

**Separate But Superior?  
A Review Of Issues And Data  
Bearing On Single-Sex Education**

by

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**Executive Summary**

Public education in the United States evolved from single-sex to coeducational settings late in the 19<sup>th</sup> century. Single-sex schools then existed only as independent or church-affiliated schools. In 1972 the passage of Title IX legislation promoting gender equity made it illegal to create new single-sex public schools and classes, except in rare circumstances to remedy prior discrimination. Existing single-sex schools were permitted to continue and some courses—human sexuality and chorus, for example—as well as contact sports were allowed to remain single sex. Attempts in the 1990s to pass legislation permitting single-sex schools failed until the 2001 reauthorization of the Elementary and Secondary Education Act of 1965 (No Child Left Behind). The U.S. Department of Education proposed new regulations to govern the legality of single-sex schools and classes in March, 2004. The proposed regulations drew much negative comment and as of September, 2006, have not been implemented.

Multiple theoreticians give multiple rationales for the alleged superiority of single-sex settings. Single-sex education is variously seen as a means:

- to increase the enrollment of girls in courses they often avoid in coeducational settings;
- to alter and improve self-concept and self-esteem in girls;
- to reduce “distractions” that attend coeducation classes once students reach adolescence;
- to better control the behavior of boys;
- to increase the achievement of at-risk students of both sexes;
- to reduce or remove sex-based stereotypes and achieve gender equity in classrooms;
- to improve education outcomes by paying attention to pedagogically significant gender differences, especially in brain function.

And, for some, it is the less-than-optimal solution to less-than-optimal-coeducation settings. For these commentators, rather than segregating students by sex, educators should strive to improve conditions in coeducation classes so that they benefit all students equally. They hold that segregation by sex costs society in ways similar to segregation by ethnicity or class.

The research, although copious, is mostly flawed by failure to control for important variables such as class, financial privilege, selective admissions, religious values, prior learning or ethnicity. Of 2,221 quantitative studies, only 40 survived a review from the American Institutes for Research commissioned by the U.S. Department of Education's Office of Planning, Evaluation and Policy Development, even though the review had relaxed its criteria for judging studies methodologically adequate. Those

included in the AIR review reported on 33 outcomes, ranging from achievement test scores to graduate school attendance to self-esteem to unemployment rates and even to duration of first marriages.

The findings do not form a coherent body and therefore the single recommendation possible is that:

- A series of specific questions should be asked of any proposal for single-sex schools or classes.

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**Background**

*History*

Initially, all formal education in the United States occurred in single-sex schools. Females did not attend schools but were educated, to the extent that they were educated, at home. In the 1800s girls began attending their own schools. In the 1880s and early into the 20<sup>th</sup> century, however, communities sought an economy of scale and merged the genders into coeducational “common” schools.<sup>1</sup> It was also hoped that the presence of girls would temper boys’ behavior, an argument now sometimes put forth for single-sex education: in the culture of today, boys make “intemperate” advances on girls that would not have been tolerated in the 19<sup>th</sup> century classes. As coeducation became dominant, single-sex schools existed almost solely in the private sector as either church-affiliated schools or independent secular schools.

In 1972 the passage of Title IX legislation promoting gender equity made it illegal to create new single-sex public schools and classes, except for rare exceptions. Although Title IX had its most visible impact on athletics, it also has had major influence in

classrooms, opening previously segregated classes and bringing attention to gender disparities. It is sometimes referred to as “*Brown v. Board*” for gender, after the 1954 Supreme Court decision holding that race-segregated schools were “inherently unequal.”

Several attempts in the 1990s to pass legislation permitting single-sex schools failed.<sup>2</sup> Section 5131(a)(23) of the 2001 reauthorization of the Elementary and Secondary Education Act of 1965 (No Child Left Behind), however, authorizes the use of funds to establish single-sex schools and single-sex classes within coeducational schools. The paragraph states that the schools must be “consistent with applicable law.”

In March, 2004, the U.S. Department of Education published draft regulations governing the operation of single-sex classes.<sup>3</sup> These regulations held that:

1. Coeducational schools operating single-sex classes must provide a rationale for the classes, such as a historic failure of girls to enroll in certain classes offered for both sexes (for example, physics or computer science).
2. They must provide either a single-sex class for the other gender or a coeducational class in the same subject at the same schools.
3. They must conduct periodic reviews to determine if conditions still render the single-sex class necessary.

Single-sex *schools*, however, would not have to provide any rationale or conduct periodic reviews. Although charter schools would be exempt from all three regulations, the district implementing a single-sex school would have to provide “substantially equal” courses, services, and facilities at some other school or schools within the same district.

“Substantially equal” is a phrase first used in the *Brown v. Board* decision and re-invoked in the court’s 1996 decision in *United States v. Virginia*, a decision requiring the

Virginia Military Academy (VMI) to admit women. In her opinion on the 7-1 decision (Justice Scalia against; Justice Thomas recused because his son was attending the school), Justice Ginsberg observed that sex differences were a cause for celebration but that in the field of education single-sex institutions would be permitted only to remedy prior discrimination or to provide instruction that would “ advance full development of the talent and capacities of our nation’s people.”<sup>4</sup> The Court held, though, that the Virginia Women’s Institute for Leadership, the program the state of Virginia had offered as a substitute for admitting women to VMI, provided a “pale shadow of VMI in terms of the range of curricular choices and faculty stature, funding, prestige, alumni support and influence.”<sup>5</sup> It did not constitute a substantially equal parallel education to that offered by VMI. By refusing to admit women, therefore, VMI violated the equal protection clause.

Although the decision made it clear in the concrete instance that VMI did not offer women a substantially equal education, the proposed 2004 regulations offered no further clarity in the abstract: they provided no clear definition of, or criteria for, the “substantially equal” requirement.

Reactions to the proposed regulations were swift and strong. Typical was the commentary of Sadker and Zittleman who lamented that the Department’s regulations ignored the most salient aspects of the single-sex schools which was not that they were single-sex:

What we applauded in private single-sex schools was not their gender uniformity, but their educational practices. Many educators, including us,

attribute much of the academic successes of these private schools to their smaller class sizes, engaged parents, well-trained teachers, and strong academic emphasis. Other educators believe that single-sex schools work less well for boys than for girls, or that only boys from low-income families benefit. Still others believe that such schools may intensify gender stereotypes and homophobia. But so far the Bush plan does not address these factors.<sup>6</sup>

Sadker and Zittleman further observed that “the effectiveness of single-sex education in public schools—which involve different factors from private schools—has yet to be carefully studied.”

