

GENDER EQUITY IN COEDUCATIONAL AND SINGLE-SEX ENVIRONMENTS

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INTRODUCTION

In the 1985 *Handbook*, this chapter was titled “Sex Equity in Classroom Organization and Climate” (Lockheed & Klein, 1985) and sought to define the elements of a sex-equitable classroom so that “both overt and hidden curriculum treat boys and girls equitably [and] that they receive equal benefits from instruction” (p. 190). It focused on three areas where classroom inequity was most prevalent: sex segregation in the classroom, inequity in teacher-student interactions, and inequities in peer interactions. Specific studies cited students’ tendencies from a very young age to voluntarily segregate into single-sex groupings, teachers’ “sex-differentiated expectations” of and interactions with students, and male domination of mixed-sex groups (p. 199). In brief, coeducational classrooms were found to reflect and reproduce sex inequities found in larger society. Several strategies or interventions to combat classroom inequities were proposed including teacher training in the following areas: raising teacher awareness of equitable student-teacher interactions, encouraging cross-sex student groupings, and creating collaborative, mixed-sex groups. In addition to those strategies, single-sex schooling was briefly discussed but rejected as a possible solution to remedy the gender inequities present in coeducational classrooms.

Because of the potential for single-sex schools to both reinforce stereotypes and engender further inequities, the 1975 regulations to Title IX prohibited single-sex interventions in publicly funded schools except under certain limited situations. Those circumstances included contact sports, human sexuality classes, and *remedial* or *affirmative* activities that would help reduce sex discrimination. In part because of the examples set by successful private and parochial institutions, as well as changing attitudes towards public education in general, interest in single-sex schooling has grown, prompting some public schools

to begin experiments with single-sex classes or schools. By necessity, these programs have mostly flown under the radar of federal scrutiny.

But the landscape for single-sex schools changed dramatically, as this *Handbook* went to press, when the U.S. Department of Education issued new Title IX regulations in fall of 2006. These modified regulations now allow public schools to offer single-sex classes for more broadly defined purposes such as “improving the educational achievement of students” by “providing diverse educational opportunities” or meeting the particular, identified educational needs of its students (Office for Civil Rights, October 25, 2006). The door has been potentially flung open for a radical change in public schooling, a kind of change not seen since the 1970s. This, despite the fact that research on public single-sex schooling remains mixed and inconclusive.

The purpose of this current chapter, then, is to touch briefly on gender equity research in coeducational classroom interactions since 1985, to present the emerging research on single-sex classrooms and schools, to identify solutions/interventions that impact increasing or decreasing gender equity in both coed and single-sex environments, and to make recommendations for policy, practice, and future research.

GENDER EQUITY IN EDUCATION: UP TO AND BEYOND TITLE IX

Education in the United States carries with it a legacy of separate and unequal access, resources, and attainment for women, people of color, and those with low income. For over 200 years, only White, privileged men were formally educated and admitted to the most prestigious universities. Separate girls’ schools (and schools for *coloreds*) prepared students for their segre-

gated roles in society. Well into the 1970s, even students in co-educational public secondary schools routinely received instruction along different tracks, with boys being placed in shop classes, while girls were enrolled in home economics. Male students were also more likely to be funneled into upper level mathematics and science courses. Many of the most prestigious universities were all-male. Harvard University, the oldest university in the U.S., did not formally admit female college students until 1970 (though Radcliffe women had been taking classes with Harvard men for several decades). And just as *Brown v. Board of Education* (1954), the subsequent Civil Rights Act (1964), and the Civil Rights Movement eventually changed the institutionalization of separate and unequal educations for racial and ethnic minorities, Title IX of the Education Amendments (1972) and the Women's Movement of the 1960s and 1970s began the march toward gender equity for women in education. Title IX states:

No person in the United States, on the basis of sex, can be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving federal financial assistance.

Though Title IX provides broad protections against all types of sex discrimination in educational environments, inequities in classroom interactions are hard to capture and even more difficult to prove. These differences in teacher and student interaction patterns are often small, quick, subtle, and unintentional, and it is difficult to document the impact of these gender inequities on student outcomes. Thus, gender equity educators have advocated training and awareness programs, rather than legal challenges, to provide equitable educational environments and outcomes for all students. These training recommendations are discussed in this *Handbook's* teacher education chapter as well as later in this chapter.

As the authors noted in the 1985 edition (Lockheed & Klein 1985), studies on classroom interactions documented how boys received more attention than girls in coeducational classrooms. As evidence of gender inequities and sexual harassment mounted throughout the 1980s and 1990s (AAUW 1992, 1998a), some began to advocate single-sex education, especially for girls. Proponents saw single-sex schools as studious environments free from distractions, or as an opportunity to help women overcome sex stereotypes and succeed in areas where males traditionally had the advantage, such as science and engineering. Later, a demand for the kind of success promised by single-sex schools was seen by school choice advocates as additional justification for the need for charter schools and vouchers.

But opponents have argued that separate has never meant equal in U.S. education, and that many single-sex school curricula were not designed to address sex discrimination. Some pro-

grams were found to reinforce sex stereotypes, while others were declared illegal under Title IX or the Equal Protection clause of the 14th Amendment and were shut down. This chapter will discuss the difficulties in answering the question of whether single-sex education is worthwhile for advancing equity. The answer will always be "it depends." It depends upon the nature of and reason for the single-sex intervention, what it is compared to, and the consistent results or outcomes associated with or attributed to its use. See also Sadker (2004).

For close to 35 years, the 1975 Title IX regulations have been providing guidance on how the law should be interpreted in the many areas it covers, from athletics to vocational education. Part of this guidance relates to single-sex education. Segregation of students by sex has been accepted as a type of sex discrimination and thus a violation of Title IX, even if it is done voluntarily. Often interpreted as prohibiting all single-sex classes and single-sex public schools, the 1975 Title IX regulations in fact allow these classes and schools under certain limited circumstances.^{1,2} These exceptions, as noted previously, include allowing schools to offer single-sex classes for instruction in specific areas such as contact sports or human sexuality. Additionally, they permit some single-sex schools or the separation of students in sex-segregated classes within schools if the reasons constitute "remedial or affirmative action." Remedial or affirmative action has been interpreted by gender equity advocates as being designed to decrease sex discrimination in educational outcomes, the main purpose of Title IX.

Restrictions on single-sex education were loosened in October 2006 when the new Title IX regulations—proposed in 2004—were issued by the U.S. Department of Education. Despite numerous public objections to the proposed changes (over 5,000 public comments) and a lack of conclusive research on single-sex schooling, the U.S. Department of Education issued regulations that amend, but do not retract, the single-sex guidelines in the 1975 Title IX regulations. The Department did this by making it much easier to justify legally permissible K–12 nonvocational single-sex education. And while increasing the purposes and circumstances under which sex-segregated education may occur, these recent regulations do not require the educational institution to explicitly end sex discrimination. As discussed next, the 2006 regulations say that single-sex education can be used for important governmental objectives such as increasing academic achievement by offering diverse educational opportunities. Separate facilities or classes are now allowed as long as the excluded gender receives *substantially equal* educational opportunity in a single-sex or coeducational setting. Evaluations must be conducted every 2 years, at minimum.

Critics have raised a number of concerns regarding the 2006 Title IX regulation changes. First, *substantially equal* is not specifically defined nor is it the legal standard. The law demands true equality. Second, there are no instructions in the regula-

¹This information applies to all recipients of federal financial assistance covered by Title IX, as well as other institutions covered by the 14th Amendment Equal Protection Clause or state laws providing for equal rights on the basis of sex or laws prohibiting sex discrimination in education. Thus, it could apply to museum and recreation department programs, as well as health education and employment training programs funded by other federal agencies.

²While overshadowed by the less stringent justifications for single-sex education in the 2006 modifications of the 1975 Title IX regulations, the single-sex exceptions in the 1975 regulations have not been rescinded.

tions to learn if the single-sex environment contributes to increased sex stereotyping and sex discrimination, or if it contributes to achieving any important governmental or educational objective such as increased academic achievement. There is also no expectation that this single-sex intervention provides evidence that it is any better than comparable, high-quality instruction in coeducational environments or, finally, that the selection of the single-sex option is truly completely voluntary.

An additional concern is that this shift to allowing more experimentation seems to be at odds with the Department of Education's policies and legislatively mandated standards. For example, the requirements for education innovations set forth in the No Child Left Behind (NCLB) legislation of 2002 and in the Department's Institute of Education Sciences in 2003 mandate that educators make changes in education programs only if these changes can demonstrate a positive impact based on scientific evidence. The Department of Education's wording—that "single-sex education *may* provide benefits to *some* students under *certain* circumstances" [italics added]—does not appear to be based on conclusive, scientific evidence. Indeed, later sections of this chapter will note that virtually no studies on single-sex schooling meet the Department's current definition of scientific rigor to determine effectiveness. While a descriptive study on public single-sex schooling, commissioned by the U.S. Department of Education in 2003 is currently underway, thus far, their literature review (2005) notes that research on single-sex schooling is equivocal. Critics note a shift in policy now years in the making where the federal government, traditionally the watchdog of civil rights and equal opportunity, has lowered its standard for equity in education, while at the same time raising its stake in academic achievement standards and curriculum, traditionally the domain of state and local authorities.

With so many unanswered questions remaining for this 2006 modification of the 1975 Title IX regulations, it remains to be seen whether it will withstand the certain legal challenges to its application without changes, or whether the rules might not be revised or rescinded by a future administration. Nevertheless, it is for now the law of the land and the recommendations section of this chapter and the summary chapter 31 will discuss what educators and researchers can do to continue to further gender equity.

