

THE PARADOX OF SINGLE-SEX AND CO-EDUCATIONAL SCHOOLING

Alan Smithers and Pamela Robinson
Centre for Education and Employment Research
University of Buckingham

Headmasters' and Headmistresses' Conference

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Contents

<i>Executive Summary</i>	i
1. Introduction	1
2. Academic Achievement	5
3. Subject Choice	11
4. Separate Classrooms	18
5. Personal and Social Development	21
7. Overall Assessment	26
<i>References</i>	32

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Executive Summary

The Headmasters' and Headmistresses' Conference has commissioned the Centre for Education and Employment Research to review the latest evidence on educating boys and girls together or separately, either in different schools or separate classes.

Academic Achievement

Reviews in Australia, USA, Canada, New Zealand, Ireland and the UK have found little evidence of consistent advantages in either single-sex or co-education. It is difficult to compare like with like since in most Western countries single-sex schools are a small special group and differ in ways other than the gender of their intake.

The importance of pupil ability and background makes it essential that these are taken into account in school comparisons. In the few studies where ability has been controlled for, apparent advantages to single-sex or co-education can emerge, but they are small and inconsistent. The comparisons will also have been confounded by differences in, for example, socio-economic status, ethnicity and such school factors as leadership and teacher expertise. While there are some very good girls' schools and boys' schools, it does not look as though they are good because they are single-sex.

In America, against a background of co-education, it has been found that single-sex schooling can benefit disadvantaged children. It is argued that this is not because of the gender mix *per se* but because it represents a pro-academic choice on the part of their parents/guardians.

Subject Choice

One of the drivers of research on the gender mix of schools has been the feminist perspective that the under-representation of females in the sciences is *prime facie* evidence of discrimination. Separating the sexes in education has been advocated as a solution. More boys than girls do study subjects like physics, but high ability girls are just as likely to study the subject in a mixed as a girls' school. The proportion of girls studying physics rose by 64 per cent from 1961 to 1986 just at the time girls' state schools were disappearing. A lot else was happening so the relationship is unlikely to be causal, but by the same reasoning neither can it be claimed that the differences between single-sex and co-educational schools are because they separate or mix the sexes.

Subject predispositions seem to be deep-seated. In international comparisons of 15 year-olds conducted by OECD/PISA, girls were ahead in all 40 participating countries on reading, while boys obtained better results in maths in 38 (all except Iceland and Thailand). Girls and boys who achieve a similar platform for higher education by passing A-level physics tend to go in very different directions, girls to medicine, veterinary science and biological sciences, and boys to engineering and technology, and maths and computing.

There is no clear evidence that single-sex education narrows the gap in subject choices, but it is open to question whether this should be a prime aim even. The subject gender gap can be reduced by not allowing choices or capping performance, but neither of these would seem desirable in themselves.

Separate Classrooms

More recently the focus has shifted to the relatively poorer performance of boys in English, in particular, and more generally in examinations. In 2005, 18.7 per cent of girls were awarded an A*/A in English GCSE compared with 11.4 per cent of boys. Considering all subjects, girls were 18 per cent more likely to take A-levels. This has led to calls for, and some experimentation with, single-sex classes.

No consistent findings have been obtained in relation to performance, attitude or teachers' reactions. This is perhaps not unexpected since trying to tease out the effects of a few classes within schools from all the other factors is even more difficult than comparing whole schools. There has been relatively little systematic research, but a number of enthusiastic media reports. These could be examples of the Hawthorne effect (a kind of placebo effect) whereby the extra attention associated with any change seems to bring about a short-term improvement.

Behaviour and Emotional Development

One of the earliest arguments for co-education was that it provides an environment that is more realistic and conducive to social adjustment. As with academic achievement, the findings are contradictory with some studies appearing to show that co-education has an advantage as regards social development, while others have found that girls feel better integrated in single-sex schools. It has also been suggested that in mixed settings such factors as differential expectations and treatment by teachers, male dominance, and girls serving as a negative reference group come into play. With single-sex classes, some studies have reported positively on the more targeted teaching which is possible, but others on increased behaviour problems and resentment.

Views of Pupils and Teachers

Some studies have asked for the views of pupils and/or teachers with experience of both single-sex and co-educational schools. A ten-year follow up in Australia of two schools that had changed from single-sex to mixed found that teachers believed that both boys and girls preferred co-education. They reported that behaviour was worse for girls, but not boys, in co-educational schools, and girls in girls' schools were more competitive. In an earlier study we found that boys and girls with experience of both tended to prefer co-educational schools.

Parental Preferences

Most parents tend to choose schools on reputation and exam results, irrespective of whether or not they are single-sex or mixed, though for some parents, especially for cultural or religious reasons, it can be the over-riding concern. Students who had been co-educated appeared more satisfied with the experience. Nearly all who had attended mixed schools envisaged co-education also for their children. But of those who had been to single-sex schools, over a third of the females and half the males who expressed a preference did not want their children to go to such schools. Different age ranges were viewed differently, with separation between the ages of 11 and 16 more popular than for younger children or sixth-form studies. Some schools are advocating a 'diamond' pattern whereby the sexes are educated together in the early and later years but separately in-between. Parents' reactions to, and the performance of, these schools have yet to be tested.

Transition to University

Students from co-educational schools did not report social adjustment to the mixed-sex environment of university as being easier than those from single-sex schools. Both groups found 'having to look after yourself' the hardest thing, plus there were concerns about being separated from school friends and adapting to life on campus. Students from co-educational schools were just as likely to run into particular difficulties, and how these were perceived and coped with seemed to be very much a matter of personality.

Overall Assessment

While gender composition is one of the most obvious features of a school, and has attracted a lot of research, it is not necessarily an important factor in a school's success, however judged. Indeed the evidence seems to suggest otherwise. The main determinants of a schools' performance are the ability and social background of the pupils. It is only after these have been taken into account that school factors such as leadership and teacher expertise come into play. The gender mix is only one of the school factors and its effects, if any, are usually not strong enough to be detected by the methods of educational research. Whether to mix or separate the sexes in education is an issue which arouses strong feelings, but on which there is little conclusive evidence. Herein lies the paradox: people 'know' one or the other is better but cannot prove it.

Ultimately, the shape of any educational system running on parental preferences will be settled by the market. The independent sector has to respond directly to parental choices and here single-sex education is contracting. The government is attempting to create a market in the maintained sector also, and it remains to be seen whether this will lead to a change in the proportion of single-sex schools (currently about 12 per cent of the total). So far there has been no general clamour from parents for more, though there is a demand from particular parents, cultures and faiths. Most parents seem to be looking for a good school regardless of its gender mix.

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1. Introduction

- 1.1 While one of the most obvious features of a school is whether it is for one or both sexes, it does not follow that this will have a major impact on its success, however defined. The ability of the pupils, the socio-economic status of the parents, the leadership and teaching, reputation and income, and size, among other things, could all be expected to have a bearing, and they may not only act separately but also in various and varying combinations. Nevertheless, the issue of whether to mix or separate the sexes for schooling touches the emotions, and it has become one of the most researched topics in education.
- 1.2 In part, the passions have been stirred by the changing balance between single-sex and co-educational schools. In England, the first schools were just for boys. It was not considered necessary for girls whose role in life was perceived as quite different to go to school. Young ladies were taught at home by governesses. When the education of girls emerged as an issue in the latter part of the nineteenth century, it was thought obvious that it should be along the same lines as the existing schools – as separate sex schools. Occasional co-educational schools, like Bedales, were established as progressive experiments, but as recently as 1968 only three of the 273 leading independent schools were mixed (Smithers and Robinson, 1997).
- 1.3 When a national system of state secondary education began to evolve in the early part of the twentieth century it was assumed that educating boys and girls separately was the right thing to do, and most secondary schools were for one sex or had separate entrances to the two halves of a shared building. Some mixed schools were established particularly in rural areas where there were not enough children to sustain two schools, but single-sex education remained the norm through to the 1960s. Then with hardly any debate it was cast aside in the move to comprehensive education. In ending selection by ability at age 11 it was accepted that selection by sex should go as well. Boys' and girls' grammars and secondary moderns were mainly swept up into co-educational comprehensive schools except in those local authorities which declined to reorganise. By 2004 (DfES, 2004) only about one in eight of the secondary schools in England were single-sex - 226 for girls only and 184 for boys only - out of a total of 3,409 (including middle deemed secondary). As survivors from an earlier system they are a special sub-group. Over a quarter (29 per cent) of the present state single-sex schools are grammars among which they remain very much in the majority (75 per cent). A number of the single-sex comprehensives also had been grammars which have been allowed to continue to select up to half their intake.
- 1.4 There has also been a shift to co-education in the independent sector, again driven by external forces – in this case the market - rather than intrinsic merits. By 2005, of the 598 independent schools covering the secondary age range in England just under half - 215 girls' and 81 boys' - were single-sex, including those taking students of the other sex in the sixth-form (Smithers and Robinson, 2005). Single-sex education which was once taken for granted in the sector, now feels threatened. Girls' schools, in particular, have felt vulnerable, as boys' schools have opened their doors to girls.