Similar statements appeared from the American Association of University Women (AAUW), the National Organization of Women and the Feminist Majority Foundation. The AAUW noted that the proposed regulations were logically self-contradictory. On the one hand, the Department argued that single-sex classes would improve achievement. On the other hand, to meet the “substantially equal” requirement, a district need provide only a coeducational class.<sup>7</sup> As of September 25, 2006, the regulations have yet to be implemented.

### ***Categories of Belief***

Sadker and Zittleman illustrate one set of beliefs about single-sex schools: that their superiority, when it exists, occurs because of pedagogical factors one would find in any effective school, single-sex or coed. The AAUW adopted the same position in its

1998 publication, *Separated by Sex: A Critical Look at Single-sex Education for Girls*.<sup>8</sup>

It later wrote that if girls were more comfortable in single-sex classes, then something was wrong with the coeducational setting and the appropriate effort would be to attempt to right it.<sup>9</sup> This is obviously a political or philosophical position, not one derived from empirical studies in the behavioral or biological sciences.

In one chapter in *Separated by Sex*, Lee defines a “good” school as one that has high achievement outcomes and a low correlation of those outcomes with socio-economic status, or high achievement outcomes and a small gender gap. Reflecting on her own work and that of colleagues, she delineated the qualities that emerged:

- Smaller school size.
- A constrained curriculum where almost all students take the same, mostly academic curriculum.
- More personal social relations among school members. This defines these schools more as communities than bureaucracies.
- More authentic instruction that involves students in higher order thinking, teaching that is more constructivist than didactic, where students are encouraged and expected to become actively engaged in their own learning.
- A pattern of authentic instruction that is pervasive in the school rather than isolated in the classes of teachers who happen to teach this way.
- A common willingness on the part of teachers to accept personal responsibility for all their students’ learning, including a belief that all their students can learn what they are taught.<sup>10</sup>

These are general statements, but derive exclusively from research on single-sex high schools. They also derive almost exclusively from studies of Catholic schools compared with public schools or single-sex Catholic schools compared with coeducational Catholic schools. As such, they illustrate Lee's encounter with "the file drawer" problem: Studies that produce statistically significant results more often find their way to publication than those that do not. The latter remain in the researcher's file drawer. Lee reports that she and her colleagues *found no consistent pattern of effects for attending either single-sex or coeducational independent schools for either boys or girls in independent schools* (emphasis in original).<sup>11</sup>

A second set of beliefs about single-sex schools is held by those who might be called the Conditional Believers. These might agree with Lee in theory, but hold that the social conditions of actual schools do not attain the desired state that Lee describes. Therefore they advocate single-sex schools under certain conditions or for certain constituencies. Sometimes, the focus of such advocates is on the attention-getting, classroom-dominating, sexual innuendo of boys to the disadvantage of girls. The girls, then, need single-sex schools, or at least classes, in order to have opportunities to demonstrate leadership and simply to receive their fair share of attention. Sadker and Sadker showed that teachers were unaware of the differential amounts and kinds of attention given to boys vs. girls and were shocked to see videos of themselves concentrating on boys.<sup>12</sup>

Conditional Believers represent a variety of stances. Some think that single-sex classes broaden the range of topics that can be discussed without embarrassment or laughter or, in the case of boys, permit attention to academic outcomes that would violate

the anti-intellectual norms of coed classrooms. Sax, for example, contends that only “geeks” will make the effort to properly pronounce French words in a coed language class but, in a room with only other boys, more will compete to determine who has the best accent.<sup>13</sup> This is a contention Sax makes without research data.

Others think that, for various reasons, girls in single-sex schools or classes would be more inclined to take courses in mathematics and the sciences and would do better in those classes in a single-sex setting. [I deleted Eric’s comment here. The operative word is “would.” Still others think that gender equity is best attained and best inculcated as an attitude in single-sex classrooms.

Perhaps the most systematic conditional believer is Cornelius Riordan of Providence University. Riordan believes that single-sex classrooms are more effective only for at-risk students from lower socioeconomic backgrounds, especially students of color, but for both sexes.<sup>14</sup> He uses this contention to explain why one study conducted in 1998 did not find Catholic schools more efficacious for girls while earlier studies did: from 1972 to 1992, Catholic schools for girls experienced a “meteoric” rise in the socioeconomic status of their students. He contends, though, that even when effects show up, the effects are small compared to the effects of socioeconomic status and the type of curriculum in a school.

Riordan lists a dozen theoretical rationales for why positive effects occur in single-sex schools, the last four being appropriated from Lee.

1. The diminished strength of youth culture values.
2. A greater degree of order and control.
3. The provision of more successful role models.

4. A reduction of sex differences in curriculum and opportunities.
5. A reduction of sex bias in teacher-student interaction.
6. A reduction of sex stereotypes in peer interaction.
7. The provision of greater number of leadership opportunities.
8. *The requirements for a proacademic parent/student choice.* (italics in original)
9. Small school size.
10. A core curriculum emphasizing academics taken by all students.
11. Positive relationships among teachers, parents and students.
12. Active and constructivist teaching and learning.<sup>15</sup>

In a summary statement, Riordan claims:

Single-sex schools are places where students go to learn; not to play, not to hassle teachers and other students, and not primarily to meet their friends and have fun. Aside from affluent middle-class communities and private alternative schools, coeducational schools are not all about academics.<sup>16</sup>

Riordan appears to want schools to be more single-mindedly academic:

The problem is not just about youthful anti-intellectualism, antisocial behavior, athletics and rock concerts, sexual harassment, heterosexual attraction and subsequent distraction, and the contentiousness that comes from increased diversity in the schools; it is about all these things and more.<sup>17</sup>

Of the twelve possible reasons that single-sex schools would prove superior to coed schools, Riordan considers No. 8, the proacademic choice, the most important, hence its listing in italics.

This choice sets into motion a set of relationships among teachers, parents, and students that emphasize academics and deemphasize youth culture values, which as I have suggested, dominate coeducation schools...The choice is not at all about sex and romance nor is it about exclusion. It is about the rejection of antiacademic values that predominates in our culture and schools.<sup>18</sup>

Riordan contends as well that only single-sex schools, not single-sex classes, make a difference. A single-sex class within a coed school environment cannot overcome the prevailing anti-academic culture. This position is not wholly consistent with some other statements. Riordan believes that the anti-academic culture dissipates as one moves up the socioeconomic status ladder. It would seem reasonable, therefore, that single-sex classes might work for some goals—for example, enrolling more girls in science and mathematics classes.

