grade 7 classes in Taiwan	Observations, quantitative and qualitative analysis of video tapes of laboratory group work	In same-gender groups, girls read and recorded results slightly more and boys observed experiments slightly more; in mixed-gender groups these patterns varied by group
Johes, Howe, & Rua (2000)	To examine gender differences in students' science attitudes, interests, and experiences	437 Grade 6 students from 5 schools in rural, urban, and suburban areas of the southeastern US, 42% Euro-American, 26% African American, 9% Hispanic, 15% Asian-American, 8% other	Closed-response survey questionnaires	Girls were more interested in biology and boys in physical science topics, and girls more often chose jobs that involve helping others; girls more often viewed science as difficult and boys more often as male domain, and boys had more out-of-school experience with science tools
Dawson (2000)	To compare sex differences in students' interests in science topics and learning activities in 1980 to those in 1997	203 Year 7 students in 8 primary schools in South Australia	Comparison of closed-response survey questionnaires given to students in 1980 and 1997	Girls' and boys' overall interest level decreased, while boys' interest in physical science topics increased; both groups, but more so girls, showed increased preference for active, hands-on learning activities
Harwell (2000)	To examine middle school girls' perceptions of themselves as learners, of science, and of the science classroom	215 Grade 7 girls from 4 schools in the southern US	Structured peer interviews conducted by students	Most girls viewed themselves as successful learners, preferred active learning, and had "naïve" views of the nature of science

Roger & Duffield (2000)	To describe influences on girls' choices to opt out of science and technology and to analyze initiatives that attempt to address this situation	NA	Literature review and theoretical discussion	Six key factors underlie gendered school option choices, and 5 positions characterize initiatives aimed at encouraging girls and women in science, engineering, and technology
Bell (2001)	To examine gender differences in performance on memory retrieval questions on a national science achievement test	750 students age 16 in the UK	Analysis of question responses on General Certificate of Secondary Education (GCSE) examination	For memory retrieval questions, girls outperformed boys in biology, and boys outperformed girls in physics
Muller, Stage, & Kinzie (2001)	To examine science achievement and growth rates in high school by racial-ethnic and gender subgroups	1,348 African American, 1,668 Latino, 799 Asian American, 1,891 White Grades 8, 10, and 12 students in the US	Analysis of survey data from NELS of 1988, 1990, and 1992 using hierarchical linear modeling (HLM)	Racial-ethnic gaps were larger than gender gaps within subgroups, and gender differences in predictors of achievement and growth rate varied by racial-ethnic subgroup
Stake & Mares (2001)	To evaluate the impact of 2 science summer enrichment programs on students' science attitudes using multiple measures	330 gifted Grade 12 students from 76 high schools in the Midwest, 8.5% African American, 13.0% Asian American, 74.8% European American, 3.6% other ethnic groups	Multiple closed-response pre, post, and 6 month follow-up survey questionnaires, student and parent reports of program impact	Pre-post testing revealed no significant changes, but student and parent reports revealed girls benefited from program more than boys
Davis (2002)	To examine the challenges faced by women science educators in facilitating an after-school science club for urban girls	2 educators and 55 girls ages 6-12 in southwestern city, population served by youth club 65% Latino, 26% White, 5% African American, and 77% at or below poverty level	Interviews with teachers and girls, formal participant observation of 22 weekly club meetings, collection of documents	Economic, structural, and ideological barriers hindered club's goal of giving girls access to legitimate science activity
Mattern & Schau (2002)	To describe the relationship between the science attitudes and achievement of White middle school students and how it varies by gender	1,238 Grades 7 and 8 White students in 10 classrooms in 8 mostly rural schools in northern New Mexico	Closed-response survey questionnaires and 2 achievement instruments	For girls, attitude and achievement were not related, while for boys higher achievement led to more positive attitudes
Jayarathne, Thomas, & Trautmann (2003)	To evaluate the impact of a summer science enrichment program for high-achieving girls on science confidence, interest, participation, and aspirations over time	38 Grade 8 program participants and 173 applicants as comparison group, 37% of participants and 10% of comparison group minority, mostly African American	Closed-response survey questionnaires given to participants and comparison group before, 1 year after, and 4 years after program	Program participation overall did not influence outcomes measured, and at two later time points, nonminority participants had most and minority participants least positive outcomes
Reid (2003)	To examine differences in girls' and boys' attitudes and perceptions towards physics over time	2,866 students ages 10-18 in Scotland	Closed-response survey questionnaires	Girls' physics attitudes declined more than boys' at about age 13; girls' attitudes in particular increased again in later secondary years for those who continued to take physics