- 1.5 Ironically, the first major researches on the topic in the UK were conducted by Dale (1969, 1971 and 1974) in reaction to the dominant single-sex education of the time and he came up with a number of advantages for co-education, not all of which have stood the test of time. Now the boot is on the other foot and single-sex education is seeking to make the case for its strengths. In particular, great play has been made in England of the dominance of single-sex schools in the league tables of examination results (GSA, 2006). In 2005, for example, all of the top ten independent schools were single-sex, nine of them all-girls. Five of the top ten maintained schools were also girls', with the other places occupied by three boys' and two mixed. But while some very academically successful schools are single-sex, it does not follow that they are successful because they are single-sex.
- 1.6 In America, the debate over whether to educate boys and girls together or separately has become even more highly charged. The fight for equality in education there began with an assault on the all-male colleges in higher education, which were eventually forced to admit women. (Salomone, 2003). Emerging from these struggles, and in the wake of the civil rights movement, equality of opportunity in education was equated with the sexes being educated together. This was enshrined in law in 1972 as Title IX, "no person in the United States, shall on the basis of sex, be excluded from participation in, be denied the benefits of, or be subject to discrimination under any educational program or activity receiving federal financial assistance." This was strongly supported by the feminists of the time, but has subsequently come to be seen by some as something of a millstone, impeding innovation.
- 1.7 A strand of single-sex education nevertheless continued in the United States among those schools not dependent on federal funding, mainly independent or Roman Catholic. During the 1990s two thorough reviews of single-sex and mixed education were published in the United States, one conducted by the US Department of Education (1993) and the other by the American Association of University Women (1998). They found very much the same thing: no striking differences, but some inconclusive pointers towards single-sex education. These findings were interpreted by the AAUW - committed as it is to equality through co-education - as showing that "you cannot conclude that separating by sex makes a difference" (Weinman, 1998). But the National Coalition of Girls' Schools (1998) - not surprisingly strongly in favour of single-sex education - put out its own press release under the headline, "Girls' schools offer valuable lessons for educational reform". The NCGS also countered by citing the results of the national Scholastic Aptitude Test which showed their students to be, on average, approaching 100 points above the mean. The clash between the AAUW and the NCGS shows just how vulnerable research evidence in education is to what people already believe and 'know'. The two groups use the same findings to support diametrically opposed views. Both are passionately committed to equality in education, but one sees this as more achievable through co-education and the other through single-sex education. Both are able to read into the evidence what they want to see.
- 1.8 The Headmasters' and Headmistresses' Conference (HMC) has commissioned the Centre for Education and Employment Research at University of Buckingham to help them to try to make sense of the seemingly confusing and contradictory

information in one of the most researched topics in education. Our approach has been to examine each of the main claims made for single-sex and co-education in turn and then try to come to an overall assessment. The main claims made for single-sex education are academic:

- that both boys and girls are more likely to achieve their academic potential in a single-sex environment;
- that both sexes, but particularly girls, are less likely to be put off subjects that they are good at and like because these subjects are perceived as being for the other sex.

1.9 The main claims for co-education are to do with personal and social development. It has been argued that the sexes growing up together, including in school, brings a number of benefits including:

- greater happiness, better behaviour and fuller emotional development;
- smoother transition to the mixed environment of university and life generally;
- and hence, parents and pupils prefer it.

1.10 Although single-sex is often treated as one category, it cannot be assumed that all-girls and all-boys schools are the same. If it is true, as it is sometimes claimed, that girls can achieve more in their own schools because the boys are not there to dominate, disrupt or distract, one has to wonder about the effects of doubling the number of disruptors and distracters as would be the case in all-boys schools - unless it is further claimed that this behaviour is only elicited in the presence of girls. You cannot have an educational system in which single-sex education is just for the one sex. Where possible in this report we make a three-way comparison between girls', boys' and mixed schools, but much of the research has been conducted from the point of view of girls.

1.11 The separation of the sexes in single-sex schools does not have to be absolute. Girls' and boys' schools can be on adjoining or nearby campuses with some lessons and activities shared. Other schools, for example, the erstwhile Leeds Grammar School for Girls and the Leeds Grammar School for Boys (both independent) have combined to form a school where the pupils are mixed to age 11, separated for secondary education and co-educated again in the sixth-form. From the other direction some hitherto co-educational schools have sought to reproduce the assumed academic benefits of single-sex education by introducing separate-sex classes in some subjects.

1.12 In the report we consider the main claims made in turn, drawing on the latest evidence from the United Kingdom and around the world. Having pointed out that the interpretation of research evidence in education tends to be subordinated to prior value commitments and knowing how emotionally charged the topic is and that not everyone will be pleased with what we report, perhaps we should lay out our

credentials. One of us is male and the other female, one of us went to a single-sex secondary school (PR) and the other a mixed-sex school (AS), and of our daughters (not with each other) one attended a co-educational school, another a single-sex school and the third switched from a single-sex school to a mixed school for her sixth-form studies, so hopefully our own value filters will not intrude too much.

2. Academic Achievement

- 2.1 The overall conclusion of the most recent reviews of the relative merits of single-sex and mixed-sex schools is that the jury is still out. Gill (2004, p117) writing in Australia concluded: “There is no conclusive answer for all young people, much less all girls or all boys ...but perhaps such an answer is no longer to be expected.” Salomone (2003, p 235), writing in America and predisposed to find a role for single-sex education, summed up her very thorough review of the research evidence by conceding: “There is no doubt that research comparing the relative merits of single-sex and co-education has not yielded definitive answers. But that admitted in itself says less about either approach than it does about educational policy and research.” A formal systematic review conducted for the U.S. Department of Education (Mael *et al*, 2005, p x) found: “As in previous reviews, the results are equivocal. For many outcomes, there is no evidence of either benefit or harm”. Thompson and Ungerleider (2004, p 16) writing from a Canadian perspective suggest, “the research we reviewed is too tenuous to support the organization of single-sex classrooms or schools.”

Determinants of School Success

- 2.2 These reviews from around the world bear out the picture that has been forming in the UK. The Equal Opportunities Commission conducted a major review in the early 1980s (Bone, 1983, p 2) which concluded: “The repeated absence of a strong indication in favour of either a girls-only environment or mixed environment through the great variety of research reviewed supports the conclusion that this aspect of schooling on its own has not been crucial.” Our empirical researches (Smithers and Robinson, 1995, 1997 and Robinson and Smithers, 1999) found that, “while some schools may be better than others, and while some pupils may do better in a single-sex or mixed environment, there is no general rule.... Effectiveness cannot be raised by merely segregating the sexes.” (Robinson and Smithers, 1999, p 47). Not accepting our conclusions, the Association of Maintained Girls’ Schools commissioned Elwood and Gipps (1999) to assess the findings independently. They must have been disappointed that, in what was largely a re-run of our evidence, Elwood and Gipps (p 51) repeated our conclusion that, “the performance of a school in terms of examination results has much less to do with whether it is single-sex or not than with other factors.”
- 2.3 There is thus an emerging consensus both in this country and elsewhere that there are no striking advantages to either single-sex or co-education. While frustrating this is entirely understandable. Schools are complex social organisations. A great variety of factors act and interact within and around them affecting the quality of education (which does not take place exclusively in schools). When attempts have been made to assess the impact of these various factors a strong and remarkably consistent finding is obtained: that by far the most powerful predictor of the examination performance of a school is the ability of the pupils who go there (Salmons *et al*, 1994; Gorard and Smith, 2004; Smithers and Robinson, 2005). Social background is another major determinant (McCallum and Demie, 2001; Bynner and Joshi, 2002). School effectiveness at best tends to be in third place, and the gender mix is but one aspect alongside, among other things, the school’s ethos, leadership and teaching quality, and spending per pupil. An early study by Thomas

et al (1994) found that single-sex schooling did appear to influence girls' GCSE results, but this showed up only when this was the sole school variable in the analysis, suggesting that it may have been a proxy for school type.

NFER Research

- 2.4 In trying to tease out any effects of gender mix on school or pupil performance it is essential, therefore, to control for ability, social background and type of school. This is hard to do. One of the best attempts to date is that of Spielhofer *et al* (2002, 2004) at the National Foundation for Educational Research. They drew on national data for England to compare the performance of pupils in the GCSE exams in 2001 with their results in the Key Stage 2 tests of 1996. Data were available for 369,341 pupils from 2,954 maintained mainstream schools in England (2,798 comprehensives and 156 grammars). About one in ten of the comprehensives were single-sex (284 out of 2,798), compared with three out of four grammars (117 out of 156). The core of the results is reproduced in Chart 2.1.

Chart 2.1: School Type and GCSE Results, 2001

School Type	Single-sex and Co-education Schools Compared
Girls' Comprehensive	Girls in single-sex schools achieve slightly better results at GCSE (about a quarter of a grade), with the effect being most noticeable for the girls of lower prior achievement.
Boys' Comprehensive	No difference
Girls' Grammar	No difference
Boys' Grammar	Boys in single-sex grammar schools achieve slightly better results (3.5 GCSE points more on average).

Source: Based on Figures A10 and A11 (page 65) in Spielhofer, T., O'Donnell, L., Benton, T., Schagen, S. and Schagen, I. (2002). *The Impact of School Size and Single-Sex Education on Performance*. LGA Research Report 33. Slough: National Foundation for Educational Research.

