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ABSTRACT

This paper examines selected Australian studies and studies produced in other countries on gender research of classroom interaction between students and their teachers. The results, deficiencies in methodology, selective reporting of data, and the policies based on the research are highlighted. To substantiate a request for more complex and scientifically-based research, rather than the relatively simplistic but politically-appealing sex difference approach, an analysis of verbal interactions involving 113 students in 24 science classes for year 8 in Brisbane, Australia was conducted. The interactive categories for teachers included organization, behavior, and task; initiation and response were used for students. Superficial analysis of the data included a bias in favor of male students, but a detailed analysis indicated that the interaction patterns of female students were not significantly different from those of the male students. The differences that did exist can be explained by the activities of particular subgroups of both male and female students. The conclusion was that certain individuals receive more attention, and therefore, both male and female students were being disadvantaged. Tables and a 46-item bibliography are included. (DJC)

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GENDER RESEARCH IN CLASSROOMS: SCIENTIFIC OR POLITICAL?

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Abstract

Australian government policy on the education of girls and the effect of its implementation are summarized. The policy is based on selected Australian and overseas research on gender differences in classroom interaction patterns. Such research is reviewed and the equivocal nature of results, deficiencies in methodology, selective reporting and the political use made of the selected research are highlighted. The analysis of 24 Year 8 science lessons in Brisbane, Australia is reported using interaction categories for Teacher of "Organisation", "Behaviour" and "Task" and for Student of "Initiation" and "Response". Superficial analysis of the data indicates a bias in favour of boys but a detailed analysis indicates that the interaction patterns of girls are not significantly different from those of boys. What differences do exist can be explained by the activities of particular subgroups of both boys and girls. A request is made for future research in this field to be based on more complex and scientifically-based perspectives rather than on the relatively simplistic but politically-appealing sex difference approach.

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GENDER RESEARCH IN CLASSROOMS: SCIENTIFIC OR POLITICAL?

John A. Clarke and Barry C. Dart

AUSTRALIAN GOVERNMENT POLICY ON THE EDUCATION OF GIRLS

Since International Women's Year in 1975, there has been a significant upsurge in interest in the education of girls, culminating in 1986 in Australia with the publication of A National Policy for the Education of Girls in Australian Schools (Commonwealth Schools Commission 1986). During these years, the Commonwealth Schools Commission in Australia has published two reports relating specifically to the education of girls viz., Girls, School and Society (Commonwealth Schools Commission 1975), and Girls and Tomorrow: The Challenge for Schools (Commonwealth Schools Commission 1984) and one where the education of girls is a significant element, Quality and Equality (Commonwealth Schools Commission 1985). These reports have had considerable influence on educational thinking and policy in Australia. They also have the potential to continue to exert such influence.

Examples of influence are shown in State and Territory Departments of Education where there have been the appointment of Women's Advisers or Equal Opportunity Officers and the production of policy statements designed to promote equal opportunity in education and eliminate gender bias in school practices and organisation. Specifically, Girls and Tomorrow (Commonwealth Schools Commission 1984) recommends "...urgent action to redress the neglect of girls in classroom practices" (p. vii).

An example of potential influence is to be found in the Quality and Equality (Commonwealth Schools Commission 1985) report which recommends that one of the seven major elements to be included within the Education Priorities Program should be Affirmative Action for Girls i.e. within particular programs there should be a greater emphasis on the specific needs of girls. And further, one action that the Commission believes will lead to the educational needs of girls becoming a major professional responsibility,

> ...is to incorporate system policy explicitly into recruitment, selection and promotion criteria (of teachers). Candidates for professional and administrative positions should be required to demonstrate their knowledge of, and commitment to, educational principles and practices for improving the educational experience of girls and for achieving more equitable outcomes. This will require appropriate pre-service and in-service provision for teachers (Commonwealth Schools Commission 1986, p. 20)

In developing the recommendations in these reports, the Commission has not undertaken original research, but rather has worked from Australian and overseas reports and policy documents and from the research on which they are based. A danger inherent

in this procedure is that the research referred to may be unsatisfactory and/or inappropriate for local conditions (Hacker 1986). That this may be the case is intimated by the Victorian Ministerial Advisory Committee on Women and Girls who, after reviewing "...current research on the issue (that coeducation disadvantaged girls), ...concluded that there was insufficient Australian research on which to base advice" (Schwarz 1987, p. 135). If this is so, then the use of questionable research findings for political purposes should be of concern to educators and educational researchers.