Elgar (2004)	To examine gender representation in a newly published series of Bruneian textbooks	Brunei	Analysis of 3 recently published science textbooks entitled <i>Lower Secondary Science for Brunei Darussalam</i>	Females were underrepresented in images and text, and females most often associated with motherhood while males took on variety of roles
Sencar & Eryilmaz (2004)	To examine what factors moderate gender differences in students' misconceptions about electric circuits	1,678 Grade 9 Turkish students	Closed-response achievement tests and survey questionnaires	There were no gender differences on theoretical items, and differences on practical items disappeared when age and interest-experience related to electricity were controlled for
Chambers & Schreiber (2004)	To examine the relationship between extracurricular activities and academic achievement for girls of different ethnicities	4,382 Grades 8 and 10 American girls, 78% Caucasian, 9% Latina, 7% African American, 6% Pacific Islander	Analysis of survey data from NELS of 1988 by gender and ethnicity	Many extracurricular activities positively impacted achievement, but there were differences by ethnicity
Fadigan & Hammrich (2004)	To describe the educational and career paths of young women who participated in an informal science education program during high school	152 young women 4-9 years after participating in US program during Grades 9 and/or 10, 89.47% minorities, all from urban, low-income, single-parent families and interested in science	Longitudinal, descriptive case study using program documents, self-administered survey questionnaires, and semi-structured interviews	Most participants enrolled in college, almost half pursued science-related careers, and most described features of the program as influential in their future educational and career decisions
Dhindsa (2005)	To examine students' perceptions of the cultural learning environment in science classes	831 upper secondary science students from coeducational schools in Brunei, 33.1% males, 66.9% females	Closed-response survey questionnaires	Students perceived classes to be gender equitable, although this varied by region
Van Langen, Rekers-Mombarg, & Dekkers (2006)	To examine sex differences in choice of science and math subjects and the factors that influence those choices for girls and boys	987 pre-university students from 55 schools in The Netherlands	Analysis of portion of large-scale national cohort (Secondary Education Pupil Cohort 1993)	Girls chose fewer science and math subjects than boys, independent of achievement levels, and girls' choices but not boys' were impacted by family background
Miller, Blessing, & Schwartz (2006)	To examine gender differences in students' views and perceptions about science classes and majors, science, and scientists	79 Grades 10-12 students in small southern US city, 75% Euro-American, 25% minority (mostly African American), most college-bound	Closed- and open-response survey questionnaires	Girls liked biology, chose people-oriented majors, and chose science majors to help people or animals or to prepare them for a health profession; girls often perceived science as uninteresting, passionless, or leading to an unattractive lifestyle

