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FEMALE DISTANCE EDUCATION STUDENTS OVERTAKING MALES IN SCIENCE

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ABSTRACT

This study was initiated to compare the performance of male and female distance education students of the University of Education, Winneba in Integrated Science. This was done by randomly selecting the cumulated grades of male and female students of 2002, 2003 and 2004-year groups in Integrated Science for analysis.

The results of Integrated Science for the Basic School Teacher 1 for the 2002-year group indicate that 19.02% (31) males and 6.13% (10) females failed whilst 55.21% (90) males and 58.90% (96) females obtained grades between C+ and A. The differences between the means were highly significant (W = 13; df = 8,P< 0.01). For the 2003-year group 7.87% (20) and 8.27% (21) males; and 10.63% (27) and 19.69% (50) females scored grades A and B+ respectively. The differences between the means were highly significant (W = 17; df = 8, P<0.01). In the case of 2004 year group 6.11% (16), 11.46% (30), 22.90% (60) and 22.90% (60) males; and 8.40% (22), 15.65% (41), 23.66% (62), and 22.90% (60) females scored grades A, B+, B, and C+ respectively. The differences between the means were significant (W = 9.5; df = 6, P < 0.05). The results of the 2002-year group in Integrated Science for the Basic School Teacher 2 showed that majority of both males and females scored grade D. In all cases the females generally registered better performance than the males. The differences between the means were significant (W = 10.5, df = 6, P < 0.05).

KEYWORDS: Integrated, distance, sex, gender, performance.

INTRODUCTION

Sex refers to the biological characteristics of males and females whilst gender refers to culturally specific assignments of traits and roles to each sex. When a sex difference; that is a difference between a group of males and females in some educational outcome such as an average test score is reported, we are usually speaking of gender difference, one due at least in part to differentiated learning experiences provided by the culture (Acker, 1990). The most striking differences between the sexes in educational profile are in subjects studied rather than level reached. Attrition of women from science is well documented (NSF, 1989; Seibert, 1972 and NRC, 1991). According to the Equal Opportunities Commission (EOC) (1986) boys predominate in technical drawing and physics at 'O and A' levels, mathematics and computer studies at 'O' level, whilst girls predominate in domestic subjects or cookery at all levels, office practice at 'A' level, sociology at 'O and A' levels and English at 'A' level. Metalwork and woodwork are also studied almost entirely by boys to examination level (EOC, 1985).

In universities too, subject differentiation is marked For example, women undergraduates are in the majority in French, English, and Sociology but are very small in proportion of students in physics. In Great Britain, in 1984/5 there were 31,093 male full time undergraduates studying engineering and technology compared with 3,504 females (EOC, 1986). In recent years there has been a tendency for female students at Oxford and Cambridge to be awarded lower degree classifications than male students. One possibility is that the tendency is linked to differences in the extent to which females and males conform to a confident rather than a cautious style of presentation in academic work (Martin, 1997).

Tests to show differences between males and females suggested that males seem to be more aggressive than females and to perform better on visual-spatial tasks and in mathematics. Females tend to be more timid than males and to have superior verbal abilities (Jacklin, Maccorby, Poering, and King, 1984; Hyde, 1981; Sharman, 1978; Witelson, 1992; and Weintraub, 1991). Scientists have long known that men and women's brains differ slightly. Women have smaller brains, but they have more neurons in the brain and a larger bridge between the two sides of the brain, which may help explain their better language skills and better intuition. Stimulation of the brain shows that men have more activity in the part of the brain linked to action especially aggression, whilst women's brains are more active in the region that controls complex expression of emotion (Calhoun, Light and Keller, 1997). Once identified as male or female, boys and girls are treated differently. This means that a girl's developing nervous system is being sculpted differently from a boy's in daily social interactions (Calhoun, Light and Keller, 1997). Although, differences between boys and girls are small before puberty, at the onset of adolescence sexual maturation and cultural norms combine to provide noticeable differences.

Adolescent girls often have crisis of self-esteem and begin to lower their expectations for themselves (Gilligan, 1982). By high school, the division between male and female worlds is clear-cut (Richmond-Abbott, 1992). Biological factors may play a role in this process, but cultural influences are so pervasive that it is virtually impossible to isolate the effects of biology. Even though more women are working today and new job opportunities are opening in formerly all –male fields, the social expectations and gender roles formed during the 1950s persist as society's idea (Calhoun, Light and Keller, 1997).

Women turn to be interrupted more frequently than men. When this happens, they get the message that their contributions are not as valuable and they may hesitate to join discussions in the future (Hall, 1982).

In England and Wales the majority of full-time teachers in the nursery/primary sector are females (78%) but not in the secondary sector (46%). In all sectors except the nursery and infant age range, women are concentrated in the bottom grades, becoming almost invisible in the upper echelons of further and higher education in Britain (DES, 1986).