GENDER EQUITY IN COEDUCATIONAL CLASSROOMS

Since the 1970s, numerous U.S. studies have documented gender inequities in coeducational classrooms from preschool to graduate school. This bias most often takes the form of males and females being treated differently by teachers. For example, girls often receive less teacher attention than boys. Sexism among peers, where male students dominate coeducational classes or groups, has also been found. Hall and Sandler's (1982) early work was among the first to document this chilly climate women face in college classrooms where professors call on male students more frequently than female students and female students are interrupted more often than male students. In 1985, this chapter summarized key findings from the 1970s

and early 1980s on classroom interactions that further illustrated gender inequities (see Lockheed & Klein 1985). Research on both teacher-student interactions and peer interactions brought to life the inequities girls and women and sometimes boys faced in the coeducational classroom.

This new chapter will focus on the key research studies and research reviews that kept this topic at the forefront of the national conversation. When the 1985 *Handbook* was in press, the U.S. Department of Education released studies by Lockheed and Harris (1984) as well as Sadker and Sadker (1984). Both were descriptive studies of sex equity in coed classroom interactions. They used somewhat different observation instruments, but arrived at complementary conclusions. Both studies found that teachers reacted differently to the behaviors of male and female students. In the Lockheed and Harris study, the authors reported that boys, on average, were more disruptive in the classroom and received more of the teacher's attention. This male preeminence or dominance was found uniformly across the study in all 29 classrooms observed across two school districts. Similarly, the Sadkers' study spent 3 years investigating sex bias in classroom interactions in over 100 classrooms, and developing training strategies to reduce or eliminate them. Though bias was reduced in the classrooms where teachers received training interventions, the authors found that boys participated more disproportionately in class when compared with girls. Boys also received more teacher praise, acceptance, remediation, and criticism than girls. Though both were important studies, they did not receive nearly the attention that the American Association of University Women report (1992) and the Sadkers' book on gender equity (1994) did a decade later.

How Schools Shortchange Girls (AAUW 1992) and *Failing at Fairness* (Sadker & Sadker 1994) together brought national attention to persistent gender inequitable practices present in coeducation. Both summarized numerous classroom studies that documented how male students still received the majority of the teachers' time and attention, how males called out more than females, and how males received more precise feedback and criticism from instructors. Even in preschool, boys received more "hugs, more instructional time and more teacher attention" (AAUW 1992, p. 118). When the Sadkers examined gender and race, they found that the students who were most likely to receive teacher attention were White males, followed by minority males, White females and, lastly, minority females. This imbalance of teacher attention was even more pronounced in traditionally male subject areas such as math, science, and technology (Lee, Marks, & Byrd, 1994).

Ten years later, Jones and Dindia (2004) conducted a meta-analysis of 32 studies from 1970 to 2000 on sex differences in classroom interactions. The authors concluded that females continue to be shortchanged in the coeducational classroom, and that there is sufficient evidence to support the claim that teachers treat male and female students differently. In a majority of studies reviewed—conducted in kindergarten through post-secondary classrooms—teachers interacted more with male students than female students, primarily to reprimand or critique male performance. This finding has stayed constant over time (1970–2000), though the authors note there are few empirical studies after 1985. In addition, teachers were not found to

praise male students more than female students. The authors looked at how several factors such as teacher sex, student behavior, and student achievement may contribute to the dynamics of teacher-student interactions, but did not find any systematic patterns of relationships in the studies they examined. These results agree with the previously discussed national studies by Lockheed and Harris and the Sadkers that were not included in the Jones and Dindia meta-analysis. Finally, these studies found no consistent pattern for sex of the teacher in relation to their interactions with female or male students. In other words, even female teachers who considered themselves to be unbiased were found to pay more attention—albeit more negative attention—to the males in the classroom.

Despite many efforts and increased public and teacher awareness of these patterns of gender inequities in classroom interactions, there is no recent evidence to suggest that this inequity has disappeared. Though gender bias persists in the classroom, many view sexism as irrelevant or old-fashioned. Others remain oblivious to gender bias in the classroom and are, as Sadker describes, *gender blind* (see teacher education chapter in this volume) when it comes to evaluating their classroom or school climate. An example of this is seen in a study of one public middle school (Spencer, Porsche, & Tolman, 2003), which found that although teachers and students reported in surveys that their school was gender fair, classroom observations and interviews found major differences in how boys and girls behaved and were treated by teachers. In particular, as boys were more vocal and demanding of teachers' attention, teachers spent more time with boys. As in the meta-analysis by Jones and Dindia discussed previously, boys in this study appear to receive more of teachers' time, though it is often time spent in more negative interactions. This suggests that gender equity cuts both ways, and that both girls and boys may be shortchanged in co-educational classrooms. Girls are often ignored and boys often receive more negative teacher attention generally related to their disruptive behavior.

In addition to these studies and research reviews, popular books and media coverage helped make teachers and the public more aware of gender inequities in classroom interactions. As a result, teacher and administrator training programs were developed in the late 1980s and early 1990s to address gender inequity in classrooms. However, due to funding issues, political climate, etc., these programs were not broadly replicated and thus did not have a wide-ranging impact, though there is some evidence that they were helpful in promoting gender-equitable interactions in the classroom. For example, the Sadker program "Succeeding at Fairness" was recommended as a promising program by the U.S. Department of Education-sponsored Gender Equity Expert Panel (U.S. Department of Education, 2001).

As mentioned earlier, this attention to gender bias in the classroom may help explain why since the mid-1990s an increasing

number of parents seek single-sex education for their children, particularly for their daughters. The next section will suggest why this movement has gained increased visibility and media attention, though it still accounts for a very small proportion of schools³ and even a decreasing proportion of Catholic schools.⁴ Though the increase in parents seeking single-sex education may be the result of some parents seeking less sexist schooling options for their daughters, there is no compelling evidence that single-sex schooling is a general remedy for the problem of gender inequity in coeducational environments (AAUW, 1998b). In fact, a closer look at the history of single-sex schools in the U.S. reveals just the opposite effect: separate is not equal.

GENDER EQUITY RELATED TO SINGLE-SEX SCHOOLING IN THE UNITED STATES

Historical Background

Sex-segregated schooling is not a new idea. From colonial times until the mid-1800s, "only a few schools were open to girls" (Tyack & Hansot, 1990) in the U.S. But the history of single-sex schools and classes in the United States has generally been one of unequal resources and sex-stereotyped curriculum with preference and resources given to the education of males. Many believed that women and men were naturally different, and thus, they needed separate educations to prepare them for their different futures. Early colonial dame schools, and later women's colleges and seminaries, had the primary mission of preparing young women for their place in society as wives and mothers and, later, teachers (Tyack & Hansot, 1990).

Even well into the 20th century, most private all-girls schools and women's colleges (with a few notable exceptions) continued to offer a less rigorous academic curriculum than their all-boys counterparts. In cities that had separate public high schools for boys and girls, the girls' schools always received less funding and fewer resources (Sadker & Sadker, 1994). Not until Title IX was enacted in 1972 did things truly begin to change in educational environments that received federal funds. While Title IX was generally interpreted as prohibiting new public single-sex schools, private schools—that did not obtain federal financial assistance—remained unaffected.

To comply with the non-sex discrimination provisions of Title IX, public schools integrated formerly gender-segregated classes like home economics and auto shop/woodworking classes. But in violation of Title IX, many continued sex-segregated physical education classes for non-contact sports. (See the physical education/athletics chapter 18 in this volume.) Girls could no longer be legally prohibited from taking traditionally male courses like physics or calculus, or be discriminated against in

³The 1987–88 NCES schools and staffing survey reported that only .1% of all students attending public schools attended single-sex schools and 7.9% of all private school students attended single-sex schools, so that the national student total in single-sex schools was only 1.0% (see Hollinger, 1993, p. 29).

⁴A recent report by the National Catholic Educational Association found that 140 Catholic schools consolidated or closed in 2002, the majority in cities. Between 1993 and 2003, 394 Catholic schools, most built to serve immigrant communities, have closed. There was also a decrease in Catholic single-sex high schools from 424 in the 2002–2003 school year to 392 in 2005–2006, while the total of coed schools remained about the same at 791 to 793 (www.ncea.org visited on 7-20-06).

admissions to public universities, or be subject to quotas in graduate schools. Despite these advances in girls' access to opportunities, research documented how gender bias and sexism persisted in coeducational classrooms throughout the 1980s and 1990s (see previous section on coeducation for specific studies). Research also documented how sexual harassment on school campuses, especially in traditionally male-dominated courses or majors, creates an unfriendly or hostile environment for females (AAUW 1993, 2002, 1998a and chapter 11 on sexual harassment in this *Handbook*) thus, the renewed interest in an old idea: single-sex schooling.

Paradoxically, this rekindled interest in single-sex schooling came at a time when many single-sex colleges and religious schools had been experiencing declining enrollment. From their peak in the 1950s, the number of single-sex colleges for women and men steadily declined as many institutions became coeducational primarily for financial survival. Although previously established single-sex colleges, such as the Virginia Military Institute, had been allowed under Title IX regulation, using the Equal Protection Clause of the 14th Amendment, the Supreme Court decided in 1996 that VMI had to admit women since there were no comparable public Virginia colleges for women.

During the same time period, many single-sex Catholic high schools became coeducational in order to maintain their enrollment levels. Despite this decrease in Catholic single-sex schools, there was some increase in private single-sex schools, especially for girls. The National Coalition of Girls Schools reported a 23% increase in student enrollment from 1991 to 2005 for K–12 private girls schools (see www.ncgs.org), though these tended to be schools with extremely high tuition that serve predominantly White, upper-class girls.

Recently, there has been a small increase in public single-sex, K–12 schools. While in 1996 there were only five public single-sex schools still operating in the U.S. (among them Western High School in Baltimore, founded in 1844, and the Philadelphia High School for Girls, founded in 1846),⁵ by 2005 that number had increased to over 30 public single-sex schools across the nation. Add to that figure the many public coed schools now experimenting with single-sex classes or dual academies, and the total number of public single-sex schools in the U.S. may be in the hundreds. (Prior to the 2006 Title IX regulations, it was extremely difficult to get an accurate count of public single sex-schools, as some schools feared legal challenges if they were not in compliance with Title IX.)