- 2.5 Spielhofer *et al* (2004) found that taking attainment at the end of primary schooling into account girls in single-sex comprehensives did slightly better than those in co-educational comprehensives, with the difference disappearing among those who scored at Level 5 and above in the Key Stage 2 tests. In grammars, no difference was detected. For boys, however, apart from a slight, non-significant, difference in favour of single-sex schools in the lower part of the Key Stage 2 range, there was no difference between boys in single-sex and co-educational comprehensive schools. But, again in contrast to the girls, a difference was found, in favour of single-sex schools among the grammars. Curiously, both girls and boys pupils attaining Level 6 at Key Stage 4 appeared to achieve better GCSE results in comprehensives than in grammars.
- 2.6 While the research is impressive, it cannot be taken as conclusive. The contrasting results for girls and boys between comprehensive and grammar schools suggests that the influence of mixing or separating the sexes is not of over-riding importance. Other variables which were not measured, for example, socio-economic status, ethnic background or the extent of homogeneity in the school types could be exerting a greater influence. The dataset did not include any information on ethnicity and for religious and cultural reasons high achieving girls from the

minorities could make up an above average proportion of the intake to single-sex schools. The term comprehensive embraces a wide range of schools including former grammar schools which can select up to half their intakes. Spielhofer *et al* (2004) also draw attention to the girls' schools being over-subscribed with their pupils sometimes travelling a considerable distance to attend suggesting "that they are deliberately chosen by parents who are informed and interested in their children's education." Or to put it another way, they will have to select their pupils, if not academically then on some other criterion.

U.S. Systematic Review

- 2.7 The United States Department of Education (Mael *et al*, 2005) has recently reviewed 43 sets of results (including Spielhofer's) comparing single-sex and co-education in terms of academic achievement, either general or in particular subjects. The studies were all that remained from the initial search strategy which yielded 2,221 papers. This was after the criteria had had to be relaxed in order to include all correlational studies with statistical controls, otherwise in the absence of experimental research virtually none would have remained.
- 2.8 Of the 43 studies included, 15 are shown as having found positive achievement effects for single-sex schools, which appears encouraging for their advocates. But when unpacked the details seem less secure. In their tabulation Mael *et al* have totalled the findings for the various subjects areas and since the same study may include several, there is multiple counting. In fact, four of the positive findings come from Lee and Bryk (1986), four from Riordan (1985, 1990, 1994) and three from LePore and Warren (1997), all drawing on the same datasets from Catholic schools in the US. Of the other four: another involved a comparison of Catholic schools (Caspi, 1995); Carpenter and Hayden (1987) conducted a study in Queensland and Victoria; Woodward, Fergusson and Horwood (1999) compared schools in New Zealand; while the fourth was the Spielhofer *et al* research in England.
- 2.9 Remarkably, none of the three main groups identified above, themselves, still claim a general positive effect for single-sex education. Lee (1998) wrote, "I do not think the research on single-sex schooling (my own and others) should be interpreted as favoring the separation of boys and girls for their education." She seems to have been led to this conclusion by heavy criticisms from Marsh (1989) and her own failure to reproduce her results. Marsh (1989) pointed out that Lee and Bryk had not sufficiently taken into account pre-enrolment differences and had applied a weak test of statistical significance. When he re-analysed their data he found only three significant effects by school type out of the original 74, and these on relatively unimportant variables. Lee, herself, attempted to replicate her findings for Catholic schools on independent schools, the other sector in the U.S. where single-sex/co-educational comparisons are possible. But she found, "no consistent pattern of effects for attending either single-sex or co-educational independent schools for either boys or girls in independent schools." She makes the very interesting point that since there was no clear pattern to the findings she could not publish these results unlike those she had obtained for Catholic schools. It is probable, therefore,

she argues that the “published studies represent a biased sample of research on any topic.”

- 2.10 Riordan (1998, 2002), the other researcher contributing four of the positive findings, has also modified his stance. He now takes the view that single-sex schools work for some pupils in some circumstances and most likely for reasons less to do with separating the sexes than with what that separation says about the school. In his more recent research he has found that while “the academic and developmental consequences of attending one type of school versus another are typically insignificant for middle-class or otherwise advantaged students”, effects are detectable for “students who are historically or traditionally disadvantaged.” Gender, socio-economic status and race interacted. He found that the impact of attending a single-sex school was greatest for African-American and Hispanic females from low-income homes, somewhat less for their male counterparts, less still for white middle-class females, with no differences found for white males or affluent students regardless of gender or race. He suggests that the important thing about single-sex education in the American context is what it tells you about the parents’ and pupils’ concern for and support for education: “in selecting a single-sex school ... students reject the anti-academic norms that permeate most public schools attended by at-risk youth. They make a pro-academic choice.”
- 2.11 Riordan and his colleagues (Baker *et al*, 1995) have also made the very interesting discovery that higher achievement in single-sex schools tends to be found only in national educational systems where such schools are relatively rare. They compared single-sex schools in four countries with different single-sex enrolments: Belgium (68 per cent), New Zealand (48 per cent), Thailand (19 per cent) and Japan (14 per cent). They observed that the smaller the proportion of single-sex schools, the more there would be an achievement differential. This is supported by results from Ireland, both north and south, where pupils are more evenly spread between single-sex and co-educational schools, and academic achievement appeared unaffected by which was attended (Daly, 1996; Hannan *et al* 1996; McEwen *et al*, 1997). Riordan (1998) suggests that when single-sex schools are rare, “the pro-academic choice made by parents and students will result in a more select student body, which will bring with it heightened academic demands.”
- 2.12 The other main contribution to the 15 positive findings for single-sex education reported by Mael *et al* may have been misclassified. Although LePore and Warren (1997) are listed three times as having found higher maths, science and verbal achievement for boys in boys’ US Catholic schools compared to their counterparts in co-educational schools (but no differences for girls), they report that this apparent effect can be attributed to pre-enrolment differences in measured background and prior achievement. They conclude “we find no evidence that Catholic school boys or girls learn more than their co-education Catholic school peers during high school.” Riordan (1998) has suggested that the students in US Catholic schools have become more affluent since his early research and the failure to find differences in the 1990s is consistent with his hypothesis that single-sex education is mainly beneficial to the disadvantaged.

- 2.13 Of the other four studies, Spielhofer *et al* (2002, 2004) has already been discussed. Carpenter and Hayden (1987) in Australia found that the major determinant of girls' academic achievement among those that they measured was mother's educational level, but socio-economic status and the variety of schooling available could heighten or minimize the effects of school type. Woodward, Fergusson and Horwood (1999) found that boys and girls in single-sex schools appear to fare better than their co-educated counterparts, but the achievement difference in English disappeared when parental background, school behaviour and cognitive ability were statistically controlled, though some differences remained for a basket of subjects. Caspi (1995) found girls in single-sex schools tended to do better than those in mixed schools, but there were differences according to whether the girls were 'early-maturing' or 'late-maturing'. These occasional positive findings have to be set alongside the 27 sets of findings included in the Mael *et al* (1995) analysis of educational achievement that yielded either no or mixed differences between single-sex and co-educational schools (one found positively for co-educational schools). In the circumstances, Mael's conclusion that "the results are equivocal" seems eminently reasonable.

Boys' Schools

- 2.14 Mael *et al* (1998) also noted that "males continue to be under-represented in this realm of research." But one study from the boys' viewpoint that is often cited was conducted by Able (2000), headmaster of Dulwich College, and reported to the International Boys' Schools Coalition. It involved comparing the examination results in 1998 of ten triplets (two more added in 1999 when the analysis was repeated) of boys', girls' and co-educational independent schools in England, matched as far as possible on intellectual, socio-economic and day/boarding grounds. He reported that "the advantage of single-sex schooling is even greater for boys, in terms of their academic results, than for girls". However this study like many others suffers from having no information on the pupils' prior ability so we cannot know how well schools within the triplet were matched. Other studies have also reported that boys do better in single-sex schools including Lee and Bryk (1986), LePore and Warren (1987), Riordan (1985, 1990, 1994), and Woodward *et al* (1999) but the limitations in these studies have already been discussed. Against the claim a number of other studies have found that boys appear to achieve more academically when co-educated (Baker *et al*, 1995; Lee and Lockheed, 1990; Wong *et al* 2002).

Beliefs and Evidence

- 2.15 There is thus little decisive evidence for either girls or boys achieving more in single-sex or co-educational schools. But it is still believed that there are effects. Smith (1996) in Australia studied the changes in a boys' school and a girls' school that were brought together to form two co-educational schools. He found that there were no academic disadvantages for either sex in the change (but there were social advantages). Nevertheless, the teachers believed that girls did less well in the 'male' subjects. When they were shown an analysis of the actual results they were surprised. They explained that their perceptions had been "influenced by the community belief that co-educational schools are 'bad' for girls' achievement, especially...in male-dominated subjects." Another belief is that where there is

choice girls are more likely to embark on ‘male’ subjects and boys, ‘female’ subjects when they attend single-sex schools. It is to an exploration of that claim we now turn.

Resumé

- 2.16 Comparisons of girls’ and boys’ achievement by school type come out more often in favour of single-sex schools. But the differences tend to be small and inconsistent and open to other explanations, for example, the ability and social background of the pupils. Commentators around the world have concluded that while differences may be found between single-sex and co-educational schools those differences are unlikely to be due mainly or even substantially to the fact of being single-sex or co-educational and that separating the sexes is not a recipe for raising educational performance.

