

An exploratory survey of male and female learner opinions on secondary school biology education in Gauteng

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An exploratory survey was undertaken to determine whether secondary school learners have certain preferences regarding the biology they study at school and whether learners from co-educational and single-sex schools hold the same opinions. A survey schedule comprising two components was developed. The first component consisted of 15 items related to the biology learning programme, and the second consisted of 10 items related to the school. These schedules were completed by 384 Grade 11 learners (16 to 17-year-olds) in co-educational and single-sex schools in Gauteng province.

Introduction

Research outputs on the gender dimension of learning science and science related fields, are numerous. Investigations on gender differences in mathematics and science show that males frequently outperform females in relevant achievement tests and although gender differences in mathematics have decreased in recent years, such differences in science have either remained stable or have increased (Soyiba, 1999:75).

As far as biology is concerned, Tunnicliffe (1998:796) reports that the findings of the 'Assessment of Performance Unit' in the United Kingdom show that at age 11, differences in the performance of females and males are small. This corroborates the report of Braund (1991:107) which claims that previous studies on general, non-quantitative reasoning ability reveal little difference in the performance of males and females until around the age of 11. After this age females begin to overtake their male counterparts, but males do, however, catch up in later adolescence.

The performance of learners in the matriculation examination, particularly in South Africa, is constantly under scrutiny. Cognitive achievement has always featured in examinations, but as Weinburgh and Englehard (1994:118) point out, affective aspects have been neglected. Oliver and Simpson (1988:154) determined that achievement and attitudes do, however, go hand in hand and consequently affective behaviour in the science classroom is strongly related to achievement. Research in science education also suggests that gender may influence attitudes toward science and consequently influence achievement. Several studies (Johnson, 1971:479; Simpson & Oliver, 1985:523) have proposed that more males than females have a positive attitude to science in general. However, when the sub-disciplines of science are considered, females have a more positive attitude towards biology, whereas males are more positive towards physics and chemistry (Schibeci, 1984:57). Males and females also differ as far as their interest in various activities, that are biological in nature, are concerned, for example, plants generally do not appeal to males, whereas more males than females prefer pond dipping (Tunnicliffe, 1998:797). This differs somewhat from the research findings of Manganye (2001:221) undertaken in the Northern Province (Limpopo) in South Africa, namely that Grade 11 males prefer to study plant biology, human reproduction and genetics more so than their female counterparts, whereas the Grade 11 females preferred the study of micro-biology and animal biology more than the Grade 11 males.

It is possible that the type of school, whether it be a single-sex school or a co-educational school, may influence opinions and attitude towards a learning area. Harvey and Stables (1986:164) mention that the general belief is that females in all-female schools perform better than females in co-educational schools. The possibility exists though that admission requirements of single-sex schools give preference to higher ability learners and consequently the difference in performance does not give a true reflection of the situation. If co-educational schools are supported for social reasons, then it is possible to argue for single-sex classes for particular learning areas. Preliminary research

results have for example suggested that females improved their mathematics results in single-sex classes (Harvey & Stables, 1986: 164). It is against this background that an exploratory investigation was undertaken involving learners in both single-sex and co-educational schools in Gauteng Province.

Purpose

The purpose of this study was to perform an initial survey to obtain learners' opinions about the biology learning programme as it relates to gender and school composition. Two questions form the focus point:

1. Do male and female learners have gender related opinions about the biology learning programme?
2. Do the opinions of learners differ when co-educational and single-sex school learners are compared?

As indicated in the preceding paragraphs, previous research has suggested that female learners are generally more positive about biology than male learners, and that female learners initially perform better academically than their male counterparts. Male learners do, however, overtake their female peers towards the end of their schooling. The question arises whether these findings hold for the South African learner and whether single-sex schools influence learner perceptions of biology. A further intention of this investigation was to ascertain whether there are any grounds for empirical research on attitudes of learners towards biology in general and to the existing biology learning programme in particular, and whether any connection exists between the type of school learners attend and their preferences and achievement in this field. To get an insight into whether learners' perceptions of biology may be linked to the type of school they attend, statements referring to the running of the school, were included.

