GIRLS ACHIEVEMENT IN SINGLE SEX CLASSES: A COMPARATIVE STUDY OF GIRLS' PERFORMANCE IN LUSAKA PRIMARY SCHOOLS 1997-1999

By

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A Dissertation Submitted to the University of Zambia in Partial Fulfilment of the Requirements for the Degree of Master of Arts in Gender Studies

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DECLARATION

I, Abby P.T. Zulu, do solemnly declare that this dissertation represents my own work and that it has not been previously submitted for a degree at this or another university.

Signed:_____

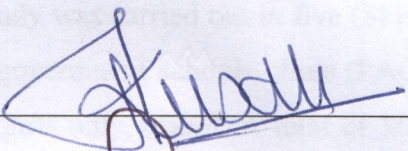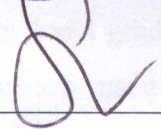Date :_____19 | 06 | 09_____

APPROVAL

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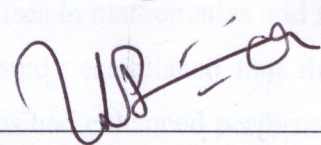
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ABSTRACT

Single-sex classes were one intervention under the Programme for the Advancement of Girls Education (PAGE) introduced by the MOE aimed at improving girls participation rates; increasing girls' academic performance; and increasing self esteem and confidence.

The major aim of this study was to examine the extent to which single-sex classes had achieved in raising performance in girls at primary school level. The study also examined whether single sex classes had increased confidence and self esteem in girls; and also examined pupils actual performance levels in mathematics and science exercises. This was done in order to gain an understanding of PAGE and what was being achieved in single sex intervention.

The study was carried out in five (5) primary schools in Lusaka urban. The sample consisted of all government schools, three (PAGE) schools and two non-PAGE schools one of which was a girls only school. A total of 365 respondents provided the required information (300 pupils at grade 4 and grade 6 level, 40 teachers, 20 parents, and 5 head teachers). To achieve its purpose the study used interviews, focus group discussions, questionnaire, observation and exercises in mathematics and science.

The study established that the overall perception of all the participants is that single-sex classes had enhanced performance among the girls in PAGE primary schools. The study also established that performance in the exercises in Mathematics at grade 4 level was similar for both girls and boys. At grade 6 level, average percentages in the maths exercise in PAGE schools showed that Edwin Mlongoti performed better with 90% of the girls in single sex classes obtaining average scores compared to the other PAGE comparable schools, Chamba Valley with 50% of the girls obtaining average scores and Bauleni 40% of the girls obtaining average scores. Overall results in maths between single sex classes and mixed classes at grade 6 level showed that within PAGE schools girls in the single-sex classes performed better, with 70% in single sex classes obtaining average and good scores compared to 53.3% in mixed classes. From the participant's perspective single sex classes have been successful in terms of improving academic performance of girls, decreased incidences of pregnancies; increased class participation for girls in single sex classes, interest by girls in completing school; and good learning environment for girls.

The study had the following recommendations based on the evidence from the results: single sex classes to continue; improvement of teacher/parent involvement in pupils' performance; improvement of record keeping for monitoring; training of teachers in gender issues to continue; and further research to investigate single sex classes from another perspective.

DEDICATION

This dissertation is dedicated to my husband Mr. Levi Zulu and our children: Isaac, Daniel and Tamara, for their challenging support, commitment and words of encouragement; and to my mother Mrs. Idah Phiri and late father Mr. Patrick Phiri for their parental guidance through life.

ACKNOWLEDGEMENTS

ABBREVIATIONS

CIDA   Canadian International Development Agency

ECZ   Examinations Council of Zambia

EFA   Education for All

FAWEZA   Forum for African Women Educationalists of Zambia

FGDS   Focus Group Discussions

GCSE   General Certificate of Secondary Education

HIV/AIDS   Human Immune Virus/ Acquired Immune Deficiency Syndrome

MOE   Ministry of Education

MVT   Monitoring and Valuation Team

NFER   National Foundation for Educational Research

PAGE   Programme for the Advancement of Girls Education

PEO   Provincial Education Officer

PTA   Parents Teacher's Association

SSABSA   Senior Secondary Assessment Board of South Australia

U.K.   United Kingdom

U.S.A.   United States of America

ULEAC   University of London Examinations Council

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CHAPTER ONE

BACKGROUND TO THE RESEARCH PROBLEM

1.0   Introduction

This chapter introduces the investigation into girls' performance in selected primary schools in Lusaka urban. The presentation begins with background information on girls' academic performance in Zambia as well as on the Programme for the Advancement of Girls Education (PAGE). Thereafter, the chapter states the problem under investigation, the significance and objectives of the study as well as the specific research questions. This section is followed by the operational definitions for the key terms used in the study, the scope of the study, a list of some of the limitations and an outline of the structure of the dissertation. Finally, the chapter concludes with a summary of the main issues dealt with in the chapter.

1.1   Girls' Academic Performance in Primary Education in Zambia

One of the major concerns of the Zambian government has been the need to enhance and ensure equal participation of both girls and boys in primary education. In Zambia, like in most Sub-Saharan African countries, there has been unequal participation in primary schooling for girls for various reasons. Notable of these has been girls' poor or under-achievement especially in subjects of mathematics and science. Girls' performance tends to be poorer than that of boys especially in the national leaving examination at Grade Seven level at the end of the primary cycle resulting in girls experiencing lower progression rates compared to boys. Studies have traced the problem of unequal participation and poor performance of girls to a number of factors. These include persistent apprehension, fears and myths on the part of parents, teachers and girls themselves (FAWE, 1995); cultural and traditional practices that have placed girls in second position (Kelly, 1995); the negative self image and inferiority complex internalised by girls (Mutukwa, 1995), poor learning and biased classroom practices by teachers (Maimbolwa, Chilangwa, 1995); poor quality and biased teaching materials (Mitchell, 1995) and the education policy providing for a lower cut-off point for girls introduced in the 1970's which has reinforced the belief in girls that they cannot perform at the same level as boys.

Since the 1990's, through the actions of women's organizations at national, regional and

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international level, gender equity in education has emerged as an issue of major importance. National and international agendas and conferences such as Jomtien (Thailand, 1990) and Beijing (1995) increasingly showed that equal education opportunities for both girls and boys not only as a human right (Convention on the Right of the Child) but also as the key to and an essential tool for achieving the goals of equality, development and peace, and more equal relationships between women and men (Beijing Platform for Action, 1995).

Zambia was an active participant at the Jomtien conference on Education for All (EFA) in 1990 out of which it developed a National Education Policy reflected in the strategy document "Focus on Learning" (1992). This reflected a shift in policy since 1991, in which there has been reinforced emphasis and focus on expanding and improving primary education for all, and addressing issues on the empowerment of women and girls' education.

The shift in educational policy in Zambia as observed above is attributable to research which has shown that public investment in girls' education yielded more benefits to society. For example, it was observed that: the education of women and girls reduced infant mortality rate and improved the nutritional status of the children; an educated girl was more likely to marry at a later age and have fewer children; and educated mothers were likely to encourage and influence their daughters to achieving in education (UNICEF, 1997). Education helps prevent the spread of HIV/AIDS as it endows women and girls with more decision making power over their own bodies and in the family.

In Zambia, during the period 1994/1995, the Ministry of Education (MOE), with donor support, instituted a research agenda to address the problem of girl – child education in the country. Various studies were conducted to challenge the acceptability of unequal participation of girls in primary school, to improve the quality of schooling and to advocate for strategies to improve the academic performance of girls in school. The following studies were conducted during this period:

(i)   *Below the Poverty Line in education: a Situation Analysis of Girl – Child Education in Zambia.* Michael J. Kelly, 1994.

(ii)   *A Research Agenda on the Girl – Child.* Claudia Mitchell, 1994.

(iii)   *Comprehensive Education Analysis (Chipata District, Eastern Province).* Geoffrey Lungwangwa, 1995.

(iv)   *Learning from Inside the Classroom.* Irene Maimbolwa-Sinyangwe and Barbara Chilangwa, 1995.

(v)   *Barriers to Girls' Education: A Study of Knowledge, Attitudes and Practices of Zambian Educationalists.* Monica Munachonga, 1995.

(vi)   *Listening to the Girl – Child.* Dickson Mwansa, 1995.

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(vii) *Survey of Conditions in 20 Zambian Schools.* Dylan Aspinwall, 1995.

(viii) *In the Best Interest of the Child.* Tukiya Mabula and Yizenge Chondoka, 1995.

In summary, some of the findings arising from the studies cited above were that several factors hindered girls from achieving as well as boys in school. It was observed that some of the problems faced by girls were related to their developing sexuality. These problems were aggravated by cultural and traditional beliefs and practices in society (Kelly, 1995); that girls were victims of sexual abuse and harassment at the hands of fellow pupils and male teachers (Mwansa, 1995); that girls interacted less with teachers than did the boys especially in the rural areas and that girls experienced more problems related to their school work than did the boys (Maimbolwa- Sinyangwe and Chilangwa, 1995); girls were known to have a crippling negative self-image and inferiority complex, bred in by the attitudes of parents and teachers and the society. This negative self-image was reinforced more deeply by the low number of successful role models with whom girls could interact (Mutukwa, 1995); Mabula and Chondoka (1996) also found that teenage mothers found it difficult to return to school and if they returned they performed badly in their academic work. It was evident that the scenario portrayed in the studies listed above hampered girls' opportunities to perform well in their academic work thereby greatly impairing the achievement of Zambia's national declaration of Education for All (EFA).

Against a background of persistent constraints to girls' educational achievement in Zambia, as evidenced by research studies, the MOE with donor support began to pay more attention to the gender dimension in primary education.

1.2   Programme for the Advancement of Girls' Education (PAGE)

1.2.1 Introduction

The Programme for the Advancement of Girls' Education (PAGE) was introduced in 1994 within the MOE with the support of the Canadian international Development Agency (CIDA) and the United Nations Children's Fund (UNICEF), as a programme that sought to promote girls' education in Zambia by promoting and creating public awareness on the importance of girls' education at national level within the framework of Education for All (EFA).

The development of PAGE started with several research studies undertaken from 1994 to 1995, with the situation analysis of Girl – Child Education in the country under the Research Agenda for Girls' Education in Zambia cited earlier.

PAGE as a programme was addressing specifically problems associated with the education of girls and empowering girls and women to fully participate in and benefit from the

economic and social development of the country and to ensuring the survival of girls into adulthood with particular emphasis on protection from HIV/AIDS. The major objective was to be achieved by improving the efficiency and effectiveness of classroom practice so as to provide the learners, especially girls with the basic competencies through the implementation of specific interventions that directly impacted on access, retention and performance or achievement of girls in both primary and secondary schools in Zambia. The major goals of the programme as stated in the MOE document, PAGE Provincial Implementation Guide (1999) were:

(i)   *to deliver quality primary education to all children, especially girls; and*

(ii)   *To reduce gender disparities in primary education enrollment, retention, completion and achievement.*

The immediate objectives of PAGE were:

(i)   *to improve access, retention and progression of girls in school;*

(ii)   *to increase teacher and parental support for the education of girls;*

(iii) *to build up self confidence and self esteem of girls; and*

(iv)   *to deliver quality primary education to all children, especially girls.*

Based on the findings and recommendations of the research studies, the MOE drew up a package of interventions to be pilot tested and implemented in 20 selected schools in Lusaka and Eastern provinces of the country. Only five out of the eight interventions were introduced and implemented in 20 primary schools. These interventions were:

(i)   Research studies on crucial aspects of girls education;

(ii)   Advocacy and sensitization, a means of increasing awareness on the importance of girls education;

(iii) Family Pac, aimed at sensitizing parents to share responsibilities with the school in taking interest in the education of their children, especially girls;

(iv)   Gender Across the Curriculum aimed at introducing gender studies and social change topics into the regular courses in two Primary Teacher Training Colleges, to increase gender sensitivity of teachers (David Livingstone and Chipata Teacher Training College); and

(v)   Single-sex Classes aimed at improving performance and increasing self esteem and confidence in girls.

PAGE went to scale, covering the whole country in 1997 targeting selected schools, and has extended to over one thousand schools in the seventy two districts of the country (UNICEF, 2002).

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1.2.2 Single-sex classes

The need to introduce single-sex classes was identified and recommended by Kelly (1994) and Maimbolwa-Sinyangwe and Chilangwa (1995). Kelly found out that the academic performance of girls in girls-only schools at secondary level was better than those in mixed schools. In recommending for single-sex classes Maimbolwa and Chilangwa argued that evidences from research studies had shown that, left to learn on their own girls did comparatively well both in mathematics and science subjects, "we recommend a system of streaming of classrooms on the basis of sex". Similarly, Kelly recommended that classes in some large primary schools should be re-arranged and split along single-sex lines so that girls, uninhibited by the presence of boys, may be better able to develop their potential. In summary, the recommendation made by Kelly (1994) and Maimbolwa-Sinyangwe and Chilangwa (1995) was that a system of streaming on the basis of sex into single-sex classes at the primary school level should be experimented as an intervention towards reducing gender disparities in enrolment, retention, completion and academic achievement for girls.

The main objectives of single-sex classes were:

(i)   to improve girls participation rates (attendance, retention and promotion);

(ii)   to increase the academic performance of girls; and

(iii)   to empower girls and to develop a positive change of attitudes and behavior in boys.

Single-sex classes were to be implemented in large schools with no problems of shortage of classrooms, as this would only entail re-arranging the classrooms into girls only classes, boys only classes and mixed classes and relocating teachers. Teachers of single-sex classes were to be either male or female who would be role models and conversant with girl-friendly teaching methodologies and attitudes necessary to fulfilling the objectives of this intervention. Single-sex classes were to be implemented at Grade 4 and Grade 6. Twenty schools were selected: ten (10) in Lusaka and ten (10) in the Eastern province of the country as pilot schools for single-sex classes.

1.3   Statement of the Problem

Research conducted between 1994/95 on the situation of girls in the country had shown that societal attitudes, cultural practices and negative classroom practices had combined to discriminate against girls in terms of survival within school and examination performance. Single-sex classes were one intervention under the PAGE programme introduced by the MOE as an intervention that would provide girls with a conducive environment of learning away from the customary coeducational setting. These classes were aimed at improving girls participation rates; increasing girls' academic performance; increasing self esteem and confidence and empowering girls to develop a positive change of attitudes and behavior towards academic performance in Mathematics and Science subjects.

At the time of the present study available information on PAGE as a programme came from the Monitoring and Validation Team (MVT) from the School of Education at the University of Zambia (1997/1998) based on data collected on all PAGE interventions that were tested in the first 20 pilot schools. In the final round of evaluatins the Unza MVT with regard to single sex classes, administered tests in maths and science during Term III, 1997 to 10 randomly selected girls in mixed and single sex classes in grade 5 and repeated the tests in Term I,1998 to girls in grade 6 the same cohort that sat for the first test in grade 5. The results for the maths and science tests for both grade 5 girls and grade 6 girls showed that there were no significant differences between girls' grade scores since the separation of pupils into mixed and single sex classes, and that basic competences were very low among all girls (Mumba, 1998). The impact of single sex classes on girls performance, was not clear, therefore there was need for further investigation to find out how adolescent girls were being affected in their performance by the intervention. The present study was concerned with the investigation to find out specifically how adolescent girls were being affected in their performance in single sex classes in PAGE schools.

1.4   Significance of the study

In Zambia, the problem of low achievement and poor performance of girls at primary school has continued to be a source of concern in terms of narrowing the gender gap in education. Although studies on academic performance and type of school at secondary level had revealed that girls performed better in single-sex schools, there was need to investigate the situation of girls in single-sex classes in PAGE primary schools at the pilot stage. This study is important as it contributes to the existing body of knowledge in the area of girls' education. In addition it provides useful insight to the MOE and cooperating partners interested in the advancement of girls' education in Zambia, and provides reference for future research.

1.5   Objectives of the Study

The general objective of the study was to find out how girls had fared in performance in single-sex classes in PAGE pilot primary schools since their inception in 1996. The following were the specific objectives of the study:

(i)   to ascertain whether or not single-sex classes had been effective in raising girls' performance in mathematics and science;

(ii)   to find out whether or not single-sex classes had increased girls self esteem and confidence; and

(iii)   To assess and compare performance between girls in single sex classes and mixed classes in PAGE and non-PAGE primary schools.

1.6   Research Questions

Three specific questions concerning the impact of single-sex classes on performance were asked.

(i)   How have girls in single-sex classes fared in performance in mathematics and science compared to girls in mixed classes in PAGE schools?

(ii)   Have single-sex classes improved and increased girls self esteem and confidence? If so to what extent?; and

(iii)   How do girls in PAGE schools compare in performance with girls in non-PAGE primary schools?

1.7   Operational Definitions

In this study, words and phrases were used with the meanings as indicated below:

Achievement: The level of girls' academic class performance once enrolled.

Performance: The level of attainment in the maths and science exercises.

Single-sex classes: Classes in PAGE primary schools re-arranged on the basis of sex, for girls and boys.

Mixed classes: Classes with both girls and boys unseparated.

PAGE schools: Selected primary schools, in Lusaka Province, ten in total Implementing single-sex classes.

Non-PAGE schools: Primary schools that were not part of the PAGE pilot schools in Lusaka Urban.

1.8 Scope of the Study

The scope of this study is confined to examining one educational intervention put in place by the MOE to address equity issues, focusing specifically on improving girls' achievement or performance in single-sex classes at the primary level in selected schools in Lusaka. The study focuses on establishing whether similar results as those recorded at the secondary school level of girls performing better in same sex learning groups can be realized at the primary school level in PAGE single-sex classes in the research areas.

1.9 Limitations of the Study

The results of this study have to be interpreted in the light of the following limitations. Firstly, that they are based on five primary schools in Lusaka urban out of several primary schools, out of which three (3) were PAGE schools and two (2) non – PAGE schools. Secondly, a study of this nature should have covered all the twenty (20) PAGE pilot schools in both Lusaka and in the rural areas of Chipata, Eastern Province. Limited time and financial resources did not make it possible for the researcher to undertake an exhaustive study. Thirdly, the findings of this study may not reflect the situation pertaining to single-sex classes in the rest of the schools in the research areas of Lusaka and Eastern provinces in the country. Fourthly, the dissertation has taken a long time to be completed and finally submitted. The reasons for this situation are due to the researchers' personal difficulties experienced during this period which prevented the timely submission of the written work. However, the work can still be used as a reference to what the situation of girls was like in terms of academic performance in single sex classes at the pilot stage.

1.10 Structure of the Dissertation

There are four chapters after the introductory one. Chapter II presents a review of relevant literature while Chapter III focuses on the methodology which comprises the data collection and analysis procedures. Chapter IV reports the findings of the study from the maths and science exercise, the comparisons in performance between pupils in single-sex classes and those in mixed classes and the comparisons between PAGE and Non-PAGE schools. Finally, Chapter V discusses the findings, draws conclusions and makes some recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.0   Introduction

The present chapter reviews relevant studies on factors that influence girls' performance. The information is presented in four sections. The first section consists of information on studies carried out in other regions of the world, and the second contains information on studies carried out in Sub – Saharan Africa while the third contains information on studies carried out in Zambia. The chapter concludes with a comment on the common focus for the reviewed studies and states the focus for the present study.

2.1   Literature on Girls' Performance in Other Parts of the World

In the U.K, studies that were conducted prior to the introduction of GCSE (General Certificate of Secondary Education) in 1988, revealed that the differences in performance in mathematics between girls and boys at secondary school level were more pronounced in favour of boys (Burton, 1986 in Elwood 1995). In another study undertaken in the UK on examination and coursework performance, results have revealed that the pattern of gender related performance had changed in favour of girls in the last 15 years. A study undertaken in 1992 by the University of London Examinations Council (ULEAC) and the National Foundation for Educational Research (NFER) tried to investigate the extent to which the structures and assessment techniques used in GCSE actually increased or reduced the gender differences that exist in examinations results.

According to the findings from the analysis of results patterns for GCSE over a period of six years from 1988-1994, there were more girls than boys entering for GCSE examinations, 94% girls compared 90% boys entered for GCSE, in English for the 16 year old cohort ; girls finished compulsory school better qualified in terms of the proportion of A-C grades; and that more girls 98% of 16 year old entered GCSE Mathematics compared to 93% boys and that girls were substantially ahead of boys in the proportion of A-C grades (Elwood, 1995). Evidence from various researches in the U.K has shown that the gap was very narrow between the genders especially in the traditionally 'male' subjects, but that the worry now in the U.K was the underachievement of boys relative to girls, as girls were consistently outperforming boys across the 5-16 age range.

In Australia, studies undertaken in a project research by the Senior Secondary Assessment Board of South Australia (SSABSA) to investigate the gender differences in English and mathematics in public examined subjects over a period of three years found similar results as those in the U.K. The findings were that girls consistently outperformed boys in all states in English, and that girls were proportionally better represented in the higher score ranges in mathematics compared to boys (Elwood, 1995).