3. Subject Choice

3.1 As with achievement, it is widely believed that single-sex education is beneficial for subject choice. It is an impression which its advocates are keen to foster. In the United States, the website of the National Association for Single Sex Public Education makes the bold claim that “single-sex schools break down gender stereotypes”. In the UK, the Girls’ Schools Association frequently makes similar assertions. In a widely-reported speech (eg Lightfoot, 2004) to its 2004 annual conference, Cynthia Hall, the association’s president that year, argued that girls are much more likely to specialise in science, maths and languages when they are educated separately, because boys undermine their confidence in mixed classes. Despontin (2006a), another president of GSA, wrote, “in a single-sex school there is no stifling, archaic gender-stereotyping of subjects.” Bridgett (2006), director of communication and development for the Girls’ Day School Trust, has claimed, “on average, twice as many girls at GDST schools chose physics as the national average.” These would be powerful arguments for single-sex education (for girls) if they were true, but are they true in the sense that differences in subject choices result from the separation of the sexes in education?

Gender and Subjects

3.2 There seems little doubt that, on average, boys and girls do tend towards different subjects and attain different standards. But in trying to tease out the impact of one sex upon the other it is important to distinguish participation from performance. Chart 3.1 shows both take-up and outcomes in the 2005 A-level examinations.

Chart 3.1: Participation and Performance at A-level¹ in 2005

Subject	Entries			% A Grade		
	Female	Male	F/M	Female	Male	F/M
Computing	816	6,426	0.13	14.2	14.1	1.01
Physics	6,197	21,922	0.28	34.2	27.0	1.27
Other Science Subject ²	1,188	3,226	0.37	19.5	21.5	0.91
Further Maths	1,695	4,238	0.40	60.2	57.2	1.05
Economics	5,730	11,895	0.48	35.1	29.0	1.21
Sport/PE	7,594	12,532	0.61	18.8	9.0	2.09
Maths	20,178	32,719	0.62	43.6	39.0	1.12
Art and Design	27,931	12,523	2.23	30.7	24.3	1.26
English	59,526	26,332	2.26	20.7	20.7	1.00
Religious Studies	11,806	5,053	2.34	25.7	24.3	1.06
Expressive Arts/Drama	13,321	5,079	2.62	17.4	14.1	1.23
Psychology	37,237	12,798	2.91	20.0	11.4	1.75
Sociology	20,189	6,528	3.09	20.1	15.0	1.34
Home Economics	1,134	51	22.24	19.3	5.9	3.27
All Subjects	424,594	359,284	1.18	23.9	21.5	1.11

1. Joint Council for Qualifications

2. Not including biology, chemistry or physics.

Source: Joint Council for Qualifications, National Provisional GCE A Level Results - June 2005, (All UK Candidates).

- 3.3 If one looks at the relative numbers of boys studying English and girls, physics, it may appear that some had been put off by the opposite sex, but when it comes to the results girls, in fact, do better in physics and boys no worse in English. Girls, in fact, tend to do better in most subjects, including those where they are in a minority. This has an important bearing on school performance tables since broadly speaking the higher the proportion of girls and the brighter they are, the better are the chances of a school occupying a top position. Hence the prominence of selective girls-only schools in the league tables.
- 3.4 But it clear also from Chart 3.1 that where choice is allowed boys and girls tend to gravitate towards different subjects. Nearly eight times as many boys as girls sat computing, three and a half times as many physics, and over twice as many further maths and economics. In contrast, leaving aside home economics which hardly anyone takes any more, about three times as many girls as boys took psychology and sociology, and over twice as many art and design, English, religious studies and expressive arts/drama. Generally, boys tended to opt for the more impersonal end of the subject spectrum and girls the people-oriented.

Chart 3.2: University Subject Areas of Students with A-Level Physics

Subject Area	Female	Male	All ¹
Physics	6.2	8.4	7.9
Physics Related ² /Combinations	2.4	2.1	2.1
Other Physical Sciences	9.5	7.0	7.6
Total Physical Sciences	18.1	17.4	17.6
Medicine and Dentistry	23.9	8.2	11.8
Biological Sciences	9.3	3.9	5.2
Veterinary Science & Agriculture	3.4	0.6	1.2
Maths & Computing Sciences	8.9	18.1	16.0
Engineering & Technology	12.1	29.2	25.2
Architecture, Building & Planning	2.3	2.4	2.4
Social Studies	3.8	4.2	4.1
Business & Administration	2.7	3.4	3.3
Creative Arts & Design	2.2	2.0	2.0
Other ³	4.0	2.3	2.7
Combinations	9.2	8.2	8.4
Mean N 1996-2005	6,381	21,096	27,476

1. Means for 1996–2005.

2. Materials science and astronomy.

3. Includes mass communication and documentation; languages and related disciplines; historical and philosophical studies; and education.

Source: Smithers, A. and Robinson, P. (2006). *Patterns and Policies in Physics Education*. Buckingham: The Carmichael Press, Chart 6.3, page 33.

- 3.5 Moreover, if we look beyond A-levels to examine what male and female students who have attained a seemingly similar platform for university by passing A-level physics choose to study, we find that they go in different directions little influenced by the type of school to which they went. Chart 3.2 shows that even fewer girls read physics at university than take it at A-level. Irrespective of school type, female

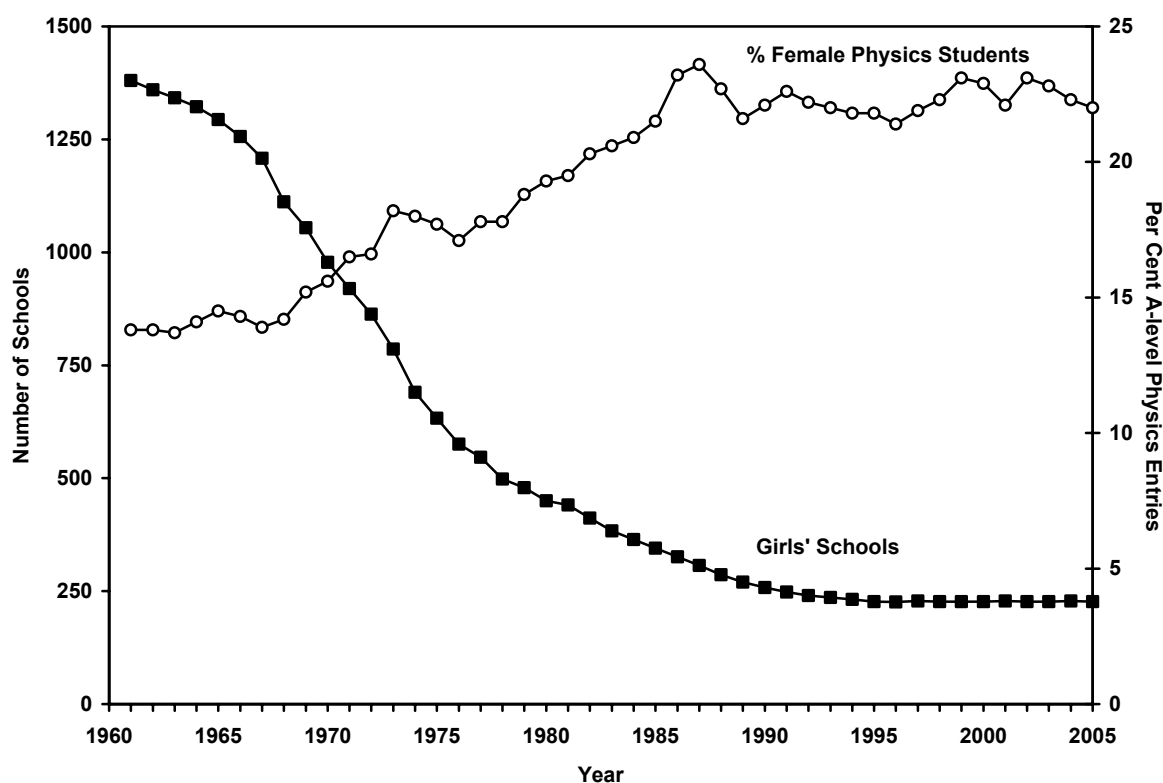
students mainly use their physics A-level as an entry qualification to medicine and dentistry, veterinary science and the biological sciences. In contrast, male students opt predominantly for engineering and technology, and maths and computing sciences.

- 3.6 What leads to these different choices is a matter of considerable dispute, with some emphasizing biological and psychological differences and others the script society writes for behaviour. From the earliest years there are small differences, on average, in verbal abilities with the advantage to girls, and in numerical and spatial abilities with the advantage to boys (Maccoby and Jacklin, 1974). It is important to recognise that these are not absolute differences, but rather small differences in the means of distributions that overlap to a large extent. Nevertheless, in the OECD's (2004) comparisons of the mathematical literacy of 15-year-olds in 40 countries, boys obtained higher scores in all but two (Iceland and Thailand). In sharp contrast, girls were ahead in all 40 countries in reading.
- 3.7 It could be, therefore, that the sexes are predisposed to different subjects. The contrary view is that some fields of study have become artificially associated with males and others females, and this leads to both sexes writing themselves off unnecessarily from what they might otherwise enjoy and be good at. Societal 'scripts' can and do change. Whereas just twenty-five years ago it was still unusual for a girl to go to university, females are now in the majority. There is a strand in educational thinking which sees the different subject choices of boys and girls as *prime facie* evidence of sexism stemming from outdated sex roles. It is imperative, therefore, to even up the outcomes. Whatever the reasons for the different subject choices of girls and boys, they are evidently deep-seated and will not be easy to change, whether primarily biological or societal.