Method

Subjects

The sample consisted of 384 Grade 11 biology learners from ten schools in Gauteng Province, which is the most populated province in South Africa. Four single-sex schools were involved in the investigation. The six remaining schools are co-educational schools and were randomly selected. Of the 384 learners, 198 were male and 186 were female. The survey schedules were handed out to learners during the biology period and collected after they were completed. As the anonymity of learners was assured, the schedules were completed in full.

Instrument

The opinions of learners were collected using a survey schedule based on original statements made by Grade 11 learners about the biology learning programme and about the school. These learners were not included in the final sample. For each statement, learners were asked to respond by selecting either the 'agree' or 'disagree' options.

The statements were pre-tested on a group of 74 learners who originally participated in the formulation of the statements, but were

not included in the survey. Ambiguous statements were identified by learners and were removed leaving 25 statements addressing two components:

- the Grade 11 biology learning programme, and
- the school in general.

Results

To facilitate analysis of the opinions of learners, the percentage of learners agreeing with the statements as set out in the schedule, are provided. The results in Table 1 are opinions of males and females in single-sex and co-educational schools regarding the biology learning programme and those in Table 2 address the school component.

Table 1 Percentage of male (σ) and female (φ) school learners in single-sex (SS) and co-educational (CE) schools agreeing with statements related to the biology learning programme

Statement related to biology programme	CE (n=136)		SS (n=62)	
	% σ	% φ	% σ	% φ
I always enjoy biology lessons	43.4	50.8	71.0	31.5
We do enough practical work in biology	24.3	68.2	71.0	87.0
I would enjoy biology more if I could learn more about the plants in my area	22.0	70.5	48.4	48.1
There is no point to learning about cell division	73.5	40.9	72.6	85.2
Plant classification is useless information	85.3	87.9	85.5	94.4
Studying flowers is interesting	19.1	83.3	30.6	72.2
Genetics helps me to understand why I look the way I do	54.4	82.6	64.5	42.6
I enjoy practical work on animals	93.4	43.9	93.5	20.4
Learning about viruses is necessary to understand disease	84.6	64.4	66.1	53.7
Genetics is complicated and difficult to grasp	83.1	85.6	38.7	70.4
It is important to know about photosynthesis	15.4	34.8	32.3	35.2
I like studying about the human body	97.8	87.1	96.8	83.3
Biology is my favourite subject	39.7	55.3	66.1	50.0
There is too much information to memorize in biology	86.0	92.4	64.5	63.0
Biology helps me to understand nature	86.8	61.4	67.7	75.9

Discussion

Opinions: Biology learning programme

The majority of learners, irrespective of gender or school type, agreed with the statement that plant classification can be considered as useless information; that it is not necessary to know about photosynthesis; that studying viruses contributes to understanding of diseases and that the learning programme contains too much information that has to be memorized. This reiterates the findings of De Jager (2000:14-15) that numerous biology education specialists in South Africa consider the biology learning programme content-loaded and examination orientated and that it does not relate to issues that learners encounter in their daily lives.

On a positive note, the majority of learners (irrespective of gender and school type) enjoyed studying about the human body and indicated that biology helps them to understand nature.

Male and female learners in single-sex schools appear to be satisfied with the amount of practical work they do. However, the males in co-educational schools were of the opinion that they did not do enough practical work. The possibility exists that single-sex schools tend to concentrate more on practical work than co-educational

Table 2 Percentage of male (σ) and female (φ) school learners in single-sex (SS) and co-educational (CE) schools agreeing with statements related to the school