CHALLENGES TO CONDUCTING RESEARCH ON SINGLE-SEX SCHOOLING

Studying and making decisions about when it is likely to be helpful to try single-sex education is very complex. While most of this chapter is focused on single-sex schools, the research

challenges for single-sex classes and programs are similar. For example, one issue unique to publicly funded sex segregation is that it must occur on a voluntary basis. In other words, parents and students must choose to participate in single-sex schools/classes. This makes scientific studies extremely difficult when random assignment of students is not possible. The next section discusses how this and other methodological considerations create challenges that make conducting quality research studies on single-sex education very difficult.

Research Methodology Challenges

Much of the existing research suffers from one or more methodological weaknesses making it extremely difficult to make well-supported, research-based decisions on patterns of results even from a substantial cluster of studies with similar conclusions. Some methodological challenges or problems in interpreting research results from single-sex studies will be discussed in this section in terms of: (a) issues in inferring results from one population to another (generalizability); (b) limitations associated with comparing studies using different process and outcome measures; (c) confounding treatment variables, particularly in large data base studies that make it difficult to know what might have explained the patterns of associations as well as limited knowledge of causal impact; (d) inadequate attention to many aspects of gender analysis from the simple disaggregation of information on males and females in the coed comparison to the use of indicators and analyses that focus on gender-sensitive information; and finally, (e) the pervasive issue of selection bias in studies of single-sex environments, including especially, but not limited to, private and parochial settings.

Since most of the research on single-sex education has been on schools, the following discussions will also dwell on that type of intervention. First, the four types of methodological challenges will be described in more detail, followed by a discussion of four major reviews of research on single-sex schools since the 1985 *Handbook*. Lastly, an examination of selected studies on single-sex schooling will further illustrate the challenges inherent in this type of research.

Key methodological challenges that are especially salient for research on single-sex education include:

Generalizability or making inferences from the specific study or clusters of studies to other contexts. Single-sex studies of schools, classes, or programs (or interventions) rarely attend to all the key comparisons: male-only versus female-only interventions, and male-only and female-only interventions versus well-matched coeducational interventions. Readers of individual research studies as well as of research reviews should always look for all of these comparisons. Most studies of single-sex schools compare schools for women with coeducational schools. For example, if they just examined girls schools, but stated their results in terms of single-sex versus coed schools, it would be

⁵In Philadelphia, the prestigious companion single-sex high school for boys became coed after a successful law suit using the state Equal Rights Amendment to allow girls equal opportunities, but there has been no parallel integration of Girls High by boys.

inappropriate since there would be no reason to assume that the positive or negative results also pertained to boys schools.⁶

In making comparisons between the single-sex and coed environments, it is important to try to have well-matched comparison groups for both legal and research purposes. In studying single-sex interventions, especially related to the allocation of public funds, it is also important to know if the same resources and support are provided for males and females. Thus, if sex-segregated academies are being established, it is important to make sure that the girls and the boys academies receive equal tangible and intangible support and benefits. If not, the schools are probably not complying with Title IX or the 14th Amendment equal protection clause of the U.S. Constitution and possibly other state laws providing for equal rights. Additionally, for research purposes when making these three-way comparisons of single-sex and coed schools, it is important to make appropriate matches among types of schools such as elite academic schools, alternative schools, dual academies, public schools, private schools, religious schools, or secular schools, urban, or rural, size of school and much more.

Another generalizability issue that is more feasible to examine in specific single-sex classes or programs than in single-sex schools is whether the intervention is documented clearly enough to be replicable for other sites. Some single-sex interventions focused on helping girls in math and science have been replicated with similar results in various sites using different instructors. (See science, engineering, and technology chapter 13 in this *Handbook*.)

Some common over generalizations in discussions of single-sex research in addition to not making clear what is being compared (schools, classes, programs) involve claims that: (a) patterns of single-sex research results from colleges apply to single-sex elementary and secondary schools in the U.S., (b) research on private and religious schools in the U.S. should explain what will happen in public U.S. schools, and (c) that studies in other countries, particularly those that have a history of single-sex education, should be equally applicable to the U.S. where the context is quite different.

1. Discussions of single-sex education often point to research on private women's colleges that report favorable outcomes for alumna when compared to their coeducational peers (Tidball et al., 1995; Astin, 1993; Tidball & Kistiakowsky, 1976). Some women's colleges have been found to positively influence student self-confidence and leadership involvement. Though coed colleges can certainly learn from the success of women's college alumna, the findings from studies on women's colleges are difficult to assess for the same reasons already discussed. For example, it is difficult to determine whether the success of women's college alumna is due to their family's socioeconomic status or the selectivity of the school. It is also problematic to generalize from studies of colleges to K-12 schooling.

Even when women's colleges have purposeful and unique approaches to meeting needs of women, it is generally difficult to document what the key aspects of this are that may

contribute to their success, and how these supportive practices may also be used by other women's colleges or perhaps by coed colleges to better meet women's needs. Reviews by Tidball, Smith, Tidball and Wolf-Wendel (1999) and *A Closer Look at Women's Colleges*, a U.S. Department of Education report (Harwarth, 1999), shed some light on these questions, but it must be remembered that most women's colleges remain exclusive institutions that generally cater to students from middle to high socioeconomic status. The postsecondary chapter 30 in this volume contains more information on single-sex colleges.

2. Even many studies conducted within the U.S. on single-sex schooling have limited generalizability for public education because they have been primarily conducted in Catholic schools or private schools and colleges. Any findings drawn from these studies must take into account the religious orientation of the schools and the fact that their selectivity limits their student body. Because families choose these schools and students are not randomly assigned, studies that compare single-sex schools with coeducational schools are limited by the inability to fully control for differences between the student populations. Findings on student achievement are confounded by variables such as socioeconomic status, self-selection related to achievement motivation, or other idiosyncratic characteristics of particular populations.
3. Though numerous studies have been conducted internationally or in U.S. private schools or colleges, it is generally inappropriate to generalize these findings to the unique context of U.S. public schools. Most published international studies were conducted in countries with long traditions of public single-sex schools like the United Kingdom, New Zealand, or Australia, and are difficult to compare to the U.S. (Daly & Shuttleworth 1997; Harker, 2000; Jackson, 2002; Sanford & Blair, 2002; Warrington & Younger, 2003). The same holds true for international comparative studies that examine single-sex schools across countries as diverse as Nigeria or Thailand (Baker, Riordan, & Shaub, 1995; Jimenez & Lockheed, 1989; Lee & Lockheed, 1990) where there may be a history of educating only the upper classes. Indeed, as Mael (1998) notes: "until some empirical basis is devised for including or excluding research from various countries . . . resolutions cannot be properly attempted without fueling even further controversy" (p. 119). Simply put, inferences from international studies may not be appropriate for the U.S. where the context for single-sex schools is so different.

Inconsistency in comparative measures or indicators.

Not all studies use the same high-quality measures as indicators of what is happening during or as a result of the single-sex or coed experience being compared, and it is likely that different measures will be used for the same type of indicator such as self-esteem, dropout rates, or even achievement test scores. Not all studies use the same test data even for the same skill such as writing. Some studies look at process indicators and short-term outcome indicators such as classroom tests, and other studies look at long-term outcomes such as career paths

⁶This would be like the earlier medical studies that only studied males but suggested that the results applied to both males and females.

and earnings. Some studies focus only on measures of attitudes rather than achievement. For example, one study may report girls became more positive towards mathematics, but does not indicate if that translated to higher levels of achievement. It is also common for results in one site to be positive on some outcome measures and negative on others.

Furthermore, often little attention is given to examining indicators that are especially sensitive to gender equity issues. For example, since the first part of the chapter clearly documents the importance of attending to equity in classroom interaction patterns, even single-sex studies could examine these patterns as well as attitudes and behaviors related to sex or gender stereotyping. Similarly, indicators that are likely to provide information on ending sex discrimination should be selected whenever possible. (Other aspects of challenges relating to gender analysis will be described in the last part of this section on research methodology challenges.)

Confounding variables that restrict interpretations of correlational or causal relationships. A key rationale for single-sex education is to show that the intervention is more effective for the male and female students than alternative ways of organizing instruction that are less likely to contribute to gender inequities. Thus, it is important to know that there is a fair match in what is being compared and that there is a good chance that the planned single-sex education is responsible for, or a major contributor to, some indicators of success. However, many things other than the specified intervention happen even in a fairly well matched comparison classroom or school that may contribute to the results. Studies often fail to address the possibility that any achievement or other outcome differences may result from the unplanned differences in instructional or curricular aspects of the schools being compared and not the effect of planned single-sex or coed intervention per se. These differences may be associated with differences among teachers and their expectations of male or female students in the same school, or even in something as hard to measure as whether a school has a clear vision and focus that supports its single-sex or other activities.

While some findings indicate positive outcomes for graduates of all-girls schools compared to coeducational schools, it is not known how important other factors that have been associated with school success such as small class size, quality of the education, methods of instruction, adaptations of curricular materials, novelty and focus of the school, a charismatic leader, extra resources, parental support, personal commitment to single-sex education, and so forth may be in contributing to these differences. There may also be predictable differential results for males and females that would happen with or without a single-sex intervention. For example, if grades of students in all-girls schools are higher than grades of students in coeducational schools (with equal grading policies and the same curriculum), a potential explanation would be that this would be expected anyway since females in general earn higher grades than their male peers.⁷ And as mentioned earlier, the students attending

single-sex schools or classes may differ from those attending coeducational schools for various reasons, but it is difficult for researchers to use the normal procedure of random assignment to help control for these potential differences when participation in single-sex interventions must be voluntary.