Riordan readily acknowledges that all of the research he draws on comes from private schools. In the absence of much data about public single-sex schools, he proposes in the abstract, “a ‘voluntary community’ for public school policy which would resemble Catholic schools in every respect except for religion.”<sup>19</sup> This statement appears to assume that religion operates as an independent entity separable from all other aspects of the school. But that is hardly the case. At least in Catholic schools, religion often permeates or even dominates the rest of the establishment. Rothstein, Carnoy and Benveniste

reported situations in which the achievement goals of a school principal conflicted with the religious emphases of local priests.<sup>20</sup> Religion might be the glue that holds an otherwise loosely bound “voluntary community” together.

Finally, there are those who believe that innate gender differences require separate schools because boys and girls learn differently and learn unfortunate things in coeducational classrooms. The most ardent advocate in this category is Leonard Sax, who summarizes his position in *Why Gender Matters*.<sup>21</sup> Sax founded the National Association for Single Sex Public Education (NASSPE), originally called the National Association for the Advancement of Single Sex Public Education ([www.singlesexschools.org](http://www.singlesexschools.org)).

Sax presents evidence that newborn boys and girls see and hear differently. Boys and girls draw differently: when asked what a drawing is, girls typically respond with nouns. Boys respond with verbs. Sax cites linguist Deborah Tannen to the effect that the differences in how boys and girls use language are so great that “in many ways the second-grade girls were more like the twenty-five-year-old women than like the second-grade boys.” For Sax, these various biological and linguistic data lead but to one conclusion: “Human nature is gendered to the core.”<sup>22</sup> Therefore, society should arrange schooling to take advantage of gender differences.

One might object that yes, the genders differ, but people live mostly in a coed world, and thus children should learn how to thrive in this coed community. To this Sax responds that in coeducational settings, people learn the wrong things and that “in the ways that matter, single-sex schools may provide better preparation for the real world than coed schools do.”<sup>23</sup> Sax draws this conclusion after summarizing a study thusly:

Two psychologists went to Belfast to study the self-esteem of girls at different schools. There were no socioeconomic or educational differences between the two groups. These researchers asked the girls all sorts of questions: Are you a good student? Do your parents have good jobs? Are you good at sports? Do you think you're pretty? Do you have lots of friends?

The researchers then correlated each girl's answers with the girl's self esteem as measured by a separate inventory. They found that at *coed* schools you don't need to ask a dozen questions to predict the girl's self esteem. You have to ask only one: "Do you think you're pretty?" If she answers yes, her self-esteem is high. It doesn't matter if she is failing all her classes, if her parents are out of work, if she's no good at sports...If a girl at a coed school thinks she's ugly, then her self-esteem is in the toilet...For girls at single-sex schools...personal appearance is in the mix but it's only one factor out of many.<sup>24</sup>

In polite terms, one can say that Sax' description of the study "romanticizes" the data—draws grand, strong conclusions from humble correlational statistics that appear in a 5-page report.

Consider some of the study's characteristics that might serve to diminish the strength of these conclusions. First, no matter how clear cut the result, the study is only one study, conducted in 1989 and published in 1993. Apparently, no one has tried to replicate it. Second, there were only two schools in the study, not the many implied by Sax's statements about coed "schools" and single-sex

“schools.” Third, Sax cannot know that “there were no socioeconomic or educational differences between the two groups.” The researchers provide only two demographic facts: the two schools were both Protestant and in the same catchment area. Fourth, there were 171 girls at the single-sex school, 24 at the coed school. Why 24 sets of parents in the same neighborhood had chosen to send their daughters to a coed school, and what differences this choice might reflect or produce in the two groups, the researchers did not discuss.

Fifth, the researchers do not discuss how the effects of an extremely small school might differ from a small school. Sixth, there was only one instrument, not two: the Self-Perception Profile for Children, a widely used inventory developed by Susan Harter at the University of Denver. The inventory generates five subscales and an index of global self-worth. Seventh, while physical appearance was the only one of the five scales that predicted global self-esteem at the coed school, it accounted for no more variance in that prediction (29%), than did behavioral conduct, the best predictor of global self esteem for girls at the single-sex school (27%). Physical appearance was the second best predictor of global self worth at the single-sex school, adding 15 percent to the variance accounted for. Social acceptance added another 5 percent of variance accounted for— meaning that there were three predictors in play, not “many” as Sax stated.<sup>25</sup> Eighth, despite Sax’ comments on failing grades, parents being out of work, and so on, the researchers sought no information on these conditions and did not discuss them.

There is, however, growing scientific interest in brain differences between the sexes. As University of California neuroscientist Larry Cahill put it:

A generation of neuroscientists came to maturity believing that ‘sex differences in the brain’ referred primarily to mating behaviors, sex hormones and the hypothalamus. That view, however, has now been knocked aside by a surge of findings that highlight the influence of sex on many areas of cognition and behavior, including memory, emotion, vision, hearing, the processing of faces and the brain’s response to stress hormones.<sup>26</sup>

Most of the studies in this area focus on “micro” level brain activity, such as neuron density. On the other hand, one study cited by Cahill showed that young male and female vervet monkeys had similar toy preferences as young boys and girls, an outcome not likely due to gender bias in the human culture. Whether or not the differences affect such “macro” level events as classroom instruction is yet to be determined. Moreover, given the dispersion of most traits, it could be that while boys and girls brains differ on *average* on some traits, the distributions for males and females largely overlap, meaning that substantial numbers of boys would be more different from other boys than from girls.

Less rigorous studies have been advanced at the macro level and become parts of the popular culture, notably the efforts of Gilligan,<sup>27</sup> Gray,<sup>28</sup> Brizendine,<sup>29</sup> and Tannen.<sup>30</sup> The idea of large gender differences has been challenged by Hyde, who conducted a meta-analysis of the psychological literature on gender difference. The results of the analysis led him to advance the “gender similarities hypothesis”: men and women are

more alike than different.<sup>31</sup> In addition, he found that the magnitude and even direction of gender differences depended a great deal on the social context of the behaviors in question.

## **Recent Developments**

As noted, the 2001 reauthorization of the Elementary and Secondary Education Act of 1965 contains funds for single-sex schools or classes as one of about 30 types of local innovative programs. The U.S. Department of Education suggested altering the Title IX regulations in 2002, proposed changes in 2004, and brought forth final regulations on October 25, 2006.