This paper examines classroom interaction gender research, some of which has been used in the Reports, finds them wanting in a number of respects and tenders other data and research that questions and at times contradicts their findings. It raises the issue of the misuse of research findings for political purposes and concludes with a request for a more rational approach to research which focusses on all students who are disadvantaged in classroom interaction.

CLASSROOM INTERACTION GENDER RESEARCH

One aspect of gender research that has received considerable attention recently is that of classroom interaction patterns. This research is concerned with the comparison of class participation of boys and girls. Typical of the assertions made is that boys receive more teacher attention than do girls and are more prominent in classroom discussion than are girls (Good, Sykes and Brophy 1973; Galton, Simon and Croll 1980; Good, Cooper and Blakely 1980; Spender and Sarah 1980; Stanworth 1981; Spender 1982a, 1982b; French and French 1984; Croll 1985; Sadker and Sadker 1985). Such outcomes are used to substantiate claims that the "...teachers' systematic preferential treatment of male students and the pressure on females not to talk inhibits learning" (Commonwealth Schools Commission 1984, p. 33) and to initiate policies such as those mentioned above.

A close examination of the research literature on classroom interaction and sex differences identifies three significant issues worthy of discussion: first, the varied and equivocal nature of the findings; second, questionable research practices; and third, the tendency for reviewers and policy-makers to generalize from a limited number of studies, often for political reasons.

The Nature of the Findings

A review of the research indicates the following equivocal findings:

a. boys have more frequent contact with teachers, with a given contact being more likely to be negative for boys than girls, and, students, not the teacher, are mainly responsible for differences in interaction patterns (Good et al 1973).

b. boys receive slightly more teacher attention than girls, a difference which is not statistically significant (Galton et al 1980).

c. there are minor differences in teacher behaviour toward boys and girls, with girls initiating significantly more interactions with teachers and boys more frequently misbehaving - these differences are less than those reported in previous research (Good et al 1980).

d. boys receive a higher average level of individual attention than girls, but "...the difference is relatively modest", and is caused by a small number of boys receiving very high levels of attention (Croll 1985, p. 223).

e. boys receive a higher average number of interactions in teacher-led discussions not because of a greater willingness to participate on the part of boys or favouritism towards boys on the part of the teacher, but because a small group of boys establish themselves as the dominant pupils and use various strategies to obtain a very high level of participation (French and French 1984).

f. students' perceptions of classroom interactions suggest that boys are nearly two and one half times as likely to receive teacher attention, are four times more likely to be involved in class discussion, and are twice as likely to seek teacher help (Stanworth 1981).

g. girls receive less attention than boys in all four of the response categories analysed, with boys being almost eight times as likely as girls to call out during the lesson (Sadker and Sadker 1985).

h. both male and female teachers give more attention to boys than to girls, and are unaware of these differences. In general, the 'Rule of Two-Thirds' operates i.e. teachers spend about two-thirds of their classroom interaction time with boys, and boys perform about two-thirds of the student talk (Spender 1982a, 1982b).

i. there is no "male predominance" in levels of student-teacher interaction in terms of participation and contribution to class discussion (Dillon 1982).

j. there is no evidence to support the assertion that teachers interact less frequently with girls (Hacker 1986).

k. females have more social interactions with their teachers than males and initiates more academic questions than males (Baker 1987).

A cursory overview might well suggest a sex difference in interaction patterns but a closer examination indicates at best equivocal and at worst contradictory results. Also, a number of the results have important qualifying statements added.