Lack of appropriate analysis of key gender equity process and outcome indicators. Lastly, is the issue of paying attention to gender equity per se in the processes and outcomes of instruction—a key purpose of this Handbook. This includes keeping track of what is happening to male and female students in the coed as well as the single-sex environments. It has been rare for studies to examine both gender equity process and outcome indicators in these environments. Few have asked, “Does the single-sex education decrease sex discrimination or increase gender equity in any significant way?” This can be both a legal compliance question as well as a research question. For example, it is important to compare single-sex and coed interventions to make sure that there are comparable matches to judge the impact on the research outcomes and to also make sure that the “substantially equal” legal guarantees,⁸ such as those suggested in the 2006 Title IX regulations, are met. Although the 2006 Title IX regulations allow sex segregation for purposes not related to ending sex discrimination, they do mention the importance of obtaining evidence of comparability of single-sex and coeducational education. In the required two-year evaluations, schools must show evidence that the single-sex education was provided “consistent with the requirements of Title IX” and that the single-sex classes, extracurricular activities, and schools are provided in a “nondiscriminatory manner.”

Therefore, it is important for both legal analyses and research studies on single-sex environments to pay careful attention to indicators of gender equity in education. This would include increased equity in classroom interactions as well as outcomes such as decreasing gender gaps in achievement. This information can provide guidance on whether or not we are returning to a “separate and unequal” world where all-girls schools had fewer resources and less rigorous curricula than all-boys schools. It can also help counteract the danger of reinforcing sex stereotypes, which can lead to long-term negative consequences for students. For example, the ACLU made a successful argument against using single-sex classes to reinforce sex stereotypes in requesting the Livingston Parish Louisiana School Board to stop its plans to change its coeducational Southside Junior High to all single-sex classes based on stereotypic notions of gender differences. (ACLU, 2006; Louisiana Girl Fights Against Sex-Segregated Classrooms, Wins, 2006).

In summary, the methodological and legal issues described in this section highlight the importance of using caution in implementing a single-sex intervention as well as the important role research can play in decreasing sex discrimination or other important outcomes such as equal improvements in academic achievement for both girls and boys. Indeed, in examining reviews of studies of single-sex schooling, it is clear that method-

⁷This weakness could be counteracted if comparative information was provided for grades of girls in each type of school, but it is rare to find this type of disaggregation.

⁸Many equity advocates point out that “substantially equal” is vague, and that the true standard should be equality.

ological weaknesses often mitigate confidence in any findings on single-sex education.

Research Reviews on Single-Sex Schooling

As of our 2006 press deadline, there were no published studies in the U.S. that compare public single-sex students with public coed students, in part, because most public single-sex schools have not been in existence long enough. And while publications such as the AAUW's *Separated by Sex* (1998b) and Salomone's *Same, Different, Equal* (2003) discuss many of the issues surrounding single-sex schooling, they are not solely literature reviews. One of the first reviews of studies on single-sex schooling since the 1985 *Handbook* was in Vol. 1: *A Special Report from the Office of Educational Research and Improvement*, U.S. Department of Education, called "Single-sex schooling: Perspectives from Practice and Research," edited by Hollinger (1993) and initiated by OERI Assistant Secretary Diane Ravich who was concerned about the disappearance of single-sex schools and colleges. This report contains a research review by contractors at Mathematica Policy Research, Inc. It reviews 20 published studies on gender policy effects at the secondary school level, and 11 more on at the postsecondary level. The questions addressed at the secondary level are about: (a) differences in academic and social/affective outcomes of students in single-sex and coeducational schools, (b) "whether the differences vary for men and women students," and (c) "whether these differences are sustained once the outcomes are controlled for family background, student and school variables and sex differences" (p. 12). They concluded that "Results of the studies are inconclusive as to whether one type of school is more effective than another in promoting higher academic achievement and psychosocial development" (p. 17).

At the postsecondary level the researchers noted problems in making comparisons because of the diversity of the schools on the basis of much more than the sex composition of the student body. While the studies showed frequent positive outcomes in the comparative longitudinal studies, the authors acknowledged the possibility that women who selected women's colleges may be different in what is being measured than women in coeducational colleges. They also noted that their data was from women who went to college in the 1970s, so the results may not even generalize to their research review that was conducted in the early 1990s.

There are, however, three more recent and comprehensive literature reviews on the efficacy of single-sex schooling, though each of these has their own distinct limitations. The first review (Mael, 1998) examines over 100 studies of single-sex and coeducational schooling in the United States and abroad. In particular, this review categorizes studies by the criterion examined: academic performance, attitudes toward academics, enjoyment of school, student aspirations, non-stereotypical coursework, self-esteem, and post school success. While the author notes the lack of generalizability of studies conducted in Catholic, private, and international schools, those institutions are included in this review. Mael concludes that though there are possible benefits of single-sex schooling, particularly for females, it should remain an "option not a norm" (p. 106).

The second review (Haag, 2002) examines over 100 articles and essays from national and international contexts. The au-

thor groups the studies according to the variables examined, including self-esteem, attitudes toward academic subjects, sex stereotypes, school environment, and achievement. This review also includes studies of private and Catholic institutions where selection bias remains a concern. Overall, the author concludes that research on single-sex schools is "inconsistent" (p. 670), though she argues that some studies point to higher achievement for females in single-sex schools (not classes).

The most recent review of literature on single-sex schools comes from the U.S. Department of Education's contracted multi-year study on single-sex schooling begun in 2003. This literature review, *Single-Sex Versus Coeducational Schooling: A Systematic Review* (U.S. Department of Education, 2005), examines 40 quantitative studies and 4 qualitative or mixed methods studies. The most sophisticated review to date, it still grapples with the methodological issues inherent in single-sex research. Initially the authors identified 2,221 potential studies, but narrowed them to 379 by excluding postsecondary studies and studies of single-sex classes. The next screening found that only 114 were actual studies. None of them met the Department of Education's What Works Clearinghouse criteria for scientific studies that provide evidence of effectiveness, such as randomized experimental studies, and quasi-experimental designs with matching or regression discontinuity designs. Thus, the authors used less rigorous criteria to select the 44 studies for the analysis. They selected correlational studies if they had statistical controls on some covariates that could have greatly influenced the results, as well as appropriate measurements of the variables used. They did note that other important covariates such as motivation or socioeconomic status or grade level were not controlled. In some cases they also didn't have information on whether the correlations were similar for boys and girls (p. 89). They discuss this as a moderator variable.

As the title of the review suggests, the only comparisons it examined were with single-sex schools and coeducational schools while looking at short-and long-term indicators of success such as academic accomplishment and socioemotional development. The authors also said they looked for information to address these two questions: "Are single-sex schools more or less effective than coeducational schools in terms of addressing issues of procedural (e.g., classroom treatment) and outcome measures of gender equity?" and "Are single-sex schools more or less effective than coeducational schools in terms of perceptual measures of the school climate or culture that may have an impact on performance?" (See their coding instrument, p. 107.)

The authors reported on over 100 process and outcome indicators ranging from student academic achievement to socioemotional indicators in the 44 studies. They found equivocal results for single-sex schooling when compared to coeducational schooling. Most of the studies compared all-girls schools with coed schools (often of unknown similarity), although the California Dual Academy study was included in the summary of qualitative studies, so some comparisons of paired male and female schools were possible.

Despite its systematic approach, the Department's literature review has methodological weaknesses. Unlike much of the research on gender differences and similarities reported in the Hyde and Lindberg chapter 2 in this *Handbook* and the Jones and Dindia research review described in the first part of this chapter, this ED review was not a review of meta-analytic studies

by others or a meta-analysis in its own right. Although this ED-sponsored research review asked important questions about process and outcome variables or indicators, including some focused on gender equity, it did not include studies that used gender equity as an outcome variable at the school level (p. 85). This means that none of the studies reported on indicators related to ending sex discrimination such as decreases in pregnancy, bullying, or improved leadership performance. Another limitation was their inclusion of international studies conducted in countries with vastly different education systems compared to the U.S. Lastly, over 20 of the 44 selected studies were conducted in Catholic schools.

Selected Studies on Single-Sex Education

Bearing in mind the challenges discussed previously, some strengths and weaknesses of three types of selected studies will be discussed. These are primarily peer-reviewed scholarly studies conducted in K–12, U.S. settings between 1985 and 2005. This should show challenges in complying with both research and legal constraints to learn if the single-sex education intervention advances gender equity or even if it has other outcome benefits to warrant its implementation in U.S. public schools. The key studies on single-sex schooling can be grouped into the following three categories: (a) studies using large-size national data sets on high school students, (b) small-scale studies comparing single-sex high schools with coeducational schools, and (c) studies of public single-gender dual academies. Summary information on the studies referenced can be found in Tables 1, 2, and 3.

STUDIES ON SINGLE-SEX SCHOOLS USING LARGE NATIONAL DATA SETS

Quite a few major studies on U.S. single-sex schools are secondary analyses of large, national longitudinal databases such as the High School and Beyond Study and the National Educational Longitudinal Studies with data representing thousands of students and schools. These studies use such large samples that they can provide information on the three key types of comparisons. They can examine outcomes for male versus female schools and they can also compare male schools with coed schools and female schools with coed schools. With the large numbers of subjects (both schools and students) these studies paint broad brushstrokes of trends. However, they often do not control for confounding variables such as student background characteristics. Nor do these studies control for differences in classroom climate, student-teacher interactions, or differences in pedagogy or curriculum. With the secondary analysis data alone, they cannot paint a detailed picture of students' lived experiences in a single-sex or coeducational environment. Without this information it is impossible to know if the single-sex male school was more or less sexist than the single-sex female school or the paired coeducational schools.