According to the Department of Education, “The new regulations do not require single-sex education, but make it easier for educators to offer, and parents and students to choose, single-sex educational opportunities while upholding nondiscrimination requirements. Enrollment in a single-sex class must be completely voluntary and a substantially equal coeducational class in the same subject must be provided.”<sup>32</sup>

A number of organizations condemned the changes. “It really is a green light from the Department of Education to re-instituting official discrimination in schools around the country,” said Marcia Greenberger, a co-president of the National Women’s Law Center.<sup>33</sup> Nancy Zirkin of the Leadership Conference on Civil Rights commented that the new regulations “violate both Title IX and the equal protection clause of the Constitution.”<sup>34</sup> And Emily Martin of the American Civil Liberties Union declared that her organization was looking at schools in many states and considering court challenges.<sup>35</sup>

Independent of their legality or constitutionality, some scholars saw the regulations as manipulating a trivial variable. “Of all the things you could think about doing to improve educational outcomes, separating kids by gender is really low on the list,” said Rosalind Barnett of Brandeis University.<sup>36</sup>

Some were taken aback that a U.S. Department of Education that emphasizes the importance of supporting programs with scientifically based research would permit single-sex schools “even though the Department of Education concluded a year ago that there was not enough evidence to definitively evaluate single-sex classes.”<sup>37</sup> This review is discussed later in this policy brief..

The press for single-sex schools and classes has been energized in part by studies indicating girls are “shortchanged” in coeducational schools.<sup>38</sup> Ironically, three of the most influential reports—*Failing at Fairness* (1994)<sup>39</sup> and AAUW’s *How Schools Short-Change Girls* (1992) and *Segregated by Sex* (1998)—do not themselves argue that such shortchanging implies the need for single-sex schools. Instead, they promote the reform of coeducational classrooms to ensure that both genders have equal opportunity to learn and that gender bias in classrooms is diminished or eliminated. The right-leaning Women’s Freedom Network, however, has challenged the conclusion that girls come up short in school.<sup>40</sup>

In 2002, the National Association for the Advancement of Single Sex Public Education (NASSPE) was founded. Later, “the Advancement of” was deleted from the name. Association adherents believe that the nervous systems of boys and girls differ sufficiently in how they function that single-sex schools operate more effectively.<sup>41</sup>

In August 2006, Livingston Parish, Louisiana, near Baton Rouge, after being sued by the American Civil Liberties Union, dropped its plan to pilot a single-sex school converted from a coed school. The cost of defending against the suit appeared to be a factor. The possibility of beginning schools with a major distraction (the previous year had opened just after Hurricane Katrina) was another.<sup>42</sup> Also in August, Michigan governor Jennifer Granholm signed legislation permitting districts to operate single-sex schools. The law appears to be of particular interest to Detroit Public Schools, whose enrollment has fallen from 150,000 in the 1990's to an expected 119,000 in 2006-2007.<sup>43</sup> Many of the losses have been to charter schools, and Detroit officials hope that if they offer single-sex schools as an option, more parents will opt to keep their children in the public schools.

## **Available Data**

### ***Difficulties in Conducting Research***

It is extraordinarily difficult to conduct scientifically acceptable research on single-sex schools. The mere fact that all such schools are schools of choice means that from the outset, no random assignment is possible. (It might be possible to randomly assign students to single-sex schools that differed on some variable of interest, but no research has yet attained that level of sophistication. According to Sax, students in the fourth grade in a Deland, FL elementary school had been randomly assigned to single-sex or coed classes.<sup>44</sup> In fact, the principal sent letters home to the parents informing them of the option and asking them to choose. She then informally “balanced” the classes in terms of their test scores and ethnic makeup; some parents who chose a single-sex class had to accept coed classrooms instead.<sup>45</sup>)

In addition, most single-sex schools that exist in the public sector in the U.S. are quite new, meaning that little time has been available for research and that what research might have been conducted would be subject to Hawthorne or John Henry effects. (A Hawthorne effect is the effect of novelty—people often behave differently at the beginning of an innovation or experiment than they do later on. John Henry effects occur when people in a group perceive that they are expected to do less well than people in another group and work harder to offset the expected deficit.) The NASSPE website lists 44 public single-sex schools. Of those, 38 were started in 2000 or later and 30 in 2003 or later. A similar time frame applies to the NASSPE list of 179 single-sex classes within a coed framework. Planning for research or evaluation from the outset appears not to have happened.

Moreover, the campaigns for and against single-sex schools have occurred during a period of great social change in regards to gender-bias and civil rights generally. Effects seen in single-sex schools might well stem from these changes. For instance, The United Kingdom decided to largely move away from single-sex schools in the 1960s. From 1960 to 1985 the number of all-girl schools fell from 1,380 to 375. During the same period of time, the percentage of girls taking A-level physics rose from 14 percent to 23 percent. This is not an outcome that those worried about gender stereotyping in coed schools would have predicted. Researchers, however, attribute the changes to increased opportunities provided by the comprehensive reform of secondary education, in which the shift from single-sex schools was only one of several strategies.<sup>46</sup>

Thus, any conclusions about the efficacy in the United States of single-sex public schools or classes depend on the extent to which one feels confident generalizing from

research in the public sector in other countries, or from research in this country comparing public and private, usually religious, schools, or comparing single-sex religious schools with coeducational religious schools.

That said, what research that does exist seems rife with preventable methodological shortcomings, such as failing to take into account religious values, class, financial privilege, prior learning, selective admissions, ethnicity, and so on. The recent American Institute for Research review of publications conducted for the National Center for Education Statistics declared early on, “As in previous reviews, the results are equivocal.” This same review finds “some” support for the premise that single-sex education is helpful and “limited” support that it might be harmful or that coeducational education is more beneficial. Mostly, though, “there is no evidence of either benefit or harm.”<sup>47</sup>

Most of the studies included in the review concentrated on student achievement outcomes, especially for girls. In some studies, boys seemed an afterthought, provided with single-sex classrooms largely to avoid Title IX complaints to the Department of Education’s Office of Civil Rights or suits by the American Civil Liberties Union. Most studies examined high schools, with a few taking place at the middle school level. Only one study was found examining a potential interaction between gender or ethnicity of the teacher and the gender or ethnicity of the students. In most instances, gender and ethnicity of teachers were not described; when they were, it was usually in the context of simply mentioning that the same teachers taught both the male and female classes.

In addition, although several advocates mention the importance of teacher preparation for single-sex classes, no studies described teacher development except in the context of how brief and inadequate such preparation had been.

The NCES reviewers noted that had they applied the What Works Clearinghouse criteria for scientifically based studies “virtually all single-sex studies would have been eliminated... Therefore, for this review, a conscious decision was made to relax these standards and include all correlational studies that employed statistical controls.”<sup>48</sup> Even so, NCES started with 2,221 studies and ended with only 40 quantitative studies and 4 qualitative studies to be included in the review.