In the U.S.A., gender differences between boys and girls have shown a decline and are almost non-existent (Hyde, 1990, in Elwood 1995). Findings from research on results and analyses on standard tests and mathematics have shown that the gender gap has narrowed and that there has been an increase in participation in mathematics courses especially by girls.

In summary, in the developed world, the picture that is presented is that the gap in performance between girls and boys at both primary and secondary school level has been closing and is continuing to do so in many subjects including mathematics, and is evidenced by the fact that girls have overtaken boys in performance.

Research has been done on the effects of different schools on performance. Some of the earliest empirical studies undertaken to consider the impact of different schooling arrangements; single sex schools or coeducation on girls' academic achievement at secondary school were done by Dale (1969, 1971, and 1974) in Welsh and English secondary schools. Findings were in favour of co-educational schooling as no significant difference in performance was observed between boys and girls. However, Dale's study was criticized by Steedman (1984, in Daly 1995) because it was biased towards pupils in academically and socially selective grammar schools.

A longitudinal study similar to Dale's study was later conducted by Steedman in the UK in co educational schools (1984, 1985) and had controls for variables such as social background, family, and parental influence. It was observed in this study that girls and boys showed no significant differences in performance.

In another study carried out in the north of England (Bryan and Digby 1986, in Elwood 1995) it was also found that achievement differences between girls in science and mathematics were not related to single sex schools. In a research conducted by Bell (Bell 1989, in Elwood, 1995) he looked at the science attainment of pupils aged 15 in England in government sponsored Assessment of Performance unit tests over a four year period. The findings were that when appropriate comparisons were made among students in selective government maintained schools, there was no evidence of mean differences in girls' scores between single sex schools and co-education schools. Similar results were obtained by Yates (1993, in Daly

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1995) in an overview of girls education in Australia, from which he concluded that 'overall research on achievement has established no clear superiority of either coeducation or single sex schooling for girls once other factors are controlled for'.

Sturgis (1994) in a similar study in Ireland agreed with these findings and argued that not only were girls improving academically in mixed sex education but that this kind of education was better preparation for life.

However, the consensus in other literature has argued in favour of single sex schools for girls, pointing out that girls in single-sex schools tend to perform better in national examinations than those in co-education schools. In America, Lee and Bryk (1986, in Daly 1995)) in a study based on Catholic single-sex schools observed that students, especially female students, benefited academically and attitudinally from single-sex schooling.

In a study carried out in Ireland in 17 secondary school by Hanafin and Ni Chartaigh (1991 in Daly 1995), it was found that girls in girls schools achieved better overall results in public examinations at the end of their schooling than their counterparts in mixed schools.

In Thailand, Jiminez and Lockheed (1989) in a study of mathematics achievement comparing performance of 8th graders in single sex schools to those of girls in coeducation schools found that after controlling for student background, single-sex schools were found to be more effective for girls in terms of mathematics achievement and exerted strong positive influence on girls' self perception. Co-educational schooling on the other hand was more effective for boys (Jimenez and Lockheeed 1989 in ABEL research study).

In Jamaica, in a survey of 14 percent of the 11th grade population controlled for socio-economic factors, single-sex schooling resulted in superior levels of achievement in geography, chemistry and biology for both girls and boys, but that girls in single-sex institutions registered the largest percentage of A's in science while girls in mixed schools scored lowest, with boys in single-sex schools and co-educational schools ranking second and third of the four groups (Hamilton 1985 in ABEL research study). These studies, suggest that perhaps single-sex schools are the best option in improving performance levels for girls.

There are a few studies, however, that have found some negative effects of single-sex schooling for girls. In Peru, for example, single-sex schooling for girls at the secondary school level was associated with a higher rate of pregnancy, and in class girls' participation was very low, and in some instances, none at all (Lafoss, Hernandez, and China 1987 in Stromquist).

However, in Saudi Arabia and Kuwait, where the sexes are segregated by policy, girls outperformed boys academically in both science and literary subjects (El-Sanabary 1989 in ABEL research study). Indeed, this suggests that the school and classroom culture define to a

great extent the self image of the girl child, thereby influencing her achievement (Njau and Wamahiu in Cotton and Synge, 1998). In Yemen, although single-sex schooling elevated girls' academic performance, it also prepared them to occupy separate spheres in the labour force, with the majority of females concentrated in the health sector (Stromquist in ABEL research study). Other studies have suggested that factors related to teacher pupil interaction in classroom affected girls' performance.

Recent developments in the U.S. on female performance have indicated that in the early elementary school years girls are ahead of boys academically achieving higher standardized test scores in every area except science (Sadker, Fox and Salata, 2000) but lagged behind boys thereafter.

Some studies have pointed out factors related to girls own self image as affecting girls' performance. According to findings from recent studies undertaken in the U.S.A., the evidence has shown that there was a relationship between academic achievement and self esteem. Evidence from these studies further showed that students who did well in school felt better about themselves and in turn they felt more capable. As girls felt less good about themselves, their academic performance declined and this poor performance eroded their confidence (Sadker 2000). This pattern was found to be particularly powerful in mathematics and science classes with only 18 % of middle school girls describing themselves as good in these subjects, down from 31% in elementary school.

In another investigation on gender equity in the classroom, findings were that girls began to perform poorly at high school level (Sadker, 2000). The drop in test scores began around the same time that another deeply troubling loss occurred in the lives of girls self esteem.

In an investigation of verbal interaction patterns in elementary school, secondary, and college classrooms in different subjects, evidence found was that approximately one half of the female students in college classrooms remained silent having no interaction with their professor, and in elementary and secondary school girls were eight times less likely to call out comments (Sadker, 2000). Sadker attributed this to the following reasons, girls receive less teacher attention, rarely see mention of the contributions of women in the curricula as most text books continue to report male worlds, and girls frequently became targets of unwanted sexual attention from male peers and sometimes from administrators and teachers. This imbalance in attention resulted in the lowering of girl's achievement and self esteem.

In *Learning to Lose* edited by Dale Spender and Elizabeth Sarah (1992), various studies done in mixed classes in the U.K found similar findings, that teachers' attention focused more on boys (Sears and Feldman, 1974 in Spender 1992); that the curriculum was directed to boys (Clarricoates, 1987 in Spender 1992); that boys were permitted to talk and encouraged to

challenge and question more than girls were (Parker, 1973 in Spender 1992). Other research in the U.K, similarly found that teachers interacted significantly more regularly with boys than they did with girls and that they asked boys more questions than they asked girls (Morse and Handley, 1982).

2.2   Literature on girls performance in Sub-Saharan Africa

It has been argued that the major constraint for girls to complete primary education in most Sub-Saharan African countries that of under-achieving (Swainson, 1995).

Several other studies in recent years in Sub-Saharan Africa have provided qualified support for the superiority of single sex schooling for girls (Jimizez and Lockheed, 1989).Other studies have argued against this, for example, in a study on girls' achievement at secondary school level in Cameroon, it was observed that girls that attended good quality co-education schools and came from better socio-economic backgrounds performed better than their male classmates in both science and languages (Kilo, 1994).

In a study by Lee and Lockheed (1989) of mathematics achievement by senior Nigerian pupils, the performance of 9th grade girls in single-sex schools was compared to that of girls in co-educational schools. The findings showed that girls in single-sex schools exhibited higher performance in mathematics and reduction in stereotypical views of mathematics more than girls in co-education schools.

In Kenya, girls in single-sex schools in Nairobi at the secondary school level performed as well as boys in single-sex schools and significantly better in mathematics than students in co-educational schools (Boit in Hyde1989).

In Swaziland, girls in single-sex schools did not choose available physical science courses as frequently as girls in co-educational schools, opting instead for mathematics and agriculture (Wheldon and Smith in Hyde 1989).

In Malawi, findings from experiments with gender streaming showed encouraging results. In one secondary school, streaming by gender and ability during a mathematics class benefited both boys and girls and narrowed the gap between girls and boys in performance (Hyde in Swainson, 1995). It was concluded from these results that gender streaming would probably be the most relevant alternative to single-sex schools for promoting better female performance at secondary school level. These results have yet to be verified at the primary level.

In Cote d'Ivoire, Tanzania, Zimbambwe, Mozambique and rural Kenya, research findings showed that girls consistently performed worse than boys through the school system (World Bank 1989). Tanzania's solution to greater access of girls into secondary school like many Sub-Saharan African countries has been to lower the pass mark for girls, but it has been argued that a more lasting solution lies in improving girls' primary achievements in school (Herz B and others, 1995).

A study in Cote d'Ivoire suggested a strong relationship between households low economic status and girls poor performance; girls' greater involvement than boys with domestic chores that left them too tired or with too little time to study; a lack of positive role models for girls, as evidenced from research that girls with older sisters who passed examinations were more likely to perform well themselves (Colliers and others 1991, Grisay 1984 in World Bank Discussion paper ,1995).

2.3   Literature on Girls' Performance in Zambia

In Zambia, research studies conducted between 1994 and 1995 studies as earlier cited in the introduction, were conducted to challenge the acceptability of unequal participation of girls in primary school, to improve the quality of schooling and to advocate for improvement in academic performance for girls in school. Findings from these studies pointed out to the problems of girls' negative self image, cultural and traditional beliefs and practices which consign girls to home based roles, problems related to girls developing sexuality, girls were harassed by boys through teasing and threats, and that girls received less encouragement and attention from teachers. These findings render support to those from Cameroon, Sierra Leone, Malawi, Guinea and Rwanda which have indicated that both male and female teachers believe that boys are academically superior to girls (Odaga & Heneveld 1995).

In a study to investigate on the girl child performance in school in relation to how she was treated in the classroom (Maimbolwa-Sinyangwe, 1995) at primary school level in four primary schools, the findings were that girls' performance was the same as that of boys in the lower grades, but that the differences in performance between boys and girls became wider as they moved into upper grades. In a study conducted in two secondary schools to investigate whether teachers perceived their interaction with students as influencing gender differences in performance (Kasonde-Ng'andu, 1999), the findings were that although teachers interacted the same way with boys and girls, there were differences in performance between boys and girls, with boys performing better in maths and sciences while girls did better in English.

However, these studies did not mention anything on the impact of single sex class learning on pupil performance of girls and boys; teacher, parent and pupil perceptions in relation to single sex class learning; and the impact on attitude, motivation, and self esteem in relation to mathematics and science subjects in girls compared to boys.

During the 1997-1998 and 1999-2000 periods the MOE contracted the University of Zambia (UNZA) Monintoring and Validating Team to undertake reviews to validate and produce thematic reports on the achievements of PAGE programmes.

The Monitoring and Validation Team (Unza MVT, 1998) investigated all PAGE programmes and collected data from interviews with teachers and results from actual tests on pupil performance at grade 5 level (third Term 1997) and grade 6 level (first school Term 1998) in the pilot schools. In one review teachers pointed out that there were no significant differences between girls' grade scores since the separation of pupils into mixed and single sex classes, and that basic competences were very low among all girls (Mumba, 1998).

In the final evaluation of PAGE by the Unza MVT, findings were that single sex classes had been appreciated by the communities and girls themselves, but observed that there was need to determine the effects of single sex classes on pupil performance (Mumba, Chikalanga, Sikwibele and Nkhata, 1998).

A study by Bernard (1999) also pointed out the need for systematic data that would assist to determine the effects of single sex classes. It was against this background that this study sought to investigate what impact or difference single-sex classes had made in raising girls' performance and building self-esteem and confidence during the pilot stage in PAGE primary schools. In a subsequent study by Siachitema (2002) to evaluate the success of USAID support to four districts of Southern Province for the period 1998-2002, the findings were that most communities perceived PAGE positively, but that more systematic studies on the effects of single sex classes on performance were required. This study is an attempt to provide some answers on the extent to which single sex classes have been successful in improving girls' performance.

CHAPTER THREE

METHODOLOGY

3.0   Introduction

The present chapter focuses on the following components of the study: The first section consists of information on three perspectives on girls education adopted in the study, the research paradigm and research design used in the study, the selection of research sites and reasons for the selection, the characteristics of the samples, the sample size, the data collection instruments and procedures and the data analysis process.

3.1   Perspectives on Girls Education

The three perspectives mentioned in the present study can be considered as an input to the overall discussion on girls' education and arose out of the researcher's own recognition and acceptance that girls should be educated. The study included the following approaches:

(i)   The one employed by the World Declaration on Education for All at the World Conference on Education for All (EFA) held in Jomtien, Thailand in 1990 which views education as a precondition for development, economic growth, and poverty elimination and produces respect for human rights and the prevention of HIV/AIDS. The Zambian government committed itself to achieving quality basic education for all by 2015 with particular emphasis on girls' education, and to eliminating gender disparities in primary education by 2005 (UNESCO, 2004), in recognition of the importance of girls and women's education;

(ii)   The approach identified in several research studies which shows that the economic and social returns to educating women are greater than those for men (Hertz B, Subbarao K, Habib M, and Raney L, 1995). There are several benefits from female education: educated mothers have educated children and healthier children; they participate in the labour force; contribute to decline in fertility, infant mortality and poverty; improve productivity and are able to combat and prevent HIV/AIDS; and

(iii)   the approach by feminists and educators whose argument is that girls can accurately know their abilities if they are given a fair chance to achieve, as demonstrated by the high performance of girls in girls' single-sex schools at secondary school level (Kelly, 1995) whose achievements are equal to or better than those of boys. Research from several countries has shown that girls tend to perform better in a variety of subjects from languages to mathematics if they attend girls' schools especially at the

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secondary school level (Jimenez and Lockheed, 1989). This study sought to review this position at the primary level.

3.2   Research Paradigms

Paradigms have been described as ways in which people view the world or make interpretations of their situations. They shape how we understand and interpret events in the world in relation to ourselves, those we interact with and our interventions. Kane (1995) defines paradigms as patterns or models of understanding and states that social and cultural factors are crucial to understanding situations but many people are reluctant to examine these factors because they fear that their research will not be scientific. Herbert (1990) states that paradigms are useful in providing direction for research, as they lead to intensive and focused investigations. Two paradigms are discussed in this chapter: the positivist paradigm and the feminist paradigm.

3.2.1 Positivist paradigm

In research this paradigm has been dominant for many years. The paradigm is based on the assumption that reality exists it is 'out there' and can be objectively investigated. Kane (1995) states that in the positivist approach the world is stable, consistent, predictable and orderly and that the research techniques are usually quantitative because the variables are clearly defined, can be measured and the results can be converted to numbers. This approach has been criticized because it disregards the human participants to the investigation.

3.2.2 Feminist paradigm

Spender (1980) in *Men's Studies Modified* and in *Social Construction of Gender* argues that the one weakness of the "objective" or positivist approach has been that it deliberately leaves out the reference to the personal or subjective aspects of the human condition. Feminists believe that women were not consulted about their own lived experiences partly because the personal was not taken into account, hence distorting facts about women's existence. The feminist paradigm seeks to demonstrate that feminist theories have an important part to play in challenging and transforming patriarchal knowledge, traditional biased male research methods, and in promoting research which raises issues of raising girls' and women's empowerment as well as raising awareness and consciousness of women in any given situation.

As earlier stated, none of the paradigms can be proved or disproved as right or wrong. They help to show that there are many ways of looking at a subject or topic in research through many valid viewpoints. This study was guided by the feminist and the positivist paradigms. The feminist approach was found suitable as the study emphasized issues that contribute to enhancing girls' educational opportunities. The positivist approach was found suitable as it would enable the researcher understand the levels in performance with regard to mathematics and science subjects among pupils, girls and boys in single-sex classes or mixed classes.

3.3   Research Design

The study employed both qualitative and quantitative research designs. The present study involved asking questions and probing in order to obtain information from pupils, parents, school heads and teachers on whether single-sex classes had managed to improve girls' performance and to increase self esteem and confidence. To achieve this, the researcher used qualitative data collecting techniques.

Qualitative research, according to Nherera (1999) and Kane (1995) is research that produces findings by non-statistical procedures, and uses data gathering techniques such as observation and interviews. Qualitative research was found most appropriate for the present study because the investigation sought to find out the views and feelings of the pupils, parents, teachers on the issue of single-sex classes and their achievement in enhancing improvements in girls performance.

Quantitative data collecting techniques were used in the study because the study dealt with statistics from the test exercises in maths and science subjects administered to pupils, and from the different groups of participants: the pupils, teachers, head-teachers and parents/guardians. A combination of research methods were used to produce a better and deeper understanding of the issues being investigated. Using as many approaches as possible, triangulation, was used in order to provide a clearer picture of the prevailing situation in schools and to strengthen and verify the research findings.

3.4   Research Area and Sites

The study was conducted in Lusaka urban. Lusaka, the capital city of Zambia, was selected as a study area for a number of reasons. The 1999 Ministry of Education report lists 221 primary schools in Lusaka district. The figure comprises basic schools, private schools, and community schools. For this reason it was chosen as a pilot area for PAGE programs including the implementation of the single-sex class intervention in 10 selected schools.

Lusaka was selected for the study because it was a PAGE single-sex class's intervention pilot area with 10 PAGE schools that had started experimenting the intervention. The other reason was that Lusaka has good transport system. It was easier to access and to get to the schools in the study without much difficulty. The schools that were selected for the study are presented in Table 1 below.

Table 1: Overall Enrolments in Schools selected for the study

School	Girls	Boys	Total Enrolment	Type of School
Bauleni Basic Primary School	747	766	1513	PAGE
Chamba Valley Basic School	740	743	1480	PAGE
Edwin Mlongoti Basic School	869	848	1717	PAGE
Tunduya Basic	1046	1072	2118	NON-PAGE
St. Patricks	1494	–	1494	NON-PAGE
Total	4896	3429	8322	

Source: School Records 1999

3.5 Ethical Considerations

The study ensured that ethical issues were given due consideration. For example, throughout the research process, the researcher ensured that the confidentiality of the participants in the study was maintained. In addition, prior consent was obtained from the school head teachers, parents/ guardians where the research was carried out and participants were all treated the same and gave out the answers freely.

3.6 Sampling

3.6.1 Introduction

This study employed purposive sampling in selecting schools, classes, teachers/ guardians, and school headteachers. Random sampling was used to select pupils to participate in the study from each class in order to give each pupil an equal chance of being selected.

3.6.2 Selection of schools

Five schools were selected in Lusaka urban. These comprised three PAGE schools and two non-PAGE schools. Firstly, the list of all government primary schools in Lusaka was obtained from the District Educational Officer. The schools were stratified under PAGE and non - PAGE primary schools. Lusaka urban had ten PAGE primary schools in different

townships, which are densely populated. The second step involved drawing three schools from the sample of PAGE schools. The selected schools had similar characteristics in terms of size and enrolment levels. The information obtained from the DEO's office was very useful as it was the basis for the selection of the schools.

In terms of size, all the schools selected were Grade One schools, with total enrolment figures of about 1,300 pupils and above and are located in high-density areas of Lusaka. The PAGE schools selected were: Bauleni Basic Primary School, Edwin Mlongoti Basic Primary School and Chamba Valley Basic Primary School. The Non-PAGE Schools selected were: Tunduya Basic Primary School and St. Patrick's Primary School. Although St. Patricks Basic Primary School is located in the Kabwata area, which would not be classified as a shanty township, the school takes in many children from the nearby townships of Kamwala and Misisi. It was assumed that the schools in PAGE pilot areas and those in non-PAGE areas could be matched since they were all government schools following same curricula, and predominantly enrolled pupils from the townships. In view of these common characteristics, the schools were comparable. One major difficulty experienced in selecting the schools was that the schools in the sample were located in different townships.

3.6.3 Selection of classes and grades

Having selected the schools, the next step was the selection of grades and classes to be considered in the study. A total of six classes were purposively selected in PAGE schools with three classes at Grade 4 level and three at Grade 6 levels. Most of the PAGE schools would have one single-sex class for girls, one single-sex class for boys and two or three Mixed classes. The choice of the grade levels at which single-sex classes were introduced in the ten PAGE schools varied greatly with very few cases of uniformity. Some schools had implemented single-sex classes from as early as Grade 1. The three PAGE schools in the study had introduced single-sex classes at Grade 4 and at Grade 6 level in 1996. Similarly, in Non - PAGE schools, three classes were selected at Grade 4 and Grade 6 levels. Grade levels were chosen following the PAGE single-sex guidelines. In addition, Grade 4 was chosen because it was the last grade at lower primary, but also because most girls would not have reached adolescence stage. Grade 6 level was chosen because pupils would have at this stage reached puberty and would have experienced and come through many grades and survived, and would only be left with one year before proceeding to secondary school. A total of 40 pupils were selected at each grade level in the case of PAGE schools. In non-PAGE 30 pupils were selected at each grade level.