Although some of these studies used the same national data base (but often for different years), they did not always examine the same indicators across schools. Also, many of these studies focus on Catholic high schools and compare Catholic sin-

gle-sex and Catholic coed high schools (Lee & Bryk, 1986; Lee & Marks, 1990; LePore & Warren, 1997; Marsh, 1989; Marsh, 1991). Some other studies compare Catholic and public school student achievement using a variety of different outcome indicators (Marsh, 1991; Riordan 1985; Riordan 1990). It is not surprising that even studies using large numbers of schools and students and sometimes the same data base and the same researchers find different results when comparing single-sex and coeducation schools on a wide variety of different indicators. For example, five studies (Lee & Bryk, 1986; Lee & Marks, 1990; Marsh, 1989; Marsh, 1991; Thompson, 2003) used the same High School and Beyond database, but examined different outcome measures and came to different conclusions. None of them obtained information on the extent to which the school supported gender equity. However, two other studies drawn from the large databases examined gender equity outcomes such as students' attitudes toward sex-stereotyped majors, careers, or roles. The study by Lee and Bryk (1986) examined the effect of school type on a number of outcome measures including sex-role stereotyping and described some positive relationships such as finding less stereotypical sex-role attitudes for students attending the all-girls Catholic schools. In Thompson's (2003) study of alumna from over 2,000 schools (all-girls private, coed private, and coed public), women who attended all-girls schools were found to be more likely to major in sex-integrated fields, versus highly female fields, than women who attended coed schools. However, confounding variables in these studies (even in the studies of Catholic single sex and coed schools) make it difficult to attribute findings solely to the single-sex environment. Even when controlling for student background characteristics, other variables such as class size or differences in curricular and instructional programs/resources may have been at play. Factors such as class size, parents' socioeconomic status, teacher attention, and specific curricular programs may have been more significant than whether a school was coed or single sex. In other words, though there may be a correlation between single-sex schools and the findings, it was not possible to prove causation.

The study "Sexism in Single-Sex and Coeducational Independent Secondary School Classrooms" by Lee et al. (1994) was unique in that in addition to using information from the large private schools data base, it obtained classroom observations in 20 girls, 20 boys, and 20 coed schools. Thus, unlike most large data base studies, the researchers were able to describe how the patterns of sex stereotypes varied similarly in all three types of schools; in other words, male, female, and coed schools can each be equally good or bad at perpetuating or fighting sex stereotypes. For example, in studying the classroom interactions, Lee and her colleagues found teachers initiated similar types and frequency of sexism in all three types of schools. The sexism ranged from teachers' encouragement of sex stereotyping to teachers' use of offensive, uncensored sexist language.

SMALL SCALE STUDIES COMPARING SINGLE-SEX WITH COED SCHOOLS

There are many dissertations and other small-scale studies of single-sex environments, usually private, independent high schools, or Catholic schools. These small-scale studies rarely

do the full three-way comparison of matched girls and boys schools and coed schools, but may pay attention to gender analysis of both process and outcome indicators. They are usually convenience examples of no more than six single-sex schools. Studies on all-girls schools are more common than studies of boys' schools. Shmurak (1998), for example, did a longitudinal case study of students at four all-girls and coeducational schools to examine academic achievement, career aspirations, and attitudes toward gender. Streitmatter (1999) studied one all-girls private school and all-girls math and science classes in public coeducational schools where students reported being less distracted in all-girls settings, and having more positive attitudes toward math and science. Some of these studies collect information from enrolled students and may even do systematic observations of the schools, but others collect more post hoc or longitudinal information. For example, James and Richards (2003) collected information from male graduates of private male and coed schools.

Small-scale studies may look in-depth at gender issues and focus on the cultural aspects of single-sex schools and classrooms. Their generalizability is severely limited however, by their small numbers of non-representative, non-randomly selected schools and students. Often too, the selected schools are not well matched, or may be undergoing substantial transitions. For example, studies by (Signorella, Frieze, & Hershey, 1996; Steinback & Gwizdala, 1995) were conducted in all-girls schools making the transition to coeducational education. A related major study by Brody, Schmuck and other colleagues examined gender equity issues in a Catholic boys high school that became coeducational and two nearby Catholic girls high schools (Brody et al., 2000; Schmuck, Nagel, & Brody, 2002). These transition studies present a whole host of confounding variables, as well as insights on the influence of gender. Overall, small-scale studies of single-sex schools—when they are well matched with comparable male and female and coed schools—have the potential to illuminate many of the complexities of single-sex schools, as well as strategies to increase gender equity. They should also be able to document purposeful strategies used to decrease sex discrimination in outcomes and to document efforts to counteract sex stereotyping in the philosophy and practices of the school.

STUDIES OF SINGLE-GENDER DUAL ACADEMIES

Several studies of public single-sex schools examine dual academies, coeducational schools with all-girls and all-boys classes. Because these schools have both boys and girls on the same campus (sometimes with the same teachers/administrators), the pairs of girls and boys schools are well matched in facilities and resources. The largest study of public single-sex schools to date is a three-year study of 12 single-sex schools in 6 California dual academies that served low income or minority students (Datnow, Hubbard, & Woody, 2001). There are also smaller studies of some of these dual academies. These single-gender dual academies were created as a pilot program via state legislation and received \$500,000 state grants. They were primarily designed to

increase school choice, but little thought or teacher training was provided to attend to any gender consciousness issues raised by this overt sex segregation. The Datnow, Hubbard, and Woody study conducted over 300 interviews and classroom observations and focused on examining equity implications. They found that in most cases the main reason students attended these dual academies was because these single-gender academies had more resources than their district's coed schools. While there were active efforts to recruit at-risk students for the dual academies, in some districts the academies operated under capacity and only four academies remained after 2 years and only one after 3 years when the state funding ended. The single-sex academies also had some positive and some negative implications for the districts' coeducational schools, but no explicit comparisons with matched coed schools were studied.

This overall study generally found that the sex-segregated schools increased sex discrimination. For example, the study found that "traditional gender stereotypes were often reinforced in the single gender academies. Boys tended to be taught in more regimented, traditional, and individualistic fashion, and girls in more nurturing, cooperative and open environments." Also, "students received mixed messages about gender from their teachers." One of the findings that may be more likely to occur in dual academies than separate single-sex schools is that "the creation of separate academies for boys and girls on the same campus led to a dichotomous understanding of gender, where girls were seen as 'good' and boys were seen as 'bad'" (Study Executive Summary, p. 4).

In a substudy, Hubbard and Datnow (2005) found that the smaller classes and increased resources achieved through additional funding made a bigger difference to "at-risk students" than the single-sex classes. So, even in what may seem as a well-matched set of similar experiments with a clear focus on sex segregation, it is still challenging to attribute outcomes solely to single-sex arrangements. However, like many of the small-scale studies, the researchers were able to examine what was happening enough to learn that there was little attention to the purposes of single-sex instruction to either address common socialization related needs of the male and female students or to counteract sex stereotyping. For example, Woody (2002) found that grouping of males who were having trouble in school was not addressed with any effective strategies to help them maximize their special abilities.

Although there may be fewer confounding variables in studies of dual academies than in other comparisons of single-sex and coed schools since the girls and boys are on the same campus and the equitable distribution of resources can be monitored, unplanned and undocumented differences in pedagogy and curriculum can still be a concern. If dual academies increase in number, it may be possible to design rigorous comparisons of all-male and all-female groups such as these fairly well-matched schools, or perhaps even study matched sex-segregated classes if the nature of the treatment to decrease sex discrimination is clear. However, any future dual academies or single-sex classes need to be fully compliant with Title IX, the 2006 Title IX regulations, and the Equal Protection clause of the 14th Amendment. That means that there needs to be an accurate research based rationale for why the dual-academy option would decrease sex discrimination or improve students' achievement,

TABLE 9.1 Large Data Base Studies of Single-Sex Schools

Author	Article Title	Journal Source	Sample	Measure	Findings
Riordan, C., 1985.	Public and Catholic Schooling: The Effects of Gender Context Policy	<i>American Journal of Education</i>	22, 652 seniors in 1,318 schools (37 Catholic single sex schools, 37 Catholic coed schools, 20 public single sex schools, 1212 public coed schools, 1 private single sex school, and 11 private coed schools) Students from the National Longitudinal Study of High School Class of 1972.	Student questionnaire, school records, test battery taken from the NLS (National Longitudinal Study) to measure the effects of school type on academic achievement.	Both males and females at Catholic single sex schools outperformed their coed Catholic counterparts. For females in vocabulary and reading; for males in math and ultimate educational attainment.
Lee, V. E., and Bryk, A. S., 1986	Effects of Single-Sex Secondary Schools on Student Achievement and Attitudes	<i>Journal of Educational Psychology</i>	1,807 students in 45 single-sex Catholic schools and 30 Catholic coed schools. Students from the High School and Beyond Study (HSB).	Survey of effects of single-sex versus coed schooling on academic achievement, achievement gains, educational aspirations, locus of control, sex- role stereotyping, and attitudes and behaviors related to academics.	Single sex schools deliver specific advantages such as a more positive attitude toward academics and homework, higher achievement in reading and science and greater locus of control and higher career aspirations, to their students in all areas, particularly female students.
Marsh, H. W., 1989	Effects of Attending Single-Sex and Coeducational High Schools on Achievement, Attitudes, Behaviors, and Sex Differences	<i>Journal of Educational Psychology</i>	2, 332 Catholic high school students attending 47 single-sex Catholic schools and 33 coed Catholic schools. Students from the HSB (High School and Beyond) Study.	Effects of school type, sex, and interaction on senior year outcomes and postsecondary activities.	Changes during the period analyzed were unaffected by school type. There were changes related to sex, such as higher educational aspirations and likelihood of taking math and science courses, but the sex differences were unaffected by school type.
Lee, V. E., and Marks, H. M., 1990	Sustained Effects of the Single-Sex Secondary School Experience on Attitudes, Behaviors, and Values in College	<i>Journal of Educational Psychology</i>	1,533 college students who attended 75 Catholic secondary schools, 45 single-sex and 30 coeducational schools. Students from the HSB (High School and Beyond) Study.	Sustained effects of single-sex and coeducational secondary schools on attitudes, values, and behaviors of both men and women, measured 2 or 4 years after graduation.	There were sustained effects of single-sex secondary schooling for both men and women, however, effects for women extended to attitudinal and behavioral outcomes. Single-sex educational experiences were found to impact young women positively in regards to academic and professional achievement.
Riordan, C., 1990.	<i>Girls and Boys in School: Together or Separate?</i>		Students from single- sex and coeducational high schools (public and private/Catholic schools)	Student academic achievement, aspirations and attitudes.	Significant differences for African- and Hispanic- American boys in single sex schools. No significant differences in math or science for both boys and girls.
Marsh, H. W., 1991	Public, Catholic Single-Sex, and Catholic Coeducational High Schools: Their Effects on Achievement, Affect, and Behaviors	<i>American Journal of Education</i>	10,507 students from 853 public schools, 33 Catholic coed schools, 21 Catholic boys' schools, 26 Catholic girls' schools. Students from the High School and Beyond Study (HSB)	Three-group design using data from the HSB Study. Main effects of school type (public, Catholic coed, Catholic single sex) on growth during last two years of high school examining affective variables, academic choices, post-secondary activities, and academic achievement outcomes	Students from single- sex Catholic schools and coed Catholic schools demonstrate a similar pattern of growth in terms of locus of control, academic achievement, and self- concept during the last two years of high school.

