

THE UNIVERSITY OF ZAMBIA

SCHOOL OF EDUCATION

**DEPARTMENT EDUCATIONAL PSYCHOLOGY, SOCIOLOGY AND SPECIAL
EDUCATION**

TITLE:

**AN INVESTIGATION INTO THE RELATIONSHIP BETWEEN
GIRLS' AND BOYS' SELF CONCEPT AND PERFORMANCE
IN MATHEMATICS AND SCIENCE**

**SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENT OF THE
MASTER OF ARTS DEGREE IN EDUCATIONAL PSYCHOLOGY.**

BY

ECLOSS MUNSAKA

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DEDICATION

I dedicate the whole of this work to my father, Mr. Patrick Munkombwe, my mother Mrs. Sowi Munkombwe, my brothers and sisters and my posterity.

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AUTHOR'S DECLARATION

I, Ecloss Munsaka, do hereby declare that this dissertation presents my own work and that it has not been previously submitted for a degree at any level at this or any other University.

APPROVAL

This dissertation of Ecloss Munsaka is approved as fulfilling part of the requirement for the award of the degree of Master of Education in Educational Psychology by the University of Zambia.

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ABSTRACT

The purpose of this study was first to investigate whether male students had a higher self concept than female students in mathematics and science. Secondly, to establish whether there was a positive correlation between self-concept and performance.

A sample size of 114 students (56 females and 58 males) from four selected coeducational secondary schools in Lusaka city namely; Munali, Kamwala, David Kaunda and Libala was used in the study.

To measure self concept, two questionnaires were designed; one for the self rating of self concept by the students and the other for the teacher rating of the students' self concept in mathematics, physics and chemistry. Each of these questionnaires contained five items which sought to measure the current performance of the student in the subject, the student's past performance in the subject, the amount of effort that the student applied in the subject, the reaction of the student when confronted with questions in the subject and the amount of interest of the student in the subject. These were answered using the 1 to 7 likert-type scales which were also the basis for scoring. As a way of gauging performance, tests were set in mathematics, physics and chemistry. Each of the tests had twenty questions which were converted to percentages.

The procedure followed in administering the instruments was; first, subject teachers in all the three subjects; mathematics, physics and chemistry, administered the tests that

were set to gauge the performance of the students. Subject teachers were used to administer the tests in order to make the students apply themselves in full without them thinking the tests were just for research. Shortly after the tests were written, the researcher with the help of the subject teachers administered the self rating questionnaires to the students. Subject teachers also filled out the students' rating questionnaires after the subjects were written. The marking of the tests was done by the teachers who had set the tests to avoid disparities in scoring. As a basis for testing the first hypothesis namely; boys have a higher self concept than girls in mathematics and science, the chi – square test was used. The second hypothesis namely; there is a positive correlation between self concept and performance, was tested using the product- moment correlation test.

In view of the low self concept that girls were found to have in mathematics and physics and the positive correlation that was found between self concept and performance in mathematics, physics and chemistry, the following recommendations were made to the ministry of education in order to try and improve the self concept of girls and consequently performance in these subjects:

- a. Teachers should from as early as pre- school, start instilling some positive attitudes in the girls towards mathematics and science subjects so that right from the outset, girls develop positive self concept in these stereotypically “masculine subjects”. Positive attitudes can be developed through teachers telling girls as

often as possible that they have the same cognitive endowment as boys in all the areas including mathematics and science.

- b. Allocation of science subjects to students in schools should not show any biasness towards the male students- as many female students as males should be allowed to take up science subjects. By giving female students a chance to do science subjects on an equal footing with the male students, chances of producing more female science teachers who would act as role models to female students in schools would be enhanced.
- c. There should be a deliberate policy by the ministry of education to encourage schools to as often as possible invite adult females who have been successful in the fields of science and mathematics to inspire female students and act as role models.
- d. In the case of single sex schools, there should be uniformity in subject combinations in male and female schools. For example, girls' schools should offer pure sciences (physics and chemistry) as much as boys' schools do. This would remove the stereotypical notion that females are not well endowed in pure sciences.
- e. Home environments where boys and girls are growing together should be such that no discriminatory remarks which lead girls to believe that girls are inferior to

boys are uttered since this does not just have an effect on the formation of general self concept but academic self concept as well.

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CHAPTER 1

1.1 INTRODUCTION

The construction of self-concept is predominantly dependent on the social environment, that is, the experiences that one gets through the interaction with others and the feed back he or she gets eventually determine how one perceives himself or herself. Charles (1964:76) amplifies this:

while the self-concept is unique and personal, it derives from social experience. A person sees himself as a success or failure only in relation to his experiences with others, or in the way those experiences have been for him.

In the academic circles therefore, self-concept is formed on the basis of earlier academic experiences, that is, if one experienced success in his or her earlier academic tasks, he or she is very likely going to anticipate success even in his or her subsequent tasks in that area. Similarly, if one experienced failure in the past in a particular area, one is likely to anticipate failure in that area in the future. This trend of things can be understood better by looking at the self-evaluation theory (Swann, et al. 1992). According to this theory, people's self-perceptions lead to confirming behaviours designed to reassure themselves of their true nature. For example, a person who believes he or she is honest reaffirms this by engaging in behaviours that reveal his or her honesty. Stated differently, people strive for consistency in the judgement of their abilities. For example, a person's self-perception that he or she lacks mathematical ability should negatively affect his or her evaluation of his or her performance on a mathematics test. Self-verifying behaviours have been amply demonstrated in Swann (1992) and Wells & Sweeney (1986).

A number of studies that have been done to evaluate the performance of girls and boys indicate that there are some marked disparities in performance between girls and boys especially in the areas of mathematics and science. According to Mwanza (1990), there is evidence to suggest that for mathematics and science, the gap between boys and girls' examination performance is wide: girls lag behind boys. Kelly (1994) in a study done on performance of girls and boys in selected secondary schools in Zambia revealed similar findings: girls performed rather badly especially in mathematics and sciences. Dorsey (1989) also revealed that girls do not do well in mathematics and science subjects. It is against this background that this study sought to investigate the relationship that exists between girls' and boys' self-concept and performance in mathematics and science.

1.2 STATEMENT OF THE PROBLEM

A number of studies conducted on the performance of girls and boys have tended to show that there are disparities in levels of performance between boys and girls. The disparities have been highest in the areas of mathematics and science. Here, often girls lag behind boys (Kelly,1994; Mwanza,1990; Dorsey,1989). Further, other studies (Byrne, Shavelson, and Bolus, 1982; Calsyn and Kenny, 1977; Byrne 1986 ; Newman 1986), show that there is a close relationship between one's self concept and his or her performance. The aim of this study was to investigate the nature of self-concept that boys and girls had in mathematics and science and relate it to performance in these subjects.

1.3 GENERAL OBJECTIVE

The main objective of this study was to establish through correlations the relationship between self concept and performance.

1.4 SPECIFIC OBJECTIVES

- a) To assess the nature of self-concept (high or low) that girls and boys had in mathematics and science.
- b) To assess the relationship between self-concept and performance in mathematics and science.

1.5 RATIONALE

A number of studies have been conducted in many parts of the world to assess the relationship that exists between self-concept and performance and the findings in most of these studies have been that there is a positive correlation between self-concept and performance, that is, a positive self-concept will translate into good performance. Quite a number of studies have been done in Zambia to compare the levels of performance between girls and boys in various subjects and like many studies done elsewhere, the findings have revealed that boys do better than girls in most subjects especially in mathematics and sciences. However, none of these studies has tried to venture into carrying out a study to find out the nature of self-concept that girls and boys have in the different subjects. It is for this reason that this study looked at how boys and girls perceived themselves with respect to their abilities in mathematics and science. It was hoped that the study would lead to advocacy for 'girl child education' in that, policy makers and all those involved in the girl child education would have more insight into the

key areas and focus on addressing matters to do with girl child education. In general, this study was aimed at contributing towards building a curriculum that would relevantly be responsive to the needs of all students (boys and girls) in the education system.

1.6 RESEARCH HYPOTHESES

H_0 There is no difference in the level of self concept between boys and girls in mathematics and science.

H_1 Boys have a higher self-concept than girls in mathematics and science.

H_0 There is no correlation between self concept and performance.

H_1 There is a positive correlation between self-concept and performance.

1.7 STUDY LIMITATIONS

Financial resources and time were the two major limiting factors in this study. To be able to come up with comfortably generalizable findings, there was need to have had a larger sample which this study was not able to do due to the limitations in financial resources. The study would also have been more helpful and complete if it had looked at the causal relationship between self-concept and performance in mathematics and science but due to the time limitation such an extensive study was not possible. The use of a self rating questionnaire was found to be limiting as well since as is normal, matters of accuracy and honesty on the part of the students could not be guaranteed.

1.8 OPERATIONAL DEFINITION OF KEY TERMS.

Science: In this study, the term refers to pure physics and chemistry

Academic self concept: General self concept refers to the way one perceives oneself in different areas of life and academic self concept is a part of general self concept which focuses on how one perceives oneself in relation to what they can do in the area of academic work.

Performance: This refers to one's level of ability in a particular area. In this study, test results were used as the basis for gauging performance.

Anxiety: This refers to a person's feeling of fear and tension which interferes with normal performance.

1.9 ORGANISATION OF THE DISSERTATION

After chapter1, the introductory chapter, the rest of the dissertation is divided as follows:

- a. Chapter 2: Review of related literature
- b. Chapter 3: Methodology
- c. Chapter 4: Presentation of results
- d. Chapter 5: Discussion of results
- e. Chapter 6: Summary and recommendations

CHAPTER 2

2.1 REVIEW OF RELATED LITERATURE

A growing body of literature such as Byrne, Shavelson, and Bolus (1982), indicates that academic self-concept is clearly differentiable from general self-concept and that academic self-concept is more highly correlated with academic achievement and other academic behaviour than is general self-concept. Despite this close link that studies have been able to establish between academic self-concept and achievement, it is as yet not clear which of the two; self-concept or performance causes the other, as Byrne, et al. (1982:12) further point out:

Perhaps the most theoretical question in academic self-concept research involves determining the causal ordering of academic self-concept and academic achievement....many self-concept enhancement programs are based on the assumptions that an improvement in self-concept will lead to gains in academic achievement.

This view stems from the belief that academic self-concept has motivational properties such that changes in academic self-concept will lead to changes in subsequent academic achievement. Kenny (1991) contrasted self-enhancement and skill development models of the relationship between self-concept and achievement. According to the self-enhancement model, self-concept is a primary determinant of academic achievement. In contrast, the skill development model posits that academic self-concept is primarily a consequence of academic achievement. According to this model, the best way to enhance self-concept is to develop stronger academic skills. It is thus considerably difficult to devise a methodology that can clearly show the causal relationship between academic

self-concept and achievement. Kenny (1991) proposed the method of cross-logged panel correlation to establish which of the two variables, academic self-concept or achievement over self-concept in a variety of comparisons, thus supporting the skill enhancement model.

It should be pointed out that studies that were conducted in the past yielded different results depending on how achievement was inferred, whether from the standardised test scores or school grades. Newman (1984) inferred academic achievement from standardised test scores and argued for the predominance of academic achievement over academic self-concept. Byrne (1986) inferred academic achievement from a combined construct based on both school grades and standardised test scores and found no support for the causal predominance of either construct. Although interpretations should be made cautiously, this pattern is consistent with Marsh's (1987) suggestion that prior academic self-concept is more likely to affect subsequent achievement if it is inferred from school grades that are responsive to motivational influences rather than from standardised test scores.

Quite some extensive research has been done to compare self-concept and performance of boys and girls and significantly interesting results have been found in these studies. Labouvie et al. (1990) observed that most of the studies that evaluated gender differences in self-esteem found that adolescent females scored lower on self-esteem than did adolescent males. Simmons and Rosanberg (1975) found that more girls reported lower self-esteem than boys during middle and late adolescence but not between the ages of 8

and 11. In a study of fourth, sixth, eighth and tenth grade students, Bohan (1973), found no significant differences between grades or sexes except in the tenth grade. Going by the findings in these studies, it would appear that disparities in self-concept between girls and boys only become apparent in adolescence, when they are in secondary school.

Studies have also been done to compare self-concept in specific academic areas with the level of anxiety. Anxiety as Morris et al. (1978) observe, has been found to be consistently related to the lower achievement in mathematics at all ages. Despite the studies that have been done, it is very difficult to demonstrate the causal relationship between anxiety and poor performance. For example, Llabre and Suarez (1985) found that achievement of university students in an introductory algebra course was not affected by mathematical anxiety once mathematics aptitudes had been controlled for. Mathematics anxiety has also been found to be higher in females than males at all levels of schooling. It has been suggested that the higher anxiety in female university students may be a result of their being more self-critical of their anxiety and performance in mathematics than males, irrespective of their actual achievement Flessati and Jamieson (1991). Zeidner (1991) however, argues for deficit interpretation of statistical anxiety amongst university students studying social sciences, irrespective of gender, because students with higher anxiety generally have poorer prior achievement in mathematics, a lower sense of self-sufficiency and also report more aversive prior experiences with mathematics. According to this view, if one has had unpleasant prior experiences with mathematics, one is likely to be anxious in the subsequent mathematics tasks and as a result is likely to perform badly.