3.6.4 Selection of pupils

Sample of Pupils that participated in the study

	Sample	Female	Male	Total
Pupils	300	160	140	300

The target population was defined as pupils, girls and boys that were currently attending government primary schools at Grade 4 and Grade 6 levels from three PAGE and two non - PAGE government primary schools in Lusaka. The pupils' ages ranged from 10 to 12 years for Grade 4 and from 13 to 16 years for Grade 6 pupils. The first step taken was to request for class registers from the class teachers. Using systematic random sampling, all the names of pupils in a class were written on individual pieces of paper, and were put in a box from which only 10 pupils were selected in each class. For the mixed classes the samples were stratified by sex, and equal numbers of girls and boys were selected.

An additional number of five pupils were selected from each class, as a way of ensuring ready availability of replacement for pupils who might not come to school on the day the research was to commence. The ten pupils from each class were sampled for the purpose of participating in the mathematics and science exercise. Having selected ten pupils from different classes, the names of the pupils in the sample were recorded in a notebook according to school grade and class. A total of 300 pupils participated in the study. Out of this number 160 were girls and 140 were boys.

3.6.5 Selection of teachers

In all the schools, teachers were purposively selected. Usually these would be teachers that taught and were in charge of the selected classes while school head-teachers were selected by virtue of their positions in the school. In the PAGE schools six teachers were selected, except at one where four were selected because there were only mixed classes at Grade 4 level. In the non-PAGE schools category, two teachers were selected, one at Grade 4 level one at Grade 6 levels. There were a total of 20 teachers interviewed from the five schools. On average, six teachers were interviewed per school in the PAGE-schools category while two teachers were interviewed in the non-PAGE category. Five head-teachers were selected for this study.

Table 2 : Sample of Headteachers/ Teachers that participated in the study

	Sample	Female	Male	Total
Head Teachers	5	1	4	5
Teachers	20	13	7	20
	25	14	11	25

3.6.6 Selection of parents and guardians

Sample of Parents that participated in the study

	Sample	Female	Male	Total
Parents	40	26	14	40

The sample of parents in the study included some of the parents of the pupils who had been interviewed. Using the purposive sampling procedure, a total of 40 parents were selected to participate in the study. With the help of the school head-teachers, parents in the study were sent call-out notices through the pupils selected to be interviewed. The notices explained the purpose of the enquiry and invited the child's mother, father or both to avail themselves on the day indicated for interviews.

The total distribution of the participants is presented in the Table below.A summary of all the respondents in the study are shown in Table 5 .

Table 3: Total Sample of Respondents that participated in the study

	Sample	Female	Male	Total
Head Teachers	5	1	4	5
Teachers	20	13	7	20
Pupils	300	160	140	300
Parents	40	26	14	40
Total	365	200	165	365

3.7 Data Collection

3.7.1 Research instruments

3.7.1.1 Introduction

The exercise for collecting data for the study was undertaken over a period of one week in each of the five schools. Different research instruments were employed in order to collect data and information from pupils, parents/ guardians, teachers and school heads. The choice of which research method to use was influenced by its appropriateness to the objectives of the study, and its administrative convenience. Five methods were used in this study: the questionnaire, semi-structured interviews, focus group discussion, observation and exercises in mathematics and science subjects.

3.7.1.2 Questionnaire for school head-teachers

A questionnaire was used to collect required information from school head-teachers on single-sex classes, what impact single-sex classes had on girls' performance especially in maths and science, and in raising their self esteem and confidence, and their experience in teaching these classes. School head teachers were firstly spoken to and then given questionnaires to complete on their own. A time frame was given to the school heads when the researcher would require and collect the completed work.

3.7.1.3 Semi-structured interviews

This method was used to collect required information from teachers, parents and pupils on single-sex classes, what impact single-sex classes had on girl's performance. An interview schedule was developed consisting of a list of questions which focused on the research questions and the objectives of the study. To achieve the collection of data, the researcher used written notes to record the discussion of the interviews. The shortcoming was that this was time consuming, the use of a tape recorder would have been more appropriate. For pupils, interviews were conducted in the classrooms while for parents they were held either in their homes or at school. Teachers and head-teachers were interviewed in their offices.

3.7.1.4 Focus group discussions

These were held with the parents, teachers and pupils at different times. The focus groups consisted of 10 participants. Participants in the focus group discussions were asked the same questions from the interviews. The discussions were perceived necessary as some parents could have found it easier to respond to certain issues in a group then as individuals. The discussions with parents focused on the importance of single sex classes, how far girls were perceived to have improved in their performance compared to boys, and homework. The

discussions with teachers focused on performance of girls in mathematics and science subjects, and the perceived improvements in performance in girls since the introduction of single sex classes. The pupil's discussions focused on their academic performance in mathematics and science and their perceived improvement, and their views on single sex classes.

3.7.1.5 Observation

The aim of participant observation was to capture pupil behaviors and pupil teacher interactions. The following were observed; the way teachers interacted with pupils in the classroom, the general climate in the classroom, whether or not teachers treated girls in single sex classes the same as those in mixed classes, pupil reaction to questions asked, and pupil reaction to answering questions. The researcher with the two assistants shared the responsibility of sitting in different classroom during lessons in mathematics and science subjects at Grade 4 and Grade 6 level in single-sex classes and mixed classes at set times.

In the present study, the researcher and the two assistants divided themselves, and sat in the selected classes for a day from the beginning to the end of the lessons. An observation checklist was used to capture the relevant aspects of pupil-teacher interaction.

3.7.1.6 Testing

The purpose of this exercise was to find out actual levels of attainment in performance of pupils at Grade 4 and Grade 6 levels in maths and science. A question paper, an answer sheet, pencil, rubber, sharpener were presented to the pupils on a desk. A table showing the columns in the answer sheet was drawn on the blackboard. An example of how to fill in the answers was carefully explained to the pupils. Pupils were given the exercise in maths and science in the same day at intervals of twenty-five minutes in between maths and science paper. For grade four levels the exercises were conducted in the mornings.

For the Grade 6 level, the exercises were conducted in the afternoon. The difficulty experienced during the exercise was that most of the pupils were not able to read well in English. The exercise proved cumbersome as pupil after pupil again and again put up their hands to have a question explained to them in the local Zambian language, Chinyanja, which most pupils would predominately speak. The multiple choice type of answering had the disadvantage of some pupils especially at Grade 4 level to guess at the answers and filling in the boxes in the answer sheet. The papers were marked and scored the same day the particular test was administered and scores recorded in a notebook.

3.7.2   Pilot testing of the instruments

The Questionnaire and Interview guide was pilot tested in three government schools within Lusaka away from the study areas. A total of 90 respondents participated in the exercise. After consultation with teachers in schools concerning the syllabus and work covered at Grade 4 and Grade 6 levels for the year, questions for the exercise were designed by an experienced researcher familiar with the syllabus and curriculum in the formulation of primary school examinations at the Examinations Council of Zambia (ECZ). Two versions of maths and science papers, each carrying different questions (Version 1 maths and science for Grade 6/4 and Version 2 maths and science Grade 6/4) were used. Each version contained 30 multiple choice questions. An answer sheet was prepared and extra plain paper was provided for rough work.

This was important in order to assess which questions would be fair for the pupils and which ones would be quite hard for the pupils to answer. The pilot also assessed the clarity of the instruments, time taken to complete the task and any observed difficulties faced by pupils during the pilot. The results from the pilot indicated that the instruments were clear, but that there was need to reformulate the questions from the two versions and incorporate them into one paper for maths and another for science.

It was noted that more time would be required by the pupils to complete the tasks before them. As a result, instead of the 45 minutes given for pupils to complete their work, one hour (60 minutes) was the time allocated for the final papers. The exercise was a new experience for most children in general. The older ones were better able to understand instructions than the younger ones.

It was also noted during pre-testing that most of the pupils had no pencils, rubbers, and sharpeners for use and that a lot of time was spent borrowing from others in different classrooms. A lot of time was also spent in reading through the questions first in English and then interpreting in the local Chinyanja language, which is widely spoken by many in Lusaka urban. When this was done the pupils' level of understanding was discovered to be high. The exercise was conducted in the mornings for the Grade Four pupils and in the afternoon for the Grade Six pupils. Special permission had to be requested from school heads for this to take place. The pupils did not have a prior knowledge what kind of exercise they would be writing. The questionnaire and the interview schedules were also pre-tested. The pilot study proved to be very beneficial because the researcher was exposed to practical fieldwork challenges before the actual study.

3.8   Data processing and analysis

3.8 Data Processing and Analysis

The data from the maths and science exercise and questionnaires was all entered into and analysed through the Statistical Package for Social Sciences (SPSS). Qualitative information from interviews and focus group discussions were recorded as written notes in note books, for each focus group discussion and interview. The information was then compiled into summary sheets for different types of interviews and focus group discussion and analysed. To ensure that differences among schools and research areas were brought out in the data analysis the compilation and analysis were first done within each school. The analysis addressed the research questions and the objectives of the study.

3.9   Summary

This chapter presented the methods used for collecting the data, the selection of schools, classes and participants, the procedures used in the study and the justification for using them. The next chapter presents the findings from the study.

CHAPTER FOUR

PRESENTATION AND DISCUSSION OF FINDINGS

4.0 Introduction

This chapter presents the findings of the study which are organized in line with the objectives of the investigation as outlined in chapter one. The presentation begins with findings on whether or not the introduction of single-sex classes had improved girls' performance. Thereafter, the chapter reports on findings relating to the extent to which the introduction of single-sex classes had increased girls' self-esteem and confidence. Finally, the chapter presents results involving comparison in performance in Mathematics and science exercises between PAGE and Non-PAGE schools.

4.1 Participants' Views on the Impact of Single-sex Classes on Girls' Performance

4.1.1 Introduction

The first objective of the study was to find out the extent to which the introduction of single-sex classes in PAGE schools had enhanced girls' performance. This objective was investigated by gathering information on performance of girls in PAGE primary schools from school head-teachers, teachers, parents and pupils on whether or not single-sex classes had an impact on girls' performance since their inception in 1996. The study was carried out in 1999, two years after the introduction of the PAGE single-sex class intervention in the three PAGE schools in Lusaka Urban which were selected for the investigation. The results on this variable revealed that the majority of the participants, over ninety percent, were of the view that single-sex classes had begun to improve girls' performance.

Table 4 : School head-teachers / teachers views on the usefulness of single sex classes

	AGREE		DISAGREE		NO OPINION		TOTAL
	F	M	F	M	F	M	
School head teacher	1	5					5
Teachers	16	4					20

4.1.2 School head-teachers / teachers views on the usefulness of single-sex classes

The results presented in Table 4 show that all the school head-teachers and teachers were in support of single-sex classes stating that they were achieving their intended goal of enhancing girls' performance.

The questionnaires with school head-teachers and interviews with teachers in PAGE schools provided information on whether or not single-sex classes had addressed the issue of raising girls' performance. The majority of the teachers pointed out that the performance for both girls and boys at the lower primary level from Grade 1 to Grade 4 was generally good for both genders. But during the upper primary level, teachers observed that girls' performance began to go down, and with reference to the present study most of the teachers pointed out that the performance of girls in mixed classes in end of term tests was lower compared to that of girls in single-sex classes. When asked what difference the separation into single-sex classes meant for boys, teachers pointed out that boys' performance remained relatively good regardless of the class they were in whether mixed or single-sex.

The school head-teachers and teachers in the PAGE schools advanced a number of reasons in support of the PAGE single-sex class intervention since its inception.

4.1.2.1   Noticeable improvement in girls academic performance

The teachers identified improvement in girls' academic performance and increased desire and interest in completing school successfully, as some of the most notable outcomes of the PAGE single-sex class intervention. An example of this improvement was reported in one PAGE school by teachers who had noticed that for the first time in a mock examination at Grade 6 level, a number of top places in the year were taken by girls, an indication of better performance compared to that of some boys. The teachers reported that before the intervention the highest score by any girl in a mock examination would be ranked 15th with positions one to fourteen being taken up by the boys. This situation had changed since the introduction of single-sex classes. The reasons advanced by teachers for this change included increased sensitisation and encouragement within the school for girls to take up the challenge and work harder, the creation of a more conducive environment for girls' learning, improved teaching

methods and girls' improved self-esteem and confidence and increased sense of commitment among teachers in PAGE pilot schools.

As far as boys were concerned, teachers described their performance as having improved too as there were attempts by boys to compete and overcome girls.

The consensus in opinion by school head-teachers and teachers in all the PAGE schools involved in the study was that girls generally had begun to improve in their terminal exams, were enthusiastic towards achieving better grades and showed willingness to work independently. In relation to the purpose of this study, it is clear that due to PAGE, single-sex classes had been appreciated by school heads and teachers.

4.1.2.2   Decreased incidences of pregnancies

In all the PAGE schools teachers reported that since the introduction of single-sex classes, there had been a reduction in girls' absenteeism and in girls' leaving school on account of pregnancy. For instance, during the interviews conducted with teachers, one female teacher gladly narrated how, in 1999, the year in which the study was being conducted, the school had not recorded a single case of pregnancy from the senior classes.

4.1.2.3   Increased class participation

Another notable change that teachers indicated to have observed since the introduction of single-sex classes is that there was improvement in girls' attitude and behaviour as well as in class participation in single sex classes. Teachers cited examples of their observations that girls in single-sex classes felt superior to those in mixed classes and that they talked about the advantages of single-sex classes so much that teachers were being overwhelmed with requests by girls in mixed classes seeking to be shifted to single-sex classes. The researcher's observation confirmed what the teachers had said. Girls in single-sex classes were more outward and confident in what they were doing compared to girls in mixed classes.

The teachers attributed changes in girls' behaviour and levels of participation to sensitisation within the school about the need for change in attitude and behaviour between girls and boys. The sensitisation process had enabled the girls to speak out and to take up the challenge that they can perform roles that were previously prescribed for boys only. One teacher in one PAGE school disclosed that girls were

increasingly beginning to participate in football, debates and drama, which was not the case before the introduction of the PAGE single-sex class intervention.

It was reported during interviews with teachers that girls in mixed classes were also able to take up school responsibilities such as class monitoring or bell ringing which were previously performed by boys. However, in the interviews held with three teachers who taught mixed classes, it was explained that the situation for girls in mixed classes was still one of dependency on boys and that even when they knew the correct answers; they lacked the self-motivation and confidence to speak up.

4.1.2.4 Improved attitude towards subjects like Mathematics and Science

The majority of teachers in PAGE schools stated that girls' dependency syndrome in single sex classes in these subjects had to a great extent begun to reduce. For example one teacher in one PAGE school stated that girls in single-sex classes showed more willingness in exercises such as setting up apparatus and observing an experiment on their own, and were more ready to work independently in Mathematics exercises. Comments from teachers suggested that girls in single sex classes had begun to view mathematics and science less as a male domain and were participating fully in the subjects.

4.2 School head-teachers and teachers views on factors affecting girls' progress

4.2.0 Introduction

Although initial indicators showed that the PAGE single-sex class's intervention was a success, teachers identified a number of challenges that could affect the progress of girls' performance in both single-sex classes and mixed classes. For example, during interviews with teachers they stated that efforts to follow up pupils and the parents at home to discuss the homework programme, proved to be difficult because of the small number of PAGE bicycles in the school compared to the large number of pupils homes to be visited in reaching the parents to monitor and to find out how parents were managing to help their children at home.

They pointed out that it was important for parents to help the children at home to complement the teachers' work at school since there were not enough teachers to give effective individual attention to pupils. The teachers also stated that there was lack of commitment on the part of parents towards the education of their children. One teacher stated that a major problem was that some parents did not show up for

meetings arranged at the school. Another problem was that some parents were just not able to help their children with homework, because they themselves had limited education adding that even though there was a homework policy within the school parents did not sign for children's homework. Parents still regarded the teacher as the only source of information and the class as the only place where learning for their children takes place. It was explained that in general many parents in the townships did not appreciate the idea of helping their children with class work at home, although the homework policy and the Family Pac programme were in place in all the PAGE schools.

The majority of teachers expressed concern on parent's negative attitude towards their children's schooling even when they were summoned to come to school to discuss their children's progress. Girls and boys were still not helped with homework at home as they would usually be left at home to clean the house or sent to the market to sell or to the clinic to take sick siblings for medication while the mother went to the market.

From the teachers' comments, it is clear that most of the parents have a negative attitude towards helping their children with their school work.

The majority of teachers in the PAGE schools felt that the programme might not achieve its expected results because there was lack of proper monitoring efforts by the Ministry of Education (MOE). The teachers interviewed identified four factors as compromising the impact of the intervention. The four factors were absenteeism, orphanhood, lack of teaching materials and poor conditions of service for teachers.

4.2.1   Absenteeism

The teachers interviewed in PAGE schools stated that despite efforts through workshops to sensitize parents on the need for girls to be in school in good time, cases of late-coming were higher among girls than boys mainly because of the extra responsibilities given to the girls at home. However, absenteeism was reported to have reduced for both girls and boys.

4.2.2   Orphanhood

Fifteen children in the sample reported that they were orphans living with uncles, aunts or grand-parents. The teachers explained that the problems affecting orphans were serious, and were more negatively affected than other pupils depending on how

they were being treated at home. During interviews, one teacher illustrated this observation by giving an example of a parent who had three of his own children at the same school and the one-orphaned niece living with him. The teacher explained that the man had paid in full the PTA (Parents Teachers Association) charges for all his children but had not paid for the niece. These findings from the interviews with teachers show that the situation of girls can be even worse when they are orphaned. One girl complained of mistreatment by her aunt and broke down during the interview.

4.2.3 Lack of teaching materials

The teachers interviewed reported that there was widespread shortage of teaching materials thereby compromising the quality of teaching. In some cases the teaching materials were not delivered to the schools in time due to excessive bureaucracy resulting in pupils, especially those in examination classes, not benefiting from the use of the materials. Lack and non-timely delivery of teaching materials were viewed as impacting negatively on pupils' performance. The teachers also felt that there was need to review the syllabi to make them more relevant to the changing times as well as to match them with the children's level. The teachers complained that in some cases the syllabi tended to go beyond the children's levels and grades, with reference to science subject. There has been an improvement in expenditure on teaching materials; therefore this problem has in some way been addressed.

4.2.4 Poor conditions of service

The teachers interviewed confessed that the problem of poor conditions of service, such as low salaries and non-conducive working environment were compromising their commitment and dedication to work.

4.2.5 Pupils' views on the usefulness of single-sex classes

	AGREE		DISAGREE		NO OPINION		TOTAL
	F	M	F	M	F	M	
Pupils	30	10	6	4	5	5	60

The table indicates that thirty of the girls compared to ten boys out of the total of sixty interviewed were in support of single-sex classes. It was important to find out the specific reasons pupils advanced on the usefulness of single-sex classes in improving performance. There was a big difference between girls at Grade 4 level and those at

Grade 6 level in their views on single-sex classes. At Grade 4 level the majority of girls expressed very little need for separate classes for girls and boys compared to girls at Grade 6 level. Findings show girls at grade six levels supported the introduction of single-sex classes. The reasons advanced by girls were that in single-sex classes there was a lot of competition among themselves on who got first position in class, there was an atmosphere of freedom in these classes compared to mixed classes where boys would always tease them, and that single sex classes had enabled them to participate in learning activities. Girls also said that in the girls-only classes, they concentrated more on their work, and encouraged each other to join activities like the mathematics and science clubs, drama and debate as a way of improving their performance and confidence.

The majority of the boys expressed a positive attitude towards single-sex classes but preferred the continued use of these classes for girls only. The reason given was that in their view it was good that girls be given a chance to compete well with boys.

The pupils interviewed highlighted a number of factors as affecting their performance. These included lack of support in their homework by their parents; girls were burdened by carrying out various household chores and looking after siblings, boys were burdened by engaging in income generating activities of selling by the roadsides or at the market to support their parents especially their mothers to generate some income to support their families.

Interviews conducted with both girls and boys in both single-sex and mixed classes revealed that there was a common difficulty expressed by the pupils which had to do with their inability to read in English. This was observed during the Mathematics andscience exercise where pupils had to have questions explained in the local Chinyanja language. It was evident that most pupils faced a lot of learning problems especially related to the English language as a medium of classroom instruction.

4.2.6 Parents' views on single-sex classes

	AGREE		DISAGREE		NO OPINION		TOTAL
	Female	Male	Female	Male	Female	Male	
Parents	23	4	3	10	0	0	40
Perctntage (%)	88.5%	28.5%	11.5%	71.5%	-	-	

Overall, there was a big difference between male and female parents in the appreciation of single sex classes with 88.5% female parents compared to 28.5% male parents in support of single-sex classes for girls. The table in addition shows that,

there was also a significant difference between male and female parents in relation to those opposed to the idea of single sex classes enhancing girl's performance, with 71.5% male parents compared to 11.5% female. This situation indicates that fathers did not understand the problems girls were facing, and therefore their level of appreciation of what PAGE was trying to do for the girls was low, while the majority of mothers showed a great understanding in what PAGE what trying to do girls and expressed the view that single-sex classes had provided a supportive environment for girls to learn more effectively.