Single-Sex Schools

- 3.8 A major claim for single-sex schools, particularly girls' schools, is that they are effective in combating gender stereotyping. If they were a major influence one might have expected the proportion of girls studying, say, physics to have gone down as schooling switched from single-sex to co-educational. But, in fact, the reverse seems to have been the case. In Chart 3.3 we plot girls entries to A-level physics as a proportion of the total from 1961 to the present alongside the number of girls' schools in the maintained sector. Over that period, the number of girls' schools fell from 1,380 to 226, while the proportion of physics entries from girls actually rose by over half (from 14 to 23 per cent).
- 3.9 Advocates of single-sex schools will protest that this is not fair, and nor is it. Many other changes were taking place during those years and it cannot be inferred that the move away from single-sex schools actually promoted physics uptake by girls. The most likely explanation of the correlation is the increased opportunities that the comprehensive reform of state secondary education offered. But if we stand the argument on its head by the same logic neither can it be claimed that any higher proportion of girls studying the sciences in single-sex schools is necessarily due to the fact of them being single-sex. As with achievement, it could be that pupil ability, parental expectations and teaching quality are much more important than gender composition.

Chart 3.3: Girls' Schools and A-level Physics Entries



Sources: UK A-level physics entries from Smithers and Robinson (2006) and number of schools for England from annual volumes of Statistics of Education: Schools (DFE and DfES); up to 1977 schools data include Wales.

3.10 In considering whether there is an actual effect of separating the sexes on subject choices it is necessary first to distinguish attitudes from behaviour and then to be sure that any differences are not due to associated factors rather than the separation itself.

Attitudes and Choices

3.11 Several studies have obtained evidence that girls' and boys' attitudes to subjects are apparently influenced by the gender composition of the school. Stables (1990), for example, found in a questionnaire survey of 2,300 13-14 year-olds in 13 single-sex and mixed comprehensive schools that there were statistically significant differences between the school types in attitudes towards the sciences. Boys in single-sex schools were more likely to say they liked biology and girls in single-sex schools were more likely to say they liked physics and chemistry. But the differences between girls and boys far outweighed the differences between single-sex and co-educational schools. And it was the boys who were more likely to be influenced by co-education than the girls. Stables' sample was of 13-14 year-olds. Colley *et al* (1994) obtained an interesting age difference. In their sample of 11-12 year-olds they found that children in single-sex schools were less likely than those in co-educational schools to go along with subject stereotypes, but this was less evident among 15-16 year-olds where gender rather than school type accounted for the observed differences.

- 3.12 A frustrating but commonly observed phenomenon in social psychology is that attitudes do not always predict behaviour. When it comes to subject choices, themselves, there is little solid evidence for a school-sex effect. In an early study, Smithers and Collings (1981) found no difference in the likelihood of high ability girls choosing the sciences and maths in single-sex or co-educational schools. What mainly led to the differences between schools was the proportion of high ability girls within them.
- 3.13 One striking claim made for single-sex education was made at a recent Headmasters' and Headmistresses' Conference. At its annual meeting in Dublin in 2003, Caroline Gipps, educational researcher and at that time deputy vice-chancellor of Kingston University, commented that "English was a dying subject among boys in mixed comprehensive school sixth-forms, because it was increasingly perceived to be a 'girls' subject." This was widely reported in the newspapers (eg Smithers, 2003 - no relation) and accepted by those attending. But the evidence is shaky. English (in its various forms) is, in fact, the second most popular A-level for boys (after maths). Grammar and independent schools (which include most of the single-sex schools) together contribute just over a fifth of the total, so it hardly seems as if the subject is dying in mixed schools. When asked for the data, Gipps was kind enough to explain, "my comment was based, not on actual data, but a conversation I had with an exam board staff member" (Gipps, 2006).
- 3.14 It remains an open question, therefore, whether there is an effect of school-sex composition on A-level choices. To get the actual picture will take a specially commissioned survey. The examination boards publish examination results by type of school attended (as one of 11 categories) and also by sex but not as cross-tabulations, which would have to be commissioned. That would at least get the raw participation figures clear, but their interpretation would depend on digging deeper into the associated factors such as ability, social background and school effectiveness.

Other Studies

- 3.15 One researcher who has looked particularly closely at school influences on subject take-up is Daly. In a series of papers with co-workers he has investigated participation in maths and the sciences in Northern Ireland, Wales, Australia and England (Daly, 1995; Daly, 1996; Daly and Shuttleworth, 1997; Ainley and Daly, 2002). In no case did he find that attendance at a single-sex school, of itself, increased maths and science take-up by girls, any apparent differences being attributable to other factors. (In fact, the one difference Daly, 1995, found was that girls in single-sex schools participated less in science courses.) Marsh (1991) similarly found no differences in maths and science participation between single-sex and co-educational schools once ability, socio-economic status and sex had been taken into account.
- 3.16 Two studies which have obtained evidence of an effect of school-sex on subject choice are those of Spielhofer *et al* (2002) and Lee and Bryk (1986). The Spielhofer study looked at the GCSE examination, where opportunities to choose are limited. They found that girls in single-sex schools are more likely to take the separate sciences and less likely to take food technology than their co-educated counterparts,

but this was also true of the boys. This pattern of entries could therefore reflect the ability of the pupils and the courses provided by the schools rather than sex separation itself. In the Key Stage 3 tests at 13-14 both boys and girls in single-sex schools were more likely to have been entered for the higher tier tests, perhaps indicative of higher ability. Lee and Bryk (1986) found girls in single-sex high schools were more likely to enrol in mathematics, but so also were boys who were in addition more likely to enrol in physical sciences, so it is hard to interpret in terms of sex-stereotyping.

Does It Matter?

3.17 The evidence for the popular belief that single-sex education helps to combat the sex-typing of subjects does not seem very strong. But does it actually matter that girls and boys seem inclined to go in different directions? It clearly is an issue for some who see it as *prima facie* evidence of sexism. Gender and Science and Technology Conferences (GASAT) have been held about every two years since 1981 to discuss how to deal with it. Parker and Rennie (2002) set out the features for the gender-inclusive science curriculum that GASAT has agreed:

- “firstly, is sex equitable in terms of the ways it is communicated through language, illustrations and examples;
- secondly, it emphasizes social and environmental applications;
- and, thirdly, *it is structured in ways which minimize students’ capacity to choose against scientific disciplines.*” (our italics).

3.18 While it seems sensible that teachers should use applications and illustrations that appeal to the whole range of pupils, it is hardly inclusive to narrow the gender gap in science by not allowing girls any choice. The research of Gray *et al* (2004) points to another way in which gender gaps could be reduced. They drew on a national data set to track the progress of pupils from Key Stage 2 to GCSE. They found that girls made greater progress than the boys in about half the schools and there was no difference in the other half (boys improved more in only about 0.1 per cent of schools). But, interestingly, they also grouped schools according to whether the schools performed above, around or below expectations. On this basis, the schools in which the girls made the greater progress tended to be the higher performing ones overall, and those where the gender gap was less tended to be the lower performing. That is, schools which appeared to be doing well in narrowing the gender gap may not have been stretching their pupils as much those in which it was increasing.

3.19 Stressing equality of outcome as an objective, therefore, may lead to demands to compel students to take subjects beyond which it is reasonable to ask them to do so or looking kindly at those schools which are not stretching the pupils. Where is the harm in letting girls be girls and boys be boys when it comes to choosing the subjects to study?

Resumé

3.20 As with achievement, there is no conclusive evidence for the popular belief that separating the sexes for secondary education reduces the sex-stereotyping of

subjects. It is clear that girls and boys when able to choose, irrespective of school type, tend to opt for different subjects. But the notion of sex-stereotyping can itself be questioned since it implies that subject choices are being driven externally rather than from within. Given that what leads a person to choose particular subjects is deep-seated, whether mainly biological or societal in origin, and given the many ways in which schools vary of which the gender mix is but one, it is perhaps not surprising that no simple relationship has been discovered. This leaves the way open for persuasive narratives to be constructed in conference speeches and fed by newspapers eager for eye-catching stories.

4. Separate Classrooms

- 4.1 Separating the sexes for teaching does not have to mean different schools. There have been a succession of good-news stories suggesting that separate classes for boys and girls in otherwise co-educational schools can improve the education of both sexes in a variety of ways. Originally put forward as a way of trying to encourage more girls into the physical sciences, it is now being seen as a means of boosting boys' achievement. The pressure on schools through targets and league tables has encouraged a number to experiment with single-sex classes, and the approach is being tried out in countries across the world. Trials have also been reported from Australia, U.S., New Zealand, Sweden and elsewhere.
- 4.2 Notwithstanding the upbeat newspaper accounts from a number of schools, the observed effects of separate classes on subject choices and educational achievements are inconclusive, with no compelling general evidence as to the benefits for either sex. At first sight, it would seem to be a topic that lent itself readily to experiment. It might be thought that something analogous to a drugs trial could be conducted with pupils randomly assigned to single-sex or mixed classes. However, apart from the ethical considerations, it is difficult to approach the ideal of varying just one factor at a time. Some teachers may be more enthusiastic about teaching single-sex classes so the delivery could be different; the arrangement could cut across the normal sets within the school affecting the children differently; and the novelty of the arrangement could be expected to have an effect. Studies of performance of all kinds are vulnerable to what has become known as the 'Hawthorne Effect' (a kind of placebo effect), named after attempts in the 1920s at the Hawthorne works of the Western Electric Company to raise productivity by varying the working conditions systematically. To the great surprise of the lead researcher, Elton Mayo, all the treatments seemed to result in improvement. These findings led to the founding of the human relations school of management, but pulled the rug from under experiments seeking to regard people as 'subjects' responding to 'experimental treatments'.
- 4.3 It is difficult to summarize the findings of research on single-sex classes, partly because they have been inconsistent and partly because the researchers have attempted to measure different things. Among the criteria adopted for judging their effectiveness have been academic achievement, A-level choices, attitudes to subjects and self-concepts (Jackson, 2002). Contradictions occur in who appears to benefit most. Robinson and Gillibrand (2004), for example, studied a school in which 13-year-olds took science single-sex classes for a whole year. They found some benefits for higher-set girls, but not for lower-set pupils who complained that single-sex teaching deprived them of social interaction with the other sex. In contrast, in America, the thrust of the findings has been that separate classes have most impact on disadvantaged students (Salomone, 2003). In a major study in Australia it was the researcher who made a 180-degree turn. Rowe (1988) in reporting the findings of a study in Victoria where boys and girls had been randomly assigned to maths classes suggested that pupils in single-sex classes improved more than those in mixed classes, but in a re-analysis eight years later Marsh and Rowe (1996) interpreted the data as showing that, if anything, it was the girls in co-educational classes who fared better.

