

Sex Differences in Science Achievement at G.C.E. 'O' Level

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It is usually taken for granted that boys are better than girls in science subjects. A recent study that shows science achievement of males and females separately indicates that this assumption has an empirical basis. Thus the I.E.A. (International Association for the Evaluation of Educational Achievement) study of science education¹ in nineteen countries shows that boys consistently achieve significantly higher than girls in the physical science items at each of the three age levels sampled in every country, and the differences widen with increasing age.² On the other hand Jan Harding, quoting percentage passes of boys and girls in the three Nuffield 'O' Level sciences and one other 'O' Level examination in each of Biology, Chemistry and Physics that represented a more conventional course in 1974, comes to a different conclusion. She finds no significant *overall* differences in any of the six examinations. However she notes significant sex differences, generally in favour of boys, particularly in mixed and single-sex comprehensive schools.³ A Maltese report mentioning sex differences in attainment on the national examinations held in Government Secondary schools in June-July 1975 shows that in seven subjects (English, Maltese, Mathematics, General Science, Italian, History of Malta and Geography) at Form I and Form II level, the performance of girls is consistently higher than that of boys. In General Science, in particular, the superiority of girls' attainment is such that in Form I, the *average* girl's score is only four points lower than that of a boy at the *75th percentile*, while in Form II, the *average* girl's score is equal to that of a boy at the *75th percentile*.⁴ These latter results are quite reliable as they are based on a sample of 1682 pupils in Form I and 1127 pupils in Form II. However the authors of the report note that more boys than girls are creamed off to private schools and that the girls' greater verbal ability may have given them added advantage over their male counterparts in the General Science examination.

In view of these divergences and of the educational implications of any sex differences in science education, it was decided to investigate the achieve-

ment in science of a selected sample of Maltese students at school leaving age. For this purpose, G.C.E. 'O' level results were chosen because of the relatively objective way of setting the papers and of correcting and moderating student scripts. Only results of students sitting for at least five 'O' levels in Biology, Chemistry, Physics, Mathematics and English Language in the same session of the London University G.C.E. 'O' Level Board were considered. This selection was adopted to obtain as homogeneous a sample of students as possible. No distinction was made between candidates from state or private schools or private entries. In order to obtain a reasonable sample size, the results of each session from June 1975 to June 1978 were checked and the following were found suitable.

June 1975 14 results January 1978 6 results
 June 1976 14 results June 1978 50 results
 June 1977 33 results

During the January sessions of 1975, 1976 and 1977 there were no candidates sitting for the five subjects under consideration at the same time. The total of 117 results (80 male and 37 female) were then analysed for any sex differences.⁵

RESULTS

Male (M) and Female (F) G.C.E. 'O' Level results

Grades	Biology		Chemistry		Physics	
	M	F	M	F	M	F
A	4	2	7	1	5	0
Pass B	13	7	14	6	16	4
C	16	8	15	11	16	4
D	4	7	7	3	6	8
Fail E	15	5	7	3	14	6
U	28	8	30	13	23	15
Totals	80	37	80	37	80	37

From June 1975 only Grades A, B and C are considered as Pass.

If one considers percentage passes, the

following results are obtained:

	Biol.	Chem.	Physics	Maths.	English Language
Male	41	45	46	65	39
Female	46	49	22	65	57

DISCUSSION

From these results, the following points emerge quite clearly.

1. In Chemistry and Biology the girls' achievement is equal to that of boys. In fact a chi squared test on the number of passes and failures of boys and girls in these two subjects shows no significant difference between them. However one should note that in this sample, boys obtained better pass grades than girls in Chemistry.
2. In Physics, boys fare much better than girls. In fact one can say that the girl's achievement here is rather poor. A chi squared test on the number



of passes and failures of boys and girls now shows a significant difference ($0.02 > p > 0.01$). In general one can say that while the girls' achievement is equal to, if not better than that of boys in Biology, Chemistry, Maths and English Language, one cannot help noting that their achievement in Physics falls below expectations.

The reasons for this inequality in Physics are difficult to point out but one must certainly exclude differences because of textbooks, laboratories and teachers, at least as far as state schools are concerned, since there is no reason to believe that girls are at a disadvantage in these areas. One must also reject the belief that girls are not science-minded since their results in Biology and Chemistry prove otherwise. In this respect, any misconception about the scientific worth of Biology and Chemistry should be dispelled because, even at 'O' Level, these subjects require an amount of scientific reasoning skills comparable to that required by Physics.

Plausible explanations for the difference in Physics results which have empirical support⁶ are that girls exhibit a generally negative attitude towards the subject and that their own expectations and those of their teachers are particularly low. If these explanations for girls' underachievement in Physics are accepted, corrective measures should be taken to develop more positive attitudes towards the subject and to raise expectations. Ensuring better results for girls is certainly important because of the implications for their tertiary education prospects.

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1. Comber L.C. and Keeves J.P., *Science Education in Nineteen Countries*, Almqvist and Wicksell/Wiley, 1973.
 2. Whitfield R.C., 'Educational Research and science teaching' in *School Science Review* 60, 212, 411-430, 1979.
 3. Harding, Jan, 'Sex differences in Science Examinations' in *The Missing Half: Girls and Science Education*, Manchester University Press, 1981.
 4. Falzon J.M. and Sammut A., *A report on the national examinations held in Government Secondary Schools (Forms I to V) in June-July 1975*, Education Department, Malta, 1976.
 5. These results were collected by D. Mizzi in connection with her long assignment on correlations between science subjects, Mathematics and English presented in part fulfilment of the PGCE course, 1979.
 6. Kelly A., 'Sex differences in science achievement: some results and hypotheses' in *The Missing Half: Girls and Science Education*, Manchester University Press, 1981.