Another area where literature should be reviewed in this study is that of gender stereotyping of roles and tasks. As evidenced by Mura (1987), the gender typedness of a task affects performance experiences. Females are least and males most confident on masculine gender - typed endeavours such as mathematics, physics, spatial tasks, technical problems, computers and performance in typical masculine occupations. Fawe (1997:2) gives the following as further evidence of some of the stereotypes held against girls in schools: "Girls are not as bright as boys. Girls simply lose interest in school in general after a few years. It is not worth giving girls secondary or university education". Such are the statements that girls are confronted with as soon as they are old enough to decipher language. More often than not these messages are accepted as the true reflection of things and girls come to build their academic self-concept around such beliefs. These stereotypes are even worse in the areas of mathematics and science, as pointed out in this statement.

There is an even greater problem in mathematics and science, subjects that girls do not only appear to do poorly in, but that few study at all. Only a small number of girls in Africa opt for these subjects at secondary level, let alone university (FAWE, 1997: 2).

Two studies by Beyer (1990), provide support for self consistency hypothesis and highlight the importance of gender typedness of the task. Expectancy, which was affected by the gender typedness of the task was a significant predictor of post task self evaluations of performance. Females' low expectancies on masculine tests in politics and sports predicted their inaccurately low self evaluations. Males' expectancies on these tasks predicted their more accurate self evaluations. Such low expectancies by females

automatically tell us that the conception of themselves in those areas is rather low and negative.

It has been widely demonstrated for instance by Gillan (1982) and Spender(1982) that boys typically attract more of the teacher's attention than girls in coeducational classrooms. Dale Spender has documented this generalization in her book, "Invisible Women ". Spender found that girls, especially in junior secondary years, are reluctant to express their viewpoints in front of boys. Gill (1992), reported that higher teacher- male student interaction was more common when the teacher was inexperienced. More experienced teachers adopted strategies in the classroom to reduce the imbalance in interaction with boys and girls, nevertheless, boys still received more teacher attention than girls . The reluctance of girls to speak up in class does not necessarily mean that girls are disadvantaged in terms of their classroom learning or educational achievement. In extensive classroom observational study in South Australian schools by Gill (1992), reported that boys asked more trivial questions merely to gain attention , whereas girls were more likely to seek clarification for their learning problems from their friends or their seating partners.

Some cultural norms and beliefs do contribute to the prevailing poor performance of girls in most subjects. According to FAWE (1997), there are prevailing cultural expectations, norms and traditional attitudes that restrict female achievement, mobility and opportunity. Like wise, the amount of time girls are required to spend on domestic tasks and other productive activities reduces the time and energy they have to spend in school and on school work, thereby affecting their attendance, performance and attainment.

One important factor influencing students' levels of achievement is motivation. Graham (1989) posits that much of the chronic failure of black children can be understood as reflecting problems in motivation. Graham further stated that far too many minority children perform poorly in school not because they lack basic intellectual capabilities or specific learning skills but because they have low expectations, feel hopeless, lack interest or give up in the face of potential failure (1989:120). Going by Graham's postulation therefore, one's motivation to do a particular task is dependent on expectations, that is, if the expectations are low, the level of motivation will be low too. Similarly, if the expectations are high, the level of motivation will be high. It could therefore be argued that disparities in performance between boys and girls in various areas of academic pursuit can be linked to motivational factors. In this regard, this relationship can be summed up in the equation: "Expectations= Motivation + performance". Eccles et al (1983), came up with the term "achievement values" . By this they meant individuals' interest in a task, its importance to them, and its usefulness. They found that adolescent females in comparison with adolescent males, value mathematics less. Males in the junior high years are more likely than females to perceive mathematics as important for future career goals.

Inevitably, the self-esteem motive confronts incoming information about the self that is negative. One strategy to cope with negative information involves acknowledging a "pocket of incompetence" . Through recognising the kinds of situations that reveal one's fault, one can avoid such negative encounters. Another strategy is to place special

importance on domains wherein one is capable, while devaluing any domain in which one is not competent (Rosenberg, 1967). Although little empirical evidence supports the existence of the first process, a variety of researchers have presented data consistent with the second process- that individuals lower the importance of domains in which they lack skill as shown by (Campbell ,1989 ; Harackiewicz, et al. 1984; Rosenberg, 1979). This lowering of domain importance suggests that importance is, in fact, a dynamic quality that may shift in the service of self-esteem.

Lowering of domain importance when a particular aspect of the self is threatened is outlined as a possible defensive manoeuvre in the self evaluation model (Tesser and Campbell, 1982, 1983; Tesser, et al. 1988). The model postulates that the relevance, or the importance, of a particular ability domain will influence how an individual responds to the performance of a close other in that domain. Thus, specifically, if an individual is out performed by a close other in an ability domain that is not relevant to his or her self concept, then the individual is free to " bask in the reflected glory " of the other's performance (Cialdini et al, 1976). On the other hand, if an individual is out performed in a domain that is relevant to his or her self-concept, then the upward comparison will result into a negative feeling. In such a case, the model suggests that decreasing the domain's importance is one possible action that will alleviate the negative feeling. It therefore follows that in this socially comparative model of self evaluation, domain importance shifts to maximize positive inferences about the self.

Australian research findings on the effect of gender - based education are conflicting. For example, a longitudinal study was conducted in a Victorian high school which randomly allocated year 7 and 8 students into coeducational or single sex classes in a coeducational school. When the students were administered items from standardized mathematics achievement tests on three occasions over a two year period, the researcher, Rowe (1988) found no gender differences in achievement based on the type of math class, but did report increased levels of confidence in learning and using mathematics by girls in single sex classes. "where in turn, there is a significantly increased likelihood of their subsequent participation in senior mainstream mathematics education" (Rowe 1988: 80) . On the other hand, Carpenter (1985), examined the year 12 achievement scores of a sample of 1200 carefully selected Queensland students. He reported that student achievement in a given type of school, was influenced by a number of variables including curriculum, teacher's encouragement and the social class background of the student. He found out that:

while single sex schooling appears an advantage to the daughters of mothers who are white collar workers to avoid low year 12 marks and gain medium results , coeducational schooling offers such girls a small advantage in achieving high marks. Among girls whose mothers did not hold a paid job , single sex schooling offers a little more insurance against scoring low marks. (1985: 469).

A review of U.K and Australian studies on the alleged academic advantages of single sex over coeducational school attendance concluded that the empirical evidence in favour of single sex schools is of questionable value (Willis and Kenway 1986). These reviews maintain that a causal relationship between single sex school attendance and superior achievement has not been established, arguing that separate schooling is dangerous in its

potential for greater social divisiveness. Students who are educated in separate schools may develop attitudes towards the opposite sex which are outdated and stereotypical (Phillips, 1979).

The complexity of the interactions between single sex and coeducational schooling, social class, teacher and curriculum variables is such that it has led one reviewer of the field to the following position:

Research reviewed leads to the conclusion that type of school makes little difference to gender inequalities (especially those suffered by girls) that single sex classes for specific purposes in coeducational schools are only of limited value; and that new ways of reducing sexism in all types of schools, whether mixed or sex segregated, must be found (Gray, 1987: 34).

While it is important and indeed good to venture into eliminating such sexism in all kinds of schools, it would not do much good if trouble was not taken to get to some of the self indoctrinated beliefs that lead girls to live up to these discriminatory expectations. Often girls are only vaguely aware, or are not aware at all, about this self indoctrination which works to their disadvantage. Thus a study like this one whose aim it is to bring out the relationship between self-concept and performance, can make a positive contribution in the reduction of academic inferiority of the girls.

In a research done by Beyer (1990) on calibration, research participants had to average their performance on many items of a multiple choice test into one overall post task self evaluation of performance. Research on calibration has found that both sexes i.e. males and females are poorly calibrated - specifically, they over estimated that their answer was

correct. A number of studies (Fischhoff, Slovic, & Lichtenstein, 1977; Lichtenstein & Fischhoff, 1977; Lichtenstein, Fischhoff, & Phillips, 1982) demonstrate poor calibration by both girls and boys. Only one study (Newman, 1984) found that girls expressed less over confidence than boys- that is, girls were better calibrated. Two explanations exist for the discrepancy between research on accuracy of self evaluations and research on calibration: (a) gender differences in accuracy exist only at the level of self evaluation and not individual questions (b) the discrepancy may be a methodological artifact. Calibration studies have typically used neutral gender- typed general questions.

As was the case with Beyer's (1990) research, a study was done to assess response bias using analysis borrowed from signal detection theory. Response bias was understood to refer to a person's willingness to claim high confidence for having answered a question correctly. Response biases can vary from liberal to conservative and reveal an inability to discriminate correct answers from incorrect answers. However, people with different response biases make different kinds of errors. For example, after answering a question, person 'A' claims perfect confidence regarding the correctness of the answer, whereas person 'B' is much less confident. A's response bias is more on target than B's if the question was answered correctly. However, if the question was answered incorrectly, B's response bias is more appropriate. Thus a very liberal response bias reveals over confidence: despite an incorrect answer, a person is confident. A person with a conservative response bias will rarely state high confidence and will often mistakenly indicate low confidence despite answering the question correctly. Analogous to the predictions for the accuracy of self evaluations and calibration, this study hypothesised

that girls would show significantly more conservative response bias than males on masculine task, in the case of this study, mathematics, physics, chemistry. Maimbolwa-Sinyangwe (1985), observes that self concept does not exclusively affect performance; a low self concept child might achieve well because he is highly motivated, a high self concept child might achieve poorly because she is not motivated to work. This , she goes further, supports the claim that achievement is influenced by a variety of factors. Also how many or which factors influence a child's performance may vary from one child to another. Further, in her study, Maimbolwa-Sinyangwe found out that the high correlation between the teachers' ratings of the pupils' self concept and motivation could imply that the teachers based judgement of both self concept and motivation on the same behaviors. In other words the teachers were more conversant with the behavioral patterns that influenced performance. Maimbolwa-Sinyangwe further found out in her study that pupils tended to rate themselves higher than the teachers rated them on both self concept and motivation. This difference, she argues, could have been due to a variety of reasons. One reason could have been that pupils, in a spirit of aggrandizement, were overestimating their capabilities. For this study, the response bias assessment was not done per se because the concern was not to find out the responses for the individual questions, rather the concern lay in assessing the general picture of self perception in relation to general performance on the administered tests in all the three subjects.

In order to avoid any problems that could arise as a result of students inaccurately rating themselves, there is often need to use teacher ratings in that teachers are less susceptible to biases. A large and growing body of research testifies to the value of teacher ratings. A

representative example is the work of Morine – Dersheimer (1978 ;1979a; 1978 ;1979b), whose findings suggest that teacher estimates of students' ability are accurate and highly useful. Such findings should not be surprising : Teachers are professionals with a generally well – developed knowledge base of day to day experience with their students. They develop a deep understanding of students' general and specific abilities. Wiederholt and Bryant (1987) noted that experienced teachers appear to have an internalised scope and sequence chart that allows them to make a determination of the learning abilities of the students in their classrooms after a relatively short observation time. This kind of knowledge can be translated into more permanent form by means of such assessment as rating scales, written opinions, and grades (Hammill & Bryant 1989: 11). The accuracy of teacher judgments has been shown repeatedly (Gresham, 1986; Nelson, 1971; Shafer, 1982), as has their correspondence with the results of standardized academic achievement tests (Brophy & Good, 1974; Hammill & Hresko, 1994; Keogh & Smith, 1970; Ohlson, 1978). Egan and Archer (1985: 26) believed that existing correlations between students' actual achievement and teachers' ratings of student achievement have not been given sufficient credence:

There is no compelling evidence that teachers are in fact inaccurate. Since the 1920s, there have been dozens of studies reporting correlations in the order of .5 to .6 between teacher ratings and various standardised tests. These correlations may be considered as coefficients of concurrent validity, and as such they are quite large.