The 40 studies cover 33 outcomes. This means that none of the outcomes studied generated what might be called a “corpus” of research literature sufficiently large to draw conclusions with confidence. This is true even though some studies address more than one outcome and figure into the tally more than once.

There are other outcomes for which apparently no studies exist. Several callers to National Public Radio’s “Talk of the Nation” broadcast about single-sex schools expressed the view that their single-sex school experiences had left them badly prepared to relate to the opposite sex<sup>49</sup>. Of course, “badly prepared to relate to the opposite sex” does not describe a precise set of behaviors or attitudes, but no studies of this outcome turned up in the author’s search and, if any exist, none met the criteria for inclusion in the NCES review.

It is worth closely examining some of the less-than-rigorous qualitative studies because they illustrate the complexity of the issue, the difficulties in implementing single-sex schools in the public sector, and the richness of details and unanticipated

events that the quantitative work cannot convey. The following review of qualitative work offers an overview of typical contextual constraints and provides a useful backdrop for the quantitative findings discussed later.

### *Case Studies and Casual Observations*

One of the four qualitative studies included in the NCES review conducted case studies on a set of single-sex schools in California.<sup>50</sup> While he was governor of California, Pete Wilson proposed funding up to 10 districts for single-sex pilot studies, and in 1997 the legislature appropriated money for them at \$500,000 per year for two years. The funding could have accommodated up to 20 academies in 10 districts, but only six districts signed up. Wilson apparently envisioned the girls' academies as focusing on mathematics and science and the boys' academies focusing on discipline. The law required a district to have an academy for each sex and for the same numbers of each. Five of the academies were middle schools, two were high schools.

The legislation focused principally not on gender, but on choice. The academies were to "increase the diversity of California's public school offering." Interested districts were given only two months to prepare and submit proposal, however, a minimal time to think through various issues. Those who applied saw the grants as extra resources to help them with existing problems. As researchers tracking the project reported, "Instead of seeing the single gender academies as primarily an opportunity to address gender inequities, most educators saw the grant as a way to help address more typical education and social problems of low-achieving students."<sup>51</sup>

Some districts had difficulty recruiting boys, some had difficulty recruiting girls. Some students were referred to the academies by teachers in regular schools who wanted

them out of their classrooms. Some students, especially boys, learned of the single-sex academies through their corrections officers or other social services providers. Parents and students alike mentioned that the single-sex setting would reduce “distractions.” Some Muslim students chose the academies for religious reasons. Some chose the academies based on the reputations of the schools of which they were now a part—while the schools were separate buildings, all but one set of academies were on the campus of an existing coed school. This led in some cases to the stereotyping of students in the same-sex academies as “bad,” “preppie,” or “gay.”

Although the academies were envisioned as means to boost girls’ achievement in mathematics and science as well as to temper boys’ behavior, teachers were able on occasion to use the single-sex settings to impart moral instruction otherwise not possible. According to the researchers “many of the students in this study had come to believe... that it was acceptable to engage in dating, marriage, and/or pregnancy at an early age.” In the single-sex setting teachers could counter such beliefs. According to students, conversations about sex, unprotected sex, and pregnancy were much more candid than in their previous coed schools, but these conversations still made some students uneasy. Both boys and girls apparently appreciated the reduction of “distractions” that they had experienced in coed classrooms.

Turnover constituted a significant issue, with administrative changes hampering continuity and atmosphere. In several instances, young, white male principals with some administrative experience were replaced by African American females who had none. One pair of academies endured six principals in three years. Teacher turnover also created problems. Administrators had trouble recruiting veteran teachers because the

teachers feared that the end of the grant might be the end of a job or might result in a transfer to an undesirable venue. Of the 35 teachers present when the academies opened, only 10 remained at the end of the second year. Some students experienced a series of substitutes and “Even when they had permanent teachers, they were often new, inexperienced, and frequently unknowledgeable about working with at-risk youth.”<sup>52</sup>

Wilson’s departure from the governor’s mansion and the installation of a Democratic successor resulted in diminished funding for the second year of operation. Four of the districts closed their academies after that second year, and a fifth shut down after a third year. The closures thwarted the researchers’ plans to collect and analyze achievement data.

Democrats had not endorsed the academies initially and had agreed to the legislation only because otherwise they would have held the entire budget hostage to a \$5 million program. When they won back the governorship, they had no reason to continue to fund the academies. Republicans, for their part, appeared to be influenced by the American Association of University Women’s report *Separated by Sex* which had been covered in the *Sacramento Bee*. AAUW did not advocate single-sex classes. Unlike private schools, which might have been able to obtain support through endowments from wealthy alumni, the constituents of the academies had neither other sources of money nor political clout to influence legislation.

Although many parents expressed support for the academies, neither they nor the staff nor the students had any particular theory about why a single-sex school was a good thing. The lack of commitment to single-gender education helped undermine support for the schools.

Ruminating over their study in a later paper, the researchers developed four policy recommendations, only two of which seem specific to single-sex schooling:

1. Experiments with single-gender education in the public sector need to be driven by a strong theory of single-gender education.
2. Leadership stability at the school or district level is important.
3. Innovations that have an inauthentic beginning almost surely will not be sustained.
4. Policies for single-gender public schooling need to be more carefully crafted.<sup>53</sup>

The lone remaining academy, “The San Francisco 49ers Academy,” appears to be as much a crime-reduction effort as anything, at least for boys (the DeBartolo family, owners of the 49ers football team, partly funds the school and participates in a variety of activities with the students). To be eligible for the 49ers Academy, a student must have been expelled from another school. When rumors circulated that the school might close, a truant officer worried that the neighborhood crime rate would soar (the community once had the highest murder rate in the nation).<sup>54</sup> On the California Standards Test, 5 percent of the boys scored proficient or better in reading while 3 percent did so in math. For girls the figures were 18 percent and 20 percent, respectively. On the norm-referenced California Achievement Test, 6 percent of the students scored above the 50<sup>th</sup> percentile in reading, 9 percent did so in Language Arts, and 18 percent did so in math.<sup>55</sup> Whatever its impact on behavior, the academy does not appear to be producing high academic outcomes.