The equivocal nature of classroom research is not a new phenomenon. There is such a variation in human behaviour that it is not surprising that research findings tend to disagree. On occasions, the research evidence is so overwhelming that you can be reasonably confident that it represents what is actually happening. It is our contention that this has not been the case in research on the relative participation of boys and girls in classroom interaction. A close examination of what the research really says indicates that the findings are of such a nature that they suggest, indeed almost demand, caution of interpretation.

The Quality and Reporting of the Research

In reviewing gender research in science classrooms, Hacker (1986) identifies a "...relatively small number of studies based on ...quantitative observation of classroom processes" (p. 58) but notes that

> ...serious flaws in research design and data analyses are apparent. Important factors other than class gender have been ignored, even though they are likely to influence classroom processes; issues of observer training and reliability have been disregarded; sample sizes have been small or atypical of the general population to which results are generalized; the statistical significance of results has often been left unexamined (Hacker 1986, p. 58).

Similar concerns have been raised about gender research in other subject areas. Hattie and Fitzgerald (1987) recently reviewed and meta analyzed the literature on sex differences in computer usage in schools. They located 124 articles but only 19 "...included an adequate level of data to permit the studies to be used in the meta-analysis. (Most of the articles) ...were statements of opinion on how girls are different from boys in the use of computers" (Hattie and Fitzgerald 1987, p. 5). Even within the 19 studies, there were methodological flaws e.g. inadequate reporting of the duration of the computer course.

Yates (1987) reviews gender research in mathematics education and, although not as critical, concludes that "...differences between girls and boys are not as large as was previously thought once the samples for comparison are controlled in terms of previous mathematics learnings and an equally selected ability range" (p. 257). Researchers have also found differences between countries (Keeves; 1975), between states (Moss 1982) and between schools within a state (Brown and Fitzpatrick 1981; Carpenter, 1985) in sex-typed patterns of mathematical achievement, all of which raise questions about the sources of achievement being mapped. In similar vein, Doolittle and Cleary (1987) conclude that although some gender differences exist in mathematics achievement, "...(it) is not a simple consequence of differential instruction. ...(The) cause or causes of gender differences ...is not clear" (p. 164).

Consider now some of the specific research used in policy formulation in Australia. The 1984 report on the Education of Girls (Commonwealth Schools Commission 1984) in discussing patterns of classroom interaction cites as its major references the work of Cosgrove (1981) and Spender (1982a). However, each of these studies uses inadequate methodology and/or inadequate reporting.

Cosgrove (1981) reports that 82% of teacher time was spent talking to boys. However, her claims are based on the analysis of a tape of just one of her own lessons. She states that other tapes showed similar results.

Spender (1982a) refers to her own research and that of other teachers of mixed-sex classes in an anecdotal fashion, mentioning percentages of time spent interacting with boys and girls without any specification of her sample and the types of interactions involved. Her only specific statement is to refer to the analysis of ten taped lessons in which she spent a maximum time of 42% interacting with girls and a minimum time of 58% interacting with boys.

Both major references show evidence of either questionable research practices (generalising from one instance) or inadequate reporting of the sample and analysis procedures used.

Another example of questionable research practices - selective reporting - can be found in French and French (1984). They analyse one lesson in some detail. They did observe "...a large number of lessons" (p. 133), number unreported, but note that

> ...in most cases, though, the uneven distribution of (interactions) is not quite so marked, and the activities are rather less frequent in occurrence. Because they are so richly represented in the present lesson, it provides us with a focal point for the presentation and discussion of patterns (p. 133).

In other words, French and French (1984) have chosen an atypical lesson that gives them the results they want.

The Tendency to Generalize

The work of Spender (1978, 1980, 1982a, 1982b) has had a large influence on some Australian writers interested in the education of girls. Cosgrove (1981), Ramsay (1982), Foster (1984), Taylor (1984) and Vickers (1984) all refer to her work, in particular to the 'Rule of Two-Thirds'. As indicated earlier, the 1984 report on the Education of Girls (Commonwealth Schools Commission 1984) relies heavily on the writings of Spender (1982a) and Cosgrove (1981). These reviewers and policy-makers appear to accept this research with its quite substantial limitations as the reality of classroom interaction in both primary and secondary classrooms. One could speculate as to the political motivation underlying this apparently unquestioning acceptance by reviewers

and policy-makers of research findings which are congruent with their personal viewpoints.