Eccles et al. (1983) developed a questionnaire to measure students' beliefs about ability in mathematics and science, effort expenditure in school, expectancies for success in each activity, and the subjective value they attach to activities in each domain. The value

items tapped the children's beliefs about how interesting or how much of fun each activity was, how important it was to the child, and how useful it was to each student. Based on factor analyses of mathematics items by Eccles and colleagues, the following scales were formed from the questionnaire items: mathematics self-concept of ability, containing three items; mathematics expectations for success, containing three items; mathematics effort, containing one item; mathematics value, containing seven items; intentions to take more mathematics courses, containing one item; science self-concept of ability containing three items; science expectations for success, containing three items; science effort, containing one item; science value, containing seven items; intentions to take more science, contain one item. The results for this study show some important group differences in the achievement beliefs of African American adolescents. Considering the sex differences, first, boys had higher beliefs about their abilities in mathematics and science, higher expectations in mathematics and valued science more than girls did overall. These findings are similar to other studies of sex differences in achievement beliefs in both African American and white adolescents (Garin and Epps, 1975; Hale-Benson, 1986; Wigfield, et al. 1991), particularly when considering male and female beliefs of ability in mathematics.

In dealing with the issue of self-concept, one should not forget the different values and beliefs that exist in different societies, in that, these have an influence on how one constructs his/her self-concept. Societies vary in the way they are organised; some societies emphasize individualism while others believe in collectivism. Markus and Katayama (1991), have pointed out the variations in the ways people from different

cultures tend to think about themselves. People from Western cultures tend to have an individualistic self-concept, with emphasis on individual characteristics and, achievement, whereas those from Non-Western cultures tend to report a collectivist self-conception in which the person does not think about him or herself so much as an individual but rather in terms of relations with other people. For this reason, one has to take extra care in generalising western findings about self-concept to the Non-Western cultures.

Despite these specifics about cultures, it is also quite clear that many characteristics of age and gender have a universal physiological basis. From about 8-9 years of age, children throughout the world experience major changes that may well lead to changes or in threats to their self concept (Hattie, 1992). At about that age, there is a marked increase in the growth of brain cells, particularly in the frontal lobes, that lead to the development of higher cognitive processes, such as planning and intentional and abstract behaviour or to formal operational thought (in Piagetian terms). There are also universal physiological changes related to puberty that may affect boys' and girls' perceptions of the self. Related to these bodily changes is the almost universal transition from primary to secondary school at about 11 to 13 years of age. This transition is often associated with changes in the nature of instruction and different expectations on the part of the teachers, family and peers. (Hattie, 1992). Thus, given these universal changes related to age, gender and cultural differences in the nature of one's self-concept, the question of reliability of the western cultures remains an open one. It is for this reason that this study

sought to establish the relationship between self-concept and performance in mathematics and science between girls and boys in four selected secondary schools in Lusaka city.

2.1.1 Summary of the Reviewed Literature

The review of literature in the pertinent areas of this study has revealed some significant findings which have been summed up. Firstly, a wide body of literature which includes Byrne Shavelson, and Bolus (1982), has indicated that academic self concept is clearly differentiable from general self concept and that academic self concept is more highly correlated with academic achievement and other academic behaviour than is general self concept. However, as Bryne, et al. (1982: 12) have pointed out, it as yet not clear which of the two; self concept or performance causes the other:

Perhaps the most theoretical question in academic self concept research, involves determining the causal ordering of academic self concept and academic achievement...many self enhancement programs are based on the assumptions that an improvement in the self concept will lead to gains in academic achievement.

This view stems from the belief that academic self concept has motivational properties such that changes in academic self-concept will lead to changes in subsequent academic achievement. This principle behind the link between self-concept and performance is similar to the postulations in the self-evaluation theory. According to this theory, people's self perceptions lead to confirming behaviours designed to reassure themselves of their true nature. For example, a person who believes he or she is honest reaffirms this by engaging in behaviours that reveal his or her honesty. Stated in another way, the self evaluation theory implies that people strive for consistency in the judgement of their abilities. For instance, a person's self perception that he or she lacks mathematical ability,

should negatively affect his or her evaluation of his or her performance on a mathematics test. Self verifying behaviour have been amply demonstrated in Swann, (1982) ; Wells & Sweeney (1986).

Quite some extensive research has been done to compare the self concept and performance of males and females and significantly interesting results have been found: Labovie et al. (1990) observed that most of the studies which evaluated gender differences in self esteem, found that adolescent females scored lower on self esteem than adolescent males. Simmons and Rosenberg (1975), found that more girls reported lower self esteem than boys during middle and late adolescence but not between the ages of 8 and 11. In a study of fourth, sixth, eighth, and tenth grade students Bohan, (1973), found no significant differences between grades or sexes except in the tenth grade where female students were found to lag behind male students. It would appear going by these findings, disparities in self concept between males and females only become apparent in adolescence when they enter secondary school.

Studies have also been done to compare self concept in specific academic areas and the level of anxiety. Anxiety as Morris et al. (1978) observe, has been found to be consistently related to the lower achievement in mathematics at all ages. Mathematics anxiety has been found to be higher in females than males at all levels of schooling. It has been suggested that the higher anxiety in female university students may be a result of their being more self critical of their anxiety and performance in mathematics than are males, irrespective of their actual achievement (Flessati and Jamieson, 1991). Zeidner (1991), argues for deficit interpretation of statistical anxiety amongst university students

studying social sciences, irrespective of gender, because students with higher anxiety generally have poorer prior achievement in mathematics, a lower sense of self sufficiency and also report more aversive prior experiences with mathematics.

Literature on the effect of task gender stereotyping and expectancies, has also been reviewed. Two studies by Beyer (1990) provide support for self consistency hypothesis and highlight the importance of gender typedness of the task. Beyer revealed that expectancy which was affected by the gender typedness of the task was a significant predictor of post task evaluations of performance. Females' low expectancies on masculine tests of politics and sports predicted their more accurate self evaluations. Beyer's observations agree with Graham's (1989) postulations that one's motivation to do a particular task is dependent on their expectations; if the expectations are low, the level of motivation will also be low. Similarly, if the expectations are high, the level of motivation will be high. It could therefore be argued that disparities in performance between males and females especially in mathematics and science can be linked to motivational factors. This relationship could be illustrated further by the equation: "Expectations = Motivation + Performance".

Eccles et al. (1983), came up with the term 'achievement values'. By this they meant individuals' interest in a task, its importance to them, and its usefulness. They found that adolescent females in comparison with adolescent males valued mathematics less. Further literature (Mura,1987; FAWE, 1997), demonstrates that females are least and males most

confident on masculine gender- typed endeavours such as mathematics, physics, partial tasks, technical problems, computer and performance in typical masculine occupations.

It has also been generally demonstrated, for example, in studies by Gillan (1982), Spender (1982) and Gillan (1991) that boys typically attract more of the teacher's attention than girls in coeducational classrooms. This has led one literature reviewer of the single sex/coeducational schooling area to make the following assertion:

...type of school makes little difference to gender inequalities (especially those suffered by girls) that single sex classes for specific purposes are only of limited value; and that new ways of reducing sexism in all types of schools whether mixed or sex segregated must be found (Gray, 1987: 34).

A large and growing body of research testifies to the value of teacher ratings. A representative example is the work of Morine- Dersheimer (1978 ;1979a ; 1978 ;1979b), whose findings suggested that teacher estimates of student ability are accurate and highly useful. Wiederholt and Bryant (1987), noted that experienced teachers appear to have an internalised scope and sequence chart that allows them to make a determination of the learning abilities of students in their classrooms after a relatively short observation time.

Egan and Archer (1985 : 26) give further support to the accuracy of teacher ratings:

There is no compelling evidence that teachers' ratings are in fact inaccurate. Since the 1920s, there have been dozens of studies reporting correlations in the order of .5 to .6 between teacher ratings and various standardised tests. These correlations may be considered as coefficients of concurrent validity, and as such they are quite large.

CHAPTER 3

3.1 METHODOLOGY

3.2 Population

The target population in this study were all grade twelve students-boys and girls doing mathematics and pure Sciences (Physics and Chemistry) in the four coeducation secondary schools in Lusaka city district namely; Munali, Kamwala, Libala and David Kaunda.

3.3 Sample

The total sample comprised 114 grade twelve students (56 females and 58 males) from the 4 selected coeducation secondary schools in Lusaka city namely, Munali Senior Secondary School, Kamwala Secondary School, Libala Secondary School and David Kaunda Technical Secondary School. A mixed grade 12 class (one with boys and girls) offering mathematics, physics and chemistry was picked from each school. The sample was selected from a total population of 184 students (128 males and 56 females). Since there was low female representation in pure science classes in all the four schools, all the female students were included in the sample. Due to their large numbers, the male students had to be randomly selected to match the small number of female students. Numbers of males and females had to be as close in size as possible because the study was anchored on correlations which cannot be done if numbers vary very diversely. Below is a table showing the age distribution of the subjects in the sample:

AGE DISTRIBUTION OF BOYS AND GIRLS IN THE SAMPLE

Age in Years	Male	Female
16	0	2
17	10	30
18	24	20
19	16	4
20	8	0
Total	58	56
Average age	18.3	17.4

3.4 Instruments.

Two self concept questionnaires, one for the self rating by the students, the other for teacher rating of students' self concept were devised. The same questionnaire was used for all the three subjects – mathematics, physics and chemistry. Each of the questionnaires contained five items which sought to measure; the current ability in the subject, the past ability in the subject, the amount of effort put in the subject, the students' reaction (confident or uneasy) in the subject and the amount of interest the student had in the subject. The questionnaires used were adopted from questionnaire items used by Eccles et al. (1983) and expanded to include items about physics and chemistry. The items used by Eccles et al. (1983) were adopted and used for the Zambian situation because they were found to be without any cultural biases – whichever culture students come from. they are able to make an evaluation of their performance. Similarly, teacher ratings were used because all schools, whether in developed or developing countries, as a requirement perform thorough evaluation of students' performance. For this reason, the instruments were not piloted. The questionnaire items were answered using the one to

seven likert-type scales which formed the basis for scoring. To determine the level of reliability of the tests and the self concept questionnaires, some coefficient alpha reliability tests were computed. For the mathematics, physics and chemistry tests, the coefficient alpha estimate of internal consistency reliability was $r = 0.85$. For the self concept questionnaires with a total of 15 items, an even higher coefficient alpha of internal reliability of $r = 0.94$, was found. In the previous researches (Eccles et al. , 1983 ; Eccles , 1984 a ; Eccles et al. , 1984 b), the reliabilities for the scales based on these items ranged from .60 to .90. As can be seen from the alpha values, the instruments had high reliability.

To measure performance, three tests were set in mathematics, physics and chemistry. Each paper had a total of 20 questions with one point each. These were converted to percentages. These tests as shown above had a coefficient alpha estimate of consistency reliability of 0.85.

3.5 Procedure

First, consideration was made to create an atmosphere where the students would write the tests without them thinking or feeling that they were doing it purely for research which would have made some students reserved in their application of efforts on the tests. In order to avoid this, the researcher gave the test papers to the subject teachers who administered them as part of normal preparation for the grade 12 final examinations which were due five weeks later at the time. Students' questionnaires were administered shortly after writing all the tests. The researcher with the help of the teachers administered all questionnaires. Subject teachers filled out the students' self concept

rating questionnaires after the tests were written. The marking of tests was done by the teachers who had set the papers in order to bring about uniformity in the allocation of marks. As has already been mentioned, each paper had twenty points which were converted to percentages by multiplying by five.

3.6 Data Analysis

Data analysis was done on the computer using the statistical package for social sciences (SPSS). There were two hypotheses to test, namely;

1. Boys have a higher self concept than girls in mathematics and science.
2. There is a positive correlation between self concept and performance.

The first hypothesis was tested using the Chi-square test. The second hypothesis was tested using the product-moment correlation and percentage classifications. In the percentage classifications, each of the self and teacher rating categories, namely, low, medium and high rating categories was related to the corresponding performance categories namely, low, medium and high respectively which were created. The performance categories were created by segmenting the marks in mathematics, physics and chemistry in three parts as follows: 0 to 33% (low performance category); 33% to 66% (medium performance category); 66% to 100% (high performance category). The aim here was to see how much congruence existed between self concept and performance categories. The results obtained from the whole analysis are shown in the next chapter, chapter four.

CHAPTER 4

4.1 FINDINGS

As has already been stated, the first two hypotheses, namely that boys have a high self concept in Mathematics, Physics and Chemistry; girls have a low self concept in Mathematics, Physics and Chemistry were looked at simultaneously.

4.2 Comparison of overall self and teacher rating categories between male and female students

4.2.1 Self Rating

In order to form the overall self-concept categories, the self ratings in all the three subjects were merged and three categories namely, low overall self rating category, medium overall self rating category and high self rating category were formed. Table 1 shows comparisons between males and females in three overall self- rating categories:

TABLE 1: Overall Self Rating

Gender	Overall Self rating categories		
	Low overall self rating category	Medium overall self rating category	High overall self rating category
Female	40.5% (22)	29.7 % (17)	29.7 % (17)
Male	23.7% (14)	28.9 % (17)	47.4% (27)

N = 114 (56 females and 58 males)

Gender differences were noticed in the overall self ratings; in the low overall self rating, there were 40.5% females as compared to 23.7% males in the same category. In the high overall self rating category, there were 47.4% males and 29.7% females. The Chi-square however revealed no significant relationship between the overall self rating categories in the females' domain and the overall self rating categories in the males domain (Chi=3.17,

$P=.204$). In other words, self concept as shown by the ratings done by students in all the three subjects was not significantly different between male and female students.