The Young Women's Leadership School in East Harlem is often held up as a success story of single-sex schools in the public sector. While no formal study of the school's students and graduates appears to have been conducted, a qualitative case study has been published. According to Celedón-Pattichis, the school attempts to create a collaborative and mutually supportive learning environment. Students sit at tables to be facing other students at all times. Said one teacher, "When they start here, they are so competitive, and they won't answer questions—if they feel embarrassed or think they might not know...." The school also attempts to create a self-image of the students as leaders and the school as a community.<sup>56</sup>

The school presents something of a mixed picture in terms of achievement. In 2004-2005 the school contained 401 students in grades 7-12, 63 percent Hispanic, 33 percent Black, and the rest evenly divided between Whites and Asians. More than 90 percent of the class of 2006 had, after three years of high school, passed the Regents tests in English, Mathematics, Science and Global History, while 87 percent had passed the test in U.S. history.<sup>57</sup>

Seventy percent of the class of 2005 planned to attend four-year college and another 22 percent said they were headed for two-year institutions. Reports asserted that 100 percent of the first two graduating classes attended college. The 57 percent of the class that took the SAT, however, scored only 413 on the verbal and 416 on mathematics, compared with 443 and 472 citywide and 505 and 504 nationally. Some of the difference might be accounted for by the fact that only a relatively small percentage of the city's students—36 percent—took the SAT, and they were likely to be among the most talented students in the city. Still, the Leadership School's lower scores are hard to reconcile with

reports that all of its students take mathematics through pre-calculus.<sup>58</sup> The school's college counselor, Christopher Farmer, alleges that the city's numbers are off, and that 100 percent of the school's students take the SAT.<sup>59</sup> It would be interesting to know what institutions of higher education the students attended and how well they fared.

Another qualitative study, authored by Kathryn Herr and Emily Arms, traces the arc of a California public middle school. Unlike the California schools described earlier, this school did have at least some gender-equity thought behind it, although that got lost in the difficulties of implementation and in the emphasis on raising test scores.<sup>60</sup> The school was initially to have been all girls, but warnings about Title IX violations led to a school housing both sexes but offering only single-sex classes. Because the school had had consistently low test scores, the central office decided to reconstitute the school as a single-sex institution. The school held more than 1,000 students, largely Black, Hispanic and Asian, the latter mostly Cambodian.

The reconstitution plan came from outside the school. Current teachers had to reapply for positions there if they wished to stay. Only one-third asked for reassignment, but of the 47 teachers that eventually made up the faculty, only seven had taught in the school prior to the reconstitution. Most of these seven transferred at the end of the first year. The massive leavings destroyed the school's institutional memory. In addition, many neighborhood students had seen the school as a source of social support for out-of-school problems, and that support had disappeared or, at best, had to be constructed anew.

At the same time as the school shifted to single sex, it moved from traditional curriculum organization to blocks of multidisciplinary instruction. This required much

planning time for teachers, most of whom held certification in only one subject area; this innovation might have distracted them from thinking about the implications of the new single-sex structure. Many of the new hires lacked certification and taught on emergency waivers. The district hired four veteran teachers as department heads, but these found themselves working not only on curriculum development but on helping the novice teachers with classroom management, discipline and even with such basics as how to keep a roll book. With the curricular specialists in this role, the teachers often reacted with alarm when a specialist visited a teacher's classroom: "Oh my God, what have I done wrong?"

The "party line" about why the school existed was that it minimized classroom distractions. The administration gave little attention to deeper conversation about gender bias and equity. Prior to the school's opening, the staff watched a one-hour video by Riordan on current research regarding the education of boys. They also heard a principal from one of the state-sponsored schools described earlier. There was no staff development, no ongoing conversations about gender issues.

Herr and Arms report that "when we as researchers asked to come into their classes to observe, teachers often enthusiastically invited us to see their girls' classes followed by a comment that their male classes were another story."<sup>61</sup> Teachers believed that the experiment was working for girls and perceived girls functioning at higher levels, even when evidence pointed to the contrary. For instance, they perceived girls as better readers although a higher proportion of them were assigned to developmental reading. The wisdom of having one teacher teach both genders apparently never arose, although teachers came to prefer teaching only one sex. The perceived superior performance of

girls left most conversations outside of class “in reference to the question ‘What do we do about the boys?’ By appearing to do well, girls ceded attention to the boys, much like they do in coeducational classrooms.”

Because low test scores had caused the school’s reconstitution, the need to increase test scores dominated many of the year’s discussions and faculty meetings. “The single-gender classes were simply the context or backdrop for the emphasis on standardized testing.”<sup>62</sup> Herr and Arms sum it up thusly:

The story of the school’s first year of single-gender reform is primarily one of missed opportunities. The multiple innovations, the short lead time in terms of implementation, the reconstitution of the whole school and its culture, all overshadowed initial and any ongoing thinking regarding the possibilities of gender reform. On its own terms—that of raising test scores—the school was a success. Yet viewed through the lens of contributing what we can learn about gender equity, the missed opportunity emerges as the biggest story to be told.<sup>63</sup>

This study, like a number of studies found in the literature, lasted only one year and, also like some other studies, took place in the first year. Such studies are subject to artificial or short-lived outcomes resulting from the novelty of the situation.

Herr later reported that the school seemed to think that separation by gender was a sufficient change in itself. She also stated that teachers thought they should teach either boys or girls so that they could stay “in role.” Teachers operated in a “humane” role with girls, but felt they needed to take on an “authoritarian” style with boys; they found alternating between the two during a single day difficult.<sup>64</sup>

Herr and Arms found that, indeed, some of the boys' classes were "hypercontrolled" or in some cases, out of control. Teachers reported that once they got through their male classes, they could relax. Herr and Arms posited that with fewer demands for discipline, pedagogy might come to the fore and the teachers might "think more creatively about fostering a gender equitable climate, at least for the girls." But the increasing pressure to improve test scores suppressed any discussion about gender equity.<sup>65</sup>

### *Quantitative Studies*

Reviews of quantitative studies in the single-sex literature differ in content mostly because of when they were conducted, although there have been a few arguments about whether or not a given study's methodology was sufficiently sound to be included in a review. The NCES review is both the most thorough and the most systematic.<sup>66</sup> Less rigorous reviews with the same conclusions, however, were conducted by Smithers and Robinson in England,<sup>67</sup> Thomson and Ungerleider in Canada,<sup>68</sup> and Gill in Australia.<sup>69</sup>

The NCES review selected studies to be included by applying increasingly tight criteria, though not those used in the What Works Clearinghouse since those would have excluded virtually all studies. Once the reviewers prepared summaries of the studies that passed muster, they attempted to contact the studies' authors and provide them the summaries and an opportunity to comment on how well the summary interpreted the original. All but five authors were located, provided at least four weeks to comment, and reminded twice via emails. The sources not contacted were authors of doctoral dissertations. The review began with articles appearing in 1988 or later. A few earlier articles referenced in the more recent pieces were later added.