The parents of girls in single-sex classes reported that the most notable changes in girls were an improvement in willingness to attend school and toward class work and improvement in academic performance. Most of the parents preferred their children to attend mixed classes until Grade 4 or Grade 5 after which they could be separated into either single-sex classes or mixed classes. They pointed out that such an approach would facilitate the noting of differences in the behaviour of the boys and the girls so that only those who, in the opinion of the teachers, might require separation are separated. This would ensure that the separation exercise is done on a more rational basis. In addition, some parents preferred the mixed setting because it would enable the boys and the girls to develop and internalise the attitude and practice of mutual respect and working together as equal partners.

The majority of the parents identified teacher absenteeism as one of the factors affecting girls' performance. They stated that some of the teachers lacked commitment to their work and that parents were aware that teachers neglected their classes in search of extra money. They suggested that improving teachers' conditions of service and raising their salaries might help in addressing the problem. They also suggested the introduction of extra lessons for pupils who are lagging behind and proposed that teachers be paid for the extra work done from the monies administered by school PTA committees. From the interviews with parents it was observed that many parents were not able to provide the time to sit and assist their children with school work because of lack of time for most working parents and because of poverty for the majority as stated above.

4.3 Observations on the Impact of Single – Sex Classes in Raising Girls' Self – Esteem and Confidence

4.3.1 Introduction

The second objective of the study was to find out whether or not single-sex classes had increased girls' self-esteem and confidence. The objective was investigated through observation of how teachers and pupils interacted in classroom settings. The selection of this research instrument was based on the premise that, as evidenced from various studies undertaken between 1994/1995 on the situation of girls in education in Zambia, teachers convey stereotypical negative messages about gender to pupils through what they say and expect from pupils, through teaching methods as well as through their perception of pupils' aptitudes and abilities.

One of the main objectives for introducing the PAGE single-sex class intervention was to counter the negative, stereotyped attitudes in school and to develop confidence and self-esteem among the girls. In order to achieve this, the PAGE programme put up measures to address specific school issues which could compromise the effectiveness of the intervention. Some of these measures included gender sensitisation sessions for teachers in order to ensure attitude change towards boys and girls, re-orientation of teaching methodologies, improvement of the school physical environment, improvement in school organization and parental involvement in school work. The present study sought to establish whether or not these measures had achieved the intended objective.

Self esteem and self-concept or personal construct is concerned with the way an individual views herself or himself compared to others around them. It has been argued by psychologists that the individual's self-description is very important and has been suggested that the ability to form a self-concept increases with age.

Most often the individual gradually develops a stereotyped and socially acceptable concept of self worth and identity of themselves and accepts him or herself for what they are by what they hear and believe others around them think about them.

An observation checklist was used to assess classroom interaction and to determine levels of self-esteem and confidence by examining two types of pupil behaviour in the classroom: the extent to which the pupils participated in asking questions and the extent to which they participated in answering questions.

The results obtained from observations of classroom sessions for mathematics and science subjects revealed the following:-

4.3.2 Pupils' participation in asking questions

It was observed that pupils in both single-sex classes and mixed classes were reluctant to ask questions. The general pattern adopted by most of the teachers at the end of every lesson was to ask the pupils if what had been taught was clear. Usually all the pupils would answer 'Yes' in unison implying that the lesson had been clear, and then an exercise would be given to the pupils to work on individually. This was the common pattern at both Grade 4 and Grade 6 level. The majority of girls, especially in single-sex classes, tended to talk and consult among themselves. This practice was particularly prevalent in one class which was being handled by a male teacher. Listening to the teachers' explanations after lessons, it was evident that it was more of the teacher's role to question pupils than vice versa.

Spender (1992) points out that there are lessons which students learn before they enter school. This is true in the Zambian context in which both girls and boys are socialized to respect the elderly and so it is regarded disrespectful to ask questions or seem to challenge an elderly person. In addition, both girls and boys bring to the classroom the understanding that it is males who should have the floor and females should be dutiful and attentive listeners. It is the case therefore that from home, girls get the initial message that they should not talk or ask questions and the school reinforces it. Girls regard talking, especially in the form of questioning or challenging, as masculine behaviour. This is clearly an indication that in Zambia as elsewhere in Sub-Saharan Africa the socialisation process has a profound effect on girls at both home and school. Various ways of improving the situation were suggested by some teachers. These included teacher training and sensitization in issues that seem to be influenced to some extent by the gender of the learner.

In addition teachers pointed out that training in gender issues would assist them to be aware of the similarities and differences in the socialization of boys and girls and how this affected their behaviour in general.

4.3.3 Pupils' participation in answering questions

The researcher's observation was that girls in single-sex classes spoke more frequently and were more ready to answer questions than the girls in mixed classes were. In single-sex classes, it was also observed that girls were less shy and were more eager to make a try in answering. With regard to answering questions, the following observations were made. At grade 4 level, there was no difference in the

level of class participation between girls in single sex classes and girls in mixed classes compared to boys. Girls tended to answered more questions than boys. At grade 6 level, there were significant differences in class participation to answering questions between girls in single sex classes and girls in mixed classes. Boys answered questions more frequently, and participated more actively compared to girls at grade 6 level in mixed classes. In the single sex classes for girls, there was free participation among girls. Girls put up their hands more than once to attempt to answer questions compared to girls in mixed classes who had to have their names requested by the teachers to attempt to answer some questions. It was noted also that even when a wrong answer was given, in single-sex classes the girls felt less conscious and less guarded about themselves. Another observation was that girls exhibited a strong competitive spirit among themselves in single sex classes.

The researcher's general observation was that the voice of the girls whether in single-sex classes or mixed classes was not heard except in answering questions posed by the teacher. Similarly boys in single-sex classes were seen to display a spirit of co-operation compared to those in mixed classes. Although not all the girls in the single-sex classes answered questions, it was evident that there was an atmosphere of freedom among them.

Interviews conducted with pupils, parents and teachers suggested that girls had indeed improved in self-esteem and confidence. Teachers attributed this change to the co-operation girls had among them. Pupils pointed out that this was due to the freedom the girls enjoyed among themselves and the manner in which the teachers related to them in the classroom. Girls in single-sex classes and those in single-sex schools did not experience the same constraints of fear and shyness in class activities as those in mixed classes. Similar results were found in Malawi that girls in single sex classes at secondary school level tended to be more competitive and less passive than mixed classes in mixed schools (Hyde, 1994 in Swainson 1995).

Despite positive impact of the PAGE single-sex classes intervention, some of the teachers handling single-sex classes at Grade 6 level in PAGE schools indicated that they preferred teaching mixed classes to teaching single-sex ones. The reasons given by some male teachers were that girls were slow in understanding and catching up with the work and that they tended to become naughty. These expressions indicated that some teachers still rated girls' capacity lower than that of boys, an attitude which could undermine girls' confidence and self esteem.

4.4 Comparison of performance within PAGE schools and between PAGE and Non-PAGE schools

4.4.1 Introduction

The third objective of the study was to compare the performance of pupils within PAGE schools as well as between PAGE and Non-PAGE schools. This objective was investigated by administering Mathematics and Science exercises to the pupils selected for the study.

The first part of this section of the study presents the findings of the comparison in performance within the PAGE schools while the second part presents the findings of the comparison in performance between PAGE and non-PAGE schools.

4.4.2 Performance within PAGE schools

This section deals with the analysis of the results from the mathematics and science exercises. The purpose was to investigate first of all what was happening in PAGE schools in terms of performance of girls in single-sex classes. In this section the analysis is confined to the three schools in the sample implementing PAGE programmes and which had introduced single-sex classes at Grade 4 and Grade 6, namely Chamba Valley, Bauleni, and Edwin Mlongoti Basic Schools.

The tables below show data and comparisons at grade 4 level and grade 6 levels in terms of performance of girls and boys in maths and science, in the three PAGE schools.The interpretation of the mathematics and science exercise was based on the six performance levels shown in Table 5 below. Brackets (}) have been used to interpret the average and better overall percentage in performance in the maths and science exercises.

Table 5: Mathematics and science performance ratings

Performance level (Score)	Rating
1-5	Very low score
6-10	Poor score
11-15	Average score
16-20	Good score
21-25	Very good score
26-30	Excellent score

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4.4.3 Girls performance in Mathematics -Grade Four Level

Pupils at Grade 4 level were asked 30 multiple choice questions in Mathematics. The exercise aimed at assessing pupils' numeracy skills, the ability to use numbers and their ability to recall previously learned material regarding numbers. The results from the exercise are shown in the Table 6 and Table 7 below.

Table 6: Grade Four Girls single–sex classes performance in Mathematics

Score Range out of 30	Chamba Valley (No class for Girls)		Bauleni		Edwin Mlongoti		Total for three schools	
	Score	%	Score	%	Score	%	Score	Average Percentage
1 – 5			3	30	-	-	3	15
6 – 10			5	50	3	30	8	40
11 – 15			2	20}	7	70}	9	45}
16 – 20			-	-	-	-	0	-
21-25								
26 – 30			-	-	-	-	0	-
Total average % SS Classes								45%
Average/above score(%)				20}		70}		
			10	100	10	100		100%

Table 6 shows the following results in Mathematics for girls at grade 4 level in single sex classes. Chamba Valley did not have single-sex classes for girls at this grade level. Results for Bauleni show that 3 girls (30%) scored the very low score range with the rating between 1-5, 5 (50%) girls were in poor score range, 2 (20%) were in average score range none were in the good, very good, or excellent score.

The results for Edwin Mlongoti show that none obtained the very low score, 30% obtained poor score ratings and 70% obtained the average score rating. By comparison, Edwin Mlongoti had more girls obtaining the average score (70%) than Bauleni (20%).The total average percentage for girls in single sex classes in the three schools, shows that 40% of the girls obtained the poor score rating, 30% obtained average score rating and 15% were in the low score range.

Table 7: Grade Four Girls Mixed classes performance in Mathematics

Score Range out of 30	Chamba Valley		Bauleni		Edwin Mlongoti		Total for three schools	
	No. of Pupils	%	No. of Pupils	%	No. Of Pupils	%	No. of Pupils	Average Percentage
1 – 5	1	10	-	-	1	10	2	6.7
1-10	4	40	5	50	3	30	12	40
11-15	4	40}	5	50}	6	60}	15	50}
16-20	1	10}	-	-	-	-	1	3.3}
21-25	-	-	-	-	-	-	0	0
26-30	-	-	-	-	-	-,	0	0
Total average and above % Mixed classes								53.3%
Average/above score(%)		50%		50%		60%		
	10	100%	10	100%	10	100%	30	100%

Table 7 shows the following results in mathematics for girls in mixed classes. Chamba Valley had 1 (10%) girl score the very low score range with the rating between 1-5, 4 (40%) girls were in poor score range, 4 (40%) were in average score range and only one (10%) was in the very good range. From this sample of the pupils 50% of girls were between average and good score range, none in the higher range (which is very high and excellent score) while another 50% were below average. Bauleni had 5 (50%) girls with poor score and 5 (50%) with average score and none got very good and excellent scores. Half (50%) were in the poor score rating and half (50%) in the average.

Comparatively Chamba Valley was slightly better than Bauleni with the advantage of one pupil obtaining the very good score range. Edwin Mlongoti had 1 (10%)pupil in very low scores rating, 3 (30%) in the poor score rating and 6 were in the average score rating and none in the good or very good and excellent ratings, however there were more pupils in the average score rating (60%).

Table 7 further shows that the majority of pupils (50%) in all the three schools were in the average score rating, with only 3.3% of girls attaining average scoring, and good scores in mathematics in mixed classes.When Table 6 and Table 7 at Grade 4 level are compared, the results show that Edwin Mlongoti had more girls in single sex classes, 70% attaining the average range score compared to 60% in mixed classes in the average range score.The overall performance of the pupils in both single sex classes and mixed classes indicates that girls performance was not satisfactory as the majority were just in the average range and below.

In their narratives five teachers that handle pupils at this level in the PAGE schools

seemed to suggest that there was not much difference in performance between girls in single-sex classes and those in mixed classes, and that girls in single-sex classes did not outperform those in mixed classes.

4.4.4   Boys Performance in Mathematics – (Grade 4 level)

Table 8:   Grade Four Boys single–sex classes performance in Mathematics

Score Range out of 30	Chamba Valley	Bauleni		Edwin Mlongoti		Total for three schools	
	No single-sex class	Score	%	Score	%	Score	Average Percentage
1 – 5		2	20	2	20	4	20
6 – 10		3	30	3	30	6	30
11 – 15		5	50}	5	50}	10	50}
16 – 20		-	-	-	-		
21 – 25		-	-	-	-		
26 – 30		-	-	-	-		
Total average and above % SS Classes							50%
Average/ Above score %			50%		50%		
		10	100%	10	100%	20	100%

Table 8 shows results of grade 4 boys' single sex classes in mathematics. Chamba Valley Primary School did not have any single-sex class for boys at Grade 4 level. At Bauleni 2 (20%) boys scored the very low score range with the rating between 1-5, three (30%) boys were in poor score range, five (50%) were in average score range and none in the very good score range. From this sample of the pupils half (50%) of the pupils were in the average score range, and 50% in the poor and very low score ranges. Edwin Mlongoti had , 2 (20%) with very low score range, 3 (30%) boys with poor score and 5 (50%) with average score and none got very high and excellent scores. Results for the two schools show that 50% of the boys obtained average scores, therefore managed to reach the minimum level.

Table 9:   Grade Four Boys Mixed classes performance in Mathematics

Score Range out of 30	Chamba Valley		Bauleni		Edwin Mlongoti		Total for three schools	
	Score	Percentage	Score	Percentage	Score	Percentage	Score	Average Percentage
1 – 5	3	30	1	10	1	10	5	16.7
6 – 10	4	40	6	60	5	50	15	50
11 – 15	3	30}	-		3	30}	6	20}
16 – 20	-	-	3	30}	1	10}	4	13.3}
21 – 25	-	-	-	-	-	-		
26 – 30	-	-	-	-	-	-		
Total average and above % SS Classes								33.3%
Average/above score(%)		30%		30%		40%		
	10	100	10	100	10	100	30	100

Table 9, shows results of grade 4 boys mixed classes in mathematics. Results from the Mathematics exercise for boys in the mixed classes show that in the low score range,

Chamba Valley had 3 (30%) boys, Bauleni 1 (10%) boy, and Edwin Mlongoti 1 (10%). In the poor range score Chamba Valley had 4 (40%) boys obtain this core, Bauleni had 6 (60%), and Edwin Mlongoti had 5 (50%) boys obtain this score.

In the average score range Chamba Valley had 3 (30%) boys obtain this score, Edwin Mlongoti had 1 (10%) boy , and Bauleni had none obtaining this score. In the above average or good score range, Bauleni had 3 (30%) boys obtain this score, Edwin Molongoti had 1 boy (10%) obtain this score.

Bauleni had none in this range of scores while Chamba Valley had 30% of the boys in the average score range. In terms of average percentage in performance for the three schools, the indication is that there were more pupils (50 %) obtain poor scores, indicating poor performance for the majority of boys in the mixed classes. Comparing Table 7 and Table 8 shows that on average boys in the single-sex classes performed slightly better (50%) compared to number and percentage of pupils in the mixed classes (20%). However, in terms of reaching good scores, Bauleni had pupils perform better in the mixed classes with 30% obtaining above average scoring in mathematics. Performance in mathematics at grade 4 level was similar for both boys and girls regardless of which class attended, with girls performing slightly better than boys. These findings confirm previous studies (for example, Sadker 2000,) which indicate that girls outperform boys in the lower grades in primary school.

4.4.5   Girls Performance in Mathematics Grade Six level

Table 10:   Grade Six Girls Single - Sex class's performance in Mathematics

Score Range out of 30	Chamba Valley		Bauleni		Edwin Mlongoti		Total for three schools	
	Score	%	Score	%	Score	%	Score	Average Percentage
1 – 5	-	-	2	20	-	-	2	6.7
6 – 10	3	30	4	40	-	-	7	23.3
11 – 15	5	50}	4	40}	9	90}	18	60 }
16 – 20	2	20}	-	-	1	10}	3	10 }
21 – 25	-	-	-	-	-	-		
26 – 30	-	-	-	-	-	-		
Total average and above and % SS Classes								70%
Average/above score(%)		70%		40%		100%		
	10	100%	10	100%	10	100%	30	100%

From Table 10 it can be observed that results from the girls single-sex classes in Mathematics at Grade 6 level that, in the low score range, Chamba Valley had none of the girls obtain this score range, Bauleni 2 (20%) girls, and Edwin Mlongoti none .

In the poor range score Chamba Valley had 3 (30%) girls, Bauleni had 4 (40%), and Edwin Mlongoti had none. In the average score range Chamba Valley had 5 (50%) girls obtain this score, Edwin Mlongoti had 9 (90%) girls, and Bauleni had 4 (40%) of girls obtain this score. In the above average or good score range, Edwin Molongoti had 1 (10%) girl and Chamba Valley 2 (20%) girl.According to the tables above the overall performance between the Schools shows that Edwin Mlongoti scored better with more than 90% of the girls obtaining average and good score compared to the other PAGE comparable schools, Chamba Valley (70%) of the girls obtaining average and good scores and Bauleni (40%) of the girls obtaining average scoring.

Table 11:   Grade Six Girls Mixed classes performance in Mathematics

Score Range out of 30	Chamba Valley		Bauleni		Edwin Mlongoti		Total for three schools	
	Score	%	Score	%	Score	%	Score	Average Percentage
1 – 5	2	20	2	20	1	10	5	16.7
6 – 10	2	20	4	40	3	30	9	30
11 – 15	3	30}	4	40	3	30}	10	33.3 }
16 – 20	2	20}	-	-	2	20}	4	13.3}
21 – 25	1	10}	-	-	1	10}	2	6.7}
26 – 30	-	-	-	-	-	-		
Total average and above % Mixed Classes								53.3%
Average/above score(%)		60%		40%		60%		
	10	100%	10	100%	10	100%	30	100%

Table 11 shows the results from the Mathematics exercise for girls in mixed classes at Grade 6 level. From Table 11 it can be observed that results from the girls Mixed classes at Grade 6 level, in the low score range, Chamba Valley had 2 (20%) girls, Bauleni 2 (20%) girls, and Edwin Mlongoti 1 (10%). In the poor range score Chamba Valley had 2 (20%) girls, Bauleni had 4 (40%), and Edwin Mlongoti had 3 (30%) girls obtain this score. In the average score range Chamba Valley had 3 (30%) girls obtain this score, Edwin Mlongoti had 3 (30%) girls, and Bauleni had 4 (40%) of girls obtain this score. In the above average or good score range, Bauleni had none obtain this score, Edwin Molongoti had 1 (10%) girl and Chamba Valley 1 (10%) girl.

When Table 10 and Table 11 are compared, the picture that emerges from comparisons of performance within specific schools is that at Chamba valley, girls in single sex classes (50%) did better in the average score range compared to 30% in the mixed classes, however overall , girls in mixed classes performed slightly better compared to single sex classes.At Bauleni the picture is that of general poor performance with girls in both single sex classes (40%) and mixed classes (40%)

obtaining similar average results. Results from Edwin Mlongoti show that girls in mixed classes did better compared to girls in single sex classes in terms of obtaining good scores (20%) and very good score (10%), while girls in single sex classes performed better in terms of the number of girls attaining the average range with 70% girls attaining this score compared to 30% in mixed classes.A further explaination of better performance by girls in single sex classes compared to mixed classes is that on average there was 30% of girls in single sex classes compared to 46.7% attaining low and poor score ranges.

The indication of the total average performance in maths for girls in the three schools between single sex's classes compared to girls in mixed classes at grade 6 levels shows that girls in single-sex classes did better, at 70% attainment compared to 53.3% in mixed classes.

The reasons given by girls for the improvement in performance in Mathematics were determination, perseverance, interest, dedication and good teaching. Teachers explained that this was due to girls having been helped to develop self-capabilities and interest in these subjects. However, during interviews, three teachers in one PAGE school expressed dissatisfaction with the performance of the girls in single-sex classes explaining that girls could do even better, but that sometimes the girls did not take their class work seriously, in spite of some improvements in their attitude towards class work. From discussions with teachers, one female teacher in another PAGE school expressed similar observations and stated that girls from single-sex classes tended to relax in their commitment to class work and sometimes became too playful, but that their performance was better than their counterparts in mixed classes. During interviews, eight teachers teaching single-sex classes indicated that girls' performance in mathematics had shown slight improvement and described it as being better than it was before the introduction of the PAGE single-sex classes intervention. Teachers pointed out that the improvement in girls' performance was due to school efforts of encouraging girls to join the mathematics and science clubs. The other reasons given by teachers to this improvement had been the freer learning environment in single-sex classes where girls learned without intimidation from the boys. The researchers' observation is that the improved quality of teaching also had a bearing on the participation and performance of pupils.

Comments from teachers tended to suggest that girls in general regardless of which class they attended had begun to see mathematics less as a male domain and were

participating fully in the subject. Girls in mixed classes expressed lack of contentment with the class they were in and explained that they desired to be shifted to single-sex classes. They complained of harassment and noise making by the boys which made it difficult for them to concentrate in class.