4.2.2 Teacher Rating

Exactly the same categories formed in the self ratings were formed for the teacher ratings

The aim of doing some overall teacher ratings was to make a comparison with the overall self ratings. Table 2 below shows the comparisons between males and females in three overall teacher rating categories:

TABLE 2: Overall Teacher Rating

Gender	Overall teacher rating categories		
	Low overall teacher rating categories	Medium overall teacher rating category	High overall teacher rating category
Female	47.9 % (27)	33.3% (19)	18.8% (10)
Male	8.7% (5)	37.0% (22)	54.3% (31)

N = 114 (56 females and 58 males)

Overall teacher ratings showed a significant difference between gender; 47.9% females as compared to 8.7% males fell in the low overall teacher rating category. 18.8% females as compared to 54.3% males fell in the high overall teacher rating category. The Chi-square confirmed the significance of this difference ($\text{Chi}=20.89, P=.000$). This means that according to teacher ratings, males significantly showed a higher self concept in mathematics, Physics and chemistry combined than females.

To further ascertain the gender disparities in self concept, a composite self concept score was created comprising three categories namely, low, medium and high rating categories

Below are the gender percentage distributions in the three categories in all the three subjects.

4.3 Comparison of total Self and total Teacher Rating Categories in Mathematics, Physics and Chemistry between Male and Female students

4.3.1 Self Rating

TABLE 3: Mathematics Total Self Rating

Gender	Total self rating Math categories		
	Low self rating in Math	Medium self rating in Math	High self rating in Math
Female	34.8% (20)	41.3% (23)	23.9% (13)
Male	19.2% (11)	32.7% (19)	48.1% (28)

N = 114 (56 females and 58males)

76.1% of the female students fell in the low and medium self rating categories while 80.8% of the male students fell in the medium and high categories. The Chi square showed a relationship between self concept in mathematics and gender (Chi=6.59,P=.037). This result shows that self concept in mathematics is dependent on gender, hence supporting the first hypothesis, that males have a higher self concept in mathematics and science than females.

TABLE 4: Physics Total Self Rating

Gender	Total self rating Physics categories		
	Low self rating in Physics	Medium self rating in Physics	High self rating in Physics
Female	50% (28)	26.0% (15)	23.9% (13)
Male	13.0% (7)	37.0% (22)	50.0% (29)

N = 114 (56 females and 58 males)

50.0% of the females as opposed to 13.0% males fell in the low self rating category in physics while 50.0% males as opposed to 23.9% females, fell in the high self rating category in physics. The Chi-square showed a significant link between the level of self concept and gender ($\chi^2 = 15.06$, $P=.001$), meaning that females showed a lower self concept in physics as compared to males.

TABLE 5: Chemistry Total Self Rating

Gender	Total self rating Chemistry categories		
	Low self rating in Chemistry	Medium self rating in Chemistry	High self rating in Chemistry
Female	34.1% (19)	29.5% (17)	36.4% (20)
Male	27.9% (16)	18.6% (11)	53.5% (31)

N = 114 (56 females and 58 males)

In chemistry, unlike the case with mathematics and physics, there was no significant link between self concept and gender ($\chi^2 = 2.76$, $P=.250$). 65.9% of the females and 72.1%

of the males, fell in the medium and high categories. This result disagrees with the hypothesis that females have a low self concept in chemistry.

To have a broader comparison, a composite score similar to the one formed in the self ratings was created for the teacher ratings as well. The composite score comprised three categories namely, low medium and high rating categories. Below are tables showing the gender percentage distribution in the three categories in all the three subjects:

4.3.2 Teacher Rating

TABLE 6 : Mathematics Total Teacher Rating

Gender	Total teacher rating Mathematics category		
	Low teacher rating in Math	Medium teacher rating in Math	High teacher rating in Math
Female	46.3% (26)	27.8% (16)	25.9% (14)
Male	16.4% (9)	36.5% (21)	49.1% (28)

N = 114 (56 females and 58 males)

74.1% of the females fell in the low and medium mathematics teacher rating categories whereas 83.6% of the males fell in the medium and high mathematics teacher rating categories. The Chi-square value (Chi=12.11, p=.002), confirmed the earlier findings in the total self ratings where males were found to have a higher self concept in mathematics than females.

TABLE 7: Physics Total Teacher Rating

Gender	Total teacher rating Physics categories		
	Low teacher rating in Physics	Medium teacher rating in Physics	High teacher rating in Physics
Female	51.0% (29)	29.4% (16)	19.6% (11)
Male	13.7% (8)	33.3% (19)	52.9% (31)

N = 114 (56 females and 58 males)

The Physics teacher rating category had a very significant Chi - Square value (Chi = 18.87, P = .000). According to these findings, teachers are more likely to rate males higher than females in Physics. This can be appreciated better by looking at the percentage distribution in the table; 80.4% of the females were rated as belonging in the low and medium self concept categories whereas 86.2% males were rated in the high and medium categories.

TABLE 8. Chemistry Total Teacher Rating

Gender	Total teacher rating chemistry categories		
	Low teacher rating in Chemistry	Medium teacher rating in Chemistry	High teacher rating in Chemistry
Female	33.3% (19)	54.9% (31)	11.8% (6)
Male	8.3% (4)	33.3% (20)	58.3% (34)

N = 114 (56 females and 58 males)

Just like was the case with physics and mathematics, females were found to lean more on the low chemistry self concept while males tended to lean more on the high self concept side; 33.3% females as compared to 8.3% males fell in the low teacher rating category ; 58.3% males as opposed to 11.8% females, fell in the high teacher rating category. The Chi- square showed a significant difference in total teacher rating in chemistry between males and females (Chi=25.48, P =.000). These results further confirm the first two hypotheses namely that males have a higher self concept than females in Mathematics, Physics and Chemistry.

4.4 Correlation Between self Concept and Performance in Mathematics, Physics and Chemistry

4.4.1 Self Rating

TABLE 9: Self concept

PERFORMANCE CATEGORIES	SELF CONCEPT CATEGORIES	
	MALE	FEMALE
MATH	.37 (P= .007) N =58	.44 (P=.002) N = 56
PHYSICS	.22 (P= .145) N= 58	.11 (P=.457) N= 56
CHEMISTRY	.20 (P= .207) N=58	.24 (P=.119) N= 56

A positive correlation was observed between self concept and performance in Mathematics for both male and female students. Females showed a correlation of .44 with

P value of .002 while males showed a correlation of .37 with *P* value of .007. These results showed though in a weak way, that there was a positive correlation between self concept and performance. Though the correlations for physics and chemistry were positive, they were not significantly so.

4.4.2 Teacher Rating

TABLE 10: Teacher Rating

PERFORMANCE CATEGORIES	SELF CONCEPT CATEGORIES	
	MALE	FEMALE
MATH	.69 (<i>P</i> = .000) N=58	.63 (<i>P</i> = .000) N=56
PHYSICS	.59 (<i>P</i> = .000) N=58	.48 (<i>P</i> = .000) N=56
CHEMISTRY	.45 (<i>P</i> =.001) N = 58	.45 (<i>P</i> =.003) N=56

Unlike the case with the self rating results, teacher ratings yielded results that showed a significant positive correlation between self concept and performance in all the three subjects for both male and female students. In mathematics, females had a correlation of .69 with *P* value of .000, while males had theirs at .63 with *P* value of .000. In physics, females showed a correlation of .59 with *P* value of .000, whereas males had one at .48 with *P* value of .000. In chemistry, females showed a correlation of .45 with *P* value of .001, while male correlation was .42 with *P* value of .003. These results strongly support the third hypothesis that there is a positive correlation between self-concept and performance. Further, they have indicated that teacher ratings are more closely related to performance than are student ratings

4.5 Percentage classifications of self concept and performance categories

Percentage classifications were done to further ascertain the positive relationship between performance and self-concept. The percentage classifications were created by dividing performance into three equal percentiles; 0 to 33% (low performance category); 33% to 66% (medium performance category); 66% to 100% (high performance category), forming three performance categories namely; low, medium and high. These were related to the corresponding self-concept categories namely; low, medium and high, which were also created by segmenting self-concept into three equal percentiles.

4.5.1 Self Rating

TABLE 11: Self Rating

Performance Categories		Self Concept Categories					
		MALE			FEMALE		
		Low	Medium	High	Low	Medium	High
h	Low	44.5% (5)	9.1% (2)	5.6% (2)	53.3% (11)	18.2% (4)	18.2% (2)
	Medium	22.2% (2)	9.1% (2)	38.8% (11)	33.3% (6)	63.6% (15)	63.6% (9)
	High	33.3% (4)	81.8% (15)	55.6% (15)	13.4% (3)	18.2% (4)	18.2% (2)
sics	Low	55.6% (4)	9.1% (2)	5.6% (2)	53.3% (15)	9.1% (1)	36.4% (5)
	Medium	11.1% (1)	NIL (0)	27.8% (8)	26.7% (7)	63.6% (10)	54.5% (7)
	High	33.3% (2)	90.9% (20)	66.6% (19)	20.0% (6)	27.3% (4)	9.1% (1)
mistry	Low	22.2% (3)	9.1% (1)	22.2% (7)	40.0% (8)	36.4% (6)	NIL (0)
	Medium	55.6% (10)	27.3% (3)	5.6% (2)	40.0% (8)	45.5% (8)	81.8% (16)
	High	22.2% (3)	63.6% (7)	72.2% (22)	20.0% (3)	18.1% (3)	18.2% (4)

As can be seen from the table the self ratings of self concept did not reveal very high congruence between self concept and performance categories, however, it should be noted that, even though the percentages were not as high as anticipated, for the most part there was some correspondence. In mathematics, there was some congruence for both males and females; the majority, 44.4% and 53.3% of the males and females respectively who rated themselves as belonging to the low self-concept category, fell in the corresponding low performance category. For the medium category, congruence was only seen among the females where 63.6% of those who rated themselves as having a medium self-concept, also fell in the medium performance category, males exhibited no congruence whatsoever in that the majority, 81.8% fell in the high performance category. In the high category, it was the males who showed some correspondence; 55.6% of those who rated themselves as having high self-concept in mathematics also fell in the high performance category. The majority of the females seemed to have over rated themselves, 63.6% of them fell in the medium performance category instead of the high performance category where they had rated themselves.

In physics, the picture observed in mathematics more or less repeated itself in that there was no clearly distinct pattern of congruence between most of the categories, however, certain categories showed some significant correspondences. In the low categories, for instance, there was correspondences for both males and females; 55.6% of the males and 53.3% of the females who rated themselves as having a low self-concept also fell in the low performance category. In the medium categories, it was only the females who exhibited correspondence; 63.6% of those who rated themselves as having a medium self-

concept also fell in the medium performance category. Males seemed to have under rated themselves in that, the majority, 90.9% of those who had rated themselves as having a medium self concept fell in the high performance category. For the high category males showed some correspondence; 66.7% of those who rated themselves as having a high self-concept in physics also fell in the high performance category. Females seemed to have over rated themselves in that most of them, 54.5% of those who had rated themselves as belonging to the high self-concept category, fell in the medium performance category. while, 36.4% even fell in the low performance category showing how much they had over estimated their ability in physics.

In chemistry the congruence between self-concept and performance categories became even more fuzzy. In the low category among the males there was no congruence; only the minority, 22.2% of the males who rated themselves as having a low self-concept also fell in the low performance category, whereas the majority, 55.6% fell in the medium performance category. This seems to indicate that males under rated themselves. Among the females there was no clear congruence only; 40.0% of those who had rated themselves as belonging to the low self-concept category, the other 40.0% and 20.0% fell in the medium and high performance categories respectively. In the medium domain, female showed a little correspondence; 45.5% of those with a medium self-concept also fell in the medium performance category. Males showed a high level of having under rated themselves in that the majority of them, 63.6% fell in the high performance category instead of the medium category where they had rated themselves. In the high category, it was the males who showed some congruence; 72.2% performed according to the high

performance category where they had rated themselves. Among females there seemed to have been over estimation of ability in that the majority, 81.8% of those who had rated themselves as having a high self-concept in chemistry fell in the medium performance category instead of the high performance category.