- 4.4 Reports of pupils' attitudes to single-sex classes are similarly discrepant. Crump (1990) reported that boys in single-sex science classes showed "a lingering resentment". In contrast, a study by the National Foundation for Education Research (Sukhandan *et al*, 2000) found that boys were generally positive and it was the girls who were unconvinced. A possible explanation is that the first study was designed mainly to help girls and the second, boys. Those put in single-sex groups for the benefit of the other sex may have become aware of this and reacted against it. Teachers also noted different reactions from different classes in the same school. In a study of teaching modern foreign languages in single-sex-classes, Barton (2002) found that the teachers' experiences of all-boys classes varied considerably with, in some cases, the targeted provision improving effectiveness, but in others behaviour deteriorating to the point where it got in the way of learning.
- 4.5 One reason for the lack of coherent findings from these experiments is that they tend to be of short duration. Younger and Warburton (2002) have conducted a study in one school in England where single-sex classes have been the norm since the school opened in the 1970s. In spite of this approach being seen by the school as enhancing performance, girls in most years, in line with the national figures, were more likely to achieve five good GCSEs. The school argues that this is because single-sex classes benefit both sexes and contribute to the overall results being above the national average. Plausible but unproven.
- 4.6 More recently the same authors have completed a four-year study involving over 50 schools for the Department for Education and Skills on raising boys' achievement (Younger and Warrington, 2005) in which, among other things, they examined the efficacy of single-sex classes in co-educational schools. They concluded that "as with other intervention strategies, there is the need for some caution in any analysis. Such single-sex classes are not a panacea in themselves." They found evidence that boys and girls can feel more at ease in single-sex classes, feel more able to interact with learning and feel free to show real interest without inhibition. There can be positive effects on achievement particularly for boys in modern languages and English, and girls in the sciences and maths. However, in some schools boys-only classes became very challenging to teach. Also "the stereotyping of expectation established a macho regime which alienated some boys". Even in the most successful schools both boys and girls said they did not want to be in single-sex classes for all lessons. Younger and Warrington concluded that for single-sex classes to work a series of pre-conditions have to be met: use of a proactive and assertive approach in the classroom; development of a team ethic; a high profile with senior managers and active promotion of the intervention to all staff, parents and governors – which is hardly a simple recipe.
- 4.7 All-told research on separate classes for the sexes in co-educational schools yields even fewer generalisations that do comparisons between single-sex and co-educational schools. (Though there can interesting outcomes in particular circumstances.) This is not surprising because individual classroom effects are even more difficult to tease out since they have to be distinguished from all the other school influences. Riordan (2002) reviewing the field in America makes the point that it is the academic culture and ethos of the whole school that is important and it is doubtful whether single-sex classes within an otherwise co-educational school

could be expected to have a major impact, especially as mixing or separating the sexes in the schools themselves does not appear to have consistent effects *per se*.

Resumé

- 4.8 There has been enthusiastic reporting of the benefits of single-sex classes, but research worldwide has been inconsistent and inconclusive. This reflects the difficulty of generalising across different groups of children of different abilities and personalities in different subjects at different ages with different teachers. A Hawthorne (placebo) effect - which gradually fades - could also be operating. Moreover, it is difficult to isolate classroom effects from school effects and different criteria have been used in the comparisons, including subject choices, educational achievement, attitudes, and self-concept.

5. Personal and Social Development

- 5.1 Irrespective of impact or not on academic achievement and choices, single-sex schools and co-educational schools can look and feel very different, and this raises the question of whether there are any detectable effects on personal and social development.

Early Research

- 5.2 The pioneering research in the field was conducted by Dale (1969, 1971, 1974) over a 26-year period when the norm was single-sex education, and co-education was struggling for a hearing. He summarized his findings on grammar schools in England as demonstrating that, “the average co-educational grammar school is a happier community for both staff and pupils than the average single-sex school; it has been equally demonstrated that this happiness is not at the expense of academic progress” (p 273). This advantage of co-educational schooling emerged more strongly for boys leading Dale to offer, “a cautious summing up would be that the progress of boys is probably improved by co-education while that of girls is not harmed” (p 269). His theme that co-education provides a more realistic and socially authentic environment has entered popular consciousness. But more recently his interpretation of the findings has been challenged. Salomone (2003, p 201) quotes with approval a commentator who suggested that Dale’s analysis is a “sexist programme in the extreme”, trading off girls’ achievement for “better adjustment” and “a more mature attitude” on the part of boys.

Quantitative Studies

- 5.3 There have been a number of attempts to compare quantitatively the personal development of pupils in single-sex and co-educational schools using psychological measures of constructs such as self-concept, self-esteem and locus of control. In Mael’s *et al* (2005) systematic appraisal, 18 studies passed the rigorous selection criteria, but in our view two do not strictly belong (those of Cipriani-Sklar, 1996 and Cuddy, 2000). Of the 16 remaining, we feel that two have been misclassified: Lee and Bryk (1986) as showing positive effects when none were reported; and Marsh *et al* (1988) entered as favouring single-sex when the reverse was the case. When these are corrected the overall picture comes out as four finding in favour of single-sex schools, three in favour of co-educational schools, and nine detecting no differences.
- 5.4 In terms of self-concept (what a person holds to be true about his or her personal existence) three of the five studies did not find differences (Lee and Bryk, 1986, Marsh, 1991, and Lambert, 1998). But Riordan (1990) found that in comparing single-sex and co-educational Catholic high schools in the United States white females in single-sex schools tended to have higher self-concepts taking into account ability and home background. However, no differences were found for males or at-risk students of either gender. A contrary indication comes from Australia where Marsh *et al* (1988), in comparing self-concepts in two single-sex schools that merged to form two co-educational schools, obtained higher scores for both boys and girls post-amalgamation.
- 5.5 The findings for self-esteem (pride in oneself) are similarly mixed. Of the six studies listed by Mael *et al* (2005), one found it to be higher in single-sex schools,

two in co-educational schools, and three found no difference. Brutsaert and Bracke (1994) in Belgium found higher self-esteem for boys in single-sex junior schools compared with their contemporaries in co-educational junior schools, but no difference for girls. They suggested that the higher self-esteem of boys was due to the presence of more male teachers. Sanders (1992) also studied elementary schools (in Milwaukee), but in contrast to Brutsaert and Bracke found that self-reported self-esteem was higher in a co-educational environment, in this case for African-American males. Riordan (1994) also found that black and Hispanic males developed higher self-esteem in co-educational than in single-sex settings, but no difference was found for girls.

- 5.6 Riordan (1990, 1994) further found differences in locus of control (the extent to which a person feels in control of his or her life) between single-sex and co-educational schools. He found that at-risk males tended to feel more in control of their lives in single-sex schools. He also found effects favouring single-sex schools for both male and female black and Hispanic students.

Transition to University

- 5.7 Another widely held belief is that co-educational schooling is more like real life so adjustment is easier to the mixed environment of university. This received some support from an early study by Harris (1986) who carried out a survey of first-year Australian university students. She found that most, especially those who had attended one themselves, believed that co-educational schools lead to a more natural attitude towards the opposite sex.
- 5.8 In a study which we conducted among first-year university students in England (Smithers and Robinson, 1997), we found, as Chart 5.1 shows, that both young men and young women tended to report somewhat more difficulty in adjusting socially to a university if they were from a single-sex school, but the differences were not statistically significant.

Chart 5.1 Ease of Adjustment

Sex	School Type	% Expressing Difficulty in Adjusting to University	
		Academically	Socially
Girls	Single-sex (N=35)	42.8	31.4
	Co-ed (N=139)	37.7	23.0
Boys	Single-sex (N=29)	44.8	24.1
	Co-ed (N=90)	41.1	18.8

Source: Robinson and Smithers (1999), Table 12, page 41.

- 5.9 The failure to establish a link reflects the many things that can affect the transition to university. Most new students experienced challenges, but how they dealt with them was more a matter of personality than type of school attended, as the following selection of comments from the students themselves show:

“I must admit I found it refreshing to be around boys rather than girls, because I found even though academically I benefited from single-sex

education, it gets very bitchy if it's just girls and I found here if you've got boys around you get a different perspective and it offers more variety."

Young Woman from Single-Sex School

"I live in halls, so it is probably just me. I'm an only child anyway so I have a problem with being with lots and lots of other people. It's really living at university twenty-four-hours a day, whereas at school you were there for six hours and then you'd come home and be totally cut off, or at least as much as you wanted to be."