4.4.6 Boys Performance in Mathematics Grade Six level

Table 12 below shows the results of the performance of boys in single-sex classes at Grade 6 level in Mathematics in three PAGE schools.

Table 12: Grade Six Boys single – sex classes performance in Mathematics

Score Range out of 30	Chamba Valley		Bauleni		Edwin Mlongoti		Total for three schools	
	Score	%	Score	%	Score	%	Score	Average Percentage
1 – 5	1	10	-	-	1	10	2	6.7
6 – 10	-	-	4	40	3	30	7	23.3
11 – 15	5	50}	4	40}	3	30}	12	40 }
16 – 20	4	40}	2	20}	2	20}	8	26.7}
21 – 25	-	-	-	-	1	10}	1	3.3 }
26 – 30	-	-	-	-	-	-		
Total average and above % SS Classes								70%
Average/above score(%)		90%		60%		70%		
	10	100%	10	100%	10	100%	30	100%

Table 12 shows result from the boys single-sex classes in Mathematics at Grade 6 level. In the low score range, Chamba Valley had 1 (10%) of the boys obtain this score range, Bauleni had none, and Edwin Mlongoti had 1 (10%). In the poor range score Chamba Valley had none, Bauleni had 4 (40%), and Edwin Mlongoti had 3 (30%). In the average score range Chamba Valley had 5 (50%) boys obtain this score, Edwin Mlongoti had 3 (30%) boys, and Bauleni had 4 (40%) of boys obtain this score. In the above average or good score range, Edwin Mlongoti had 2 (20%) boys, Chamba Valley 4 (40%) boys, and Bauleni had 2 (20%) boys obtain this score. The overall performance between the schools shows that Chamba Valley scored better with more boys obtaining average scores (50%) and above average scores (40%) compared to Bauleni and Edwin Mlongoti. However only Edwin Mlongoti had 1 (10%) obtain a very good score range of between 21 – 25. On average 70% of the boys obtained average and good scores.

In terms of average percentage for boys at grade 6 level, when the scores from the maths exercise for the three schools are compared, the results show that Chamba valley had 90% of the boys performing better obtaining scores of average and good

score compared to Bauleni 60% obtaining average and good scores and Edwin Mlongoti 60% obtaining average, good score and very good score ranges.

On the whole, the overall picture given by Table 10, girls single sex classes and table 12, boys single sex classes a comparison in performance in maths between boys and girls in single sex classes at grade 6 level is that at Chamba Valley, 90% of boys did better compared to 70% of girls obtaining average, and good scores, at Edwin Mlongoti 90% of girls did better compared to 60% of boys obtaining average and good scores, and Bauleni 60% of boys did better compared to 40% of girls obtaining average and good scores. The general performance shows that the differences between boys' and girls' score in maths at grade 6 level in single sex classes was not very significant, with girls at Edwin Mlongoti performing better than boys, an indication of good performance for girls at this level. When asked about the overall performance of girls compared to boys in single sex classes at grade 6 level, teachers' responses were that girls' performance had improved greatly. The reasons advanced for this were that girls had began to realize that they too could perform better than boys, and were showing interest in subjects like mathematics. This finding is different from earlier findings where girls' performance became progressively poor as they moved form the lower to upper primary levels (Maimbolwa-Sinyangwe and Barbara Chilangwa 1995).

Table 13: Grade Six Boys Mixed classes performance in Mathematics

Score Range out of 30	Chamba Valley		Bauleni		Edwin Mlongoti		Total for three schools	
	Score	%	Score	%	Score	%	Score	Average Percentage
1 – 5	2	20	-	-	-	-	2	6.7
6 – 10	3	30	5	50	1	10	9	3
11 – 15	3	30}	4	40}	3	30}	10	33.3}
16 – 20	2	20}	1	10}	5	50}	8	26.7}
21 – 25	-	-	-	-	1	10}	1	3.3 }
26 – 30	-	-	-	-		-		
Total average and above % SS Class								63.3%
Average/above score(%)		50%		60%		90%		
	10	100%	10	100%	10	100%	30	100%

Table 13 shows results in Mathematics for grade 6 mixed classes. Chamba Valley had 2 (20%) boys in mixed class score the very low score range with the rating between 1-5, 3 (30%) boys were in poor score range, 3 (30%) were in average score range and 2 (20%) were in the good range score.

Bauleni had 5 boys (50%) obtain poor score range, and 4 (40%) with average score

and 1 (10%) obtained above average score. Edwin Mlongoti had 1 (10%) boy in poor score rating, 3 (30%) had average score rating, 5 (50%) had good or above average scores and 1 (10%) obtained very good score and none had excellent score.

When the three schools are compared, the results show that Edwin Mlongoti had 90% of the boys performing better obtaining scores 30% of boys with average scores, 50% with good score and 10% with very good scores compared to Chamba Valley 50% obtaining average and good scores and Bauleni 50% obtaining average and good score ranges.

A comparison in performance between Table 12, boys in single sex classes and Table 13, boys in mixed classes mathematics exercise shows that at Chamba Valley, boys in single sex classes (90%) did better compared to boys in mixed classes (50%). At Bauleni, and Edwin Mlongoti, there was little difference in boys' scores between single sex classes and mixed classes. In terms of total average percentage in performance, the mixed boys class did slightly better, obtaining average percentage of 73.3% compared to 70% of boys in single sex classes. Teachers confirmed during discussions that boy's performance did not show major differences regardless of the class one belonged to.

4.4.7 Girls Performance in Science (Grade 4 Level)

An exercise in science was administered to Grade 4 girls attending single-sex classes and those in the mixed classes. Table 14 and Table 15 below show the results of the girls' performance in science.

Table 14: Grade Four Girls single–sex classes performance in Science

Score Range out of 30	Chamba Valley (No class for Girls)		Bauleni		Edwin Mlongoti		Total for three schools	
	Score	%	Score	%	Score	%	Score	Average Percentage
1 – 5			4	40	4	40	8	40
6 – 10			5	50	6	60	11	55
11 – 15			1	10}	-	-	1	5}
16 – 20			-	-	-	-		
21 – 25			-	-	-	-		
26 – 30			-	-	-	-		
Total average % SS Classes								5%
Average/above score(%)				10%				
			10	100%	10	100%	20	100%

Table 14 shows that Bauleni had 4 (40%) girls in single-sex class score the very low score range with the rating between -5, 5 (50%) were in poor score range, 1 (10%) in

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average score range and none in the very good range. Chamba Valley did not have single-sex classes at Grade 4 level. Edwin Mlongoti had 4 (40%) girls in poor score rating, 6 (60%) had poor score rating, 1 (10%) in average and none obtained very high and excellent ratings.The general picture from the table indicates very poor performance in science for girls, with a total average percentage of 55% obtaining poor score range 40% obtaining the very low score range.

Table 15: Grade Four Girls Mixed classes performance in Science

Score Range out of 30	Chamba Valley		Bauleni		Edwin Mlongoti		Total for Three schools	
	Score	%	Score	%	Score	%	Score	Average Percentage
1 – 5	7	70	3	30	5	50	15	50
6 – 10	1	10	6	60	5	50	12	40
11 – 15	2	20}	1	10}	-	-	2	10}
16 – 20	-	-	-	-	-	-		
21 – 25	-	-	-	-	-	-		
26 – 30	-	-	-	-	-	-		
Total average % Mixed Classes								10%
Average/above score (%)		20%		10%				
	10	100%	10	100%	10	100%	29	100%

Table 15 shows the following results in science for girls in mixed classes. Chamba Valley had one 7 (70%) girls score the very low score range with the rating between 1-5, 1 (10%) girl in poor score range, 2 (20%) were in average score range and none in the very good range. Bauleni had 3 (30%) girls with low score range and 5 (50%) girls with poor score and 1 (10%) with average score and none got very high and excellent scores. Edwin Mlongoti had 5 (50%) girls in very low scores rating, and 5 (50%) in the poor score rating and none in the good or very high and excellent ratings. The overall performance for girls in both the single-sex class category and the mixed class category was characterized by poor performance as shown in Table 14 and Table 15. The reason for this can be attributed to difficulties pupils had in reading English and understanding scientific concepts.

4.4.8 Boys Performance in Science Grade 4 Level

An exercise in science was administered to Grade 4 boys attending single-sex classes and those in the mixed classes. Table 16 and Table 17 below show the results of the boys' performance in science.

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Table 16: Grade Four Boys single – sex classes performance in Science

Score Range out of 30	Chamba Valley (No single-sex class)		Bauleni		Edwin Mlongoti		Total for three schools	
	Score	%	Score	%	Score	%	Score	Average Percentage
1 – 5			3	30	7	70	10	50
6 – 10			6	60	3	30	9	45
11 – 15			1	10}	-	-	1	5}
16 – 20			-	-	-	-		
21 – 25			-	-	-	-		
26 – 30			-	-	-	-		
Total average % SS Classes								5%
Average/above score(%)				10%				
			10	100%	10	100%	20	100%

Table 16, shows results in science for boys in the mixed classes. Chamba Valley had no single-sex classes. Bauleni had 3 boys (30%) obtain very low score range, and 6 (60%) with poor score and 1 (10%) obtained average score. Edwin Mlongoti had 7 (70%) boys in very low score rating, 3 (30%) had poor score rating, and none had good or above average scores. Overall results in science for boys in the three schools were vey low achievement levels.

Table 17: Grade Four Boys Mixed classes performance in Science

Score Range out of 30	Chamba Valley		Bauleni		Edwin Mlongoti		Total for three schools	
	Score	%	Score	%	Score	%	Score	Average Percentage
1 – 5	2	20	2	20	-	-	4	13.3
6 – 10	4	40	6	60	10	100	20	66.7
11 – 15	3	30}	2	20	-	-	5	16.7}
16 – 20	1	10}	-	-	-	-	1	3.3}
21 – 25	-	-	-	-	-	-		
26 – 30	-	-	-	-	-	-		
Total average and above % Mixed classes								20%
Average/above score (%)		40%						
	10	100%	10	100	10	100	30	100

Table 17 shows that Chamba Valley had 2 (20%) boys in Mixed class score the very low score range with the rating between 1-5, 4 (40%) boys were in poor score range, 3 (30%) were in average score range and 1 (0%) were in the very good range. Bauleni had 2 (20%) boys obtain poor score range, and 4 (40%) with poor score and 2 (20%) obtained average score. Edwin Mlongoti had 10 (100%) all the boys obtained scores falling in the poor score rating. The overall average percentage for the three schools was highest in the poor score rage (66.7%), indicating poor performance in all the schools in the science exercise for boys. A comparison in performance between boys in single-sex classes and those in mixed classes shows unsatisfactory results for both

classes. When the results are compared in the three schools, performance between boys at grade 4 level indicated overall a low standard of achievement for the majority of pupils with a substantial number failing to reach the minimum of average range scoring, as shown from the average percentages obtained in Table 15 and 16. This finding seems to suggest that science subject may not be adequately taught in schools.

4.4.9   Overall performance at grade 4 level

The results in Science at Grade 4 level in all PAGE schools indicated a low standard of achievement for both boys and girls, as reflected in the tables above. Interviews with teachers revealed that at Grade 4 level, regardless of which class the pupil belonged to, whether mixed or single-sex, there was no significant difference in performance between the girls and boys. Comments from teachers who taught at Grade 4 level tended to suggest that the science syllabus was too wide and hard for most pupils at this level.

4.4.10 Girls Performance in Science (Grade Six Level)

An exercise in science was administered to Grade 6 girls attending single-sex classes and those in the mixed classes. Table 18 and Table 19 below show the results of the girls' performance in science.

Table 18: Grade Six Girls single – sex classes performance in Science

Score Range out of 30	Chamba Valley		Bauleni		Edwin Mlongoti		Total for three schools	
	Score	%	Score	%	Score	%	Score	Average Percentage
1 – 5	1	10	1	10	-	-	2	6.7
6 – 10	4	40	7	70	4	40	15	50
11 – 15	3	30}	2	20}	4	40}	9	30}
16 – 20	2	20}	-	-	1	10]	3	10}
21 – 25	-	-	-	-	1	10}	1	3..3}
26 – 30	-	-	-	-	-	-		
Total average and above % SS Classes								43.3%
Average/above score(%)		50%		20%		60%		
	-	100%	10	100%	10	100%	30	100%

Results in Table 18 of Grade 6 girls single-sex classes show that, at Chamba Valley 1 (10%) girl scored the very low score range with the rating between 1-5, four (40%) girls were in poor score range, 3 (30%) were in average score range and only 2 (20%) were in the very good range.

The number of pupils failing to reach the minimum level was very high (50%) compared those obtaining above average scoring (10%). Bauleni had 1 (10%) girl

with very low score, 7 (70%) obtained poor score and 2 (20%) with average score and none got very high and excellent scores. Edwin Mlongoti had none in the low score rating, 4 (40%) were in the poor score rating and 4 (40%) were in the average score rating and 1 (10%) in the good or very high and excellent ratings respectively.

Table 18 further shows that the majority of pupils (56.7%) in all the three schools were in the very low score rating, with only 43.3% of girls scoring above average and good and very good scoring.

When the three schools are compared, the results show that Edwin Mlongoti had more girls who obtained the average range score (40%) compared to Chamba Valley (30%) and Bauleni, 20%. However, Edwin Mlongoti had (10%) girls attain good score and (10%) very good scores compared to Chamba Valley with 20% attaining good scores in science.

Table 19: Grade Six Girls Mixed classes performance in Science

Score Range out of 30	Chamba Valley		Bauleni		Edwin Mlongoti		Total for three schools	
	Score	%	Score	%	Score	%	Score	Average Percentage
1 – 5	1	10	1	10	1	10	3	10
6 – 10	2	20	7	70	2	20	11	36.7
11 – 15	6	60}	2	20}	4	40}	12	40}
16 – 20	1	10}	-	-	3	30}	4	13.3}
21 – 25	-	-	-	-	-	-		
26 – 30	-	-	-	-	-	-		
Total average and above % Mixed Classes								53.3%
Average/above score(%)		70%	20%			70%		
	10	100%	100%		10	100%	30	100%

Table 19 shows results of Grade 6 mixed class performance in Science. Chamba Valley had one (10%) girl scored the very low score range with the rating between 1-5, 2 (20%) girls were in poor score range, 6 (60%) were in average score range and only one (10%) was in the very good range. Bauleni had 1 (10%) girl with poor score and 7 (70%) with poor, and 2 (20%) with average score, none got very high and excellent scores. Edwin Mlongoti had 1 (10%) girl in very low scores rating, 2 (20%) in the poor score rating, 4 (40%) were in the average score rating and 3 (30%) were in the above average range and none very high and excellent ratings, however there were more pupils in the average score rating (40%). When the three schools are compared, the results show that for Chamba Valley there were more girls obtain the average

range score (60%) compared to Edwin Mlongotin (40%) and Bauleni (20%). Edwin Mlongoti had 30% girls obtain above average scores in Science. When Table 18 and 19 are compared in performance between girls in single-sex classes and those in the mixed classes the results in Science show that, the number and percentage of girls reaching the minimum level of average scoring was better in the mixed classes, as reflected in Table 18 with 70% of girls in the mixed classes at Chamba Valley compared to 50% in the single sex classes. Edwin Mlongoti had 70% of girls in the mixed classes did better, attaining average and above average scores compared to 60% in single sex classes. This finding indicates that sensitization on girl's education within the school and improved teaching had helped girl's performance to increase. During interviews with girls at grade 6 levels they tended to view Science and Mathematics as relevant subjects to future careers, it being the case; they saw the need to perform well in these subjects as did boys.

4.4.11 Boys Performance in Science (Grade Six Level)

An exercise in science was administered to Grade 6 boys attending single-sex classes and those in the mixed classes. Table 20 and Table 21 below show the results of the boys' performance in science.

Table 20 Grade Six Boys single – sex classes performance in Science

Score Range out of 30	Chamba Valley		Bauleni		Edwin Mlongoti		Total for three schools	
	Score	Percentage	Score	Percentage	Score	Percentage	Score	Average Percentage
1 – 5	-	-	-	-	-	-	-	-
6 – 10	5	50	3	30	1	10	9	30
11 – 15	-	-	5	50}	4	40}	9	30}
16 – 20	5	50}	2	20}	1	10}	8	26.7}
21 – 25	-	-	-	-	1	10}	-	3.3}
26 – 30	-	-	-	-	-	-	-	
Total average and above % SS Classes								59.7%
Average/above score(%)		50%		70%		60%		
	10	100%	10	100%	10	100%	26	100%

Table 20 shows the results for Grade 6 boy's single-sex class's performance in Science. Chamba Valley had none of the boys score the very low score range with the rating between 1-5, 5 (50%) boys were in poor score range, none were in average score range and 5 (50%) were in the very high and excellent score range. Bauleni had 3 (30%) with poor score, 5 (50%) with average score and 2 (20%) in the above

average good score range. Edwin Mlongoti had none of the boys in the low scores rating, 1 (10%) in the poor score rating, 5 (50%) were in the average score rating and 2 (20%) in the good or very high ratings respectively.

Table 20 further shows that in all the three schools boys in single sex classes results indicated a high standard of achievement , Chamba Valley with 50% of boys attaining above average, good and high scores, Bauleni with 50% of boys attaining average and above average and Edwin Mlongoti with 40% of boys attaining average, good, and very good scoring. When average percentage for boys in Science is compared between the three schools, boys in the mixed classes did better, with 80% of boys compared to 59.7% of boys in single sex classes.

Table 21: Grade Six Boys Mixed classes performance in Science

Score Range out of 30	Chamba Valley		Bauleni		Edwin Mlongoti		Total for three schools	
	Score	Percentage	Score	Percentage	Score	Percentage	Score	Average Percentage
1 – 5	-	-	1	10	1	10	2	6.7
6 – 10	-	-	1	10	3	30	4	13.3
11 – 15	5	50}	3	30}	2	20}	10	33.3}
16 – 20	3	30}	5	50}	3	30}	11	36.7}
21 – 25	2	20}	-	-	1	10}	3	10
26 – 30	-	-	-	-	-	-	-	
Total average and above % Mixed classes								80%
Average/above score(%)		80%		80%		70%		
	10	100%	10	100%	10	100%	26	100

Table 21, shows results at Grade 6 mixed class boys' class performance in Science. Chamba Valley had none of the boys score the very low score range or poor score range, 5 (50%) boys were in average score range and 3 (30%) were in the very good and above average range and 2 (20%) obtained the very high and excellent score range. Bauleni had 1 (10%) boy with poor score and 1 (10%) with average score and none got very high and excellent scores. Comparatively the performance of the boys in the three schools shows that the majority of the pupils managed to obtain average and above average ratings with Chamba Valley having highest numbers and percentages of pupils performing better, than Bauleni and Edwin Mlongoti.

Table 21 further shows that in all the three schools boys in mixed classes achieved slightly better results in science compared to boys in single sex classes, Chamba Valley with 80% of boys in mixed classes attaining score ranges of average, good and very goood scores, Bauleni with 80% of boys, and Edwin Mlongoti with 70% of boys attaining score ranges of average, good and very good scoring.

The performance of boys in single-sex classes compared to boys in mixed classes in science as reflected in Table 20 and 21 shows that boys in the mixed classes achieved slightly better than single sex classes.

A comparison of performance in Science between boys and girls at Grade 6 level indicates that overall achievement was better for boys than girls at this level. The average percentages for girls were 43.3% for single sex class girls compared to 53.3% for mixed classes, and 80% for mixed class boys compared to 59.7% for single sex classes. Discussions with pupils especially girls both in single sex classes and mixed classes revealed that the possible factors affecting their performance in science was that teachers did not give them feedback about what needed improvement in their work, furthermore the subject covered too many topics some of which were not well taught.

4.4.12 Girls Performance in the primary school leaving examinations

Data from the three PAGE schools in the study on the primary school leaving examinations for the period 1997 – 1999 during the period when single-sex classes had been initiated in these schools recorded slightly higher improvement in the number of girls selected to Grade 8, although the number of boys still remained higher. The improvement in examination scores and pass rates for girls in PAGE schools since single-sex classes were initiated suggests that there has been a definite improvement in the quality of instructional teaching in single-sex classes, girl's confidence, interest, and conducive learning environment. Table 22 and Table 23 shows the levels of performance in the Grade Seven final examinations and selection to Grade 8 before and after the introduction of the PAGE single-sex classes intervention at Chamba Valley Primary School and Edwin Mlongoti Primary School, Bauleni Primary school were not able to provide the records on performance before nor after the introduction of PAGE for this period, Edwin Mlongoti could not provide data for perfomance before PAGE was introduced.