Generalizations mask considerable and useful information and have the effect of ignoring other plausible interpretations. What is required is a more detailed examination of data, examination which is not restricted by a political bias. An example of a study which, on superficial treatment of data, could support the sex bias literature, but does not on closer analysis, is reported below.

A STUDY OF SCIENCE CLASSROOMS

The idea has often been put forward (e.g. Becker 1981; Parker 1982, 1984) that it is in the science and mathematics content areas that bias against girls in classroom interaction is most prevalent. This research, reported in detail elsewhere (Dart and Clarke in press), examines classroom interaction patterns in twenty-four Year 8 Science lessons and compares the participation of boys and girls. It uses verbal interaction data that was collected as part of a larger study of factors influencing the development of scientific concepts in students (Clarke in process). It is perhaps significant that when this data was collected in 1982, there was no intention to use it for gender research.

Sample

The sample consists of three teachers and 113 students (58 boys and 55 girls) in four Year 8 science classes in one metropolitan secondary school in Brisbane, Australia. A range of cognitive and affective characteristics[1] of students were measured as part of the larger study. There were no significant differences between the boys and girls on any of these measures. Also, there was no significant difference on these measures between the sample and a different Brisbane sample (Clarke 1982) and between the sample and Queensland population norms on the aptitude measures. For details, see Clarke (in process) and Dart and Clarke (in press).

Data Collection

Teacher-student and student-student dialogue was collected on audiotape. Six science lessons, three in Chemistry, and three in Biology, each lasting for approximately 40 minutes, were audiotaped for each class. All lessons occurred in a science laboratory and a tape recorder was placed on each of the six laboratory desks and on the front demonstration desk. Students were allocated to permanent laboratory seating positions by school policy and identified themselves on tape at the beginning of each lesson. These procedures along with the the normal use of names in interaction, ensured that all students could be identified. Each tape was later transcribed and used to produce a complete transcription of each lesson. These transcriptions are used in this study.

Classification of Data

The data reported here are the verbal interactions between teachers and individual students. Student-student interaction is not considered. These interactions are categorised according to source and type of interaction.

(a) Sources of interaction: Teacher-to-Student (T->S)
Student-to-Teacher (S->T)

(b) Types of interaction

T->S interactions are classified into three types:

Organisational - e.g. "Kevin, is yours cleaned up? No. I said I wanted them out here. In the cage. Water in and on the front."

Behavioural - e.g. "Kevin, stand on your feet and go over to the side please."

Task - e.g. "Jane, how do you know when you've got a saturated solution?"

S->T are classified into two types:

Response - e.g. Jane: "Um. When it's got more...more saturated than concentrated solution."

Initiation - both questions and statements. e.g. Leanne: "Can we use the scale we used last time because I know how to use it?"[2]

Analysis and Results

The number of interactions in each category across all the lessons was obtained for male and female students. This allowed the calculation of

- the total number of interaction for males and females;

- the mean ($\bar{X}$) and standard deviation (SD) for each category and for the total;

- the statistic "t" for each category and for the total.

The outcomes of this analysis are shown in Table 1 where a two-tailed test with $\alpha = 0.05$ is used.

Insert Table 1 about here

Discussion

Table 1 indicates that

(a) in every category but one, boys had a greater number of interactions than girls;

(b) girls initiated more interactions with the teacher than boys; and

(c) the largest type of interaction difference between boys and girls occurs in the "Behavioural" category.

If outcome (a) is considered alone, this study would join the many others where results have been reported simply as numbers or percentages of interactions and add to the literature supporting sex bias in science classrooms. However, outcomes (b) and (c) question such a conclusion and provide fuel for some interesting speculations.