Table 2
Girls and Science Review Theme 2- Curriculum and Pedagogy

Author and year	Purpose of study	Participants and Setting	Methods/Methodology	Major Findings
Weinburgh (1995b)	To suggest how teacher education efforts might respond to the literature on gender issues in science	NA	Discussion and suggestions based on the literature	Gender inclusive science teaching should be modeled and prominently addressed in teacher education programs
Harding & Parker (1995)	To review policy and practice around gender-inclusive science curriculum in 5 countries	Sweden, Denmark, England/Wales, Australia, US	Description of major laws, policies, and programs related to each country's efforts towards a more gender-inclusive science curriculum	Progress towards gender-inclusivity has fluctuated with changing political and economic circumstances; policy and practice interact in multiple ways
Roychoudhury, Tippins, & Nichols (1995)	To explore the application of feminist ideas about women's learning to science teaching	45 prospective elementary teachers at a midwestern US university, all White middle-class, 90% women	Interpretive study using open-ended questionnaires, student reflections, videotapes of lessons, researcher's reflective journal	The course's focus on situated, collaborative learning and long term open-ended projects triggered empowerment, competence, and ownership in the majority of students
Meece & Jones (1996)	To test hypothesis proposed in literature that girls underachieve in science because of their tendency towards rote learning	213 Grades 5 and 6 students in 10 classrooms with 5 teachers in 4 schools in mostly White middle to upper-middle class suburban areas of midwestern US	Closed-response self-reports of confidence, motivation goals, and learning strategies completed after whole-class and small-group lessons	No major gender differences revealed, although there were some trends based on ability level
Plucker (1996)	To investigate teacher attitudes and use of interventions related to gender equity	56 science and math teachers from 8 urban, rural, and suburban high schools in 6 different locations in northern US	Closed- and open-response survey questionnaires sent by mail	Many teachers had partial understandings of gender equity issues, reported mostly short-term intervention strategies, and viewed intervention as reverse discrimination
Lee & Burkam (1996)	To examine the impact of subject matter, ability, and course structure on gender gap in science achievement	18,719 Grade 8 students in US, nationally representative sample	Analysis of survey data from NELS of 1988	Gender gap in achievement was mostly in physical science and larger for higher ability students; laboratory experiences improved girls' physics achievement, not boys'
Rodriguez (1997)	To critique the National Science Education Standards (NSES)	NA	Theoretical discussion	The NSES does not articulate the theory and evidence behind its recommendations, thus limiting its potential to promote equity and excellence in science education

Alexopoulou & Driver (1997)	To examine gender differences in how small groups of students discuss physics ideas	86 students ages 14-15 from 4 schools in Athens, Greece	Coding of social interaction and argument construction during single-sex group discussions of physics questions, pre-post testing	Girls sought consensus when discussing ideas, and boys engaged in confrontations; both sexes scored higher on post-tests after discussions
Lagoke, Jegede, & Oyebanji (1997)	To examine the impact on achievement of using socio-cultural analogies in science classes in a non-Western environment	205 boys and 43 girls of mean age 16.8 years in 2 classes in 2 schools in Nigeria	Experimental design including cognitive testing before and after 6-week intervention	Girls and boys in intervention group achieved similarly and scored higher on post-tests than control students
Malone & Cavanagh (1997)	To examine gender differences in the correlation between choice of science and math subjects and cognitive preference	375 Year 10 and 11 students in 1 school in a metropolitan area in Western Australia	Closed-response survey questionnaires from career counseling computer program, analysis of school counseling records	Girls and boys who chose science and math had similar cognitive preferences, which differed from those of girls who were recommended but did not choose the subjects
Burkam, Lee, & Smerdon (1997)	To examine the impact of subject matter, ability, and laboratory activities on gender differences in science achievement over time	12,120 Grade 10 students in US, nationally representative sample	Analysis of survey data from NELS of 1988 and 1990	Gender gap in physical science grew compared to Grade 8 data; laboratory experiences improved achievement, particularly for girls
Haussler et al. (1998)	To examine qualitative differences in students' interests in physics	Longitudinal sample of ~ 1,100 and cross-sectional sample of 5,361 students ages 12-16 in Germany	Closed-response survey questionnaires of students at age 12 and 16 as well as cross-sectional sample in that age range	Students fell into 3 distinct types of interest patterns that varied by gender, age, and confidence in physics ability
Howes (1998)	To explore girls' participation in a high school genetics unit on prenatal testing designed to connect science to girls' experiences	17 Grade 10 students (16 white, 1 African American, 14 girls), range of ability, working and middle-class community	Teacher research using videotapes of classes, student drawings, student comments	Girls talked about personal knowledge of pregnancy and childbirth, focused on pain and safety, and used everyday language more readily than scientific language
McGinnis & Pearsall (1998)	To examine a male professor's enactment of gender-inclusive pedagogy in a mostly female elementary science methods class	23 female and 5 male mostly White prospective teachers in elementary science methods class at the University of Maryland	Action research case study using semi-structured interviews, classroom observations, professor, co-researcher, and student journals	Most students resisted professor's attempts to implement gender-inclusive pedagogy and were not concerned by having a male teacher
Ferguson & Fraser (1998)	To examine how gender and school size impact students' perceptions of science learning environments during the transition from primary to secondary school	1,040 students attending 47 Tasmanian primary schools and then 16 secondary schools	Longitudinal design using closed- and open-response survey questionnaires at Year 6 and Year 7	Girls' perceptions of learning environments were more positive than boys' in primary school and deteriorated more in high school; teacher/student relationships were especially important for girls