4.5.2 Teacher Rating

TABLE 12:Teacher Rating

Performance Categories		Self concept Categories					
		MALE			FEMALE		
		Low	Medium	High	Low	Medium	High
Math	Low	75.0% (7)	17.6% (4)	NIL (0)	34.8% (9)	25.0% (4)	NIL (0)
	Medium	25.0% (2)	29.5% (6)	20.0% (6)	65.2% (17)	68.8% (11)	33.3% (5)
	High	NIL (0)	52.9% (11)	80.0% (22)	NIL (0)	6.2% (1)	66.7% (9)
Physics	Low	75.0% (6)	23.5% (4)	NIL (0)	34.8% (10)	25.0% (4)	22.2% (2)
	Medium	25% (2)	47.1% (9)	12.0% (4)	60.9% (18)	56.2% (9)	22.2% (2)
	High	NIL (0)	29.4% (6)	88.0% (27)	4.3% (1)	18.8% (3)	55.6% (7)
Chemistry	Low	50.0% (2)	11.8% (2)	4.0% (1)	34.8% (7)	18.8% (6)	NIL (0)
	Medium	50.0% (2)	58.8% (12)	16.0% (6)	65.2% (12)	62.4% (19)	44.4% (2)
	High	NIL (0)	29.4% (6)	80.0% (27)	NIL (0)	18.8% (6)	55.6% (4)

Teacher rating of students’ self concept revealed better correspondence with performance. For example, in mathematics,75.0% of the males who were rated as having low self concept in mathematics also performed according to the low performance category. This congruence is very high especially considering that in the self rating congruence in the same category was only 44.4%. For the females in the same domain no congruence was

observed, however, it was noted that a number of them were under rated by their teachers; 65.2% of them fell in the medium performance category instead of the low performance category where teachers had rated them. In the medium category, females showed some congruence. The majority of them, (68.8%) , fell in the medium performance category where they were rated by their teachers. In the case of the males, there was no congruence, teachers seemed to have under rated them in that the majority of them,(52.9%) fell in the high performance category instead of the medium performance category where teachers placed them. In the high category, there was high correspondence for both males and females. 80.0% males and 66.7% females fell in the high performance category where they were rated.

In Physics, the picture observed in Mathematics in the low domain repeated itself; 75.0% of the males who were rated as having a low self concept in Physics also fell in the low performance category. Again as was the case with Mathematics, females were under rated by their teachers: 60.9% of them fell in the medium performance category instead of the low performance category where they were rated. In the medium category there was correspondence for both male and female students. This is especially striking considering that in the self ratings correspondence was only noticed among the females. Here 47.1% males and 56.3% females fell in the medium performance category in accordance with the way they were rated. Unlike self rating in Physics, teacher ratings revealed correspondence among males and females: 88.6% males and 55.6% females fell in the high performance category in accordance with the teacher ratings.

In Chemistry just like was the case with Mathematics and Physics teacher ratings showed better correspondence between self concept and performance. While in the low category of self rating there was no significant correspondence between the low self concept category and the low performance category, teacher ratings revealed some congruence for both males and females in the same category: 50.0% of the males and 65.2% of the females who were rated as belonging to the low self concept category also fell in the low performance category. The medium category too was congruent for both males and females; 58.8% males and 62.4% females fell in the medium performance category as rated by teachers. In the self rating category, correspondence was only seen among the females and even that was rather low, 54.5%. In the high Chemistry category correspondence was observed for both males and females; 80.0% of the males and 55.6% of the females fell in the high performance category where they were rated by their teachers whereas in the self ratings, correspondence was only observed among the males.

CHAPTER 5

5.1 DISCUSSION OF THE RESULTS

This chapter discusses the findings of the study in the sequence they have been presented in chapter four. First, the hypothesis: Boys have a higher self concept in mathematics, physics and chemistry than girls has been presented.

5.2 Comparison of Overall Self and Teacher Rating Categories Between Females and Males

5.2.1 Self Rating:

Overall self ratings (see table 1) did not show any significant difference between the overall self rating categories in the female domain and those in the male domain. Stated differently, it would appear, there is no significant connection between the self ratings in all the three subjects; mathematics, physics and chemistry, put together and gender. This could mean that the relationship between self concept and gender is only noticeable when the three subjects; math, physics and chemistry, are taken singly.

5.2.2 Teacher Rating:

Overall teacher ratings (see table 2) showed some marked difference between self concept and gender. It would seem therefore, that teacher ratings of students' ability in mathematics, physics and chemistry are generalizable according to gender, that is, females who have low self concept in mathematics are likely to have a low self concept in physics and chemistry. Similarly, males with a high self concept in mathematics will very likely have a high self concept in physics and chemistry as well. These results confirm the

first hypothesis which states that males have a higher self concept in mathematics, physics and chemistry than females. The non manifestation of significant difference between males and females in the overall self rating category confirms what a number of studies which include:(Fischhoff, Slovic & Lichtenstein,1977; Lichtenstein and Fischhoff,1977; Fischhoff & Phillips,1982) have shown, that males and females are poorly calibrated and tend to overestimate their abilities.

In order to have a much more complete picture of the comparisons, more comparisons were done between males and females subject by subject.

5.3 Comparisons of Total Self and Teacher Rating Categories Between Females and Males Subject by Subject.

5.3.1 Self Rating:

Table 3 shows the comparisons between males and the total self rating in mathematics and gender. This result shows that self concept in mathematics is dependent on gender. In this case, the indication was that females tended to rate themselves lowly in mathematics as compared to males, hence accepting the hypothesis that; boys have a higher self concept than girls in mathematics and science.

Compared mathematics, physics yielded results that better confirmed the first two hypotheses. Pearson Chi-square revealed a significant difference between the level of self concept and gender. This seems to suggest that physics self concept is gender specific- males have a high self concept while females have a low one (see table 4). These findings

are in conformity with most of the literature on gender typedness of the task. For example, two studies by Beyer (1990), provide support for self consistency hypothesis and highlight the importance of gender typedness of the task. Beyer argues that expectancy which is affected by the gender typedness of the task, is a significant predictor of post task self evaluations of performance. Beyer further argues that females' low expectancies on masculine tests of politics and sports, predict their inaccurate self evaluations. Males' expectations on these tasks predict their more accurate self evaluations. Considering the sex differences, males had higher beliefs about their abilities in mathematics and physics. These findings are similar to other studies of sex differences in achievement beliefs in both African American and white American adolescents (e.g. Gurin & Epps, 1975; Hale- Benson, 1988; Wigfield et al.1991), particularly when considering males' and females' beliefs about their ability in mathematics. Further, the mathematics and science domains have been traditionally stereotyped as more appropriate for males than for females (Stein and Smithell, 1969), which should be one reason why males continue to maintain more positive achievement beliefs about these activities.

Table 5 shows the link between gender and total self rating in chemistry. A different picture from what was observed in mathematics and physics emerged here. While in mathematics and physics most females fell in the low and medium self concept categories, in chemistry, the majority of them, fell in the medium and high categories. Of these, more than half, fell in the high self rating category. In the male domain like was the case in the female domain, the majority of the males fell in the medium and high self rating categories. In other words there was no difference in the chemistry self concept

between male and female students as the chi-square value confirmed, which seems to suggest that males rated themselves the same way in chemistry as the females did. This observed inconsistency with the mathematics and physics studies results could be a manifestation of poor calibration by both males and females which other studies (Fischhoff, Slovic & Lichtenstein,1977; Fischhoff & Phillips,1982), have amply demonstrated. Thus in this case, both males and females either over or under rated themselves.

5.3.2 Teacher Rating:

As can be seen from table 6, the total teacher rating in mathematics did not depart from the picture observed in the total self rating in mathematics. Most of the females, fell in the medium and low teacher rating categories. The majority of the males fell in the high and medium teacher rating categories. This seems to further confirm the hypothesis that males have a higher self concept in mathematics than females. It seems going by these findings, teachers tend to rate females and males differently in mathematics. Specifically, they tend to rate males higher than females. It also further confirms the earlier cited literature that both males and females are poorly calibrated: they are not accurately conversant with the levels of their performance.

The rating between total teacher rating in physics and gender is represented in table 7. According to these findings, teachers are more likely to rate males higher than females in physics. Like the case with mathematics, teachers seemed to bring out stereotypical belief differences about performance between male and female students more than the

students themselves. In other words, teachers indicated that more females than males, believed that they had a low self concept in physics. This view stems from the already cited beliefs that traditionally, science areas are viewed as male dominated areas and as such females are not expected to perform well. Another plausible explanation for the teachers' accuracy could be what Wiederholt and Bryant (1987) have noted that teachers are professionals with a generally well - developed knowledge of day to day experience with their students. They develop a deep understanding of students' general and specific abilities. This kind of knowledge as Hammill and Bryant (1989) observe, enables teachers to translate student abilities into more permanent forms such as assessment scales, written opinions and grades.

Unlike the case with the total self rating in chemistry, teacher ratings revealed a significant difference between self concept in chemistry and gender: females were significantly found to fall in the low and medium self rating categories whereas males tended to fall more in the medium and high categories. According to these results, even in chemistry, females have a low self concept while males have a high one. The revelation of significant gender differences of self concept in chemistry confirmed what the other already cited studies have found: that both male and female students are poorly calibrated, that is, they either over rate or under rate themselves. Further, these findings support the other findings that teacher ratings are more valuable than the self ratings. Representative of this is the work of Morine - Dersheimer (1978; 1979a;1978; 1979b), whose findings suggested that teacher estimates of student ability are accurate and more useful. According to Wiederholt and Bryant (1987), this accuracy comes about because

teachers have an internalised scope - and - sequence chart that allows them to make a determination of the learning abilities of students in their classrooms.

5.4 Relationship Between Self Concept and Performance in Mathematics, Physics and Chemistry

5.4.1 Self Rating:

Table 9 shows the correlation between performance on the mathematics, physics and chemistry tests and self concept (self rating by the students). The product- moment correlation revealed a significant positive correlation between self concept and performance on the math test. This result supported the hypothesis that there is a positive correlation between self concept and performance. However, despite this established relationship between the two, it is not clear which one; self concept or performance causes the other, as Bryne, et al. (1982: 12) point out:

Perhaps the most theoretical question in academic self concept research involves determining the causal ordering of self concept and academic achievement...many self enhancement programs are based on the assumption that an improvement in self concept will lead to gains in academic achievement.

This view stems from the belief that academic self concept has motivational properties such that changes in academic self concept will lead to changes in subsequent performance. The principle behind the link between self concept and performance is similar to the postulations in the self evaluation theory. According to this theory, people's self perceptions lead to confirming behaviors designed to reassure themselves of their true nature. For example, a person who believes he or she is honest reaffirms this by engaging in behaviors that reveal his or her honesty. Stated in another way, the self

evaluation theory implies that people strive for consistency in the judgment of their of their abilities. For instance, a person's self perception that he or she lacks mathematical abilities, should negatively affect his or her performance on a mathematics test. Self verifying behaviors have been amply demonstrated (Swann,1982; Wells & Sweeney 1986). The poor performance by female students in mathematics could also be attributed to what Eccles et al. (1983) call ' achievement values'. By this they meant individuals' interest in the task, its importance to them and its usefulness. They found that adolescent females in comparison with adolescent males, value mathematics less. In this study therefore, it would appear that, females did poorly in mathematics not because of their low cognitive abilities, but rather because of the low self image they have built around themselves in mathematics. Because of the low self concept females built about themselves, it can be argued, they also have a low achievement value in the subject leading to reduction, if not total loss of interest in the subject. This ultimately leads to poor performance. On the other hand, males did well because they have built a positive self image about themselves in the subject, which has in turn boosted the value they attach to the subject and their interest. For physics and chemistry there was no significant correlation between self concept and performance.

The explanation to this lack of positiveness between self concept and performance probably lies in what researchers on calibration have found, that both male and female students are poorly calibrated i.e. they tend to overestimate or underestimate the level of their abilities. Poor calibration by both male and female students have been amply demonstrated by Fischhoff (1977); Linchtenstein, Fischhoff and Phillips (1982).

Furthermore as Maimbolwa – Sinyangwe (1985) observes, a low self concept child may achieve well because he is highly motivated, a high self concept child might achieve poorly because she is not motivated to work. Thus the observed lack of a significant positive correlation in these results, could first be indicative of the inaccuracy of students' ratings rather than an indication of there being no relationship between self concept and performance. Secondly, it is indicative of the fact that performance is affected by a variety of other factors apart from self concept. However, it should be mentioned that the small positive values of the product moment correlation obtained show though only to a small extent, that there is a positive relationship between self concept and performance.

5.4.2 Teacher Rating:

Teacher ratings of the students' self concept in mathematics, physics and chemistry are presented in table 10. Here as can be seen from the results, the correlation values between self concept and performance were positive and high in all the three subjects. These results further support the hypothesis that there is a positive correlation between self concept and performance. The high correlations from the teacher ratings confirm what many researchers have repeatedly said that teacher ratings are more reliably accurate than the students' self ratings. Representative of this is the work of Morine – Derheimer (1978; 1979a; 1978; 1979b). Morine attributes this to the fact that teachers are professionals with a generally well – developed knowledge base of day to day experience with their students, teachers develop a deep understanding of students' general and specific abilities. Wiederholt and Bryant (1987), also noted that experienced teachers appear to have an internalised scope – and – sequence chart that allows them to make a

determination of learning abilities of the students in their classrooms after a relatively short observation time. Because of this vast interactive knowledge that teachers have about their students, it is easy for them to accurately translate the ability levels of their students into rating scales, written opinions and grades (Hammill & Bryant. 1989). This accuracy on the part of the teachers comes about because teachers view the ability levels of their students from a variety of stand points. As Maimbolwa – Sinyangwe (1985) observes, achievement is influenced by a variety of factors which may vary from one child to another. Thus, the accuracy of teacher ratings of pupils' self concept implies that teachers base their judgment of self concept on motivational factors as well.