Table 22: Chamba Valley Performance before and after PAGE

Performance before PAGE   Performance after PAGE

1995-1996					1996-1997					1998-1999				
No. sat Exam		No. passed Exam			No. sat Exam		No. passed Exam			No. sat Exam		No. passed exam		
Girls	Boys	Girls	Boys	% Girls	Girls	Boys	Girls	Boys	% Girls	Girls	Boys	Girls	Boys	% Girls
117	154	8	22	26	140	155	32	36	47	105	125	18	20	47

Table 23: Edwin Mlongoti Performance before and after PAGE

Performance before PAGE   Performance after PAGE

1995-1996					1997-1998					1998-1999				
No. sat Exam		No. passed Exam			No. sat Exam		No. passed Exam			No. sat Exam		No. passed exam		
Girls	Boys	Girls	Boys	% Girls	Girls	Boys	Girls	Boys	% Girls	Girls	Boys	Girls	Boys	% Girls
					115	134	26	30	46	134	145	27	43	38

Source: School records 1999

The results in Table 22 and Table 23 for Chamba Valley Primary School and Edwin Mlongoti Primary school between 1995 and 1998 after the introduction of the PAGE single-sex class intervention showing progression in performance by girls in the Grade seven examinations which determine selection to Grade Eight.

Table 22, relating to Chamba Valley Primary School, shows that in the 1995 –1996 academic year, before single-sex classes were introduced a total of 117 girls and 154 boys sat for the Grade Seven leaving examinations. Out of this number, a total of 8 girls and 22 boys qualified to Grade Eight. The number of girls who qualified represented 26 percent of the total number of the pupils who qualified at this school. In the 1996-1997 academic year, following the introduction of single-sex classes, a total of 140 girls and 155 boys sat the Grade Seven examinations. Out of this number, 32 girls and 36 boys qualified to Grade Eight. The number of girls who qualified represented 47 percent of the total number of pupils who had qualified at this school, an improvement of 21 percent over the 1995-1996 performance, before the introduction of the PAGE single-sex class intervention. In the 1998-1999 academic years, a total of 105girls and 125 boys sat the Grade Seven examinations. Of these, 18 girls and 20 boys qualified to Grade Eight. The number of girls who qualified represented 47 percent of the total number of pupils who had qualified at this school, an improvement of 21 percent over the 1995-1996 performance, before the introduction of the PAGE single-sex class intervention. These results suggest that the introduction of the single-sex intervention and other PAGE interventions have impacted positively on the progression of girls to secondary school.

Table 23 relates to Edwin Mlongoti Primary School where single-sex classes were introduced in 1996. The school did not provide records for the 1995 –1996 academic year, before single-sex classes were introduced. Available records for the 1997-1998 academic year, following the introduction of the PAGE single-sex class intervention, 115 girls and 134 boys sat the Grade Seven examinations. Out of this number 26 girls and 30 boys qualified to Grade Eight. In the 1998-1999 academic years, a total of 134

girls and 145 boys sat the Grade Seven examinations. Out of this number, 27 girls and 23 boys qualified to Grade Eight. The progression rates into grade 8 for both girls and boys remain vey low. It should be taken into account that government has embarked on a major programme of advocacy and sensitization on increasing girls' enrolments and access at grade 1-7 so that an increasing number of girls at grade 7 would be able to continue into grade 8 and 9. The government intends to continue to improve access and reverse the decline in enrolments in order to achieve 100% enrolment by 2015 through the Basic Education Sub-Sector Investment Program (BESSIP), (MOE, 1998).

4.5   Comparison between PAGE and Non-PAGE schools

4.5.1   Introduction

This section of the study is concerned with comparing the performance of pupils in mathematics and science between pupils in PAGE schools and those in Non-PAGE schools. The study tried to measure the perceived achievements of single sex classes by collecting data from the mathematics and science exercises in PAGE schools were the interventions were implemented compared to schools were these interventions were not introduced. The tables below show data and comparisons at grade 4 level and grade 6 levels in terms of performance of girls in maths and science, in the five schools, three PAGE schools (Chamba Valley, Bauleni, and Edwin Mlongoti Basic Schools) and two non PAGE schools (Tunduya and St. Patricks Basic Schools).

4.5.2   Performance in Mathematics

4.5.2.1   Introduction

Comparison of performance in mathematics and science between girls in PAGE schools and those in non-PAGE schools was conducted at both Grade 4 and Grade 6 level.

4.5.2.2 Comparison of performance in Mathematics at Grade Four level

Table 24: Grade Four Girls classes' performance in Mathematics

Score range out of 30	St. Patricks		Chamba Valley		Bauleni		Tunduya		Edwin Mlongoti	
	Score	%	Score	%	Score	%	Score	%	Score	%
1 – 5	-		1	10	3	30			-	
6 – 10	4	40	4	40	5	50			3	30
11 – 15	5	50}	4	40}	2	20}	6	60}	7	70}
16 – 20	1	10}	1	10}	-	-	2	20}	-	
21 – 25	-	-			-	-	2	20}	-	
26 – 30	-	-			-	-			-	
Average/above score(%)		60%		50%		20%		100%		70%
	10	100%	10		10		10	100%	10	100%

Table 24, shows results from five school, three PAGE schools and two Non-PAGE schools. St. Patricks had none of the girls score the very low score range with the rating between 1-5, 4 (40%) girls were in the poor range, 5 (50%) obtained average score range and only 1 (10%) was in the very good range and none in the higher range which is very high and excellent score. Chamba Valley, 1 (10%) girl scored low score, 4 (40%) girls were in the poor range scores, 4 (40%) obtained average scoring, 1 (10%) obtained above average scores. Bauleni had 3 (30%) girls with very low scores, 5 (50%) with poor score and 2 (20%) had average score and none got above average or very high and excellent scores. Edwin Mlongoti had none in very low score rating, 3 (30%) in the poor score rating and 7 (70%) were in the average score rating and none in the good or very high and excellent rating. Tunduya had none in the very low range and poor score rating, 6 (60%) obtained average score range and 2 (20%) in the above average score range, and 2 (20%) very high and excellent scores.

The results show that St. Patricks a girls only school had 60% of girls obtain average and above average scores, Chamba Valley had 60% of girls obtain average and above average scores, Bauleni had 20% of girls obtain average scores, Tunduya had 100% of girls obtain average, above average and very high scores, and Edwin Mlongoti had 70% girls obtain average scores.

A comparison between PAGE and non-PAGE schools shows that girls obtained satisfactory scores in the four schools, two PAGE and two non-PAGE schools at Tunduya, St. Patricks , Chamba Valley, and Edwin Mlongoti except for Bauleni a PAGE schools where the results not very satisfactory.

4.5.2.3 Comparison of performance in Mathematics at Grade Six Level

Table 25: Grade Six Girls classes' performance in Mathematics

Score range out of 30	St. Patricks		Chamba Valley		Bauleni		Tunduya		Edwin Mlongoti	
	Score	%	Score	%	Score	%	Score	%	Score	%
1 – 5	1	10			2	20				
6 – 10	2	20	3	30	4	40	1	10	3	30
11 – 15	2	20}	5	50}	2	20}	4	40}	3	30}
16 – 20	3	30}	2	20}			1	10}	2	20}
21 – 25	2	20}					4	40}	1	10}
26 – 30										
Average/above score(%)		70%		70%		20%		90%		70%
	10	100%	10	100%	10	100%	10	100%	10	100%

Table 25, shows results from five schools, three PAGE schools and two Non-PAGE schools. St. Patricks had 1 (10%) girl score the very low score range with the rating between 1-5, 2 (20%) girls were in the poor score, 2 (20%) with average score range and only 3 (30%) was in the above average or very good range and 2 (20%) in the excellent score. Average score for St. Patricks was 70% of pupils obtaining average and above average scores. Chamba Valley had 2 (20%) girls with low score, 2 (20%) with poor score and 3 (30%) had average score and 2 (20%) got very high and excellent scores. Average score for Chamba Valley was 60% of pupils obtaining average and above average scores. Bauleni had 3 (30%) girls with low score, 5 (50%) with poor score and 2 (20%) had average score and none got very high and excellent scores. Average score for Bauleni was 20% of pupils obtaining average scores. Edwin Mlongoti had none in very low score rating, 3 (30%) in the poor score rating and 7 (70%) were in the average score rating and none in the good or very high and excellent rating. Average score for Edwin Mlongoti was 70% of pupils obtaining average scores. Tunduya had none in the very low range rating, 1 (10%) in the poor score range, 4 (40%) in the average score range and 1 (10%) in the above average score and 4 (40%) in the excellent score range. Average score for Tunduya was 90% of pupils obtaining average and above average scores.

Table 25 further shows that the Tunduya had the highest number of girl's 90% obtaining average and above average scores, Edwin Mlongoti had 70% girls in the average range score managing to reach the minimum performance levels, followed by St. Patricks with 70%, Chamba Valley 60% and Bauleni with 20%. The results point to better performance in the mathematics exercise for girls at Tunduya (90% non-PAGE), compared to St. Patricks (70% non-PAGE), Edwin Mlongoti (70% PAGE)

and Chamba Valley (60% PAGE) although the differences are not very significant, except for Bauleni (20% PAGE) which had the lowest performance levels compared to all the other schools.

4.5.2.4   Comparison of Performance in Science Grade Four

Table 26: Grade Four Girls classes Performance in Science

Score range out of 30	St. Patricks		Chamba Valley		Bauleni		Tunduya		Edwin Mlongoti	
	Score	%	Score	%	Score	%	Score	%	Score	%
1 – 5	5	50	7	70	3	30	3	30	5	50
6 – 10	4	40	2	20	6	60	5	50	5	50
11 – 15	1	10}	1	10}	1	10}	2	20}		
16 – 20										
21 – 25										
26 – 30										
Average/above score(%)		10%		10%		10%		20%		
	10	100%	10	100%	10	100%	10	100%	10	100%

Table 26 shows the performance of girls at Grade 4 levels in Science in the five schools. St Patricks had 5 (50 %) girls score the very low score range with the rating between 1-5, 4 (40%) in the poor range, 1 (10%) girls were in average range and none in the above average scores. Chamba Valley had 7 (70%) girl scored the very low score range with the rating between 1-5, 2 (20%) girls were in poor score range, 1 (10%) girl was in average score range and none were in the very good range.

Bauleni had 3 (30%) girls with low scores, 6 (60%) with poor scores and 1 (10%) with average score and none got very high and excellent scores.

Edwin Mlongoti had 5 (50%) pupils in very low rating. 5 (50%) were in poor scores rating, and none in the average and above average range. Tunduya, had 3 (30%) girls with low scores, 5 (50%) with poor scores, 2 (20%) with average scores and none with high and excellent scores. The general picture from these results is poor performance in all the schools at grade 4 level.

4.5.2.5 Comparison of Performance in Science Grade Six level

A comparison of performance between girls in PAGE and those in non-PAGE schools was carried out in all the five schools in the study at Grade 6 level.

Table 27: Grade Six Girls classes Performance in Science

Score range out of 30	St. Patricks		Chamba Valley		Bauleni		Tunduya		Edwin Mlongoti	
	Score	%	Score	%	Score	%	Score	%	Score	%
1 – 5	1	10	1	10	1	10	2	20		
6 – 10			4	40	7	70	2	20	4	40
11 – 15	3	30}	3	30}	2	20}			4	40}
16 – 20	6	60}	2	20}			1	10}	1	10}
21 – 25							4	40}	1	10}
26 – 30										
Average/above score(%)		90%		50%		20%		50%		70%
	10	100%	10	100%	10	100%	10		10	100%

Table 27 shows the performance of girls at Grade 6 level in Science in the five schools. St. Patricks had 1 (10%) girl score the very low score range with the rating between 1-5, none in the poor range, 3 (30%) girls were in average range, 6(60%) were in above average range. On average, 90% of pupils at St. Patricks scored average and good scores. Chamba Valley had one (10 %) girl scored the very low score range with the rating between 1-5, 4 (40%) girls were in poor score range, 3 (30%) were in average score range and only 2 (20%) was in the good score range. From this sample of the pupils (50%) of the pupils obtained average and above average though none in the higher range (which is good and very good score) while another half were below average. Bauleni had 1 (10%) girl with low scores, 7 (70%) with poor scores and 2 (20%) with average score and none obtained good and very good scores.

Edwin Mlongoti had none of the pupils in very low rating. 4 (40%) were in poor scores rating, 4 (40%) in the average score rating and none 1 (10%) in the good score range and 1 (10%) in the very high and excellent rating. Tunduya, had 2 (20%) girls with low scores, 2 (20%) with poor scores, 1 (10%) with above average score and 4 (40%) with high and very goood scores.

Overall performance and comparison between girls in PAGE and non PAGE schools shows that Tunduya had 40% of girls obtain very good scores (21-25 score range) and the highest among the schools, St. Patricks had 20% of girls in this range and Edwin Mlongoti had 10% of girls in this range, and non from Bauleni and Chamba Valley obtained scores in this range.

Overall results on performance in Science in the five schools at Grade 6 level, therefore indicate that   Tunduya (non-PAGE) did better compared to the other comparable schools with 40% of girls obtaining very good scores and 10 % obtaining good scores, St Patricks with 60% of girls (non-PAGE) obtaining good score and

30% average scores, and Edwin Mlongoti (PAGE) with 10% obtaining very good score and 40% average scores, and Chamba Valley with 20% of girls (PAGE) with good score and 30% obtaining average scores, and Bauleni had 20% of girls(PAGE) obtain average scores maintaining the lowest scores obtained by girls among the schools.

Responses from the interviews with teachers indicated that Bauleni was experiencing a problem of lack of teachers, resulting in classes merging during some lessons. This was negatively affecting the girls in single sex classes. In the case of non-PAGE schools, the researcher observed that in terms of catchment areas these were close to medium cost / medium density with slightly better socio-economic status compared to the three PAGE schools.

The fact that results on performance in PAGE schools were lower than in non-PAGE schools does not indicate that PAGE as a programme has not achieved much in terms of raising performance in girls. It is clear as earlier mentioned that PAGE has had positive impact in single sex class intervention through improved performance of girls, interest in schools by girls, reduction in absenteeism and increased assertiveness in girls which has resulted in improved relationship between girls and boys.

4.6   Conclusion

This chapter has presented the findings of the study in relation to the three objectives set out in Chapter One of the investigation. The chapter has presented the views of school head-teachers, teachers, pupils and parents on the impact of the PAGE single-sex class intervention on the performance of girls in PAGE and Non-PAGE schools. The consensus among all the four categories of participants is that the PAGE intervention has facilitated the enhancement of performance among the girls.

The chapter has also presented information regarding participants' views on whether or not the intervention had enhanced girls' self-esteem and confidence. Further, the study has provided information relating to comparison in performance in Mathematics and Science exercises of girls within the PAGE schools as well as between the PAGE schools and the non-PAGE ones.

The study has established that pupils from non- PAGE schools showed evidence of high performance at Grade 6 levels in the mathematics exercise and Science exercises compared to pupils from PAGE schools, although the differences in pupil scores were

not very significant with some PAGE schools.

The chapter has presented evidence of the positive impact that the PAGE intervention appears to have achieved by comparing the performance of pupils in the Grade Seven examinations in two of the PAGE primary schools before and after the introduction of the intervention.

Finally, the chapter has established that there was little difference in pupils' performance between girls at Grade 4 level, while there was a difference in performance between girls in single-sex classes and those in mixed classes at Grade 6 level. The results have also shown that there was a difference in performance between girls from non-PAGE schools and those from PAGE schools at grade 6 level, although this was not very significant.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1   Introduction

The previous chapter presented the findings on girl's performance in five primary schools in Lusaka. This exercise was done in order to provide answers to the research questions in chapter one of the study. The chapter reported the results on the performance of girls and boys in single-sex classes in PAGE schools by comparing and contrasting in order to show similarities and differences in performance between girls and boys attending single-sex classes and mixed classes within PAGE schools, and differences between girls in PAGE and non PAGE schools. The purpose of the present study was to establish whether or not single-sex classes introduced in PAGE schools to improve girl's performance and increase their self esteem had achieved their intended goal.

Based on the findings reported in the previous chapter, the present chapter seeks to provide answers by summarising the findings in line with the objectives of the study. Recommendations based on the findings of the study with regard to single-sex classes are made, and further research is recommended for future examination on the subject.

5.2   Summary and Conclusion

5.2.1 Introduction

The general objective of the study was to examine whether single-sex classes had achieved the objective for which they were created at primary school level, that of raising performance in girls during the pilot stage two years after their introduction in 1996. The specific objectives that helped to accomplish the purpose of the whole study were; to examine whether single-sex classes had effectively increased pupil confidence and self esteem especially in girls towards subjects of mathematics and science which were traditionally believed to be boys subjects; the study also found out performance of pupils from a Mathematics and Science exercise undertaken within PAGE and non PAGE primary schools.

The study attempted to provide a picture of pupil performance in mathematics and science. It was expected through the mathematics and science exercises that most pupils would demonstrate and show evidence of performance levels which were desirable or at least of minimum performance. This section of the report summarises the findings of the study on the impact of PAGE on girls' performance.

5.2.2 Impact of PAGE on girls' performance

The study established that there was a consensus among all the four categories of participants the teachers and school head teachers, parents and pupils in their views that the PAGE intervention in single-sex classes had enhanced performance among the girls in PAGE primary schools.

Teachers perceived single sex classes as having been successful in terms of improvement in academic performance of girls; decreased incidences of pregnancies; increased class participation for girls in single sex classes; improved attitude towards subjects of mathematics and science subjects; improved class attendance for girls; improved teaching method; sensitization ; and increased self esteem and confidence.

Parents perceived single sex classes as having been successful in terms of improvement in academic performance of girls; improved interest by girls in completing school; good learning environment for girls, especially at grade 6 level; increased confidence; and increased desire to attend class.

Pupils perceived single sex classes as having been successful in terms of improvement and determination to achieve better, especially for girls; increased interest to complete school for girls; acknowledgement that single sex classes were good for girls by boys; increased self esteem and confidence for girls; conducive learning environment for girls; and encouragement from parents and teachers.

The findings have further shown that within PAGE schools girls in the single-sex classes at Grade 6 levels performed better and had a higher percentage of the number of girls reaching the minimum score of average percentage scoring at 70% in the mathematics exercise in single sex classes compared to 53.3% in mixed classes.

The reasons given by girls for the improvement in performance in Mathematics were determination, perseverance, interest, dedication and improved teaching. Teachers explained that this was due to girls having been helped to develop self-capabilities and interest in these subjects.

5.2.3 Statistical indications from the Maths and Science Exercises

The first set of tables showed data and comparisons of performance in the maths and science subjects within PAGE schools at grade 4 and grade 6 levels between girls in single sex classes and girls in mixed classes on one hand and between boys in single sex classes and boys in mixed classes on the other hand.

5.2.3.1 Mathematics

At grade 4 level, the overall picture given by the tables is that there were low levels of achievements for both girls and boys in both maths and science. At grade 6 level, the overall picture given by the tables is that in the maths exercise, there was significant good performance by girls in single sex classes, specifically at Edwin Mlongoti where the average percentage for girls was higher than that for boys. According to tables 10 and 11, performance in the maths exercise at grade 6 levels between girls in single sex classes and those in mixed classes, the results showed that on average there were more girls, 70% in single sex classes obtain average and good score compared to 53.3% in mixed classes.

A comparison in performance in maths between PAGE schools showed that Edwin Mlongoti scored better with more than 90% of the girls in single sex classes obtaining average and 10% good score compared to the other PAGE comparable schools, Chamba Valley had 50% of the girls obtaining average and 20% good score and Bauleni 40% of the girls obtaining average scoring and none obtained good score.

A comparison in performance between boys and girls in single-sex classes in the maths exercise showed that the difference in performance between boys and girls at grade six levels was not very significant in PAGE schools.

On the general performance of boys and girls the overall results in maths at grade 6 level in the PAGE schools revealed that boys'average percentage in performance was 70% (Table 12) in single sex classes and 63.3% (Table 13) in mixed classes, compared to girls' average percentage in performance of 70% (Table 10) in single sex classes and 53.3% (Table 11) for girls in mixed classes. As earlier mentioned, teachers pointed out that girls generally had begun to show good command in understanding and confidence with regards to working with numbers and problem solving in maths subject.

5.2.3.2 Science

The results in Science at Grade 4 level in all PAGE schools indicated a low standard of achievement for both boys and girls, as reflected in the Tables above. Interviews with teachers revealed that at Grade 4 level, regardless of which class the pupil belonged to, whether mixed or single-sex, there was no significant difference in performance between the girls and boys with girls achieving slightly better scores than the boys in the mathematics exercise.

The teachers who taught at Grade 4 level explained that at this level girls performed better in certain subjects than boys. PAGE therefore targeted mathematics and science subjects at this level, as a strategy for those pupils who would not be doing well, and to motivate girls to excel. These findings confirm previous studies (Maimbolwa and Chilangwa 1995; Sadker and Sadker 2000), which indicate that girls tend to perform better at lower grades and that there is not much difference in levels of performance between the sexes at those levels.