Von Secker & Lissitz (1999)	To examine the impact of teaching practices recommended by the NSES on science achievement and equity	2,018 Grade 10 students in 163 US schools	Analysis of survey data from part of NELS of 1990 using hierarchical linear modeling	Recommended teaching practices were associated with higher overall achievement but increased gender and minority achievement gaps
Labuddde, Herzog, Neuenschwander, Violi, & Gerber (2000)	To evaluate the impact of a gender-balanced physics curriculum on student attitudes and achievement	600 students in 31 Grades 11 and 12 classes of public schools in Switzerland	Quasi- experimental design comparing pre-post tests and questionnaires in 3 differing experimental groups and 1 control group; surveys and semi-structured interviews with teachers	Teachers found project valuable, but experimental groups did not improve in attitudes or achievement compared to controls; classrooms that used the most girl-friendly strategies correlated with more positive attitudes for girls and boys and higher achievement for boys only
Jones, Brader-Araje et al. (2000)	To examine how students use tools and equipment during science lessons	16 targeted students from 2 Grade 5 and 3 Grade 2 classes in a public urban school in southeastern US with population 50% Euro-American, 47% African American and other minorities, and 26% eligible for free lunch	Interpretive study using field notes from classroom observations of three lessons, interviews with students	Girls were more relational and cooperative than boys, followed directions more, and tinkered with materials less, while boys were more competitive and more exploratory with materials
Heard, Divall, & Johnson (2000)	To examine whether a new audio tool at museum exhibits facilitates students' hands-on activity and conceptual learning	52 Years 5 and 6 students in a suburban school in Bristol, England	Videotapes of children at exhibits, closed- and open-response pre-post tests given to experimental and control group	Girls in particular engaged in more hands-on exploration of exhibits and significantly improved in test scores when using audio tool
Cavallo & Laubach (2001)	To compare students' science attitudes and choices to take elective science classes in high versus low inquiry learning cycle classrooms	119 Grade 10 biology students with 6 teachers in a suburban US high school, 77% White, 7% African American, 7% Hispanic, 1% Asian American, 8% Native American	Closed- and open-response student survey questionnaires, teacher surveys, classroom observations	Students in high inquiry classrooms had more positive attitudes, and girls in high inquiry classrooms planned to take more elective science courses than girls in low inquiry classrooms
Parker & Rennie (2002)	To compare the implementation of gender-inclusive strategies in single-sex vs. coed classrooms	409 students and 26 science teachers in 10 public coed high schools in Western Australia	Field notes and tapes of professional development, semi-structured observations, student, parent, and school personnel interviews, closed- and open-response student survey questionnaires	Teachers, students, and researchers felt that gender-inclusive strategies were implemented more effectively in single-sex than in coed classrooms
Haussler & Hoffman (2002)	To evaluate the impact of a year-long curricular intervention on girls' interest, self-concept, and achievement in physics	456 students in 19 Grade 7 classes (12 experimental and 7 control) in 8 schools in Germany	Closed-response survey questionnaires and tests given at 4 time points to control group and three varying experimental groups	Curricular changes, teacher training, and small, single-sex classes combined, improved achievement, interest, and feelings of competence in physics for both girls and boys