The review labeled results as “mixed” if they contained statistically significant results that favored single-sex education under some conditions, but favored coed education or showed no differences under other conditions. For instance, in one study girls in single-sex schools had higher reading scores in the 12<sup>th</sup> grade, but not in the 10<sup>th</sup> grade. Results were labeled “null” if they contained no statistically significant results for some conditions. A given study could be reported as both null and positive—for example, a study that found insignificant results for males and significant results for females. The summary that follows gives the number of studies in each category of outcomes. Some studies obtained results for multiple outcome categories. Unless otherwise noted, studies focused on high schools.

For a quick grasp of the findings, the chart that follows the exposition on the findings shows the outcomes in tabular forms for the categories of studies with the most entries. (A note is in order here: In the NCES document, the tables describing the outcomes are not completely consistent with the text describing the nomenclature for the results. Specifically, a few studies that showed positive outcomes for one condition and null results for another were sometimes labeled mixed and sometimes labeled as positive. The following material corrects such inconsistencies.)

Nine studies used all-subject achievement tests (or some type of composite measure). Of these, five found positive effects for single-sex schools for girls, and two for girls in coeducational schools. Three found positive effects for single-sex schools for males. One study showed benefits of single-sex schools for females but null results for males.

Of 14 studies examining only mathematics achievement test scores, eight yielded null results for all categories. Three showed mixed results. In two of these, males in coed settings scored better, while females in single-sex settings scored better. In the third, males in single-sex schools benefited, but there were no benefits for girls. Of the three remaining studies, all showed positive effects for males in single-sex settings, but not for females.

Of eight studies looking at science achievement test scores, five showed no differences between single-sex and coed settings. Two showed females benefiting from single-sex settings, with null benefits for males. One showed a single-sex benefit for males.

Of 10 studies focusing on Verbal and English Achievement test scores, seven generated null results. Two found a benefit for males in single-sex schools and one found mixed results.

One study that examined grades in single-sex and coed Catholic high schools generated null results. One that examined high school social studies achievement found a benefit for girls in single-sex schools, null results for boys.

Of two studies focusing on such postsecondary test scores such as the GMAT and LSAT, one generated null results and one found a single-sex benefit for both males and females.

One study examining college graduation rates and one examining graduate school attendance both generated null results.

Of seven studies measuring self-concept, four generated null results. Three studies found females benefiting from single-sex schools, and two of these found positive results for males as well.

Of the six studies measuring self-esteem, three generated null results. One found an advantage for coeducation school for males in an elementary setting. One found a positive outcome for males in a single-sex setting, another for males in a coeducation setting. Results for females were null.

Complicating this already cloudy issue is the fact that researchers and theoreticians do not always agree on what the constructs of self-concept and self-esteem mean or how valuable they might be to individuals. Some argue, for instance, that high self-esteem reflects egotism and even anti-social behavior.<sup>70</sup> Different instruments were used in the different studies and it is not clear that they can be summarized with the same categories as used for, say, mathematics achievement.

Of five studies on locus of control, two generated null results. Two found positive effects for both males and females in single-sex settings and one found that result for females, but not males. (The concept of “locus of control” refers to the degree to which people perceive themselves as in control of events versus being at the mercy of outside forces).

Fourteen studies examined students’ tendency to enroll in certain courses and their attitudes toward courses. Many of these were conducted in Australia or England. Eight generated null results. One favored coed for males, four favored single sex for females and one of these also favored single sex for males. One generated mixed results, favoring coed for males, single sex for females. One favored coed for females but

generated null results for males. This study, and the study favoring coed for males, were conducted in elementary schools.

Of three studies on college aspirations, one generated null results while two favored females in single sex schools, but gave null results for males. Of two studies on career aspirations, both were positive for females in single-sex schools and one was positive for males as well.

Of four studies on juvenile delinquency, two were null and two favored females in single-sex schools.

Five studies explored the relationship between type of school and attitudes toward school. One generated null results and one favored females in coed schools. One favored females, but not males, in single-sex schools. One was mixed, favoring females in coed schools and males in single-sex schools. One conducted in an elementary school favored males in single-sex schools.

One study found that both boys and girls in single-sex schools spent more time on homework, but another study generated null results. The study showing a positive outcome used High School and Beyond data, while the null results came from comparing Catholic single-sex and Catholic coed high schools.

One study found that females in single-sex schools had more accepting attitudes toward working women than females in coed schools. For males, there were no differences between schools. In relation to work-related, sex-role stereotyping, one study found less among girls from single-sex schools, but another found less among girls from coed schools.

One study in New Zealand found that males and females in single-sex schools were more likely to complete high school. No interaction was found between type of school and socio-economic status, meaning that less-affluent students were as likely to complete school in a single-sex setting as in a coed setting. The same held for more affluent students.

One study comparing postsecondary success between single-sex and coed Catholic high schools found no differences.

A study in the United States found no differences in unemployment rates among single-sex and coed graduates, but one in New Zealand found lower unemployment rates among students from single-sex schools.

One study found Black and Hispanic students, both male and female, in more leadership roles in single-sex schools, but another study of females only found no differences.

In areas where only one study was reviewed, coed schools

- were seen as more pleasure oriented and their students more affiliative;
- produced fewer eating disorders among females;
- produced fewer females involved in political activism;
- produced fewer females satisfied with the academic part of their college experience;
- produced fewer females who chose a gender-mixed college major in contrast to a stereotypically feminine major;
- produced males and females who valued grades and leadership less and athletics, looks and money more.

There were no differences between types of schools and the perception of a safe and supportive environment, or in the percentage of graduates still married to their first spouse.

Table 1 below summarizes in graphic form the results for the categories with the largest numbers of studies. Five studies with mixed results are omitted from the chart.

**Table 1: Results for the School Gender Categories with the Largest Number of Studies**

<b>Variables</b>	<b>Total</b>	<b>SS boys</b>	<b>SS girls</b>	<b>CE boys</b>	<b>CE girls</b>	<b>0 boys</b>	<b>0 girls</b>
<b>All-subject Achievement</b>	9	3	6		2	1	
<b>Math achievement</b>	14	1		2		8	12
<b>Science achievement</b>	8	1	2			7	5
<b>English achievement</b>	10	2				7	7
<b>Self-concept</b>	7	2	3			4	4
<b>Self-esteem</b>	6	1		2		3	3
<b>Course enrollment</b>	14	1	4	1	1	9	8

SS boys: positive outcomes for boys in single-sex schools

SS girls: positive outcomes for girls in single-sex schools

CE boys: positive outcomes for boys in coeducational schools

CE girls: positive outcomes for girls in coeducational schools

0 boys: no difference for boys between single-sex and coeducational schools

0 girls: no difference for girls between single-sex and coeducational schools

As can be seen, the largest numbers of studies by far find no differences.