Considering that the self rating results revealed little significant correlation between self concept and performance, the teacher ratings which on the contrary revealed some significant positive correlations seem to prove what a number of researchers have found: that student ratings are very often inaccurate because they are affected by biases of over estimation and \ or under estimation (poor calibration). These findings of students' self ratings not being accurate are similar to what Maimbolwa - Sinyangwe (1985), found in her study. She found that the correlations were not high, indicating that pupils' self perceptions and teachers' perceptions of the pupils are only somewhat similar. Pupils in her study tended to rate themselves higher than the way teachers rated them on both self concept and motivation. This difference, she argues, could have been due to a variety of reasons, one of which could have been that pupils in a spirit of aggrandizement, were over estimating their capabilities. As other studies have found, this study found teacher ratings of students' abilities to be more reliably accurate, in fact the findings of the

correlation range which was .4 to .6 in this study is in conformity with the correlation ranges found in other studies elsewhere. For example, Egan and Archer (1985: 26) believe:

There is no compelling evidence that teachers' ratings are in fact inaccurate. Since the 1920s, there have been dozens of studies reporting correlations in the order of .5 to .6 between teacher ratings and various standardized tests. These correlations may be considered as coefficients of concurrent validity and as such they are quite large.

5.5 Comparative Percentage Classifications of Students in the Self Concept and Performance Categories

5.5.1 Self Rating:

Percentage classifications for self ratings are presented in table 11. Though not with very high values, percentage classifications revealed some congruence between self concept and performance. For example, in mathematics and physics in the low categories, congruence was observed for both males and females. These results demonstrated further that there is a positive correlation between self concept and performance, in other words, students who rated themselves as having a low self concept in mathematics and physics, also fell in the low performance categories. Further correspondence was observed in mathematics and physics among the females in the medium categories, it was also exhibited among the females in the medium chemistry category. Apart from indicating the positive correlation between self concept and performance, these results have revealed a significant pattern in which females showed some congruence in the medium categories in all the three subjects. This further goes to show that females do not have a high self concept in these subjects. More correspondence was seen in the high categories among

the males in all the three subjects. The fact that only males exhibited some congruence in the high categories again shows that males have a high self concept in these subjects, females on the other hand did not exhibit correspondence in the high category because the majority of them rated themselves lowly. Despite this general picture of correspondence observed, it should be pointed out that the fact that not every student who rated him or herself in a particular self concept category also performed according to that category, confirms the findings of other studies (Fischhoff, Slovic, & Linctenstein, 1977; Linctenstein & Fischhoff, 1977; Linctenstein, Fischhoff & Phillips, 1982) that both male and female students are poorly calibrated, that is, they tend to either over estimate or under estimate the level of their ability. This shows that matters of biases in self ratings cannot be ruled out. Not only that, performance as Maimbolwa- Sinyangwe (1985) observes, can be affected by many other factors which may not necessarily have anything to do with self concept per se. Thus one can argue that getting a situation whereby student ratings perfectly fit the actual performance levels of the students, is something very difficult, if not impossible to achieve.

5.5.2 Teacher Rating:

As can be seen from table 12, teacher ratings revealed high correspondence with performance than self ratings did. While a number of categories did not exhibit correspondence in the self ratings, teacher ratings exhibited correspondence in nearly every category for both males and females and all the percentages were higher in almost all the cases. Apart from giving further support to the positive correlation between self concept and performance, the findings also proved what earlier researchers have found,

that teacher ratings are more accurate than students' self ratings. Morine – Dersheimer (1978;1979a; 1978;1979b) found out that teacher estimates of student ability are accurate and highly useful. Such findings, she goes further, should not be surprising in that teachers are professionals with a generally well - developed knowledge base of day – today experience with their students. Teachers develop a deep understanding of students' general and specific abilities. The accuracy of teacher judgments has also been shown repeatedly (Gresham, 1986; Nelson, 1971; Shafer, 1982), as has their correspondence with the results of the standardised academic achievement tests (Brophy and Good, 1974; Hammill & Hresko, 1994; Keogh & Smith, 1970; Ohlson, 1978). To account for this accuracy in the teacher ratings of the students' performance by the teachers, Wiederholt and Bryant (1987) noted that experienced teachers appear to have an internalised scope – and – sequence chart that allows them to make a determination of the learning abilities of students in their classrooms even after a relatively short observation time. It therefore follows as observed by Hammill & Bryant (1989) that because of the knowledge that teachers have about the performance levels of their students, they have the ability to translate knowledge into more permanent forms by such means of assessment as rating scales, written opinions and grades.

Apart from the accuracy that was noticed among the teachers, it was also noticed that teachers tended to under rate female students in mathematics and physics. The low expectations of performance of the female students by teachers, probably stemmed from the widely held stereotypical view that females are not good at math and science (FAWE, 1997). The underestimation of the female students also demonstrated teachers' inclination

towards male students at the expense of the female students. Gill (1982) and Spender(1982), observe that boys typically attract more of the teacher's attention than girls in a coeducational classroom. Gill (1982) also reports that higher teacher – male student interaction, is more common than teacher – female student interaction. Because of these repeated implicit and explicit low expectations of female students by the teachers especially in the fields of science and mathematics, it can be argued that female students are conditioned to believe that they should also have low expectations of themselves in these areas, which ultimately leads to low motivation and low performance. This view is supported by Graham (1989) who posits that too many of the minority children perform poorly in school not because they lack basic intellectual capabilities or specific learning skills but because they have low expectations, feel hopeless, lack interest , or give up in the face of potential failure. Going by Graham's postulations therefore, one's motivation to do a particular task is dependent upon his or her expectations; if the expectations are low, the level of motivation will also be low. Similarly, if the expectations are high, the level of motivation will also be high. It could therefore be argued that the low self concept of female students in mathematics and science was as a result of their low expectations in these areas. Similarly, the high self concept of the males was as a result of their high expectations. This scenario can be summed up in the equation: "Expectations = Motivation + Performance."

themselves; students tended to be poorly calibrated. Despite the general picture that females had a lower self concept than males in all the three subjects, it was found out that in chemistry the difference was not as big as it was in mathematics and physics. However, although female students had a relatively high self concept in chemistry, they still lagged behind their male counterparts.

6.3 Recommendations

The following are some recommendations to the Ministry of Education to help improve the performance of female students in mathematics, physics and chemistry:

- a. Since it was found out that females do not merely perform poorly in these subjects, but also have a rather low self concept in them, teachers starting from the low levels; pre-school, if possible, should begin to instill some positive attitude in female students towards these 'masculine' subjects so that right from the start, female students can begin to build a positive self image about themselves in these subjects. To be able to instill a positive attitude towards these subjects, teachers should ensure that they do not in any way make remarks that directly or indirectly suggest that females are inferior to males in science and mathematics. Though the causal relationship between performance and self concept is not yet known, the fact that some significant positive correlation between self concept and performance was observed, means that an improvement in self concept should be able to yield some improvement in performance.
- b. The allocation of subjects to students in schools should not show any discrimination based on gender, that is, as many female students should be

allowed to take up science subjects as the males. Such a move would discourage female students from thinking that sciences are for male students. By giving female students a wide chance to do science subjects on an equal footing with male students, chances of producing more female science teachers who would act as role models to the female students would also be enhanced.

- c. There should be a deliberate policy to encourage schools to as often as is possible invite adult females who have been successful in science and mathematics areas to inspire female students and act as role models.
- d. In case of single sex schools, there should be uniformity in the subject combination in female and male schools. For example, girls' schools should offer pure sciences (physics and chemistry) as much as boys' schools do. This would help remove the stereotypical notion of females not being well endowed in sciences.
- e. Participation of female students in mathematics and science projects, should be encouraged from primary school right through to secondary school in order that they develop interest and confidence in the subjects at an early stage.
- f. Self concept is not constructed when one begins to attend school, it starts to be formed the moment one begins to interact with the others in society. In view of this, it is recommended that in home environments where boys and girls are growing together, parents and any other older siblings desist from giving girls messages that condition girls to believe that mathematics and sciences are boys' areas. This would complement the educators' efforts in the fight against female students discrimination.

6.4 Suggestions for Further Research.

1. For further research in this area, it would be useful to compare the self concept of low and high achieving males and females. Such a study would give an idea whether high achieving females rate themselves the same way as high achieving males or whether the low achieving males rate themselves the same way low achieving females rate themselves. Obtained results would give further insights into how the problem of female students' poor performance in mathematics and science can be tackled.
2. It would also be useful to do an in-depth qualitative comparative research on leading male and female academics in Zambia and see the differences if any in the way they were brought up as regards beliefs about mathematics and science.
3. A comparative study of careers of parents/guardians of high and low achieving male and female students would also be an interesting area to look at.
4. A comparative study of self concept between high achieving girls in mixed schools and high achieving girls in single sex schools would be enriching. Any disparities would also give further insights into the problem of low performance by female students in mathematics and science.

BIBLIOGRAPHY

- Bandura, A. (1981). Self – referent thought: A developmental analysis of self efficacy. In J. Flavell & L. Ross(Eds), Social Cognitive Development: Frontiers and Possible Futures. Cambridge: Cambridge University Press.
- Banks, J.A. and Grambs, J.D. (1972). Black Self-concept. New York: McGraw Hill.
- Belgrave, G. J. and Carey, C. (1985). Attributional style and its relationship to self-esteem and academic performance in black students. Journal of Black Psychology, 11 (2), 49-56.
- Beyer, S. (1990). Gender differences in the accuracy of self evaluation of performance. Journal of Personality and Social Psychology, 59, 368-370.
- Bohan, J.S. (1973). Age and sex differences in self concept adolescence. Journal of Educational Psychology, 8, 378- 384.
- Brophy, J.E., & Good, T.L. (1974). Teacher - Student Relationships. New York: Rinehart and Winston
- Byrne, M.B. and Shavelson, R. J. (1986). On the structure of adolescent self-concept. Journal of Educational Psychology, 78, 474-481.
- Campbell, J. et al. (1986). Similarity and Uniqueness: The effects of attribute type, relevance and individual differences in self esteem and depression. Journal of Personality and Social Psychology, 50, 281-294.
- Carpenter, P. (1985). Single sex schooling and girls' academic achievement. Australian and New Zealand Journal of Sociology, 21, 456 – 73.
- Charles, D.C. (1964). Psychology of the Child in the Classroom. New York: Macmillan Company.
- Cialdini, R.B. et al. (1976). Basking in reflected glory three (football) field studies. Journal of Personality and Social Psychology, 34, 366 – 375.
- Cohen, J. (1969). Statistical Power Analysis for the Behavioural Science. New York: Academic Press.

- Deaux, K. (1984). From individual differences to social categories: Analysis of a decade's research on gender. American Psychologist, 39, 105-115.
- Deaux, K. and Farris, E. (1977). Attributing causes for one's performance: The effects of sex, norms, outcome. Journal of Research in Personality, 11, 59-72.
- Dorsey (1989, June). Socialization, Gender, Academic Achievement and Aspirations of Secondary School Pupils in Zimbabwe. Human Resources Research Centre (HRRC), Working paper No. 3, University of Zimbabwe, Harare.
- Eccles, J.S., Midgley, C. and Adler, T.F. (1984). Grade-related changes in the school environment: Effects on achievement motivation. In, Nicholls, J.G. (Ed.). Advances in Motivation and Achievement, 3, 283-331.
- Eccles, J.S. (1984a). Sex differences in achievement patterns. In Sonderegger, T. (Ed.). Nebraska Symposium on Motivation, 32, 97-132.
- Eccles, J.S. (1984b). Sex differences in Mathematics participation. In Steinkamp, M. and Maehr M.L. (Eds.). Advances in Motivation and achievement, 2, 93-137.
- Eccles, J.S., Wigfield, A., Flanagan, C., Miller, C., Reuman, D.A. and Yee, D. (1989). Self-concepts, Domain-values, and self-esteem: Relations and changes at early adolescence. Journal of Personality, 57, 283-310.
- Eccles, J.S., Wigfield, A., Harold R., Blumenfeld, B.P. (1993). Age and gender differences in children's self-and task perceptions during elementary school. Child Development, 64, 830-847.
- Egan, O., & Archer, P. (1985). The accuracy of teachers' ratings of ability. American Research Journal, 22, 25-34.
- Erikson, E.H. (1950). Childhood and Society. New York: Norton.
- FAWE (1997). Girls Academic Achievement: Realizing the full potential. Nairobi: World Bank.