Bunce & Gabel (2002)	To examine the impact of teaching the particulate representation of chemistry on achievement and whether this varies by gender	447 Grades 10 and 11 students taught by 10 high school teachers from 10 US schools	Pre-post testing of treatment and control groups taught 3 2-week chemistry modules; team action research approach	Being taught the particulate nature of matter increased females' achievement but not males'
Zohar & Sela (2003)	To explore gender issues that come up in Israeli Advanced Placement (AP) physics classes	400 high schools in Israel, high achieving students, 25 girls and 25 boys in Grade 12 physics class in an Israeli city	Analysis of matriculation scores between 1989 and 2000 from large national database, semi-constructed interviews with students	Girls participate less than boys in AP physics but perform similarly; girls were deterred by competitiveness and sought deep conceptual understandings
Rennie (2003)	To examine the gender-inclusivity of a curriculum segment with a pirate theme	31 children (12 with special needs) in Year 2/3 class in Australia	Classroom observations, teacher interviews, informal conversations with students, videotape of 1 class, student work	The curriculum topic of pirates allowed students to examine and challenge dominant gender discourses
Zohar & Bronshtein (2005)	To examine teachers' knowledge and views about gender gaps in physics participation	25 physics teachers from 25 high schools in a middle to high middle class, ethnically diverse Israeli city	Semi-structured teacher interviews	Most teachers underestimated the scope and importance of the gender gap in physics and did not know about gender-inclusive practices
Baram-Tsabari & Yarden (2005)	To analyze children's science and technology questions submitted to an Israeli television program	1,676 questions submitted by children ages 9-12	Classification of questions, overall and by gender	Biology questions were most popular, especially for girls, boys submitted more questions; there were gender differences in types of questions
Christidou (2006)	To examine the science-related interests and out-of-school experiences of Greek secondary students	583 Grade 9 Greek students from 27 schools across the country	Closed-response survey questionnaires	Girls were more interested in biology and health and boys in society and technology; girls had more out-of-school experiences with using instruments and devices, exploring nature, cuisine, and handicraft, boys with manual work and computers
Zohar (2006)	To analyze the overlap between the feminist concept of "connected knowledge" and the current science and math education reform idea of "learning for understanding"	NA	Theoretical Discussion	The concepts of connected knowledge and learning for understanding are similar; linking the two has the potential to promote both scientific literacy and gender-fair education
Baram-Tsabari, Sethi, Bry, & Yarden (2006)	To analyze children's science questions submitted to an international Ask-A-Scientist website	1,555 questions submitted by Grades 4-12 children	Classification of questions, overall and by gender	Biology questions were most popular, especially for girls, girls submitted more questions but fewer with age and asked more school-related questions than boys

Table 3
Girls and Science Review Theme 3- Nature and Culture of Science

Author and year	Purpose of study	Participants and Setting	Methods/Methodology	Major Findings
Haggerty (1995)	To highlight the importance of power in gender and science issues and to examine student teachers' views of science and of gender issues	26 student teachers at a Canadian university	Theoretical discussion and action research using interviews and informal conversations	Issues of power should be addressed in teacher education; student teachers viewed science in various ways, and many were not concerned with gender issues
Matthews (1996)	To examine students' and teachers' images of scientists	242 Years 7, 8, and 10 students from 6 schools, 34 trainee teachers	Drawings of 2 scientists per student, open-response questionnaires	66% of scientists drawn by students were male, but most students did not feel science was a boy's subject; 73% of trainee teachers drew one male and one female scientist
Parsons (1997)	To examine Black females' images and beliefs about scientists	20 academically competent Black high school girls in North Carolina	Semi-structured interviews	Girls' images of scientists varied depending on whether seen as Black or White; variation was related to ideas about dominant vs. African American culture
Mayberry (1998)	To contrast collaborative learning and feminist pedagogy	NA	Theoretical discussion and description of feminist science classrooms	Collaborative learning reproduces inequitable and oppressive science systems while feminist pedagogy resists and transforms them
Meyer (1998)	To explore women's experiences in school science and recommend new approaches to teaching science	Researcher and several female elementary teachers in training in a university course named Creative Expression in Science	Narrative reflection and discussion	"Engaged pedagogy" began to address and undo teachers' past experiences of alienation and exclusion in school science
Kleinman (1998)	To examine feminist perspectives on the masculine ideology of science	NA	Theoretical and historical discussion	The masculine ideology of science perpetuated in society and the media impacts the practice of science and women and girls' participation in it
Richmond, Howes, Kurth, & Hazelwood (1998)	To explore students' responses to course assignments designed to prompt both connection with and critique of science	Prospective and practicing elementary and secondary science teachers from 4 different researchers' graduate and undergraduate US university courses	Case studies involving teacher-researcher reflections on students' responses to course assignments	Teachers, particularly those at the secondary level, resisted critiquing science