A comparison of performance in Science between boys and girls at Grade 6 level indicates that overall achievement was better for boys than girls at this level. The average percentages for girls were 43.3% for single sex class girls compared to 53.3% for mixed classes, and 80% for mixed class boys compared to 59.7% for single sex classes. The gap in performance between girls and boys was wider in science than in maths. This finding shows that single sex classes did not help girls' performance in science subject. It is likely however those girls in mixed classes were getting help with class work from the boys.

5.3   Girls increased confidence, self esteem and participation in school

The findings from the study have shown that with regards to participants' views on whether or not the intervention had enhanced girls' self-esteem and confidence it was revealed that 90% of school head teachers, 80% teachers, 80% parents and 90% pupils had appreciated the usefulness of single-sex classes in bringing changes in girls. Responses from teachers were that single-sex classes had helped increase girls confidence and assertiveness, were more competitive academically and increased interest in school work.

In some PAGE schools it was reported that girl's attendance and retention had improved. In terms of attitude towards subjects of mathematics and science at grade six level girls attributed their success to their own hard work and determination. The study has shown that the factors that had enabled this to be achieved were: sensitization within the schools and communities; girls themselves had began to feel determined and confident about achieving better results, the factor of success in achieving desirable performance levels was building girls self esteem and confidence

in girls; girls were more interested in completing school successfully and were more competitive. In term of pupil participation in classroom, it was observed that pupils did not ask questions, but participated actively in answering questions. Teachers indicated that boys participated actively in the classroom lessons while girls were passive in the case of mixed classes, while girls in single-sex classes participated actively in terms of group work.

5.4 Comparison in performance between pupils in PAGE and non PAGE schools

In assessing the impact of single-sex classes on pupil performance an attempt was made to compare girls' performance by collecting statistical data from the maths and science exercises in three PAGE and two non PAGE schools.

The results have shown that pupils from non- PAGE schools performed better than PAGE schools. At Grade 6 level in the mathematics exercise, an assessment of average performance showed that St Patricks had 70% of the girls obtain average and above, Tunduya had 90% of girls obtain average and above scores, Edwin Mlongoti (70%) average scores, Chamba Valley (60%) average score, and Bauleni (20%) average scoring.

In the Science exercise at Grade 6 level, an assessment of average performance showed that St Patricks had 90% of the girls obtain average and above, Tunduya had 70% of girls obtain average and above scores, Edwin Mlongoti (70%) average scores, Chamba Valley (50%) average score, and Bauleni (10%) average scoring .

Out of the three PAGE schools, Edwin Mlongoti obtained as good results as the two non-PAGE schools of St. Patricks and Tunduya. One possible reason for good performance according to the teachers in non PAGE schools was the emphasis the media had placed on the importance of girls education advocating for change in schools that would allow achieve high in performance and complete school. During focus group discussions with teachers in the PAGE schools, the researcher found out that single sex classes were introduced on pilot in schools which before the intervention were disadvantaged schools in terms of infrastructure, had few teachers, with high drop out rates and low enrolment rates for girls. The other factor could be related to the fact that the majority of children in these schools are from low economic backgrounds therefore socially disadvantaged. Some research evidence has suggested a strong relationship between household's low economic status and girl's poor performance.

The other reason is that girls that attended an all girls Catholic, in this case St. Patricks Basic school exhibited higher performance, rendering support to findings from several Sub- Saharan Africa countries in support of single sex schooling for girls (Jiminez and Lockheed, 1989). This could be another explanation for further advantage of non-PAGE schools compared to PAGE schools.

At Grade 4 level, the performance of pupils in mathematics and science subjects showed that there was very little difference, with girls managing to reach the desirable scores of average in both PAGE and non-PAGE schools. (Maimbolwa-Sinyangwe, 1995) at primary school level in four primary schools, similar findings were to those were that girls' performance was the same as that of boys in the lower grades, but that the differences in performance between boys and girls became wider as they moved into upper grades. These findings render support to studies conducted on performance in Zambia (Maimbolwa- Sinyangwe and Chilangwa, 1995) and in the U.S.A (Sadker, Fox and Salata, 2000).

5.5   Recommendations

5.5.1 Introduction

On the basis of the findings and the conclusion drawn from them, two sets of recommendations are made. The first set relates to recommendations on single-sex classes. The second set relates to recommendations for further research.

5.5.2 Performance of girls in single-sex classes

The study established that generally single-sex classes have been one major achievement of PAGE intervention in improving performance and raising self esteem and confidence in girls. The following recommendations are made:-

1. The MOE through PAGE programme should continue promoting single sex classes in primary schools, since single sex classes had proved to be useful in improving girl's academic performance. This would involve the MOE increasing classrooms, in schools where their impact has diminished to the extent that some schools have abandoned single sex classes.
2. Strategies to support girls in maths and science and reading at primary school level should be developed. This would involve training of teachers and incorporating gender issues in teacher training Colleges, and encouraging maths and science clubs in schools.
3. Provision of guidance and counseling for girls should be encouraged with particular emphasis on equipping and raising their confidence and raising their self esteem.

4. There should be more single sex classes at the middle basic level at grade 5 and 6 rather than at junior level.

5.5.3 Improvement of Teacher / Parent involvement in pupils' performance
It is recommended that:-
1. Participatory techniques should be used to encourage parents and the community to participate in encouraging performance of girls in school. Regular meetings could be organized by the school between teachers and parents.
2. Schools within a particular locality should promote awareness programmes to encourage involve the participation by parents and the communities. Single Sex Classes have demonstrated that improvements in educational outcome for girls are possible if such projects involve pupils, teachers, parents and the wider communities they serve.
3. The MOE should consider making gender as part of the training courses offered to those involved in school committees.
4. The Family Pac module aimed at building parental support, increasing their involvement in their children's schooling should be strengthened. Parents and teachers have meetings at the beginning of every term to be briefed about expected of their children.

5.3.4 Improvement of Record Keeping for monitoring
It is recommended that :-

1. Record keeping at the school level should be improved for the purpose of monitoring. The MOE could assist by providing guidelines, reporting formats and procedures for schools.
2. Schools should ensure that terminal exams, end of year leaving grade seven exam results were well kept.
3. Records on progression rates, completion rates should be kept in every school.

5.5.5 Training of Teachers
 It is recommended that :-
1. Affirmative action should be applied to all Teacher Training Colleges, with a goal to increasing the ratio of female teachers at primary school level. Extra Science and Maths courses should be provided in Teacher Training Colleges so that women can teach maths and science subjects with more confidence as this would impact on girls' academic performance.

2. Positive attitudes towards girls should be emphasized in the design and implementation of training programmes for teachers, and school inspectors.

3. The MOE should encourage teacher development through in service trainings in order to strenghthen gender awareness and the role teachers can play in encouraging both girls and boys participate have active participation in class.

4. Strategies to support girls in maths and science at primary school level should be developed. This would involve the creation of science and maths clubs in schools.

5.6 Recommendations for further research

Any research only manages to clarify certain issues and in the process raises others such that no study can claim to be exhaustive. The present study is no exception and has merely touched the surface of some topics. Such topics which need further study are:

1. The extent to which single-sex classes have affected enrolments;

2. A comparison of performance in girls in single-sex classes between urban and rural primary schools;

3. The extent to which progression rates of girls from primary level into secondary school have been affected by the intervention;

4. Effective ways of applying the Family Pac module in order to build parental support for their children.

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APPENDICES

APPENDIX I : QUESTIONNAIRE FOR HEAD-TEACHERS

INSTRUCTION:
Study title: Girls achievement/ performance in primary school. The aim of the study is to establish what impact Single sex classes or mixed classes have on pupil performance.

SECTION A should be answered by all Headteachers.

Headteachers in PAGE pilot schools should proceed to answer SECTION B.

Please cross (X) the appropriate response or fill in the appropriate responses in the spaces provided

All Information will be kept confidential.

INTERVIEW CODE NO: ------------------------- DATE: ------------------------

INTERVIEWER: --

SCHOOL NAME --

TEACHER---------------------------------- GRADE TAUGHT ------------------

SECTION A.

BACKROUND INFORMATION

Q.1. Sex of Teacher
     1. Female [ ]   2. Male [ ]

Q2. Age (in Years)

Q3. Marital status
    1. Single
    2. Divorced
    3. Widowed
    4. Separated

Q4. What is the highest grade in education that you reached?
    1. Lower primary 2. Upper primary 3. Junior secondary
    4. Senior secondary   5. Tertiary (college/ university certificate)
    Teacher's Analysis of Hers/ His class, and pupils

Q5. Who are running the school?
    1. Government 2. Government Aided Mission school

Q6. How long have you held this position, as Headteacher/ teacher?

Q7   Do you think girls and boys have equal progression opportunities is school? Please

    Give reasons for your answer.

Q8. Which class do you teach?
    1. Single sex class (girls) [ ] 2-mixed class [   ] 3. Single sex class (boys) [ ]

Q9. Are there any challenges that you meet in teaching your present class?
Yes [ ] No [ ]

Q 10. If answer to Ques. 9 is   yes, what are these challenges?

Q 11. Do you face any difficulties in teaching your class?
Yes [ ] No [ ]

Q 12. If answer to Ques. 11 are Yes, What difficulties do you face?

Q13. What is the general performance of the pupils in your School at grade 4 level and at?
Grade 6 level?
1. Good [ ] 2. Very good [ ] 3. Fair [ ] 4. Poor [ ]

Q14. Are girls better in some subjects? Which ones?

Q15. Are boys better in some subjects? Which ones?

Q16. How do girls perform in subjects of maths and science?

Q17. How do boys perform in subjects of maths and science?

Q18. What would you say the performance of girls is like in maths and science subjects?

1. Good   [ ] 2.   Very good [ ] 3. Fair [ ] 4. Poor [ ]

Q19. What would you say the performance of boys in these subjects is like?
1. Good   [ ] 2. Very good [ ] 3. Fair [ ] 4. Poor [ ]

Q20. Do the pupils describe their difficulties in these subjects?
Yes [ ] No [ ]

Q21. What difficulties do girls express? ---

Q22. What difficulties do boys express? ---

Q23. Have there been   improvements in performance in your pupils?
Yes [ ] No [ ]

Q24 If answer to Ques. 23 is Yes, W hat do you attribute this to? --------------------------------

----
Q25. If answer to Ques. 23 is no. What do you attribute this to? ---------------------------------

----

Q26 Could you describe other improvements have you seen in your pupils?

Head Teachers in PAGE pilot schools proceed to answer the following questions (Guidelines, experiences and problems)

Q27. Are you aware of the reasons Single sex classes were introduced?
Yes [ ] No [ ]

Q28. If your answer to Que. is yes, could you give a brief summary? -------------------------------
----

Q29. When did you start Single sex classes in your school? -------------------------------------

Q30. At what grade levels? --

Q31. How are pupils separated from mixed classes into Single sex classes?
1. Pupils choice 2. Selected by teacher 3. Other (please do explain)

Q32. If the answer to Ques. 30 is (2), please explain how this happened in your school.

Q33. Does a pupil have a choice to change classes once selected into Single sex classes?
Yes [ ] No [ ]

Q34. Would you say that Single sex classes have made any difference in girl's performance?
Yes [ ] No [ ]

Q35. How do you compare the performance of girls in Single sex classes to that of girls in mixed classes?
1. Better [ ] 2. Poor [ ] 3. Same [ ]

Q36. How do you compare the performance of boys in Single sex classes to that of boys in mixed classes?
1. Better [ ] 2. Poor [ ] 3. Same [ ]

Q37. If the answer to Ques. 29 is No, what do you think needs to be done to change this?

Q38. What problems have Single sex classes had?
1. Lack of trained teachers 2. Poor monitoring 3. Other (specify any other reasons)

Q39. Who should solve the problems stated in Ques.38?
1. Myself 2. Ministry of Education 3. Other (specify) -------------------------------

Q40. If the answer to Ques. 39 is (2) what would you like the Ministry of Education to do?

Q41.What has been achieved in Single sex classes at the pilot level to warrant their implementation countrywide? 1. a lot has been achieved 2. Too little have been achieved 3. Need for more time to realize results 4. Other -------------------

Q42. If the answer to Que. 41 is (1) specify what has been achieved.-------------------------------
----

Q43 If the answer to Que. 41 is (2) what would you have desired to be achieved? Explain----
----

Thank you for your time and co-operation

APPENDIX II: OBSERVATION CHECKLIST

School Name: _____

Grade: _____ Type of School PAGE/ Non PAGE:_____

Type of Class : _____ (Single sex class for girls or boys / or Mixed
Class)

Answering questions		Pupils asking questions		Teachers comments after wrong answer		Teachers comments after correct answer		Speaking during lesson	
Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys

APPENDIX III: INTERVIEW SCHEDULE FOR TEACHERS:

Type of school

1. PAGE pilot co-education Primary school_____

2. Single Sex girls primary school (non- PAGE) _____

3. Single Sex boy's primary school (non-PAGE) _____

4. Co-education primary school (non-PAGE) _____

School name: _____

Teacher's name_____ Sex: _____ Age: _____

Grade taught: _____ Class taught: _____

Qualifications: _____

I am a student in the Gender Department at the University of Zambia, conducting a research on pupil performance.I am interested in finding out how girls and boys are faring in their class performance.

Would you say that girls/boys are worse off in academic performance than they were a year or two ago?

Would you say they are better now, same, or you are uncertain? Why?

Are girls making as much progress in performance as they did a year ago?

In what subjects would you say girls have shown improvement? In which have boys shown improvements? Why?

Have girls/or boys shown keenness to solving problems in science and mathematics? How is that?

During the few years that girls/or boys have been learning in single sex classes, have you known any favourable or unfavourable changes in attitude?

If yes, what are these changes?

Have similar changes in attitude occurred for boys? In which areas?

What has been your experience in teaching girls only, or boys only or mixed classes?

How competent are both girls in achieving similar results to boys in mathematics and science?

How have girls adjusted in single sex classes in terms of academic performance??

If one or more things could be introduced in order to improve performance rates for girls, what things would you like to see happen?

Is the single sex class intervention in primary schooling achieving its intended purpose? Why do you say so?

Is the intervention adequate and consistent in helping girl's performance rates? In which aspects?

Do you have any suggestions that would help girl's improvement in performance?

Thank you for your time and co-operation

APPENDIX IV: INTERVIEW SCHEDULE FOR PARENTS

Name:_____ Sex:_____ Occupation:_____

Mother/father/guardian _____ Education level_____

Marital status:_____

I am a student in the Gender Department at the University of Zambia, conducting a research on pupil performance. I would like to talk with you about your child's Performance in school.

Does your child attend a mixed or single sex class?

What do you like about her/him attending such a class? Why?

Could you tell me, what the present level of performance your child has?

Is the performance good, bad, or you doing not know? Why?

In which subjects is the performance poor? In which subject is the performance good? Why?

In which subjects would you wish to see your child perform better and why?

What type of class would you prefer your child to attend? A mixed or single sex class? Why?

Generally speaking, do you think your Childs performance and attitude to schooling has changed compared to past years? Why?

What kind's changes are these?

All parents have some difficulties in encouraging their children with class work. What has been the hardest thing about doing so for your child? For which subjects?

In what areas do you encourage the girl/or boy most?

What changes have you seen in your girl/or boy child since the introduction of single sex classes?

What have these changes been? Why?

Have these been favourable or unfavourable? Why?

Would you say that there has been any advantage in your child learning in the class she attends?

What are the advantages?

What advantages have you known for girls attending single sex classes?

Do you have any suggestions or comments on that would help girls improve in their performance rates?

Thank you for your time and co-operation

APPENDIX V: INTERVIEW SCHEDULE FOR PUPILS

Type of school

1. PAGE pilot co-education primary school_____
2. Single Sex girl's primary school (non-PAGE_____
3. Single Sex boys primary school (non- PAGE) _____
4. Co- education primary school (non- PAGE) _____

Name: _____ Sex: _____ Age: _____ Grade: _____

School name: _____ Class attending: _____

I am a student in the Gender Department at the University of Zambia, conducting a research on pupil performance. I would like to talk with you about your class performance.

What would you say your performance in class is like? Is it good, poor, or you do not know? Why.

In which subjects would you say your performance is good? Why?

In which subjects would you say your performance is poor? Why?

Have you improved in any subject since last year? In which subject and why?

What has helped you improve? Do you think this improvement has been since you have been learning in single sex classes or mixed classes?

What do you like most about learning in your present class? Why?

Do you think that both girls and boys need to learn science subjects of maths and science? Why?

Girls and boys both have the same potential to perform well in maths and science is this true for you? Why?

What is it that encourages you to desire to perform better in these subjects?

Do you think that girls/ or boys in single sex classes are more intelligent compared to those in mixed classes? Why?

Thank you for your time and co-operation

Aims

Pupils should be encouraged to:

- Develop an attitude of scientific curiosity and enquiry.
- Develop the skills necessary to investigate a situation in a scientific manner.
- Develop a critical approach to evidence.
- Develop ability to generate new ideas.
- Develop an understanding of man as a living organism, and his place in nature.
- Develop an understanding of the major aspects of the physical environment.
- Develop an increased awareness of the variety of life and of the relationship of living things to their environment.

Assessment Objectives

Pupils should be able to:

Element 1: Light

- Describe how a total eclipse of the sun and an eclipse of the moon occurs. Construct a pinhole camera and describe how it works.

Element 2: Water

- Recall the relationship between water height and pressure.
- Describe a water supply systems of a village and of a town.
- Describe how and why the water supply is made safe for drinking e.g. boiling and chlorination.
- State how pollution of natural water supplies can be reduced.
- Name some water-borne diseases.
- Suggest ways by which water-borne diseases can be prevented.

Element 3: Non-flowering plants

- State that non-flowering plants do not produce seeds. (classification)
- Give examples of non-flowering plants e.g. fungus, moss, lichens and alga is a non-flowering plant.
- State that some fungi can be harmful, whilst others can be useful.

Element 4: Sound

- Demonstrate how a stretched string, skin or vibrating stick can produce different notes. (Pitch and loudness).

- State that sound take time to travel.
- State that sound travels through solids liquids and gases.

Element 5: Animals

- Draw and label the main external parts of a fish.
- Identify the internal parts of a fish, e.g. gills, intestines, swim bladder (air sac) and back bone.
- State what fish feed on.
- State that water contains dissolved air.
- Describe how fish move, and state the function of the swim bladder.
- State the importance of fish in the diet. (Source of proteins).
- Describe a fish form.
- Describe ways or methods of preserving fish.
- Discuss the effects of overcrowding in a fish pond in relation to food supply in the pond.

Element 6: Communication

- Describe how to make a telephone call.
- Draw a black diagram of the components of the telephone system.
- Describe how radio messages are sent and received.

Element 7: Human Being

- Draw a human alimentancy canal and label the mouth, gullet, stomach, liver, small intestine, large intestine and anus.
- Identify the four types of teeth and state their functions.
- State that food is digested in the mouth, stomach and intestine.
- State that digested food is absorbed in the intestines and anything left is expelled through the anus as faeces.
- List the common foods as belonging to various groups.
- State sources and functions of food nutrients (proteins, carbohydrates, fats, minerals) (e.g. Iron and calcium) (A, B, C, D), vitamins - body, protection etc.
- Discuss the importance of a balanced diet.
- State that disease in human beings can be caused by inadequate intake of the right type of food.
- State the type of food and the disease by its deficiency.
- Describe the effects of alcohol and other drugs on the organs of digestion.

Element 8: Magnetism

- Make a magnet by electro-magnetic and stroking methods.
- Identify material that can be attracted by a magnet.
- Use North to identify the poles of a magnet.
- Demonstrate the laws of repulsion and attraction.

- Demonstrate different ways of demagnetising magnet.
- Use a magnet to distinguish a magnet from a non-magnet.
- State the uses of magnets.

Element 9: Air

- Demonstrate the physical properties of air, that air has weight, exerts pressure and that it is a mixture.
- Describe evaporation.
- Discuss the importance of evaporation in everyday life, e.g. cooling, rain cycle.

Element 10:   Animals

- Describe adaptations shown by reptiles and amphibians to their way of life.
- Name animals classified as amphibians and reptiles.
- Describe life cycles of a lizard, frog or a toad.
- Study and record the features of a frog or toad and that of a lizard or gecko. compare parental care in frogs and in man.
- State that an amphibian is an animal that spends part of its life in water as a tadpole and part of land as an adult.
- Discuss methods of conserving amphibians and reptiles e.g. crocodile farming.

Element 11:   Electricity

- Classify substances as conductors and insulators.
- Describe the action of a fuse and a trip switch, and state their correct positions in a circuit.
- Explain why and how some electrical appliances should be earthed.
- Describe how to wire a 13 amp plug.
- Identify a short circuit both in an actual circuit and in a circuit diagram using appropriate symbols.
- Make and draw a simple circuit with bulbs in series using appropriate symbols.
- Make and draw a simple circuit with bulbs in parallel.
- Suggest some causes of lightning.
- State some effects of lightning on plants, animals and buildings.