Consider outcome (b). This finding is consistent with the Good et al (1980) and Baker (1987) outcomes but contradicts claims made by Stanworth (1981) that boys are more likely than girls to ask questions, volunteer information and make heavier demands on the teacher's time; by Spender (1978, 1982a) that boys demand more of the teacher's time; by Whyte (1984) that boys initiate more contacts with teachers; and by French (1986) that "...in a series of secondary science lessons... enthusiastic boys had to be quashed and girls almost forced to participate" (p. 406).

Further, Morse and Handley (1985) claim that

> ...science is a discipline demanding an enquiry approach to problem-solving; ...success in science is often more a matter of identifying which questions to ask and investigate than in the sheer grasping of factual information; that is, deciding what questions to ask and participating in question and answer behaviour is[3] an important activity in science (p. 51).

If this is the case, since girls in this sample initiated more interactions with the teacher, were they disadvantaged?

Now, consider outcome (c). Morse and Handley (1985) in science classrooms found that boys received more criticism or disciplinary feedback from the teachers. That seems to be consistent with (c). But what does (c) really mean? A closer examination of the data provides a possible answer. Reproduced in Table 2 are the interaction profiles of 10 students, all from the same class.

Insert Table 2 about here

The total number of "Behavioural" interactions for the 6 boys is 42 i.e. 49% of the total of such interactions (86) for all boys in the sample. Similarly, the 4 girls account for 47% (25/53) of the total of "Behavioural" interactions for all girls. In other words, the "Behavioural" interactions are not distributed evenly throughout the sample. A large proportion is directed to 6 boys and 4 girls in one class.

This form of inequitable distribution of interactions, one that highlights how a few individuals can receive many interactions and distort the total picture, is worth exploring further. Some studies (e.g. French and French 1984; Croll 1985) suggest that a few boys receive a disproportionate amount of attention in general, disguising the fact that similar treatment is given to most boys and girls. Both of these studies used data from primary schools. Recent research in secondary schools by Tobin and his colleagues (Gallagher and Tobin 1987; Tobin and Garnett 1987) substantiates this claim however that some students, mainly boys, are involved in a disproportionately high number of interactions. The study reported here identifies approximately equal numbers of boys and girls obtaining a "high" number of interactions, whereas more boys than girls received "low" interactions. A "high" or "low" number of interactions is defined here as more than one standard deviation above or below the mean number of interactions. This is shown in Table 3. Does that mean in this sample that boys, or at least a specific sub-group, were more disadvantaged than girls?

Insert Table 3 about here

These speculations aside, the most useful information can be gleaned from Table 1. In all comparisons in Table 1, the differences between the means are not significant.

Perhaps the most sobering statistics of all are the means for the total interactions. On average, boys received 15.02 "interactions" while girls received 12.96 "interactions". The difference is 2.06 "interactions" over six lessons. In other words, in any given lesson, a boy could receive 0.3 of an "interaction" more than a girl! Is that difference big enough to claim that girls are disadvantaged?

Summary -

This study reports the analysis of verbal interactions in 24 science lessons involving a sample of 113 Year 8 students in a metropolitan secondary school in Brisbane. The number of lessons analysed is either greater than or similar to the number analysed in the other research referred to above and there is no reason to suggest that either the school or the sample is atypical, at least for metropolitan schools. Hence the results can be regarded with some confidence as a reasonable reflection of what is happening in Year 8 science classrooms.

The findings of the Brisbane data presented in this paper are consistent with other recent Australian data presented by Hacker (1986), who concludes that

> ...in the study of science lessons here, no evidence was found to support claims that girls are disadvantaged in the science classroom environment. Girls' interactions with the teacher and with resource materials were found to be similar to boys, in co-educational classes (p. 69).

The findings also have the potential to create an illusion. A simple analysis such as summarized in outcome (a) would support the sex bias notion. It is only on a detailed fine-grained analysis that such apparent bias disappears and the "real" situation is exposed.