- FAWE .(1997).The News Magazine About Girls' and Women's Education in Africa,5, (2).
- FAWE .(1997) . The News Magazine About Girls' and Women's Education in Africa,5, (4).
- Fennema, E. (1974). Mathematics learning and the sexes. Journal for Research in Mathematics Education, 15, 126-139.
- Fischhoff, B., Slovic, P., & Linchtenstein, S. (1977). Knowing with certainty: The appropriateness of extreme confidence. Human Perception and Performance, 3, 552 – 564.
- Flessati, S.L., & Jamieson, J. (1991). Gender differences in mathematics anxiety: An artifact of response bias? Anxiety Research, 3, 303- 312.
- Gill, J. (1982, March). Is single sex schooling the answer to equity equation? Psychological Perspectives on the Self,13, 119-121.
- Gilligan, C. (1982). In a Different Voice: Psychological theory and women's development. Cambridge, Ma: Harvard University Press.
- Graham, S. (1989). In Berry,G.L., and Asamen, J.K.(Eds). Black Students: Psychological Issues and Academic Achievement. Newbury Park:C.A. Sage.
- Gray, A. (1987). Are girls the problem? : Co- education revisited. Forum of Education, 46, 34 - 46.
- Gresham, F. (1986). Conceptual issues in the assessment of social competence in children. In Strain,P., Guralnick,M. & Walker,H.M. (Eds). Children's Social Behavior: Development assessment, and modification. Orlando: Academic Press.
- Gurin, P., & Epps, E. (1975).Black Consciousness, Identity and Achievement. New York: John Wiley.
- Hamachek, D.E. (1978). Encounters with the Self. New York: Holt, Rinehart and Winston.

- Hammill, D.D., & Hresko, W.P. (1994). Comprehensive Scales of Student Abilities: Quantifying academic skills and school related behaviour through the use of teacher g judgements. Austin, T.X: PRO- ED.
- Hammill, D.D., & Bryant, B.R. (1989). Learning Disabilities Diagnostic Inventory: A method to help identify intrinsic processing disorders in children and adolescents. Austin, TX: PRO- ED.
- Harter, S. (1986). Process underlying the construction, maintenance, and enhancement of the self-concept in children. In Suls, J. and Greenwald,A.G. (Eds).Psychological Perspectives on the Self, 3, 137-181.
- Harter, S. (1993). Causes and consequences of low esteem in children and adolescents. In Baumeister,R.F .(Ed). Self-esteem: The puzzle of low self-regard. New York: Plenum.
- Benson,H. & Brown, J.D. (1986).Black Children: Their roots, culture, and reaming style. Provo, UT: Brigham Young University Press.
- Hattie, J. (1992). Self concept. Hillsdale, NJ: Eribaum.
- Harackiewicz, et al. (1984). Rewarding Pinball Wizardry: Effects of evaluation and cue value on intrinsic interest. Journal of Personality and Social Psychology, 47, 287 – 300.
- Joseph, R.A., Markus, H. R. and Tafariodi, R.W. (1992). Gender and self-esteem. Journal of Educational Psychology, 75, 940-956.
- Jussin, L., Coleman, L. and Nassau , S. (1987). The influence of self-esteem on perception of performance and feedback. Social Psychology Quarterly, 50, 95-99.

- Kelly, A. (1988). The customer is always right...girls' and boys' reactions to science lessons. School Science Review, 69, 662-676.
- Kelly, M.J.(1994). Below the Poverty Line in Education: A situation analysis of girl child education in Zambia. University of Zambia, Lusaka.
- Kenny, D.A. (1991). A general model of consensus and accuracy in interpersonal perception. Psychological Review, 98, 155 – 163.
- Keogh, B., & Smith,C. (1970). Early identification of educationally high potential and high risk children. Journal of school psychology, 8, 285 - 290.
- Khattab, M., (1987). The Effect of Self-concept on Academic Achievement. Amman, Jordan: UNRWA.
- Labouvie, E.W., et al. (1990). Risk factors of adolescent drug use: An affected – based interpretation. Journal of Substance Abuse. 2, 265 – 285.
- Llabre, M.M., & Suarez, E. (1985). Predicting math anxiety and course performance in college women and men. Journal of Counseling psychology, 33, 283 – 287.
- Levine, R., Gillman, M.J. and Resis, H. (1982). Individual difference for sex differences in achievement attributions. Sex Roles, 8, 455-466.
- Lichtenstein, S. et al. (1982). Calibration of probabilities: The state of the art to 1980. In Kahneman, D.,Sovic, P. & Tversky, A. (Eds). Judgement Under Uncertainty: Heuristics and Biases . New York: Cambridge University Press.
- Maimbolwa – Sinyangwe, I. M. (1985). Classifying Zambian Pupils for Instruction. Doctoral dissertation, University of California, Santa Barbara.
- Markus, H., & Kitayama, S. (1991).Culture and the self: Implications for cognition, emotion, and motivation. Psychological Review, 98, 224 – 253.

- Marsh, H.W. (1987). The hierarchical structure of self concept and the application of hierarchical confirmatory factor analysis. Journal of Educational Management, 24, 17 – 39.
- Marsh, H.W. and Shavelson, R. (1985). Self-concept: Its multi faceted, hierarchical structure. Journal of Educational Psychology, 20, 107-123.
- Marsh, H.W. and Smith, I.E. (1987). A cross-national study of the structure and level of multidimensional self-concept: An application of confirmatory factor analysis. Australia Journal of Psychology, 39, 61-77.
- Marsh, H. (1988). The Self-description Questionnaire 1: SDQ manual and research monograph. San Antonio, T.X: The psychological Corporation.
- Marsh, H.W. (1988). Self-Description Questionnaire 1: Manual and Research monograph. San Antonio, TX: Harcourt Brace.
- Marsh, H.W. (1988). The transition from single sex to co-education high schools: Effects on multiple dimensions of self-concept and on academic achievement. American Educational Research Journal, 25,(2), 237-269.
- Marsh, H.W. (1990). The causal ordering of academic self-concept and academic achievement. Journal of Educational Psychology, 82,385-392.
- Marsh, H.W. (1993). The multidimensional structure of the academic concept: Invariance over gender and age. American Education Research Journal, 30, 841-860.
- McCandless, B.R. (1969). Children Behaviour and Development. London : Holt Rinehart and Winston.
- Meece, J.L., Wigfield, A., and Eccles, J.S. (1990). Predictors of math anxiety and its consequences for young adolescents course enrolment intentions and performances in mathematics. Journal of Educational Psychology, 82, 60-70.
- Melhem, S.M. (1990). Self-concept and academic achievement of children: Towards developing positive self-concept. Journal of Science Education, 2, 595-636.

- Morine - Dershimer, G. (1978 - 1979a). The Anatomy of teacher prediction. Educational Research Quarterly, 3, 59 - 65.
- Morine - Dershimer, G. (1978 - 1979b). How teachers " see" their pupils. Educational Research Quarterly, 3, 43 - 58.
- Morris,T. et al. (1978). Mathematics anxiety Rating Scale: Predicting anxiety experiences and academic performance in two large groups of students. Journal of Educational Psychology, 70, 589 – 594.
- Mura, R. (1987). Sex-related difference in expectations of success in under graduate mathematics. Journal for Research in Mathematics Education, 18, 15-24.
- Mwanza, S.J. (1990). The Quality of Girls' Education in Malawi Secondary Schools. Malawi National Examinations Board, Zomba.
- Nelson, M. (1971). Techniques for screening conduct disturbed children. Exceptional children, 37, 501 - 507.
- Newman, R.S. (1984). Children's numerical skill and judgements of confidence in estimation. Journal of Experimental Child Psychology, 37, 107 – 123.
- Nottlemann, E.D. (1987). Competence and self during transition from childhood to adolescence. Developmental Psychology, 23, 441-450.
- Oakley, A. (1996). Sex and Gender and Society. Witshire: Gower Publishing Company Limited.
- O'Donnel, W.J. (1979). Adolescent self-reported and peer-reported self-esteem. Adolescence, 14, (55) 465-470.
- Ohlson, E.E. (1978). Identification of Specific Learning Disabilities. Champaign, IL: Research Press.

- O'Malley, P.M. and Bachman, J.G. (1979). Self-esteem and education: Sex and cohort comparisons among high school seniors. Journal of Personality Social Psychology and, 37, 1153-1159.
- Patten, M.A. (1981). Self-concept and self-esteem: Factors in adolescent pregnancy. Adolescence, 16, (64), 765-778.
- Phillips, S. (1979). Young Australians: The attitudes of our children. Sydney: Harter and Row.
- Purkey, W.W. (1970). Self-concept and School Achievement. Eaglewood Cliffs, NJ: Prentice hall.
- Richman, C.L., Clark, M.L. and Brown K.P. (1985). General and specific self-esteem in late adolescent students: Race and gender effects. Adolescence, 20, 555-556.
- Rosenberg, F.R., and Simmons, R.G. (1975). Sex differences in the self-concept in adolescence. Sex Roles, 1, 147-159.
- Rosenberg, M. (1985). Self-concept and Psychological well-being in adolescence. In Leahy,R.L. (Ed). The Development of the Self. Orlando, Fl: The Academic Press.
- Rosenberg, M. (1989). Society and the Adolescent Self-image. Middletown, CT: Wesleyan University Press.
- Rosenberg, M.,Malabar, F .L., Savin - Williams, R.C. and Demo, D.H. (1984). Development and stability in adolescent self-concept. Developmental Psychology, 20, 1110-1120.
- Rowe, K.J. (1988). Single sex and mixed sex classes: The effects of class type on student achievement, confidence and participation in mathematics. Australian journal of Education,32, 180 – 202.

- Shafer, E. (1982). Development of adaptive behaviour. In Begab,M., Garber,H. & Haywood,H.C. (Eds). Prevention of Retarded Development in Psycho Socially Disadvantaged Children. Baltimore: University Park Press.
- Shalven, R.J. and Marsh, H.W. (1986). On the structure of self-concept. In Schwarzer,R. (Ed.). Self- related Cognition in Anxiety and Motivation. Hillsdale, N.J: Lawrence Erlbaum.
- Shavelson, R. et al. (1976). Self-concept: Validation of construct interpretations. Review of Educational Research, 46, 707-741.
- Siann, G. and Ugwuegbu, D. (1980). Educational Psychology in a Changing World. London: George Allan & Unwin.
- Simmons, R.G. and Rosenberg, F. (1975). Sex, sex roles, and self-image. Journal of Youth and Adolescence, 4, 229, 259.
- Spender,D. (1982). Invisible Women: The schooling scandal. London: Writers and Readers.
- Spender, D. and Sara, E. (eds). (1992). Learning to Lose Sexism in Education. London: Cox and Wyman Limited.
- Swann, W.B. Jr., and Read, S.J. (1981a). Acquiring self-knowledge: The search for feedback that fits. Journal of Personality and Social Psychology, 41, 1119-1128.
- Swann, W.B. Jr., and Read, S.J. (1981b). Self-verification processes: How we sustain our self-conceptions. Journal of Experimental Social Psychology, 17, 351-372.
- Swann, W.B. Jr., and Hill, C.A .(1982). When our identities are mistaken: Reaffirming self-conceptions through social interaction. Journal of personality and social psychology, 43, 59-66.
- Swann, W.B. Jr., Pelham, B. W, and Krull, D.S. (1989). Agreeable fancy or disagreeable truth reconciling self-enhancement and self-verification. Journal of personality and Social psychology , 57, 782-791.
- Swann et al. (1992). Allure of negative feedback: Self verification strivings among depressed persons. Journal of Abnormal Psychology, 101, 314 – 317.

- Tesser, A., & Campbell, J. (1982). Self evaluation maintenance and the perception of friends and strangers. Journal of Personality, 50,261-279.
- Tesser,A., & Campbell, J. (1983). Self definition and self evaluation maintenance. In Suls,J. & Greenwald,A.G. (Eds). Psychological Perspectives on the Self. Hillsdale, N.J: Lawrence Erlbaum.
- Taylor, S.E. & Brown, J.D. (1994). Positive allusions and well – being revisited: Separating fact from fiction. Psychological Bulletin, 116, 21 – 27.
- Tesser,A. et al. (1988). Some affective consequences of social comparison and reflected processes: The pain and pleasure of being close. Journal of Personality and Social Psychology, 54, 49 – 61.
- Toug, M. and Tahan, K. (1986). Self-concept among over and under academic achievements in secondary school. Journal of Faculty of Education,1,5-44.
- Wells, L.E., & Sweeney, P.D. (1986). A test of three models of bias in self assessment. Psychology Quarterly, 49, 1 – 10.
- Wiederholt,J.L., & Bryant, B.R. (1987). Assessing Reading Abilities and Instrumental Needs of Students. Austin, TX: PRO - ED.
- Wigfield, A. and Karpathian, M. (1991). Who am I and what can I do: Children's self-concepts and motivation in achievement situations. Educational Psychologists, 26, 233-262.
- Wigfield, A. Eccles, J., MacIver, D., Reuman, D. and Midgley, C. (1991). Transition at early adolescence: Changes in children's domain specific-self-perceptions and general self-esteem across the transition to junior high school. Developmental Psychology, 27, 522-565.
- Willis, S., and Kenway, J. (1986). On overcoming sexism in schooling: To marginalise or mainstream. Australian Journal of Education, 30, 132 – 49.