(continued)

TABLE 9.1 (Continued)

Author	Article Title Journal Source	Sample	Measure	Findings
Lee, V. E., and Marks, H. M. and Byrd, T., 1994	Sexism in Single-Sex and Coeducational Independent Secondary School Classrooms <i>Sociology of Education</i>	86 classrooms from 60 private schools (20 boys' schools, 20 girls' schools, 20 coed schools) observed. Data from 3,183 students from the schools' senior class and 629 secondary math and English teachers Part of the National Study of Gender Grouping in Independent Secondary Schools.	How engenderment (socialization to gender) and sexism operates in three types of independent secondary schools. Classroom observation of interaction between teacher-student, student-student.	Teachers initiated most of the incidents in six categories of sexism. Although the frequency of incidents was similar, the forms of sexism were different at each of the three types of schools.
LePore, P. C., and Warren, J. R., 1997	A Comparison of Single-Sex and Coeducational Catholic Secondary Schooling: Evidence from the National Educational Longitudinal Study of 1988 <i>American Educational Research Journal</i>	105 male and 65 female 10th grade students from single-sex Catholic secondary schools; 79 male and 96 female 10th grade students from coed Catholic secondary schools; 95 male and 53 female 12th grade students from single-sex Catholic secondary schools; 64 males and 87 female 12th grade students from coed Catholic secondary schools. Students taken from the National Educational Longitudinal Study of 1988.	Differences between single-sex and coeducational Catholic secondary school students in academic and social psychological outcomes and whether these differences affect women more favorably.	Results indicated that single-sex schools were not especially favorable academic settings and that any advantages of attending these schools favored boys only.
Thompson, J., 2003	The Effect of Single-Sex Secondary Schooling on Women's Choice of College Major <i>Sociological Perspectives</i>	Seniors and sophomores from 36 Catholic single sex and 36 Catholic coed schools surveyed from 1980–1992, every two years. Student sample taken from the High School and Beyond study.	Effect of attending an all-girls' school on sex traditionality of women's choice of college major.	Women who attended all-girls' high schools versus coed high schools were more likely to major in sex-integrated fields such as engineering, health sciences and business, compared to highly female fields such as humanities and education.

and an evaluation to provide evidence that this happened because of the intervention that was used. Ideally, this research should also include comparison with coeducational classes using similar interventions to increase gender equity. Although it may complicate the research design, as previously mentioned, students must be able to voluntarily select either the single-sex option or a comparable coeducational option.

Gender Equity Outcomes and Single-sex Schools

Of the studies referenced in this section, 10 of the 19 include some specific aspect of gender equity in their research. This is important to note because gender bias in coeducational classrooms is one of the most popular justifications for single-sex

schooling in the United States, with proponents arguing that these schools have more gender-equitable climates in which students are free to flourish in all academic subjects. But, as these studies demonstrate, there is very little published empirical research to support the notion that single-sex schools are more gender-equitable institutions.

As detailed in the previous sections, there are mixed findings with regard to single-sex environments and gender equity. Simply put, there are no guarantees that separating boys and girls automatically creates a more equitable learning environment. Nor does it foster a climate that interrupts teachers' or students' stereotypical beliefs about gender differences. Clearly, teacher training and on-going support must accompany the implementation of any single-sex school in the public sector. The few studies that do examine gender equity demonstrate the immediate

TABLE 9.2 Small Scale Studies

Author	Article Title Journal Source	Sample	Measure	Findings
Steinback, M., and Gwizdala, J., 1995	Gender Differences in Mathematics Attitudes of Secondary Students <i>School Science & Mathematics</i>	450 students in Year 1 enrolled, 353 participants (all female); 1,000 students in Year 2 enrolled, 697 participants (323 females, 375 males). Students who attended an all-girls' Catholic school that merged with a similar all boys' school to create one Catholic coed school.	Investigator-constructed questionnaire to measure the like or dislike of mathematics, self-esteem in math, view of the importance and usefulness of math, and views of the mixed-sex school environment.	Traditional male and female differences were found in the areas of self-confidence, usefulness of mathematics, and classroom behavior. Female students' attitudes remained positive but their predictions about the mixed-sex classroom were confirmed.
Signorella, M. L., Hanson Frieze, I., and Hershey, S. W., 1996	Single-Sex Versus Mixed-Sex Classes and Gender Schemata in Children and Adolescents <i>Psychology of Women Quarterly</i>	66 students in grades 2-5 and 87 students in grades 6-12 from one private all girls' school which that has begun the transition of becoming coeducational	Pre-test and post-test at the beginning and end of the school year measured student attitudes toward sex-stereotyped activities and attitudes towards women and gender roles gender roles.	All students regardless of classroom setting were less stereotyped at the end of the school year than at the beginning.
Shmurak, C. B., 1998	<i>Voices of Hope: Adolescent Girls at Single Sex and Coeducational Schools</i>	Students at four all-girls and coeducational high schools	Longitudinal case study of students' academic achievement, career aspirations, and attitudes toward gender.	No difference in students' SAT scores, career aspirations or attitudes toward gender. Girls from single sex schools had higher AP test scores, while girls at coed schools took more science courses and were accepted at more selective colleges.
Streitmatter, J., 1999	<i>For Girls Only: Making a Case for Single Sex schooling</i>	One private all-girls school, and public middle and high schools experimenting with all-girls math and science classes	Interviews with teachers, students, administrators and parents	Students reported being more focused and less distracted in all-girls settings. Students also reported more positive attitudes towards math or science.
Schmuck, P., Nagel, N., and Brody, C., 2002; Brody, et al., 2000	Studying Gender Consciousness in Single-sex and Coeducational High Schools <i>Gender in Policy and Practice</i>	One elite, all-male Catholic high school making the transition to coeducational, and the impact on two local all-female "sister" schools	Case study with interviews of faculty, administrators, trustees and students; classroom observations; and focus groups of students and faculty	The all-female and all-male schools responded differently to the transition to coeducation. Whereas the all-female school developed new extra-curricular programs for males and changed curricula, the all-male school made no such changes in adding young women to their school.
James, A. N. and Richards, H. C., 2003	Escaping Stereotypes: Educational Attitudes of Male Alumni of Single Sex and Coed Schools <i>Psychology of Men and Masculinity</i>	412 male graduates from 12 private schools (3 all boys' boarding schools, 3 all boys' day schools, 3 coed boarding schools, 3 coed day schools).	1. Estes Attitude Scale (EAS) to assess attitudes towards English, reading, social studies, math and science and was modified to include verbal interest and quantitative interest. 2. Demographic information: College attended, major area of study, current occupation. 3. Checklist of 15 job-related skills that they perceived they learned in secondary school and which 3 that they currently use in their occupation.	Significant differences in preference towards reading and writing subjects between boys who attended single sex schools versus coed schools as well as men who chose humanities majors after high school. Significant differences between the number of men who went into science and technology fields versus humanities fields after college between single sex and coed schools.

TABLE 9.3 Dual Academy Studies

Author	Article Title Journal Source	Sample	Measure	Findings
Datnow, A., Hubbard, L., and Woody, E., 2001	<i>Is Single Gender Schooling Viable in the Public Sector? Lessons from California's Pilot Program</i>	Qualitative case study of 12 public single gender academies (6 all boys, 6 all girls)	Classroom observation of student-teacher interactions, student-student interactions, and pedagogical strategies. 200 interviews and observations with students, teachers, principals, parents and district officials.	Single gender schools, though started with the intention of addressing gender equity, became an avenue to serve other populations (i.e., low achieving). There was an absence of deep inquiry about gender equity among educators, and an absence of discussion about the difference in teaching styles for boys and girls.
Woody, E., 2002	Constructions of Masculinity in California's Single-Gender Academies <i>Gender in Policy and Practice</i>	Part of a larger qualitative case study of 12 public single gender academies (6 all boys, 6 all girls)	Student interviews and focus groups about the single- gender reform.	Separating boys and girls did little to challenge students' traditional beliefs about masculinity or how boys should act.
Herr, K., and Arms, E., 2004	Accountability and Single- Sex Schooling: A Collision of Reform Agendas <i>American Educational Research Journal</i>	One coeducational public middle school that created school-wide single sex classes (over 1,000 students)	Ethnographic case study including in-depth teacher, administrator, and student interviews; participant observation of classrooms; open-ended student surveys; and, document analysis.	Pressure to increase students' standardized test scores impacted curriculum and instruction, and diverted attention from gender and the single-gender reform. Study highlights the importance of instituting on- going teacher professional development on gender equity issues in tandem with single-sex classes.
Hubbard, L., and Datnow, A., 2005	Do Single-sex Schools Improve the Education of Low-Income and Minority Students? An investigation of California's Public Single- Gender Academies <i>Anthropology and Education Quarterly</i>	Six single-gender academies (three all-boys, three all-girls)	Interviews with 88 male students and 83 female students	Boys and girls reported fewer distractions and more intimate, caring relationships with teachers. Not clear if this was due to single-sex classes or smaller class sizes and increased resources

need for more research in K–12 schools, as well as clearer federal or state guidelines for implementing gender-equitable policies and practices in all school types.