Statement related to biology programme	CE (n=136)		SS (n=62)	
	% σ	% φ	% σ	% φ
My teacher makes biology interesting to learn	41.9	81.8	71.0	44.4
I like being with the other people in my class	79.4	81.8	83.9	44.4
Our school has very strict rules	64.0	37.1	96.8	100.0
I enjoy coming to school	43.4	88.6	83.9	44.4
My best friend is in my school	91.2	97.7	83.9	51.8
Wearing school uniforms should be stopped	47.8	76.5	40.3	46.3
I am too scared to ask my biology teacher a question	44.1	18.9	25.8	50.0
I would prefer to go to another school	20.6	14.4	17.7	46.3
My biology teacher picks on me	9.6	10.6	22.6	16.7
Learners should have more say in the running of our school	83.8	84.8	82.3	79.6

schools, but this will have to be investigated as the females appear to be satisfied with the amount of practical work performed. This preference may, however, be gender related and is further substantiated by the fact that almost all the male learners, irrespective of whether they are in single-sex or co-educational schools, enjoyed practical work on animals.

A similar result was obtained when learners were requested to respond to the statement that biology was their favourite subject. Half of the females from single-sex schools and more than half of their male counterparts (as well as most females from co-educational schools) agreed with the statement. Almost 40% of the male learners in co-educational schools do not consider the subject as a favourite. Further, as less than half of these respondents stated that they always enjoyed biology lessons, the teaching strategies that are used by biology teachers in these schools may hinder learners' enthusiasm. The group of learners involved in the survey appear to be rather negative as far as the subject is concerned. However, the majority of male learners in single-sex schools always enjoyed biology lessons and considered biology as their favourite subject. The teachers' approach to the teaching of biology and interpersonal relationships may be a contributory factor, but would need further research.

Biology content related statements suggested that most learners were of the opinion that there is no point to learning about cell division although the majority of female learners in co-educational schools did not support this view. Further, although most learners (besides the female learners in single-sex schools), were of the opinion that genetics contributed to their understanding of hereditary characteristics, the majority of learners (except for males in single-sex schools), considered genetics as complicated and difficult to grasp. This again suggests that the teaching strategies used in the different schools should be investigated.

The majority of female learners, irrespective of the school type, enjoyed studying flowers whilst the male learners did not. This coincides with the research findings of Tunnicliffe reported earlier. The fact that more learners (especially males from single-sex schools) would enjoy biology more if they could learn more about the plants in their area, suggests that the related content should be reassessed.

Opinions: School in general

The opinions of learners are used to not only contrast male and female responses about the biology learning programme, but also to ascertain whether the running of the school could influence learners' contentment and whether this coincides with their perceptions of biology.

The majority of learners, irrespective of gender or school type,

agreed that learners should have more say in the running of their schools. This indication of dissatisfaction could possibly be the cause of learners' general negativity about biology. However, most learners would not prefer to go to another school even though the results suggested that single-sex schools have stricter rules than co-educational schools.

Most learners indicated that their best friend was in their school and most learners (except for females in single-sex schools) enjoyed being with the other learners in their class. The class composition of single-sex female learners may have an impact learners' enjoyment of biology.

Less than half of the male learners in co-educational schools and of the female learners in single-sex schools enjoy going to school. These opinions correspond with those related to the statements as to whether the biology teacher makes biology interesting to learn and whether the learners were scared to ask their biology teacher a question. Although most learners disagreed that their biology teacher picked on them, any possible link between learners' dislike of their school, their teachers and their attitude towards biology, should be investigated.

Recommendation and concluding remarks

The exploratory survey suggests that male and female learners may have particular preferences regarding biology learning content and although the biology learning programme has been criticised by numerous educationists, it is essential that further research is undertaken before thorough curriculum development is undertaken. To this end, gender related interests will have to be determined and should be considered.

The survey also suggested that teaching strategies used at the different schools should be investigated and compared to ascertain why discrepancies are encountered. It is also necessary to attempt to

correlate achievement of learners with their views on biology and to ascertain why learners do not enjoy the subject.

This exploratory investigation has highlighted the need for empirical research as regards gender preferences, learner attitude towards biology learning content, teaching strategies and school composition. Further research is recommended.

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