Newton & Newton (1998)	To examine students' images of scientists over time	1,000 mostly White children ages 4+ to 11+ years from 35 classes in 5 schools in the north-east of England	Draw-a-Scientist Test compared between 1990 and 1996	At both time points, most children drew stereotypical, male images of scientists, and this trend increased with age
Hughes (2000)	To examine the extent to which the socioscientific aspects of a Science-Technology-Society (STS) curriculum are marginalized and the implications of this for inclusivity	Students and teachers using Salters' Advanced Level Chemistry course (an STS curriculum) in the UK	Analysis of Salters' curriculum using data from a prior case study	The socio-scientific aspects of the Salters' curriculum were treated as peripheral to abstract scientific concepts, which inhibits inclusive science education
Gilbert (2001)	To describe a theoretical framework for looking at the problem of gender and science education in new ways	NA	Theoretical discussion	In order to solve the problem of gender and science, we need to deconstruct the terms "gender" and "science"
Letts (2001)	To illustrate the masculinist and heteronormative nature of primary school science	NA	Theoretical discussion	Pedagogy, curriculum, and policy provide examples of the masculinist and heteronormative nature of primary school science
Chinn (2002)	To explore the influence of cultural ideas about gender on Asian women in science and engineering	4 Chinese and Japanese women studying science and engineering at the college or graduate level	Narrative interviews	Patriarchal cultural values were challenges for women pursuing nontraditional paths; women's but not their parents' beliefs were impacted by gender equity efforts
Bianchini, Johnston, Oram, & Cavazos (2003)	To examine how beginning teachers incorporate the nature of science and equitable teaching practices into their classes	3 beginning high school science teachers recently graduated from teacher education program	Critical ethnographic methods including videotapes of classes and semi-structured interviews, used to construct case studies	Teachers addressed who does science and how but not the social and cultural influences on scientific knowledge and practice
Carlone (2004)	To examine girls' participation in a reform-based physics curriculum designed to broaden ideas about science and scientists	28 mostly White Grades 11 and 12 students in 1 Active Physics class in an upper-middle class suburban town in the US	Ethnography using 6 weeks of participant observation, informal conversations, classroom artifacts, surveys, interviews with students, teachers, and administrators, and student focus groups	The Active Physics curriculum both challenged and reinforced prototypical meanings of science; girls resisted science meanings that jeopardized their identities as good students
Capobianco (2007)	To examine teachers' attempts to apply feminist ideas about the nature of science, science teaching, and science education to their practice	3 female high school chemistry and biology teachers in urban, rural, and suburban schools in western Massachusetts	Collaborative action research and narrative inquiry using semi-structured interviews, discussions, observations, and documents	Teachers were enthusiastic about using feminist ideas in their classrooms and did so in diverse ways