DISCUSSION OF ASSUMPTIONS RELATING TO SINGLE-SEX EDUCATION

Claims Favoring Single-Sex Education

Why, in the 21st century, have we seen a return to the old-fashioned notion of sex-segregated schooling? Certainly, the

rhetoric of the school choice and the voucher movement has contributed to the notion that single-sex schools should be another item on the menu of public school choices that families have for their children. In addition, the recent media attention given the emerging science of gendered brain differences has supported popular notions that boys and girls learn differently and therefore can benefit from separate learning environments.

More often, claims in favor of single-sex schooling cite what Coleman (1961) called the dating and social culture of coed schools, and the distraction from academics this poses for adolescents. Single-sex schools have been promoted as more serious and studious environments that have academic and socio-emotional benefits for students. Lastly, much of the previously

discussed classroom interaction research continues to document gender bias in coeducational classrooms and has fed public interest in single-sex schools. But are single-sex classrooms and schools—by their very nature—more gender equitable environments? At the heart of the single-sex schooling debate lies a set of popular assumptions that continue to drive policy in the absence of conclusive research.

Popular Assumptions about Single-Sex Education

Despite decades of progress, there remains a wide acceptance that there are simply innate differences between the sexes, a proposition supported by different camps for different reasons across the political spectrum. Are female and male brains different? Do, as Gurian (2001) suggests, girls and boys learn differently? Are boys more competitive and girls more collaborative? For those who would answer yes to these questions, single-sex education may be viewed as a preferred way to build on common strengths. Others may prefer to have single-sex schools counteract gender-socialized behavior by helping boys to work more collaboratively and girls to be more competitive.

But there is a danger to essentializing gender differences. Even those who cite brain research and other biological factors in support of single-sex education such as Sax (2005a, b) and Deak (2002) concede that there is considerable variability within the sexes themselves. As Hyde and Lindberg note in chapter 2 of this volume, there still exists no conclusive evidence that these biological differences result in different learning styles. If, in a single-sex environment, you teach to these supposed gender differences, what is the percentage of students who *don't* learn best in that way?

Also, in emphasizing gender differences in instructional practice, there is a risk of reinforcing traditional gender stereotypes. Early single-sex schools in the U.S. based their pedagogy and curriculum on the established *fact* that boys and girls are just different. How easy would it be to accept these differences and return to separate and unequal educations, especially in regions of the U.S. where local context or culture may wholeheartedly endorse sex-stereotyped separate spheres for women and men?

Research on the psychology of gender differences argues that males and females are ultimately more alike than different (Hyde 2005; Maccoby, 1998), and the small sex differences that do exist are malleable and increased or decreased by socialization and education (Sadker & Sadker, 1994). Researchers in the UK—where a more established system of sex-segregated schooling has allowed for more in-depth study—are firmly against a “gendered pedagogy that emphasizes essentialist constructions of boys’ and girls’ learning styles” (Younger & Warrington, 2006, p. 603).

A second assumption is that girls thrive in single-sex environments. They perform better academically (especially in math, science, and technology), participate in more leadership opportunities and pursue more prestigious careers. While a small number of studies discussed previously suggest advantages for girls in single-sex schools and women’s colleges, over-

all, this assumption is not supported by current research on K–12 schools in the U.S. This widely accepted notion may be based in part on the small body of research on the successful careers of alumna from elite women’s colleges in the U.S., research that has been improperly generalized to graduates of girls high schools. As previously noted, all U.S. women’s colleges are private, and thus draw primarily from a selective pool of female applicants who can afford private college tuition or earn a scholarship. Critics of the research on private women’s colleges, as well as all-girl high schools, point out that it is extremely difficult to know just how much of a role *selection bias* plays in their overall success.

A third assumption about single-sex schools is that they offer a studious environment free from the distractions of or harassment from the opposite sex. While this is a popular reason parents give for choosing single-sex schooling for their children, especially girls (Heather, 2002; Datnow et al., 2001), it completely discounts the real fact that students of the same sex are still able to distract one another from academics. This phenomenon was documented in a British study of single-sex classes that found all-boys classes had a “macho, male culture [where] boys are more distracted by each other than they are by the girls” (Jackson, 2002). Another study (Askew & Ross, 1990) points to increased bullying in all-boys schools where dominant forms of masculinity may be exacerbated. In fact, some have suggested that same-sex bullying and sexual harassment is just as prevalent in single-sex schools as in mixed sex schools, perhaps even more so (see chapter 11 by Paludi, this volume.) Furthermore, as Campbell and Sanders (2002) argue, the distraction argument makes the false assumption of heterosexuality and ignores the issues confronting lesbian, gay, bisexual, or transgender students who may be more distracted in a single-sex classroom. Finally, if these schools truly eliminated all student distractions and sexual tension, one would expect to find higher achievement in all single-sex schools, which is simply not the case. Rather than accepting bullying and sexual harassment as a fact of life in coeducational schools or decamping to single-sex schools, parents, students, community members, and teachers need to work together to eliminate these tensions from all schools. Creating schools free from harassment, bullying, and violence should be the first priority, and as Sadker (2004) argues, the central issue is “investing in the real equity needs of coeducational schools” (p. 8).

One relatively new assumption has begun to take hold in the past few years. Single-sex schools, as a matter of personal preference, should be available to public school students. This view aligns with the school choice movement that has gained momentum since the late 1980s and has rapidly expanded public school options beyond the neighborhood school to magnet and charter schools. With the free *marketizing* (Apple, 2001) of education, consumers (i.e., parents) are free to choose what they think is the most appropriate academic environment for their children. Why shouldn’t public school students be offered an option previously available only to parents willing to pay for a private or religious education? Would individuals who support having a choice of a single-sex school or class also support having a public school exclusively for one race or social class?

This school choice assumption has been further fueled by the commonly held, but false, belief that NCLB provided new federal funds to pay for single-sex education. While the Local Innovative Education Programs section of NCLB (2002) states that funds can be used for same-sex schools and classrooms, this provision only allows funds to be used consistent with applicable law. With the 2006 changes to Title IX regulations, educators now have the opportunity to use all federal funding for more K–12 single-sex education purposes than previously allowed, but their single-sex activities still must be consistent with applicable laws such as Title IX and the Equal Protection Clause of the 14th Amendment.

As previously mentioned, concurrent and seemingly contradictory to this laissez-faire climate, are increasing federal education mandates such as provisions in the No Child Left Behind Act (2002) and the legislation establishing the Institute for Education Sciences that call for schools to implement only those education programs or practices that have been proven effective through “rigorous scientific research” (www.ed.gov/nclb). The federal government further defines reliable evidence as obtained from studies that use experimental and control groups to test the effectiveness of an intervention. Since there are currently no published studies of public single-sex schools utilizing these research methods, parents enrolling their children in these single-sex schools or classes need to be cautious. According to the federal government’s own definition, public single-sex schools fall under the category of *an untried program* that could turn out to be *a fad* (www.ed.gov/nclb).

There is no convincing data on the effectiveness of public single-sex schools or classes. Many of these experiments have been just recently implemented, and few have been designed as rigorous research or evaluation experiments with a clear purposeful rationale for sex segregation or proper controls to collect appropriate data and draw any conclusions about the impact or effectiveness of the single-sex educational intervention. The U.S. Department of Education-sponsored study that is currently underway on nearly 30 public single-sex schools will be the first large-scale descriptive study of single-sex schools since the Datnow et al.’s (2001) qualitative case study of 12 single-gender academies in California. Like the California study, this national ED study of public charter schools, dual academies, and other single-sex schools has not been designed to examine whether or not single-sex schools are effective.

There is even less systematic research on the uncharted proliferation of single-sex classes, which like single-sex schools, are often implemented without any clear rationale or teacher training to counteract likely sex stereotypes that may be reinforced by this type of sex segregation.

RECOMMENDATIONS FOR POLICY, PRACTICE, AND FURTHER RESEARCH

In the 1985 version of this chapter “Sex Equity in Classroom Organization and Climate” (Lockheed & Klein, 1985) the focus fell more squarely on patterns of gender inequality in coeducational classrooms. The current chapter updates the summaries of the research on gender equity in coeducational classroom environments, but now also includes the growing body of research on

single-sex schools and dual academies. While many of the recommendations in 1985 centered on improving the climate of coeducational student groupings, this chapter begins to address those issues unique to gender-segregated environments. With the 2006 Title IX regulations putting single-sex education once again in the national spotlight, there are renewed opportunities for improved policy, practice, and future research.

Policy: Putting Gender on the Agenda

While the 1975 and the 2006 Title IX regulations provide some protections against overt and institutional discrimination on the basis of sex, the problems of gender inequality in the classroom are often unintentional, subtle, and pervasive micro-inequities that are difficult to document. The research covered in this chapter suggests that explicit gender equity policies are still needed for both coeducational and single-sex environments. Policymakers at the federal, state and local levels must:

1. Maintain the goal of gender equity in coeducational schools.

Even though local districts now have more freedom to offer different kinds of single-sex schooling, this will certainly not be an option for a majority of public school students. Therefore, it is imperative that the “government’s goal should be to create a successful coeducational school system free from sex discrimination” (Stone 2004, p. 21). One policy recommendation is to raise awareness as to the requirements and safeguards built into Title IX, the Equal Protection Clause of the 14th Amendment, and state laws prohibiting sex discrimination.