CONCLUSION

That sex is a significant variable is not in question here, although a critical evaluation of the research raises some interesting questions about the variable. What is significant however, is the use of questionable research for political purposes. Jumping aimlessly on to bandwagons is perhaps a necessary although questionable activity for politicians. It is however, something that educational researchers have the professional responsibility to avoid. If "jumping" is to be done, it needs to be done with the care and critical objectivity that characterizes an open-minded yet disinterested professional. It would seem that, in the area of gender research, some researchers and policy-makers have let the desire to right a perceived wrong interfere with their researching skills and override their professional responsibilities.

A number of recent writers (Hacker 1986; Doolittle and Cleary 1987; Yates 1987; Dart and Clarke in press) have appealed for a rational, rather than the sometimes emotional and/or political approach to gender research and an avoidance of such claims as "...clearly, these sex differences in interaction patterns are pervasive" (Taylor 1984, p. 4). Yates (1987) proposes the use of the action research model (Stenhouse 1975, 1980; Kemmis 1982) because of the difficulties of researching "causes" of achievement and suggests that such short-term ethnographic studies should be integrated into "...good longitudinal research on the schooling experience of girls and boys... (in order to gain) insights about what influences, both negative and positive, schooling might have" (Yates 1987, p. 260).

We feel that classroom interaction data need to be examined from broader more complex perspectives than the rather narrow and simplistic sex difference approach. Good examples of such an approach occur in recent research by Tobin and Garnett (1987) and Baker (1987). Tobin and Garnett (1987) identify level of formal thinking and locus of control as significant variables influencing interaction behaviour while Baker (1987) demonstrates how the

degree of structure in the learning setting determines the source and distribution of interactions. As suggested elsewhere (Clarke and Dart 1987), this is a more fruitful line of research to follow - the investigation of those personality and/or environmental factors which differentiate between those pupils who participate in classroom interaction and those who don't, irrespective of whether they are boys or girls.

NOTES

1. Specifically, measures of Conceptual Level, Locus of Control, Piagetian Level, general scholastic aptitude and specific verbal and numeric aptitudes.

2. As a matter of consistency, it might have seemed appropriate to classify the S->T interactions the same as for the T->S interactions. However, examination of those categories indicated that the occurrence of organisational and behavioural statements by students was minimal. In our view, this reflects the different roles adopted by teachers and students in a classroom situation.

3. We feel that this should be "are" but have quoted directly from the source.

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TABLE 1

Comparison of Interactions for Males and Females.

	Males			Females			t	p
	N	$\bar{X}$	SD	N	$\bar{X}$	SD		
T->S Interaction								
Organisational	29	Ø.5	1.Ø2	23	Ø.42	1.ØØ	Ø.42	ns
Behavioural	86	1.48	2.35	53	Ø.96	1.89	1.3Ø	ns
Task	294	5.Ø7	4.Ø5	228	4.15	3.6Ø	1.28	ns
Total	4Ø9	7.Ø5	4.72	3Ø4	5.53	4.24	1.81	ns
S->T Interaction								
Response	336	5.79	4.85	263	4.78	4.53	1.14	ns
Initiation	126	2.17	2.33	146	2.65	3.Ø6	Ø.93	ns
Total	462	7.97	6.19	4Ø9	7.44	6.85	Ø.43	ns
Total Number Of Interactions	871	15.Ø2	9.68	713	12.96	1Ø.51	1.Ø8	ns

TABLE 2

Interaction Profiles of a Selected Group of Students

CLASS 1	T -> S			S -> T	
	Org	Beh	Task	Res	Init
Robert	Ø	12	Ø	4	Ø
Tony	4	8	4	2	1
Mark	2	6	3	6	Ø
Craig	1	6	3	4	Ø
Kevin	5	6	2	1	Ø
Darren	2	4	Ø	3	1
Total:		42			
Carol	2	1Ø	2	5	4
Anne	3	6	5	5	1
Isabella	Ø	5	2	4	Ø
Julie	2	4	3	6	2
Total:		25			

TABLE 3

Comparison of the Number of Males and Females Receiving a "High" and "Low" Number of Interactions.

	Boys	Girls
High	7	5
Low	8	3