Young Woman from Co-educational School

"You've just got to start doing things for yourself, your clothes have got to be ironed by yourself in the morning and your dinner's not going to be on the table unless you go and get it! I don't think coming from an all-boys school into mixed lectures has been too much of a problem, because I am a bit of an extrovert."

Young Man from Single-Sex School

"My hall is about two-thirds boys to girls. I don't think I'd have picked it if I had known. One of the main reasons I came to university was for the social life. Maybe I built up too big expectations."

Young Man from Co-educational School

Pupil Satisfaction

5.10 In the same study (Robinson and Smithers, 1999) we also explored who were the more satisfied with their school experience. We asked them to think ahead to when they would have children and asked which type of schooling they would prefer for them. Chart 5.2 shows that nearly all those from co-education wanted it too for their children, but those from single-sex schools were much less likely to opt for single-sex education. This can be interpreted as the co-educated students having been more satisfied with their school experience.

Chart 5.2: Satisfaction

Sex	Own School	School for Future Children		
		Single-sex	Co-ed	Both/ No Pref
Girls	Single-sex (N=50)	38.0	20.0	42.0
	Co-ed (N=180)	0.0	90.6	9.5
Boys	Single-sex (N=37)	29.7	29.7	40.5
	Co-ed (N=122)	0.8	87.7	11.4

Source: Robinson and Smithers (1999), Table 11, page 39.

5.11 Other studies have reported that pupils find co-educational schools more congenial, though the findings are not unambiguous. Schneider and Coutts (1992) in the United States found that the co-educated saw their schooling as more affiliative with less emphasis on discipline and control than those who had been to single-sex schools. Brutsaert and Bracke (1994) in Belgium reported that boys in co-educational schools reported a greater sense of belonging than those in single-sex schools, with no

difference for girls. But in a later study Brutsaert and Van Houtte (2002) found the opposite - no effect for boys, but girls feeling better integrated in single-sex schools. They also point out that even in co-educational schools both boys and girls tend to prefer friends of the same sex so they are in a sense segregated too. Cipriani-Sklar (1996) detected higher levels of anxiety among girls in single-sex schools, but Brutsaert (2001) found that girls in single-sex schools show a substantially lower level of stress than their co-educational counterparts. So it begins to look very much 'as you pays your money and you takes your choice'.

Views of Parents

- 5.12 Parents can hold strong views on whether single-sex or co-education would be better for their children. The merging of the girls' school and boys' school which was studied by the Australian team (Marsh *et al*, 1989; Smith, 1996) was prompted not by intrinsic educational reasons but by pressure from parents convinced a co-educational school would provide a better social and academic environment for their children. But other parents in other parts of the world believe - for a variety of personal, social, cultural and religious reasons - just as strongly in single-sex education.
- 5.13 Early research was reviewed in Smithers and Robinson (1995). They reported that West and Hunter (1993) found that parents' views differed markedly according to whether their own sons and daughters were at single-sex or mixed schools. Those with children at co-educational schools tended to take the view that they were a better preparation for life and there was no reason to separate the sexes; those choosing a single-sex school believed that girls and boys developed at different rates and girls-only schools allowed girls to acquire more self-confidence.
- 5.14 Jackson and Bisset (2005) have recently looked to see how important the gender-composition of a school is in parents' choice of independent school. They found a similar pattern across girls' and boys' senior schools, with one interesting exception. For both, 'reputation' was the most important factor followed by 'exam results', but for the girls-only schools 'single-sex' replaced 'discipline' in the third position. In fourth place for both came 'good staff'. In choice of a mixed school, 'reputation', 'good staff' and 'exam results' were again in the top four places with 'care of the pupil' in second spot.
- 5.15 These findings are consistent with other research (West and Varlaam, 1991; Robinson and Smithers, 1999) suggesting that parents' choice of school is made mainly on whether it is perceived to be a good school. But Jackson and Bisset also detected among some of the parents' choices an echo of Dale's findings that while co-education may have benefits for boys, single-sex education can be perceived to have advantages for girls. This may be more a matter of impression than fact, since Smith (1996) contends that his results, which show social advantages for both sexes, "undermine the myth that co-educational schools are 'good' for boys and 'bad' for girls." But if a substantial number of parents subscribe to the myth it becomes a social fact which has to be taken into account.

Views of Teachers

- 5.16 Some studies have asked for the views of pupils and/or teachers with experience of both single-sex and co-educational schools. The ten-year follow up in Australia of schools that had changed from single-sex to mixed (Smith, 1996) found that teachers believed that both boys and girls preferred co-education. They reported that behaviour was worse for girls, but not boys, in co-educational schools, and girls in girls' schools were more competitive. But the attitudes of the teachers who had worked in the single-sex schools remained ambivalent. In particular, they thought that girls suffered in maths and sciences. When it was pointed out that an analysis of the results showed that this was not the case, it became clear that they were not reporting their actual experience but had bought into what they thought was a widely accepted belief. This is par for the course. Beliefs are one thing, actuality another.

Resumé

- 5.17 As with academic achievement, some findings point one way, others another, and yet others provide no clues. Comparisons of single-sex and co-educational schools bring to light no striking and consistent differences in the personal and social development of either girls or boys. Nevertheless, from Dale's research onwards there have been findings, which have had strong appeal to some and have been accepted as facts, which, in turn, have had a bearing on behaviour.

10. Overall Assessment

- 10.1 Our report could be construed as an attack on single-sex education. That is absolutely not the case. Our brief has been to assess the quality of the evidence regarding educating the sexes together or separately. If we find ourselves unpacking more of the claims for separating the sexes, it is because those lobbying for it have been making most of the running in recent years. Thirty years ago Dale's (1969, 1971, 1974) claims for co-education - against a background of single-sex education - could have been submitted to similar scrutiny, and indeed were. But now with separate-sex schools being very much in the minority in many countries, it is the advocates of single-sex education who feel the need to press their case.
- 10.2 Chief among the proponents is the U.S. National Association for Single Sex Public Education (NASSPE), and its president Dr Leonard Sax. Its website lists nineteen studies collectively seeming to make a very strong case for single-sex education. These include research attributed to Ofsted, the Australian Council for Educational Research, and the National Foundation for Educational Research. In addition, reputable academics and practitioners are prayed in aid, along with Dr Sax's own book, *Why Gender Matters*. The narrative has been taken up by other websites (eg the National Coalition of Girls' Schools; Mullins on MercatorNet), is being repeated almost verbatim in academic papers (eg Nicholson, 2005) and is trickling down through newspapers (eg Lunnon, 2006; Despontin, 2006b). It is important, therefore, to examine the evidence in detail.

NASSPE's Case

- 10.3 NASSPE's (2005) web pages on *Single Sex vs. Co-ed: the Evidence* begin by dismissing the U.S. Department of Education's study of single-sex education – that is the systematic review conducted by Mael *et al* (2005) which we considered in detail in paragraphs 2.7-2.13, pages 7-9 – as “a disappointment”, “a missed opportunity”, “many studies overlooked”, which in the circumstances, is a bit rich. The lead evidence (on the strength of Sax sharing six presentations with them in two days) is taken from Younger and Warrington (2005). They are reported as finding that single-sex classes are remarkably effective in boosting the performance of both girls and boys, when as we have seen (para 4.6) the researchers themselves were a lot more cautious. The other 18 pieces of evidence are grouped as (1) major nationwide studies; (2) ‘before and after studies’ and (3) academic studies.
- 10.4 Five major nationwide studies are cited. Ofsted is reported as demonstrating in 1998 that the superior performance of students in single-sex schools is a direct result of single-sex education. This striking finding has not been published by Ofsted and they currently have no knowledge of it (Ofsted, 2006). NASSPE references it to an article in the *Times Educational Supplement* by Dean (1998). This reports a speech by Christine Agambar, then of Ofsted, to the annual conference in Oxford in 1998 of the Association of Maintained Girls' Schools in which she does remark that pupil eligibility for free school meals does not explain the difference in examination performance of single-sex and co-educational schools (nor would it be expected to given the importance of pupil ability and teacher quality).