A cursory observation by the author shows that in Ghana about 95% of the teachers at the Basic level of education are not educated to diploma level. As a result some of them have taken advantage of distance education programme being organized by the University of Education, Winneba to pursue Diploma in Basic Education (DBE). Out of the student population pursuing the DBE programme in University of Education, Winneba women constitute over 60%. Meanwhile Integrated Science is one of the compulsory courses to be taken by all students. Connors (1981) observed

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that there is a strong case for informal assessment and formal continuous assessment. Some of these assessments should be conducted under controlled conditions if impersonation is to be guarded against. The results of this assessment should be conflated in such a way as to satisfy both students and teachers. Since distance education is still suspicious in the eyes of many, high standards in the assessment of students become all the more imperative (Connors, 1981). This suggests that for the certificate of the distance learner to receive credibility there is the need for some form of well-organized assessment. The Institute for Educational Development and Extension, which runs the distance education programme for the university, uses continuous assessment (assignment) and end of semester examinations to assess its students. The continuous assessment takes 40% and the end of semester examination takes 60% totaling 100%. So far three different year groups have completed Integrated Science for the Basic School Teacher 1 and one-year group completed integrated science for the Basic School Teacher 2. The institute has students at 12 different Study Centres throughout the country. Students from all the centres do common assignments with common marking schemes as well as common end of semester examination with common marking schemes. Examination scripts from a particular centre are not marked by tutors from that centre but by tutors from other centres or completely neutral examiners who are lecturers of the university. All examination marks are processed at the headquarters, in the Institute in the University such that names of students are arranged serially according to their index numbers but not according to centres. However, majority of the female DBE students are scared of science.

What is more worrying is that many of the students had never studied science before enrolling for the DBE programme. This is because they went straight to the teacher training colleges from middle school without undertaking any secondary education where they could study some science. Out of this group also females are in the majority. These developments make tutoring of integrated science to the distance-learning students pursuing the DBE programme very difficult. Most often it is common to hear many female students complaining about the integrated science course and consider it as impediment to their successful completion of the DBE programme. At times their overt expression of phobia towards science during tutorials makes one to wonder whether the female students will be able to pass the course at all. Hence this project was designed to find out how female distance education students pursuing the DBE programme at the University of Education, Winneba are faring in science. The main objective is to compare the results of males and females in science to find out if there is any significant difference between their performances. It is hereby hypothesized that female DBE students of University of education, Winneba distance education programme do not do well in Integrated Science as compared to their male counterparts.

RESEARCH METHOD

Sample

Marks obtained in Integrated Science for the Basic School Teacher 1 for 2002, 2003 and 2004 year groups as well as marks obtained in Integrated Science for the Basic School Teacher 2 by the 2002 year group were used. For Integrated Science for the Basic School Teacher 1, the sample involved is as follows: 163 males and 163 females for 2002 year group, 254 males and 254 females for 2003 year group, and 262 males and 262 females for 2004 year group. For Integrated Science for the Basic School Teacher 2, 163 males and 163 females in the 2002-year group were involved.

Instrument

The main instrument used is the grading system of the University (Table 1).

Table 1: The Grading System of the University of Education, Winneba

LETTER GRADE	PERCENTAGE MARK	CREDIT VALUE	DESCRIPTION
A	80 and above	4.0	Excellent
B+	75 - 79	3.5	Very Good
B	70 - 74	3.0	Good
C+	65 – 69	2.5	Fairly Good
C	60 – 64	2.0	Fair
D+	55 – 59	1.5	Satisfactory
D	50 – 54	1.0	Barely Satisfactory
E	0 - 49	0	Unsatisfactory

Data collection procedure

Data was collected by considering the cumulated (assignments + end of semester examination) marks obtained by students. Names of males and females were selected randomly from the score broad sheet generated by the examination officer of the Institute.

The corresponding grades of the selected students were tallied according to the grading system of the university (Table 1). Frequencies and percentage frequencies were determined for each grade. Using Wilcoxon matched pair non-directional test analysis the grades obtained by males and females were then compared.

RESULTS

The analyzed results of 2002-year group in Integrated Science for the Basic School Teacher 1 presented in Table 2 show that 19.02% (31) males and 6.13% (10) females scored grade E. It can also be deduced from the table that 55.21% (90) males and 58.90% (96) females obtained grades between C+ and A. The differences between the means were highly significant ($W = 13$; $df = 8$, $P < 0.01$). Though more males obtained grades A and B than the females, over all, the females generally performed better than the males.