Ya'quob, I. (1993). The relationship between self-concept facts and academic achievement. Educational Studies, 8, 154-182.

Zeidner, M. (1991). Statistics and mathematics anxiety in social science students: Some interesting parallels. British Journal of Educational Psychology , 61, 319 – 328.

APPENDIX A

TEACHER RATING OF STUDENTS' MATHEMATICS SELF CONCEPT

Kindly rate the performance of your student in Mathematics by ticking in the appropriate box.

NAME..... SEX: MALE ☐ FEMALE ☐

1. What is the performance of your student like in mathematics?
Excellent ☐ Very good ☐ Good ☐ Average ☐ Poor ☐
Very Poor ☐ Extremely poor ☐
2. How would you rate the reaction of your student when confronted with mathematics questions ?
Extremely uneasy ☐ Very uneasy ☐ Uneasy ☐ The same ☐
Confident ☐ Very confident ☐ Extremely confident ☐
3. How would you rate the effort put in by your student in Mathematics?
Extremely high ☐ Very high ☐ High ☐ Average ☐ Low ☐
Very low ☐ Extremely low ☐
4. How has the performance of your student in Mathematics been in the past?
Excellent ☐ Very good ☐ Good ☐ Average ☐ Poor ☐
Very poor ☐ Extremely poor ☐
5. How would you rate the interest of the student in Mathematics?
Extremely high ☐ Very high ☐ High ☐ average ☐ Low ☐
Very low ☐ Extremely low ☐

APPENDIX C

TEACHER RATING OF STUDENTS' CHEMISTRY SELF CONCEPT

Kindly rate the performance of your student in Chemistry by ticking in the appropriate box.

NAME:..... SEX: MALE ☐ FEMALE ☐

1. What is the performance of your student like in Chemistry?
Excellent ☐ Very Good ☐ Good ☐ Average ☐ Poor ☐
Very poor ☐ Extremely poor ☐
2. How would you rate the reaction of your student when confronted with Chemistry questions?
Extremely uneasy ☐ Very uneasy ☐ Uneasy ☐ The same ☐
Confident ☐ Very confident ☐ Extremely confident ☐
3. How would you rate the effort put in by your student in Chemistry?
Extremely high ☐ Very high ☐ High ☐ Average ☐ Low ☐
Very low ☐ Extremely low ☐
4. How has the performance of your student in Chemistry been in the past?
Excellent ☐ Very good ☐ Good ☐ Average ☐ Poor ☐
Very poor ☐ Extremely poor ☐
5. How would you rate the interest of the student in Chemistry?
Extremely high ☐ Very high ☐ High ☐ Average ☐ Low ☐
Very low ☐ Extremely low ☐

APPENDIX D

STUDENT SELF RATING OF MATHEMATICS SELF CONCEPT

This questionnaire has five questions which you are requested to answer by ticking in the appropriate box. Please ensure that you answer truthfully and honestly. Be assured that the information you give in this questionnaire will in no way be used against you, it is purely for academic purposes.

NAME..... SEX: MALE ☐ FEMALE ☐

1. What is your performance like in Mathematics ?
Excellent☐ Very good ☐ Good ☐ Average ☐
Poor☐ Very poor ☐ Extremely poor ☐
2. How would you rate your reaction when confronted with Mathematics questions?
Extremely uneasy ☐ Very uneasy☐ Uneasy ☐ The same☐
Confident☐ Very confident ☐ Extremely confident ☐
3. How would you rate the effort you put in Mathematics?
Extremely high☐ Very high ☐ High ☐ Average ☐
Low ☐ Very low☐ Extremely low ☐
4. How has your performance in mathematics been in the past?
Excellent☐ very good☐ good☐ Average☐
Poor☐ Very poor☐ Extremely poor ☐
5. How would you rate your interest in mathematics?
Extremely high☐Very high ☐ High☐ average ☐
Low ☐ Very low☐ Extremely low ☐

APPENDIX E

STUDENT SELF RATING OF PHYSICS SELF CONCEPT

This questionnaire has five questions which you are requested to answer by ticking in the appropriate box. Please ensure that you answer truthfully and honestly. Be assured that the information you give in this questionnaire will in no way be used against you, it is purely for academic purposes.

NAME:..... SEX: MALE ☐ FEMALE ☐

1. What is your performance like in physics?
Excellent☐ Very good ☐ Good ☐ Average ☐
Poor☐ Very poor ☐ Extremely poor ☐
2. How would you rate your reaction when confronted with physics questions?
Extremely uneasy ☐ Very uneasy☐ Uneasy ☐ The same ☐
Confident ☐ Very confident ☐ Extremely confident ☐
3. How would you rate the effort you put in in physics?
Extremely high ☐ Very high ☐ High☐ Average☐ Low ☐
Very low☐ Extremely low ☐
4. How has your performance in physics been in the past?
Excellent☐ Very good ☐ Good ☐ Average☐ Poor ☐
Very poor ☐ Extremely poor ☐
5. How would you rate your interest in physics?
Extremely high☐ Very high☐ High☐ Average☐ Low ☐
Very low☐ Extremely low ☐

APPENDIX F

STUDENT SELF RATING OF CHEMISTRY SELF CONCEPT

This questionnaire has five questions which you are requested to answer by ticking in the appropriate box. Please ensure that you answer truthfully and honestly. Be assured that the information you give in this questionnaire will in no way be used against you, it is purely for academic purposes.

NAME:..... SEX: MALE ☐ FEMALE ☐

1. What is your performance like in Chemistry?
Excellent ☐ Very good ☐ Good ☐ Average ☐ Poor ☐
Very poor ☐ Extremely poor ☐
2. How would you rate your reaction when confronted with Chemistry questions?
Extremely uneasy ☐ Very uneasy ☐ Uneasy ☐ The same ☐
Confident ☐ Very confident ☐ Extremely confident ☐
3. How would you rate the effort you put in in Chemistry?
Extremely high ☐ Very high ☐ High ☐ Average ☐ Low ☐
Very low ☐ Extremely low ☐
4. How has your performance in Chemistry in the past been?
Excellent ☐ Very good ☐ Good ☐ Average ☐ Poor ☐
Very poor ☐ Extremely poor ☐
5. How would you rate your interest in Chemistry?
Extremely high ☐ Very high ☐ High ☐ Average ☐ Low ☐
Very low ☐ Extremely low ☐

MATHEMATICS ASSESSMENT TEST SEPTEMBER 1999

INSTRUCTIONS

Please ensure that you indicate your full names and sex on your paper. All questions should be answered on a separate answer sheet. No electronic calculators or mathematical tables should be used.

DURATIONS: 1 hour

GOOD LUCK!

- 1 Evaluate
 - (a) $2.7 - 0.31$
 - (b) $2\frac{1}{2} + \frac{1}{4}$
 - (c) $0.025 \div 0.5$

- 2 What number is exactly half-way between -3 and $\frac{3}{7}$

3. Factorize completely:
 - (i) $16-t^4$
 - (ii) $2a^2 + 4ab + (-a-2b)$

- 4 Given that $\cos x = \frac{5}{10}$ and that x is acute, what is the value of $\sin x$?

- 5 Given that $\cos 60^\circ = \frac{1}{2}$, $\sin 150 = (?)$

- 6 Write down $\frac{1}{x-1} - \frac{3}{1-x}$ as a single fraction in its simplest form.

- 7 If $2x + 3y = 7$ and $3x + 4y = 10$, what is the value of $5x + 9y$?

- 8 What is the square matrix of

$$\begin{pmatrix} 1 & 2 \\ 1 & 0 \end{pmatrix}$$

- 9 A four sided figure has 2 (two) parallel lines only. The two parallel sides have lengths 7cm and 11 cm.

- (i) What is the name of the figure?
 - (ii) What is the area of the figure given that the distance between the parallel lines is 6 cm?
- 10 Given that S varies as $(P + 1)$ and $S = 6$ when $P = 1$, find the value of S when $P = 4$
- 11 Given that $f(x) = 3x - 7$, find
- (i) $f(0)$
 - (ii) $f^{-1}(-1)$
- 12 A cube has length 8cm. Find,
- (i) the volume,
 - (ii) the surface area of the cube.
- 13 The volume of a rectangular metal on a square base is 576cm^3 . If the height is 6cm, what is the length of the base in centimeters?
- 14 The ratios of the heights of the cylinders is 3:1. Find the volume of the bigger cylinder if that for the smaller one is 27cm^3 .
- 15 In the cold season, the temperatures on a particular day in two towns were -12°C and -10°C . What is the difference in their temperatures?
- 16 The exchange rate on a day at Chirundu boarder post was $\text{ZM\$1} = \text{K180.00}$, (where ZM\$ means Zimbabwean dollar). Calculate:
- (i) the amount of Zimbabwean dollars that could be bought from K90,000.00
 - (ii) the amount of Zambian Kwacha that could be bought from ZM\$2,000.00
- 17 (a) Light travels at 30,000,000,000 cm/s. Express the speed of light in standard form.

- (b) Round off 238.759 km to the nearest km.
- (c) Write down 998 to 2 significant figures.

18 (a) Evaluate:

(i)

$$\sqrt{0.36}$$

(ii) $(\frac{2}{3})^{-1}$

(iii) 2.7×0.54

(b) Given that $n = 2$, $m = \frac{1}{2}$, and $p = \frac{3}{5}$, find:

(i) $nm \div p$

(ii) $mp - n$

(iii) $n^2 \times m^{-2}$

PHYSICS ASSESSMENT TEST SEPTEMBER 1999

NAME: **SEX:**

INSTRUCTIONS

Please ensure that you indicate your full names and sex on your paper. All Questions should be answered in the spaces provided.

DURATION: 1 HOUR

GOOD LUCK!

1. (a) State the instrument you would use to measure:
- (i) the thickness of a sheet of paper.
.....(1)
 - (ii) the internal diameter of a test tube
.....(1)
 - (iii) The length of a football ground
.....(1)
 - (iv) a temperature of 450°C .
.....(1)
 - (v) the weight of an apple
.....(1)
- (b) (I) A cyclist travelling at 5m/s decelerates uniformly to rest in a distance of 3m . How long does he take to come to rest after the brakes are applied?
.....
.....
.....(2)
- (i) Use the space below to sketch a velocity-time graph for the motion Of the cyclist.

(2)

(c) (I) What is meant by density?

.....
..... (1)

(ii) State the S.I. Unit of density

.....
..... (1)

(iii) Brass is an alloy of copper and Zinc. 100g of brass was made by mixing 67g of copper and 33g of Zinc uniformly. Calculate the density of brass.

(Density of Copper = 8.9g/cm^3 Density of Zinc = 7.1g/cm^3)

Density of brass =(4)

(15 marks)

(d) Calculate :

(i) the resultant force which produces an acceleration of 5m/s^2 in a car of mass 900kg.

.....
..... (2)

(e) When a spring was stretched, it was found that the extension was proportional to the force applied. A force of 2.0N produced an extension of 1.6cm. The unstretched length of the spring was 12.0cm.

(i) What was the length of the spring when a force of 2.0N was Applied to it?

.....(1)

(ii) What was the length of the spring when a force of 5.0N was applied to it?

..... (2)

CHEMISTRY ASSESSMENT TEST SEPTEMBER 1999

NAME:..... **SEX:**

INSTRUCTIONS

Please ensure that you indicate your full names and sex on your paper. All Questions should be answered in the spaces provided.

DURATION : 1 HOUR

GOOD LUCK!

2. (a) The electronic structure of a neon atom is 2, 8. What is special about the outershell of a neon atom?

.....
.....(1)

- (b) The electronic structure of a calcium atom is 2,8,8,2 what must happen to Calcium atom for it to achieve the noble gas structure?

.....
.....(1)

- (c) Draw diagrams of an oxygen atom and a calcium atom ($^{16}_8\text{O}$ and $^{40}_{20}\text{Ca}$ respectively) showing the position and numbers of protons, neutrons and electrons.

(4)

- (d) Give the formula and name of the compound formed when calcium reacts with oxygen. What type of bonding does this compound contain.

Name of compound:

Formula :

Type of bonding:(3)