- 10.5 The research from the Australian Council for Education Research has been similarly inflated. ACER's website does carry a press release of a keynote address given by Rowe (2000) to the Second National Conference on Co-education held in Orange, New South Wales, in which he does present evidence of the better performance of boys and girls in single-sex environments in the Victorian Certificate of Education. But, in his published accounts of the data, Rowe (2002) stresses "it is important not to over-interpret the 'importance' of these gender and gender/class/school-grouping effects, since they pale into insignificance compared with class/teacher effects - regardless of student gender." In response to an inquiry from us Rowe (2006) commented, "Sax has an extraordinary proclivity to selectively decontextualise my published findings for his own promotional purposes. In fact, I was contacted by the Secretary to the U.S. Congress about the extent to which Sax has correctly cited my findings – to which I responded in the negative."
- 10.6 Of the other reports in this section, Able's (2000) was also a conference presentation – to the International Boys' Schools Coalition. That means three of the five are taken from conference presentations where, however provisional the thoughts may have been, they have been simplified and sharpened by the press for public consumption. As we have seen (para 2.14), Able's research was not a major national study but ten (later twelve) triplets of schools compared without establishing prior achievement levels. The Hamilton (1985) study in Jamaica similarly did not control for baseline variables. That leaves the Spielhofer research for the National Foundation for Educational Research which is intriguing. But, as we have discussed (paras 2.4-2.6), there is not a consistent pattern across all the comparisons and the effects of factors like intake differences and other differences between the schools cannot be ruled out. It is pertinent to ask: how is it that of all maintained comprehensive schools these few have retained single-sex status? A number were, in fact, former grammar schools that have held on to the right to select a significant proportion of their intakes.
- 10.7 NASSPE's category of 'before and after' studies consists of good-news stories sourced from the media (eg O'Reilly, 2000; *TES*, 2000) about schools that have experimented with single-sex classes. Strangely the headline of one of them (*TES*, 2000), 'Conflicting evidence over single-sex success', is omitted in favour of a sub-heading, 'London school segregates...' Another newspaper article in this section (Pyke, 2000) is the source of the information that David Blunkett, when Secretary of State for Education, was so impressed with the evidence that he wanted to see "a wholesale conversion of co-ed schools into single-sex academies." But that was six years ago and in the meantime there has been no sign of this happening. Yet another newspaper article (Henry, 2001) is the reference for a study attributed to "researchers at Manchester University." We have been unable to track this down outside the newspaper piece. Certainly, the School of Education there has no record of it (Brember, 2006).
- 10.8 The third category of academic studies contains some familiar names. Lee and Bryk (1986) are cited with no reference to Lee's (1998) own assessment of the findings: "I do not think the research on single-sex schooling (my own and others) should be interpreted as favoring the separation of boys and girls for their education." Riordan's (1990) research is reported with the suggestion that he has

got the interpretation wrong, “Riordan believes that the beneficial effects of single-sex schooling are most impressive for children from underprivileged backgrounds. However, this belief sets him apart from many other researchers in the field, particularly outside the United States.”

10.9 But especially interesting are the references to Dr David Riesman cited by NASSPE, quoted at some length on the website of the National Coalition of Girls’ Schools, and incorporated into a recent letter to *The Observer* by the President of the Girls’ Schools Association (Despontin, 2006b). Riesman was one of the most distinguished sociologists of his generation who co-wrote two of its most influential books, *The Lonely Crowd*, 1950, and *The American Revolution*, 1968. But he retired in 1980 and died in 2002. The separation of the sexes in education was not his prime interest and, in fact, he had an inconsistent track record on the subject. In 1968 he condemned all-male colleges as means of “preserving tacit assumptions of male superiority” yet at the age of 82 in 1990 he appeared as one of the chief witnesses for the defence as the Virginia Military Institute attempted to fend off attempts to make it co-educational (Salomone, 2003). The recent flurry of interest stems from a short essay he contributed to a Festschrift compiled by Blau and Goodman in 1990 in honour of a fellow academic, Rose Laub Coser, and it hard to see it as new evidence as is implied.

10.10 There would seem to be a lot less to NASSPE’s case than meets the eye.

Biological Differences

10.11 NASSPE also prominently displays Sax’s book, *Why Gender Matters* (2005), in which he maintains that the differences between the sexes are such as to require separate education. Now there are undoubted biological and psychological differences, but with the notable exception of the sex organs themselves few are categorical differences. The great majority are small differences, on average, between two overlapping distributions in which girls can be as different from each other as they are from boys. But even where there are differences it does not follow that the sexes have to be educated separately. Gurian (1997, 2002, 2005), who runs an eponymous institute devoted to publicising brain research in the field of gender differences, tirelessly campaigns and runs training events for the view that girls’ and boys’ brains are so different that they must be taught in different ways. But, as Rivers and Barnett (2006) point out, the meaning of any structural differences is far from clear. They dryly comment that “in the 19th century scientists thought that the greater size of the male brain meant that men were a lot smarter. We now know how off the mark that was.”

10.12 A narrative has been developed of the ‘typical boy’ as being anti-school, unable to concentrate, hating to read, disruptive to classmates, and obsessed by video-games; and of the ‘typical girl’ as lacking in confidence, easily put off the sciences and maths, distracted by boys and concerned about people not things. But while there are some boys and some girls like this, the influences of gender are far outweighed by ability, social background and race (where there are few advocates for educational separation). Nevertheless, emotive pleas are being made with increasing frequency for the segregation of the sexes in education. Perry (2006), for example, without sparing the hyperbole, has described co-education as “a biologically disrespectful model of education.” But it is a narrative, assembled like

NASSPE's case in general, from a particular interpretation of a selection of the evidence.

The Evidence

10.13 Our assessment of the balance of the evidence overall is that research on single-sex and co-education has failed to demonstrate unequivocally that one approach is superior to the other. Why should this be when so many people 'know' that separating or co-educating is better? There are four possible groups of reasons:

- there really are no differences to speak of;
- there are effects, but they are very small compared to other factors;
- there are effects, but they interact with other factors and show up in some situations but not others;
- the methods of gathering evidence are inadequate to show any differences that do exist.

Let's consider each in turn.

No Differences

10.14 This is possible, but it does not seem to accord with common sense. Single-sex schools, after all, dominate the league tables. Whether a school has just boys, or just girls, or both, is one of its most obvious features and sharing an education with fellow pupils who are of the same sex or both sexes would seem, on the face of it, to be a different experience. Hence the strong beliefs in favour of one or other. But if major advantages exist they have not been teased out so far by systematic research, and after all this time it seems unlikely that anything will be revealed that could form the basis of a school improvement programme. No factors have been identified that would lead one to recommend that a failing co-educational school, for example, could be turned round by separating the sexes or mixing the sexes if it were for girls' only or boys' only.

Small Differences

10.15 A number of studies have reported small differences, but they have generally proved inconsistent and difficult to replicate. The most likely explanation is that there can be advantages to separating or mixing the sexes, but they are minor compared with other factors. The pre-eminent position of single-sex-schools in the league tables can lead to the easy, but logically incorrect, assumption that what follows must be a consequence of. Some of the foremost schools are single-sex, but this does not mean that their success is because they are single-sex. Girls' schools tend to score higher than boys' schools, but this is because under the present assessment arrangements girls generally do better, on average, than boys in the exams. Similarly, it cannot be inferred from these results that girls' schools are better than boys' schools or single-sex education works better for girls than boys.

10.16 One of the most consistent findings to emerge from educational research is that the ability of a school's intake is the best predictor of its examination results. After that come variables to do with social background and school effectiveness. The single-sex schools that head the league tables select on ability and have pupils whose

parents tend to hold high expectations. In large measure the position of leading schools, whether single-sex or not, can be accounted for in these terms.

- 10.17 In addition, there are the school effects such as the ethos, leadership, teacher quality, spend per pupil, class size, and the curriculum. Any effects of separating or bringing together the sexes will have to show up in this mélange of influences. In an early study by Thomas *et al* (1994) the apparent effects of single-sex education disappeared when other school variables were taken into account and on its own it was found to be acting as a proxy for school type in general.

Interactions

- 10.18 Comparisons between single-sex and co-educational schools can show differences in some situations or for some children, but not in or for others. Spielhofer *et al* (2002, 2004) found different patterns for comprehensive and grammar schools. Riordan (2002) in the United States found that gender separation had little effect on male or affluent students, but was detectable in the performance of African-American and Hispanic females from low-income homes. In the case of single-sex classes, sometimes it is those of higher ability and sometimes those of lower ability who appear to benefit most; sometimes behaviour is better and sometimes worse; sometimes it is the girls who like the arrangement more, sometimes it is the boys. This suggests that separating the sexes by school or for particular classes is only one element, and not the most important element, in complex interactions.

Educational Research

- 10.19 This raises the question of whether educational research is up to revealing any differences that do exist. Science is essentially the game of patterns and it is at its best when it uncovers statements of wide application – ‘generalisations’ if you like - for example, $E = mc^2$. In education any generalisations have to be highly qualified. In the case of single-sex or co-education the results appear to show that one or other arrangement scores high on particular criteria, for particular children, in particular contexts. In other words, educational research seems to yield not ‘generalisations’, but ‘particularisations’. It is arguable whether the empirical methods of science are the best way of capturing ‘particularisations’. A case could certainly be made for the humanities being able to provide the more authentic insights.
- 10.20 But narratives can be only a poor check on what people want to believe. Down the ages people have thought it obvious that the earth was flat and that the sun and the heavens rotated about it. But eventually the evidence from careful observation, measurement and experiment demanded that a much less appealing picture of a small planet in an infinite and impersonal universe be accepted. A comfortable narrative has had to give way to the evidence. But, if in education, we have only ‘particularisations’ the evidence is likely to be vulnerable and subordinate to prior value commitments. Hence, as we have seen, it is possible for the American Association of University Women and the National Coalition of Girls’ Schools to reach quite different conclusions on the same evidence.

Conclusion

- 10.21 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. This often seems to be the case in education and the social sciences generally. The paradox of single-sex and co-education is that the beliefs are so strong and the evidence is so weak.

10.22 But while solid evidence is lacking the mood in independent education in England continues to swing in the direction of co-education. The independent sector operates as a market and, therefore, this trend presumably has something to do with parental preferences. The government is also trying to marketise maintained education and it will be interesting to see what effects this has, for example, on the number of single-sex schools. Without clear general findings, deciding whether to mix or separate the sexes for education has to be a matter of judgment. It is for the providers to work out which they think is the most appropriate to offer in their circumstances and for parents to choose the schools that they think would best suit their children. There are excellent single-sex schools and excellent co-educational schools. Our conclusion is that they are excellent for reasons other than that they separate, or bring together, the sexes for their education.

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