Table 4
Girls and Science Review Theme 4- Identity

Author and year	Purpose of study	Participants and Setting	Methods/Methodology	Major Findings
Volman, van Eck, & ten Dam (1995)	To deconstruct the discourse on girls, science, and technology common in Dutch research	NA	Theoretical discussion	The “problem of girls in science and technology” is produced by the way it has been approached by researchers; deeper examinations of gender and gendered identities is needed
Solomon (1997)	To partially review the field of gender and science and explore the factors that influence females’ choices around pursuing science	NA	Overview of gender and science field highlighting certain statistical analyses, theoretical discussion	Factors related to identity, culture, age, and solidarity with gender groups influence girls’ and women’s choices to pursue science
Gaskell, Hepburn, & Robeck (1998)	To present three versions of a gender-equity project in order to examine the impact of the way researchers report and discuss their work	20 high-achieving Grade 10 students in British Columbia	Interviews with students before and after the implementation of a curriculum module on electricity, classroom observations, collection of student assessments	Three versions of the same study yielded different conclusions and took into account the complexities and uncertainties in the data to varying degrees
Hatchell (1998)	To examine the impact of encouragement on female students’ positioning in science class	43 Year 10 females from 3 schools in an Australian metropolitan area	Individual in-depth interviews, open-ended questionnaires, participatory observation	Encouragement and high teacher expectations allowed female students to position themselves as high achievers in science
Bianchini, Cavazos, & Helms (2000)	To examine science teachers’ and scientists’ views and experiences of gender and ethnicity issues and their implications for inclusive practice	60 secondary science teachers and university scientists from 3 different studies	Analysis of data from 3 separate studies involving individual life history interviews, semi-structured interviews, and conversation groups	Teachers and scientists responded in diverse ways to issues of identity, the nature of science, perceptions of students, and inclusive practices that are placed along four continua
Brickhouse, Lowery, & Schultz (2000)	To examine how 4 female students engage in science and form scientific identities in and out of school	4 Grade 7 African American girls from a low-achieving public school in eastern US town with student population 35% African American, 65% white, and 15% on free or reduced-price lunches	Case studies over 18 months using interviews of students, parents, and teachers, classroom observations, student journals, and focus groups	The girls were confident in science and engaged with it in a variety of ways that were connected to who they are; their science classes limited the ways in which they could engage with science, and teachers were more positive towards girls with more conventional gender identities

Brickhouse (2001)	To propose a model of learning that is consistent with feminist perspectives on science education	NA	Theoretical discussion	Situated cognition is an up-and-coming model for understanding learning from a feminist perspective, in that its focus on identity formation makes gender and other aspects of identity integral to learning
Hughes (2001)	To examine students' construction of scientist identities	6 ethnically diverse students from a UK city school and a city post-16 college (part of larger study of 60 students)	Critical discourse analysis of 3 interviews with mixed gender pairs of students	Students' scientist identities took on different relationships to dominant discourses of gender and science
Brickhouse & Potter (2001)	To examine how 2 female students in science and computing courses form scientific identities	2 African American girls during Grades 7-10 at public middle schools and 1 urban vocational high school in eastern US with student population 35% African American, 60% Euro-American, and 5% Asian and Hispanic	Longitudinal case studies for over 3 years using student journals, focus groups, classroom observations, interviews with students, teachers, and parents, and field notes of science-related trips	Girls participated in and were marginalized from school science in various ways; girls experienced successes when their identities were consistent with those their school valued and struggled when they identified with science or technology but not with school science communities
Ritchie (2002)	To use positioning theory to examine how gender, status, and power intersect within groups of students during science activities	1 Year 6 science class in Australia	Video-tapes of lessons, post-lesson interviews	Positioning theory provided alternative interpretations of the role of gender in classroom interactions
Gilbert & Calvert (2003)	To pilot a new methodology for approaching issues of gender and science that explores women scientists' relationships with science and reasons for pursuing it	5 women scientists	Psychoanalytic techniques developed in narrative/family therapy in combination with conventional qualitative methods	Women were not alienated from but attracted to science for reasons unrelated to the recommendations typically given in the literature for how to engage females in science
Ford, Brickhouse, Lottero-Perdue, & Kittleson (2006)	To explore elementary girls' access to and choices of science books	45 Grade 3 girls and families from 6 classrooms in 3 suburban and urban schools in eastern US, 74% white, 11% African American, 3% Latina, and 3% multiethnic, families were middle class	Interviews with girls, families, and teachers, 25 classroom observations, field notes	Girls had access to science books in school and preferred informational narrative genres and books about animals; parents underestimated girls' liking of science books and frequented major bookstores where science books are not as available and gender stereotypes are reinforced