Title IX, now on the books for almost 35 years, is widely misunderstood and unevenly enforced. In a survey of 440 students and 84 teachers in five middle schools, Zittleman and Sadker (2005) found that the vast majority of participants did not have a basic understanding of the law. The few respondents who knew anything about the law, predictably linked it solely to issues of women’s athletics.

Clearly, the federal government needs to raise awareness among all educators in all contexts as a first step, even as local Title IX coordinators and other school officials implement policies to assess and insure gender equity in all aspects of the school climate. This focus should go beyond on-campus sexual harassment and sports to include equitable academic achievement and educational opportunities for both females and males.

2. Repeal the 2006 Title IX modifications to the 1975 Title IX regulations.

This chapter’s research review provides no convincing evidence that single-sex environments in general decrease sex stereotyping in instruction or significantly close the gender gap in educational outcomes. Separate education is rarely equal even if it is voluntary. The 2006 Title IX regulations, with so many questions unanswered, appear to move us no closer to these goals and very well may set back the gains that have been achieved by using single-sex education sparingly as specified in less permissive affirmative action provisions in the 1975 Title IX regulations.

A repeal of the overbroad and ill-defined 2006 regulations is the only prudent course of action at this time. A prompt repeal

would forestall the many court challenges that are sure to come as students present evidence of sex discrimination from poorly crafted programs with limited oversight that yield unequal treatment. For example, new single-sex programs could end up receiving more public and nonpublic resources than the mixed sex alternatives.⁹

Prior to this repeal, educators who are concerned about advancing gender equity or even those who want to avoid lawsuits should consider using the remedial or affirmative action justifications in the 1975 Title IX regulations. This would mean allowing single-sex education primarily to decrease sex discrimination. Even using the broader justifications in the 2006 regulations, educators should not implement a single-sex program unless they have clear and convincing evidence that what they plan to do will result in attaining educationally important objectives without increasing sex discrimination. For suggestions on strategies to do this see Klein (2003) and Klein (2005).

Prior to making a decision to implement any single-sex education, educators should follow guidance from a 1996 GAO report *Issues Involving Single-Gender Schools and Programs* (U.S. Government Accounting Office, 1996). It states the need for the following justifications for single-gender classes or programs:

(1) beneficiaries of the single-gender classes or programs must have had limited opportunities to participate in a school's programs or activities due to their sex, (2) less restrictive or segregative alternatives that may have accomplished the goals of the single-gender classes or programs must have been considered and rejected, and (3) there must be evidence that comparable sex neutral means could not be reasonably expected to produce the results sought through the single-gender classrooms or programs. (U.S. GAO, 1996, pp. 22–23)

To attain our *Handbook* goal of actively increasing gender equity through education, it is important to select only single-sex education options that have a high likelihood of increasing gender equity and that are more likely to do so than using gender equity promoting strategies in a mixed-sex environment. If the evidence shows that this has been accomplished, then it would be legitimate to continue the sex segregation. But since it is easy to slide into patterns of inequity and stereotyping, we recommend that all single-sex education schools or activities be actively monitored and evaluated annually to ensure that they do not foster sex discrimination, but instead advance gender equitable outcomes.¹⁰

3. Institute policies to monitor gender equity in coeducational and single-sex environments in *all* educational institutions covered by Title IX.

Coeducational and single-sex environments in public and private coed schools receiving federal financial assistance must be monitored to ensure that they are not discriminating on the basis of sex. Most of the Title IX complaints have been in sex-segregated athletic activities that have been allowed under the 1975 Title IX regulations for contact sports. As described in chapter 18, federal policies such as the athletics disclosure act

have been useful in making educators aware of whether or not they are treating their male and female students equitably.

If the 2006 Title IX regulations are not repealed quickly, it may be necessary to develop similar monitoring and reporting requirements for single-sex education or to request special studies by GAO or others to assure full compliance with the 2006 Title IX regulations. Concurrently, publicly accessible Web-based annual evaluations should assess whether single-sex education is being implemented free of sex discrimination according to applicable laws. The evaluations can be facilitated by Title IX coordinators. If they are looking at the comparative effects of single-sex interventions, it would be best if they are conducted by qualified external evaluators who can produce evidence that will meet the standards of the What Works Clearinghouse.

Even meeting the minimal *substantially equal* requirements of the 2006 regulations in terms of curriculum, resources, faculty, and facilities will be a challenge. For example, there may be inequities in areas such as curricular pacing. One study (Herr & Arms, 2002) found that teachers who taught the same academic subject to both an all-girls class and all-boys class deliberately held back their girls' class when it became clear that the boys' class could not cover the material at the same pace.

Practice: Promoting Gender Equitable Pedagogy Among Teachers

The 1985 predecessor to this chapter highlighted the importance of awareness of strategies for promoting equitable teacher-student interactions. Yet research has continued to document gender inequality in the coeducational classroom—for both girls and boys. Clearly, equitable teaching practices have not been achieved in schools. Teachers, administrators, and the teacher education community must:

1. Implement gender equity training in teacher education programs.

Few teacher education programs have incorporated gender equity interventions and strategies into their courses, and yet these programs can work. Teacher certification programs must require teacher candidates, and administrators, to study high-quality research on such topics as gender similarities and differences, gender equity issues, and bias in classroom interactions. Ongoing training should be provided for both preservice and inservice teachers, helping them to recognize the various forms of gender bias in teaching as well as in curricular materials. College instructors teaching in education programs must be familiar with Title IX protections, model gender equitable practices, and incorporate gender issues into their curriculum. Finally, teachers, administrators, and entire schools should be held accountable as to whether and how they address gender equity or gender gaps at their institutions. Systems used to evaluate all types of educators should include specific criteria to ensure they advance gender equity.

⁹In fact, in the dual academies in CA, the promise of additional resources was a key reason parents gave for selecting these schools (Datnow et al., (2001).

¹⁰Some gender equity advocates believe that any single-sex education should be extremely rare and that these interventions should not be limited to one sex, although they could be designed to meet the needs that were most common for one sex such as the classes designed to overcome math anxiety that served both women and men.

2. Require accreditation bodies to evaluate teaching programs to ensure that they include appropriate instruction on gender equity.

National organizations such as the National Council for Accreditation of Teacher Education (NCATE) must establish clearer criteria for evaluating teacher education programs related to their attention to promoting gender equity and preventing gender bias. These organizations should promote best practices and heighten awareness of gender equity issues in classroom instruction. State teacher assessment and credentialing programs must also evaluate teacher candidates' knowledge and understanding of gender similarities, of Title IX, and other relevant laws that facilitate gender equity and gender equitable teaching practices whether in coeducational or single-sex classrooms.

3. Refine and develop curricula to help K–12 students learn gender equitable interactions.

Programs should be refined and, as needed, developed to help students learn to interact in nonstereotypic, gender equitable ways with their peers, teachers, and others to learn about their rights under Title IX. Already-developed promising programs, such as the ones detailed in the U.S Department of Education's report from the Gender Equity Expert Panel (2001), must be implemented at the school level.

Further Research and Evaluation on Single-sex Schooling

The following gender equity issues must be addressed in future research studies:

1. Conduct further studies on gender equitable classroom interactions.

Though Title IX mandates that both boys' and girls' classes have access to the same resources and curriculum, it cannot legislate the gendered beliefs that teachers and students bring with them to the classroom. As Lee, Marks and Byrd (1994) found, single-sex schools are often the most sexist, with teachers and students engaging in "gender reinforcement" or "sex-role stereotyping" (1994). It is important to conduct research in both coed and single-sex environments on the most effective ways to go from awareness of gender inequalities in classroom interaction to actual behavioral changes where teachers and students routinely interact in gender equitable ways.

2. Study and evaluate public single-sex schools with comparable coeducational schools.

Studies on public single-sex schools covered by Title IX must compare girls and boys schools (or dual academies), and these schools should be compared with well-matched coed schools.¹¹ The comparisons should examine process and outcome indica-

tors on a number of variables such as sex stereotyping, as well as achievement, attitude, college enrollment, and career choices. Research must examine the culture of single-sex schools, including classroom interactions, curricular content, school climate, and organization. When making comparison studies on single-sex education, one must control for other factors like small class size and selection bias.

To learn about relative merits among single-sex options, researchers should examine various types of single-sex environments, such as single-sex schools, dual academies, coeducational schools with gender segregated classes, and even activities focused on meeting the common needs of girls or boys, but that allow both genders to participate. It is also necessary to examine the effectiveness of these interventions at different grade levels (e.g., elementary school, middle school, high school, college), and for diverse racial and ethnic populations.

3. Identify specific replicable single-sex schools, classes, and programs that increase gender equity.

Future studies should identify successful single-sex interventions and their characteristics, and determine whether they are replicable and effective in other contexts. A database of good-quality evaluations of single-sex interventions (schools, classes, and even after-school programs) should be developed, and patterns among related clusters of interventions should be described. If effective single-sex classes or programs such as Orientation to Nontraditional Occupations for Women (ONOW) are identified, they should be replicated in related contexts and further evaluated. Examples of gender equity results may include students' attitudes toward and achievement in nontraditional academic subjects, students' choice of majors and careers, and decreased gender gaps in desired outcomes. Wherever possible, evaluations of adaptations of these programs developed for single-sex environments, but used in mixed sex environments, should be reported. It is likely that many will be equally effective in coeducational environments.

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¹¹The 2006 Title IX regulations no longer require that single-sex options for both girls and boys be routinely established. Instead, in many instances all that is required is a coeducation option or comparison.

¹²See Stone, 2004 and Chapter 31 "Summary Recommendations for Achieving Gender Equity in and through Education."

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