Occasionally, a finding in one study is contradicted by a finding in another.

One relevant study, by Thomas Dee of Swarthmore, which appeared after the NCES review was completed. Since it appears to meet the NCES criteria for methodological adequacy, it is reported here.<sup>71</sup>

Dee used data from the National Educational Longitudinal Study (NELS) at the 8<sup>th</sup>-grade. NELS provides data from the same student in two different subjects from two different teachers. Dee controlled for teachers' ethnicity, certification, number of years teaching, size of the class and percent of students with limited English proficiency. For reading, science and social studies, having a teacher of the same gender correlated with higher achievement; having a teacher of the opposite gender correlated with lower achievement. In coed classrooms, about half of the students will have a teacher of the opposite gender.

In mathematics, however, having a female teacher correlated with lower achievement for both boys and girls. For this outcome Dee posits several possible explanations: boys and girls both react negatively to female math teachers; female math teachers might be less qualified; or lower-achieving students might be more likely to be assigned to female math teachers.

Girls reported being afraid to ask questions in math, science and social studies. They were less likely to look forward to these subjects and less likely to see them as useful to their future. These effects were heightened when the girls had male teachers. Boys were more negative about English classes, but also reported increased negativity under female teachers. Dee's study has not been in the public eye sufficiently long for its methodology or conclusions to be challenged. An earlier study found no pupil/teacher gender correlations.<sup>72</sup> On a blog, the lead author of that study pointed out: (1) that Dee examines only a single point in time, and (2) that we would need to know the genders of the students' prior teachers to make inferences about a gender/achievement interaction.<sup>73</sup>

Although not directly bearing on sex roles or brain differences, it is worth noting that in international studies, all nations (about 35 in most studies) have large gender gaps in reading favoring females. This holds even for nations where gender-matched education is presumably the rule. In the 2001 administration of Program for International Student Assessment, which tested the reading, math and science skills of 15-year-olds in 39 nations, girls on average scored 34 points higher in reading than boys. Math gaps favored males and were smaller (11 points) with a few reversals. Science gaps were smaller still (6 points), with about one-third of the nations showing girls outperforming boys.

NAEP data have consistently shown large gaps favoring girls in reading, but in mathematics, 9-year-old girls scored higher until 1990 and 13-year-old girls scored higher until 1982. Since the inception of NAEP trend data, the math gap for 17-year-old girls has shrunk from 8 points to 3.

These international and NAEP results open the possibility that gender differences in achievement might be more complex than has heretofore been thought. One could conjecture—at this point it would be no more than that--of the possibility that girls' innate superiority in reading is sufficient to be impervious to the gender of the instruction, while science might be more influenced by the teacher's gender.

Overall, though, these extensive findings convincingly demonstrate that any picture from any data remains murky.

## *Evaluation of the Data*

It is hard to be particularly confident about what can be learned from the available data. Most of the outcomes are not consistently found even when fairly strict controls are applied to the quality of the research. Most areas have some contradictory findings, and even those that don't are not wholly consistent. For instance, three of the seven studies on self-concept found positive outcomes for girls, but four found no significant outcomes.

There are few guidelines for the costs and benefits of single-sex vs. coeducational classes. As Dee notes, his research does not necessarily make a case for single-sex education because all of the data came from coeducational settings and the dynamics might be different in a single-sex school. Nor do we know how malleable this student-teacher gender mismatch effect, if it exists, is to training. Could appropriate training eliminate it and lead to gender equity in a coeducational school?

The case studies describe complex situations where the actors' motives matter and where unanticipated results might (or might not) have affected any attempt at a quantitative study. For example, if the distinction had been made, would the test scores for students whose teachers wanted them out of their classrooms and in the single-sex academies have been significantly different from those of the Muslim students who chose single-sex instruction for religious reasons? One wonders how many complexities the quantitative studies overlooked to attain methodological acceptability. As Salomone put it,

Perhaps researchers on single-sex education have been asking the wrong questions. As the anecdotal evidence on single-sex classes demonstrates, the focus on objectively measurable short-term

outcomes in achievement score gains, for example, may simply divert attention from the real question of short-term behavioral and attitudinal changes that ultimately produce long-term effects in career choices and greater control over one's life plan. It could be that empowerment, not higher test scores per se, is at the heart of single-sex education. Unfortunately, the personal benefits that flow from empowerment are not clearly apparent or measurable in the short term.<sup>74</sup>

Smithers and Robinson view the outcome from a slightly different perspective:

Given the seemingly small effects of separating or bringing the sexes together for education and the limitations on what educational research can and cannot do, it seems unlikely that evidence will ever be obtained that is sufficiently robust to cause the proponents of one approach or the other to change their views. The paradox of single-sex and co-education is that the beliefs are so strong and the evidence is so weak.<sup>75</sup>

## **Recommendations**

As the data do not lead to easy summary statements, so they do not lead either to firm recommendations. The single recommendation possible is that certain questions be asked of any proposed program for single-sex classes or single-sex schools:

1. What are the goals of the program? The goals of various studies reviewed above have ranged across a wide variety of cognitive, affective and behavioral outcomes.
2. Are single-sex schools or classes the *best* way to accomplish the goals?
3. What might be lost if coeducation were generally abandoned? What are the costs and tradeoffs of establishing a single-sex school or class?
4. When single-sex schools have been found to be effective, what factors produce that effectiveness? Does the proposal take these factors into account?
5. What policy obstacles lie in the way of or conflict with the stated goals? Is sex segregation a means of reaching gender equity or a tool for increasing test scores?
6. What are the rationales for the program? Gender equity? Differential brain function? Recruitment of girls into curriculum areas historically avoided?
7. Has the program been well thought through?
8. Where did the program come from? Are its sources external to the school? Is the reform expedient or, in the word of Datnow and Hubbard, inauthentic? There is a long and sorry history of attempts to impose educational change of many kinds from without.
9. Has the school administration bought in? Has the faculty? Have the parents?
10. Will a program of professional development built around the goals of the program be provided for administration and faculty?

11. Is there a sound plan to evaluate the outcomes of the program as described in #1 above?

In answering these questions two facts need to be kept in mind:

1. Lee reported that she could find no consistent results in independent private schools.
2. Riordan and others assert that the effects of single-sex classrooms are small in comparison to the effects of socio-economic status and curriculum variables.

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