Table 2: Grades Obtained by 2002 Year Group at Level 100 in Integrated Science for the Basic School Teacher 1

Grade	Males		Females				
	Freq. (x)	%	Freq. (y)	%	(x-y)	Rank	Signed Rank
A	15	9.20	13	7.98	+2	1	+1
B+	25	15.34	20	12.27	+5	4	+4
B	23	14.11	31	19.02	-8	7	-7
C+	27	16.56	32	19.63	-5	4	-4
C	19	11.66	23	14.11	-4	2	-2
D+	11	6.75	17	10.43	-6	6	-6
D	12	7.36	17	10.43	-5	4	-4
E	31	19.02	10	6.13	+21	8	+8
TOTAL	163		163				
	Calculated W =13; Tabulated W = 3, P < 0.01 (df =8)						

Results of 2003-year group in Integrated Science for the Basic School Teacher 1 are presented in Table 3. In this table, 7.87% (20) and 8.27% (21) males scored grades A and B+ respectively whilst 10.63% (27) and19.69% (50) females also obtained grades A and B+ respectively. Here also, 55.51% (141) males and 66.14% (168) females obtained grades between C+ and A. For this year group also, 7.48% (19) males and 4.33% (11) females obtained grade E. The differences between the means for males and females were highly significant (W =17, df = 8. P < 0.01) clearly indicating that the females performed better than the males.

Table 3. Grades Obtained by 2003 Year Group at Level 100 in Integrated Science for the Basic School Teacher 1

Grade	Males		Females				
	Freq. (x)	%	Freq (y)	%	(x-y)	Rank	Signed Rank
A	20	7.87	27	10.63	-7	3	-3
B+	21	8.27	50	19.69	-29	8	-8
B	53	20.87	31	12.20	+22	7	+7
C+	47	18.50	60	23.62	-13	6	-6
C	44	17.32	32	12.60	+12	5	+5
D+	31	12.20	27	10.63	+4	2	+2
D	19	7.48	16	6.30	+3	1	+1
E	19	7.48	11	4.33	+8	4	+4
TOTAL	254		254				
	Calculated W =17; Tabulated W = 3, P < 0.01 (df = 8)						

For the 2004 year group (Table 4) 6.11% (16), 11.46% (30), 22.90% (60) and 22.90% (60) males scored grades A, B+, B, and C+ respectively whilst 8.40% (22), 15.65% (41), 23.66% (62), and 22.90% (60) females also scored grades A, B+, B, and C+ respectively. No male or female scored grade E. The differences between the means of the males and the females were significant (W = 9.5; df = 6, P < 0.05). Here too the females performed better than the males.

Table 4: Grades Obtained by 2004 Year Group at Level 100 in Integrated Science for the Basic School Teacher 1

Grade	Males		Females				
	Freq.(x)	%	Freq.(y)	%	(x-y)	Rank	Signed Rank
A	16	6.11	22.	8.40	-6	3.5	-3.5
B+	30	11.46	41	15.65	-11	5	-5
B	60	22.90	62	23.66	-2	1	-1
C+	60	22.90	60	22.90	0	-	-
C	30	11.46	35	13.36	-5	2	-2
D+	30	11.46	24	9.16	+6	3.5	+3.5
D	36	13.74	18	6.87	+18	6	+6
E	0	0	0	0		-	-
TOTAL	262		262				
	Calculated W = 9.5; Tabulated W = 0, P < 0.05 (df = 6)						

The results of the 2002-year group in Integrated Science for the Basic School Teacher 2 are presented in Table 5. Though no student scored grade E majority of them, both males and females scored grade D. However, the differences between the means for males and females were significant (W = 10.5; df = 6, P < 0.05) and the performance of females is slightly better than that of the males.

Table 5: Grades Obtained by 2002 Year Group at Level 200 in Integrated Science for the Basic School Teacher 2

	Males		Females				
Grade	Freq.(x)	%	Freq.(y)	%	(x-y)	Rank	Signed Rank
A	4	2.45	5	3.08	-1	1	-1
B+	3	1.84	3	1.84	0	-	-
B	9	5.52	14	8.59	-5	6	-6
C+	12	7.36	8	4.91	+4	5	+5
C	12	7.36	15	9.20	-3	3.5	-3.5
D+	21	12.88	18	11.04	+3	3.5	+3.5
D	102	62.58	100	61.35	+2	2	+2
E	0	0	0	0	0	-	-
TOTAL	163		163				
	Calculated W = 10.5; Tabulated W = 0, P < 0.05 (df = 6)						

DISCUSSION

According to Gripps and Stobart (1993), it is in science that attainment differences are most marked. APU data showed that all differences are in favour of boys at 11 in the application of taught science concepts, at 13 applying physics concepts, at 15 applying physics concepts together with use of equipment, interpreting the data and reading information (Gripps and Stobart, 1993). A comparison at age 11 of a science lesson in a predominantly female class in the application of physics concepts showed a statistically significant difference in favour of boys (Johnson, 1989).

Frankenhaeuser, Von Wright, Collins, Von Wright, Sedvall, and Swahn (1978) in a research report on sex differences and psychoneuroendocrine reactions to examinations observed that feeling of discomfort prior to and during examination were stronger for females than males. They further stated that poor performance was associated with high discomfort in the males and with low discomfort in the females. In this research the results for all the year groups suggest that in spite of combining numerous domestic chores with learning the performance of females is slightly better than that of the males. In many cases more females scored grades A, B+, B, and C+ than males. Also, in almost all cases lesser number of females scored grade E compared to males.

The Assessment of Performance Unit (APU) tested a sample of children regardless of their exposure to science and of course part of these differences, particularly at 15, are because boys have had more exposure to the topics in question than girls (Gripps and Stobart (1993). Under this research all the males and females were equally exposed to the science courses. They were all either given course books the contents of which were discussed at tutorials with tutors or they were all taught science together at tutorials without any course book.

There has been extensive research into differences in performance between girls and boys. However, not all the evidence points in the same direction, partly reflecting changes over time. A common feature here is the improved performance of girls over the past decade, particularly in public examinations (Gripps and Stobart (1993). This observation is in line with the results of this research indicating that Ghanaian women if given the chance can march their male counterparts boot-for-boot in science. Zeldin and Pajares (2000) observed that verbal persuasions and vicarious experiences were critical sources of self-efficacy beliefs of women who selected and continue to excel at careers in areas of mathematics, science, and technology. Therefore the perceived importance of these sources of self-efficacy beliefs may be stronger for women in male-oriented domains than for individuals operating in traditional settings. Academic and relational self-efficacy perceptions resulted in the perseverance and resiliency required to overcome academic and career obstacles (Zeldin and Pajares, 2000).

In this study the results showed that majority of the 2002-year group (Both males and females) generally obtained grades below C for Integrated Science for the Basic School Teacher 2. This may be as a result of the mode of delivery of this course. The whole course was taught in eight days without the supply of any course books. However, students were supplied course books for Integrated Science for the Basic School Teacher 1 that was handled gradually for five Saturdays in five months. Meanwhile the distance learners are adults who had withdrawn from serious and competitive academic work for several years before enrolling for the distance education programme. Therefore such learners are likely to learn science concepts slowly, hence their low performance in Integrated Science for the Basic School Teacher 2. Gardner, Cheryl, and Marsha (1989) observed that cooperative small group work is a more effective strategy for both achievement and motivation for women in science.

Dresselhaus (1987) also argued that a necessary element for women's success in engineering programmes at Massachusetts Institute of Technology was providing a peer group or team with whom they could cooperate. Since there were significant differences between the results of males and females it can be said that the hypothesis is disproved pointing to the fact that the females generally performed better than the males.

The probable explanation for this is that since the females were scared of science and working from the notion that science is a male dominated subject the females would have put in more effort in learning the subject than the males. It is likely that most of the male students were overconfident and did not put in much effort as the females. According to Jacobs, Finken, Griffin and Wright (1998) the intrinsic interest in science by science-talented rural adolescent girls was most strongly related to preferring a science career, but previous experiences with science (measured by grade in school, science GPA, friends' support for science, and extracurricular science activities) and socializers' attitudes (measured by mothers' perceptions of the values of science for women and of their daughters' abilities) were also related. This implies that once the women on the distance education programme realized that without passing the science courses there was no way they could be awarded any certificate they would have had internal motivation to pass and be awarded a certificate. This motivation would have provided the impetus and driving force to learn harder than most of the men and hence their better performance in science.

Reiss (1993) observed that women have always suffered discrimination in their attempts to get parity of education and employment opportunities. This has been especially the case for those women wishing to be educated as scientists. However, for the distance learners there was no discrimination of any kind against any gender group. The women are even given the freedom to teach science if they so

wish. Perhaps the freedom from discrimination might have also given the women the chance to pursue the science courses with the seriousness they deserve, hence their better performance in these courses than the men.

CONCLUSION

From the results it is clear that the females obtained slightly better results than the males in integrated science. Hence, it is assumed that if females are given equal opportunities as males and their domestic chores lessened by any genuine means the females on the University of Education, Winneba distance education programme will perform better than their male counterparts in science related courses. The results also suggest that the university's distance education students when rushed with courses without course books may not be able to perform well in their examinations. Hence, it is very pertinent for the Institute running the distance education programme for the university to do everything possible to put all its courses in readable printed form for its students. It is hereby suggested that the results of female and male students on the distance education programme be further monitored to find out whether there will be any changes in the trend of results.

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