GRADE 6 SCIENCE - SCHEME OF ASSESSMENT

The assessment will consist of a written multiple-choice questions (30) 60 minutes.

The test will be designed to assess:

- Knowledge: The ability to recall previously learned material from specific facts to complete theories and concepts.
- Comprehension: The ability to grasp the meaning of material. This may be shown by translating material from one form to another, interpreting material and by estimating future trends. (Consequences or effects).

GRADE 6 SCIENCE

VERSION 1

30 QUESTIONS - 30 MARKS - 60 MINUTES

1. When the moon comes between the sun and the earth........... takes place.

   A. Eclipse of the sun
   B. Eclipse of the moon
   C. Eclipse of the earth
   D. Eclipse of a star

2. Where does the moon get its light from?

   A. Earth
   B. Itself
   C. Sun
   D. Star

3. Water for a large city is made safe to drink by adding........... to it.

   A. Acid
   B. Sulphuric acid
   C. Vinegar
   D. Chlorine

4. The water from lakes and rivers should be boiled before we use it for drinking. This is to.......................

   A. Remove the dirt from it
   B. Make the water soft
   C. Kill the germs in it
   D. Make the water tastier

   The pressure exerted by a liquid depends on its

   A. Volume
   B. Mass
   C. Depth
   D. Surface area

   Yeast that we use in the baking of bread is a kind of useful.......... ....

   A. Bacteria
   B. Fungus
   C. Pest
   D. Parasite

7. A mushroom is in a set of...................

   A. Germs
   B. Virus
   C. Parasites
   D. Fungi

8. Which one of these instruments uses a string to produce sound?

   A. A guitar
   B. A drum
   C. a trumpet
   D. a flute

9. Blowing over the open end of a cap of a fountain pen creates sound because.
   A. Air in the cap vibrates
   B. air outside the cap vibrates
   C. Lips of the person blowing vibrate
   D. Air in the cap stops vibrating

10. The movements that cause sound are called.......

    A. Pitch
    B. Noise
    C. Reflections
    D. Vibrations

11. A fish uses them for swimming in water. They are.........

    A. Fins
    B. Gills
    C. Scales
    D. tails

12. Fish uses................ for breathing

    A. Gills
    B. Stomata
    C. Lungs
    D. Pores

13. What is the name of the part marked X on the diagram?

    A. Set
    B. Dialling piece
    C. Earpiece
    D. transmitter
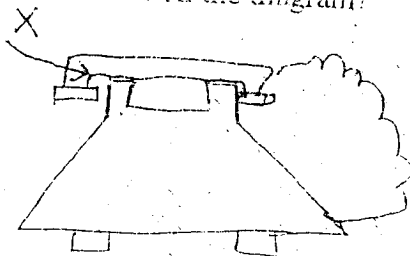
14. The changing of food which animals eat so that the food can be used by the body is

 A. Perspiration
 B. Oxidation
 C. Digestion
 D. Sweating

15. Which one of the following is a body-building food?

 A. Carrot
 B. Cassava
 C. Kapenta
 D. Cabbage

16. Orange and lemon are good source of.............

 A. Vitamin A
 B. Vitamin B
 C. Vitamin C
 D. Vitamin D

17. Which of the following teeth are specially made for grinding food?

 A. Incisors
 B. Molars
 C. Canines
 D. Bicuspids

8. A compass is a suspended........

 A. Solid
 B. Magnet
 C. Spring
 D. Coil

Which one of the following metals will not be attracted by a magnet?

 A. Iron
 B. Steel
 C. copper
 D. Cobalt

An experiment was performed using two similar magnets as shown below
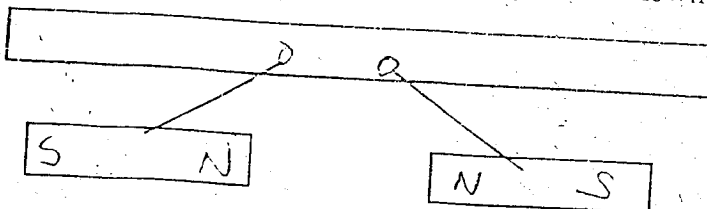
Which one of the following conclusions is correct?

  A. Magnets attract each other
  B. South pole and South pole attract
  C. South pole and North pole repel
  D. North pole and North pole repel

21. Air is a mixture of ....

  A. Salts
  B. Water
  C. Gases
  D. Liquids

22. Evaporation takes place when

  A. Steam turns to water
  B. Water turns to steam
  C. Water turns to ice
  D. Ice turns to steam

23. Which of the following is a reptile?

  A. Grass hopper
  B. Snake
  C. Bird
  D. Bat

24. Tadpoles grow and change to...............

  A. Frogs
  B. Snails
  C. Tortoises
  D. Reptiles

5. Which stage of the frog's life cycle uses the gills to obtain air?

  A. Egg
  B. Larva
  C. Tadpole
  D. Adult

. A circuit - breaker is commonly known as... ....

  A. A pole-line
  B. A transformer
  C. A switch
  D. a battery

4

27. Which list contains objects that allow light to pass through?

A. Glass, water and air
B. Glass, copper and water
C. Water, silver and air
D. air, iron and water

28. Which of the following is an insulator of electricity?

A. Copper
B. Carton
C. Glass
D. Water

29. the picture below shows part of a wire to be connected to the "line" pin of an electric three-pin plug
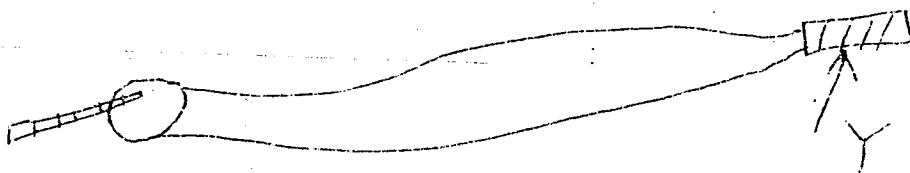
Which of the following materials can be used to make party Y?

A. Rubber
B. Plastic
C. Copper
D. Wood

30. Select the diagram that represents a battery

A.

B.

C.

D.

MATHEMATICS - TEST - GRADE 6 (VERSION 1)

30 QUESTIONS - 60 MINUTES

1. The symbol E means ......

    A. empty set
    B. member of
    C. not a member of
    D. · subset

2. One hundred plus ten thousand can be written as ....

    A. 1010
    B. 10100
    C. 10010
    D. 1110

3. The value of the digit underlined in numeral 3 8 5 0 is ......

    A. 8
    B. 80
    C. 800
    D. 8000

4. 10101 in words can be written as ....

    A. one thousand one hundred one
    B. ten thousand one hundred one
    C. one hundred one thousand one
    D. ten thousand one hundred eleven

5. Which symbol should be put in the space to make the sentence true?
    23 □ 4 = 19

    A. +
    B. -
    C. ÷
    D. x

6. 73 + 27 =

    A. 46
    B. 90
    C. 100
    D. 110

7.
$$\begin{array}{r} 93\ 723 \\ +\ 27\ 865 \\ \hline \end{array}$$

A.   75 850
B.   66 858
C.   65 968
D.   65 858

8.   Subtract .. ..

$$\begin{array}{r} 9.82 \\ -\ 6.87 \\ \hline \end{array}$$

A.   2.35
B.   2.95
C.   3.45
D.   16.09

9.   Multiplying 247 by 3 give .....

A.   741
B.   650
C.   244
D.   240

10.   Mrs Banda sold 25 packets of pencils.   If each packet had 20 pencils, how many pencils did she sell?

A.   500
B.   252
C.   45
D.   5

11.   18 450 ÷ 450 =

A.   31
B.   41
C.   45
D.   51

12.   How many classes of 25 children each can be made from a total of 200 children?

A.   8
B.   80
C.   175
D.   5000

13.
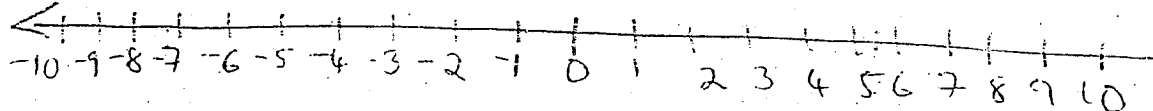
Start at zero (0), go to 6 to the right and 4 to the left. Where are you now on the number line?

A. 10 B. 0 C. 2 D. 4

14. Which of the following numbers can divide 36 without leaving a remainder?

A. 2,4,5
B. 3,6,9
C. 4,12,16
D. 8,12,18

15. 4/10 + 6/10 =

A. 1
B. 2
C. 10/20
D. 46/100

16. Which symbol should be put in the ⬜ to make the sentence: 1/2 ⬜ 3/4 true?

A. =
B. >
C. >
D. <

17. 0.11 + 0.1 + 0.111

A. 0.233
B. 0.311
C. 0.321
D. 0.323

18. What is 50% of 3?

A. 1.25
B. 1.50
C. 2.00
D. 3.50

19. 80% written as a fraction is . . . .

A. 1/5
B. 2/5
C. 3/5
D. 4/5

3.

20. What is the ratio of the length of a side of a square to its perimeter?

    A.   1:1
    B.   1:2
    C.   1:3
    D.   1:4

21. The ratio of boys to girls in a class is 3"2. If there are 30 boys how many girls are there in the class?

    A.   15
    B.   20
    C.   35
    D.   not given

Use the train timetable below to answer question 22 and 23.

Station	Arrive	Depart
Lusaka		13.15
Chisamba	18.00	18.02
Kabwe	18.59	19.04

22. How long does the train take to travel from Lusaka to Chisamba?

    A.   4 hours and 15 minutes
    B.   4 hours and 45 minutes
    C   6 hours and 2 minutes
    D.   6 hours and 45 minutes

23. How long does the train stop in Kabwe?

    A.   4 minutes
    B.   5 minutes
    C.   45 minutes
    D.   59 minutes

24. How many grams in 5kg?

    A.   4g
    B.   40g
    C.   400g
    D.   4000g

25. 3.590 litres + 1.550 litres =

    A.   4.410 litres
    B.   5.410 litres
    C.   5.140 litres
    D.   5.410 litres

4.

26. A square has a perimetre of 144cm. What is the length of its side?

    A.   12cm
    B.   36cm
    C.   46cm
    D.   72cm

27. What is the volume of the cube below?

    A. $4cm^3$
    B. $6cm^3$
    C. $8cm^3$
    D. $16cm^3$

2cm
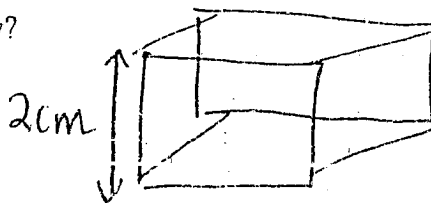
28. John got 55%, Mary 60%, Victor –45% and Bill –35% in a Mathematics Test. What was the average mark?

    A.   35%
    B.   48.75%
    C.   58.75%
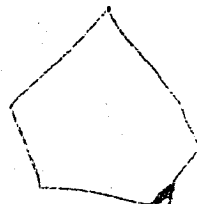   D.   68.75%
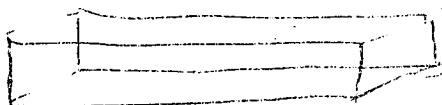
29. Which of the following shapes is a triangle?
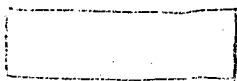
A   B   C   D

30. The number of faces in the cuboid shown is:

    A.   4
    B.   6
    C.   8
    D.   10

5.

MASTERS' RESEARCH PROJECT
PERFORMANCE LEVELS IN PAGE SCHOOLS
GRADE 4 -- SCIENCE
ENVIRONMENTAL SCIENCE - PROGRAMME OF STUDY

Aims

Pupils should be encouraged to:

- Develop an attitude of scientific curiosity and equiry.
- Develop the skills necessary to investigate a situation in a scientific manner.
- Develop an understanding of man as a living organism, and his place in nature.
- Develop an increased awareness of the variety of life and of the relationship of living things to their environment.

Assessment Objectives

Pupils should be able to:

Element 1: Animals

- Identify parts of an insect
- Describe the life cycle of a butterfly and contrast it with that of a cockroach.
- Discuss the economic importance of insects e.g. pollination and pests.

Element 2: Pressure

- Observe and name two factors (weight and area) that determine the depth of impression.
- State that the height of water tanks determine the strength of water from pipes.
- State areas in which pressure is applied.

Element 3: Human being

- Label the external features of an eye.
- Describe the functions of parts of the eye.
- Demonstrate the effects of the blind spot.
- Label a simple diagram of the human ear.
- State the functions of the pinna.

Element 4: Light

- Demonstrate that light travels in straight lines.
- Reflect sunlight from shiny objects.
- Group substances into transparent, opaque and translucent.
- State the various uses of mirrors

Element 5: Air

- State that air is necessary for living things.
- State that air is necessary for burning.
- State that polluted air is bad for living things
- Discuss how air pollution can be prevented.

Element 6: Plants

- State methods of seed dispersal.
- State advantages and disadvantages of seed dispersal.
- Group seeds and fruits according to methods of dispersal.
- Discuss the effects of overcrowding in plants.

Element 7: Ecology

- Appreciate the interdependence of organisms.
- Construct food chains involving plants and several types of animals.
- State the importance of conserving plants and animals.

Element 8: Machines

- Give examples of simple machines.
- Describe the advantages of using simple tools.
- Describe friction as a force resisting movement.
- State that cleaning and lubrication reduce friction.

Element 9: Classification of animals

- State the main external features of animals e.g. insects, fish, amphibians, reptiles, birds and mammals.
- Group animals on the basis of their features.
- State methods of conserving animals.

SCIENCE - SCHEME OF ASSESSMENT

The assessment of science will consist of a written multiple-choice questions (30) - 60 minutes.

The test will be designed to assess:

- Knowledge: the ability to recall previously learned material from specific facts to complete theories and concepts.
- Comprehension: the ability to grasp the meaning of material. This may be shown by translating material from one form to another, interpreting material and by estimating future trends (consequences or effects).
- Application: the ability to use learned material in new and concrete situations. Involving the application of such things as rules, methods, concepts, principles, laws and theories.

1. Which of the following spread malaria?

    A.   house flies
    B.   mosquitoes
    C.   ants
    D.   tsetsefly

2. Which of the following is a good way of preventing malaria?

    A.   drinking clean water
    B   sleeping under mosquito nets
    C   sleeping with your clothes on.
    D.   switching off the lights

3. How many parts of the body has an insect?

    A.   1
    B.   2
    C.   3
    D.   4

4. Insects breathe through their ....

    A.   gill
    B.   skin
    C   spirades
    D.   nose

5. Deep sea divers wear special suits. This is to protect their bodies from.

    A.   the water animals
    B.   the very cold water
    C.   the light water pressure
   D.   the high density of water

6.
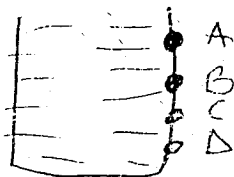
Water is poured into a can that has four holes on its side. From which hole will water come with greatest force?

7. Study the diagram below
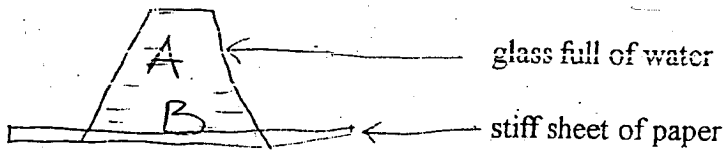
The water in the glass cannot flow out at first because ....

A. of air pressure on side C of the glass
B. of water pressure on side B
C. air presses hard on side A
D. air presses hard on side B

8. Light enters your eyes through a small hole called the ....

A. retina
B. iris
C. nerve
D. pupil

9. Look at the diagram of the eye. Which part controls the amount of light getting into the eye? Diagram on page 6

10. Which part of the ear helps to collect sound and pass it on to the middle ear

A. eardrum
B. pinna
C   auditory canal
D. ear bones

11. In the following diagram, which is the angle of reflection?

Reflecting surface (mirror)
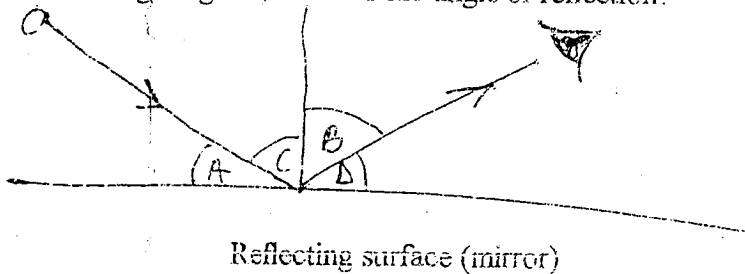
A.
B.
C.
D.

12. Look at the diagram. If the hole in card C is covered, there will be no light between:

CARDS
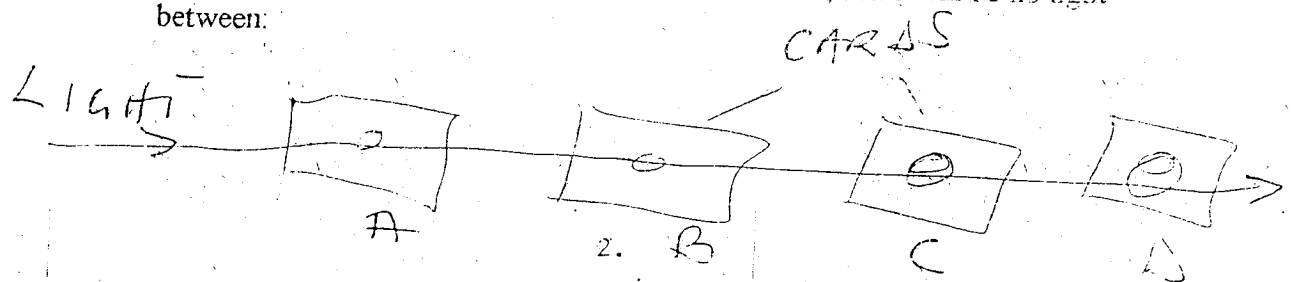
A.	A and B
B.	B and C
C.	C and D
D.	A and D

13	Light cannot pass through certain objects. these objects are known as .....

A.	opagne
B.	translucent
C.	transparent
D.	black objects

14.	Which gas in the air is needed by both burning and breathing of animals?

A.	nitrogen
B.	oxygen
C.	carbon-dioxide
D.	fuel

15.	Which one of the following is not a cause of air-pollution?

A	industrial waste
B	burning fuel
C.	pesticides
D	recycling of waste products

16.	Air pollution can be reduced by........

A.	developing engines that use fuels which pollute less
B.	using fertiliser
C.	burning of fuels e.g. in domestic fires
D.	using kerosene lamps

17.	Plants need to scatter their seeds. This process is known as the .... of seeds.

A.	germination
B.	dispersal
C.	osmosis
D.	preservation

18.	During the dry season some trees drop down their leaves. This is a way of ...

A.	seed dispersal
B.	keeping insects away
C.	getting more water from the ground
D.	lowering loss of water through transpiration

19. Which one of the following seeds is NOT correctly matched with its agent of dispersal?

	Seed	Agent
A.	Pawpaw	Animal
B.	Coconut	Water
C.	Black-jack	Animal
D.	Castor(Beans	Wind

20. A fruit of a certain plant is shown in the diagram below.
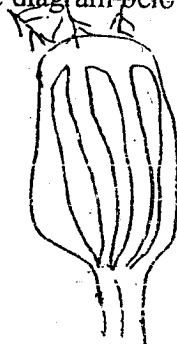
The fruit is mainly dispersed by

A. winds
B. animals
C. explosive mechanism
D. water

21. Which method of seed dispersal is demonstrated in the diagram. It is seed dispersal by

A.
B.
C.
D.
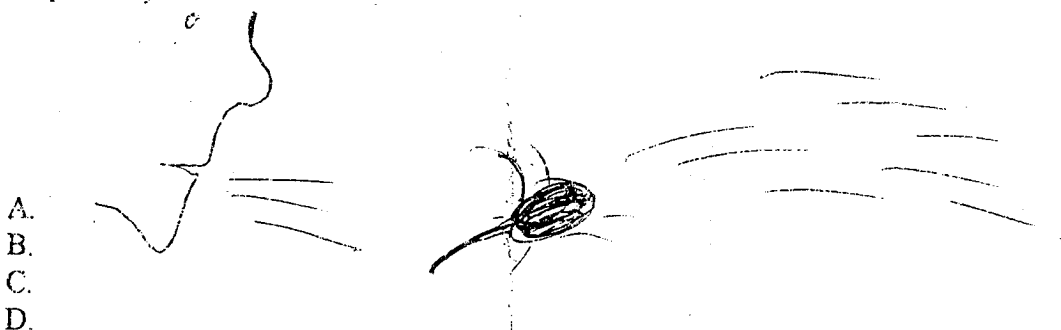
22. Plants EATEN animals DIE microbes
       BY   AND
                    BROKEN
                    UP BY

In the diagram above, microbes play the part of ....

A. producers
B. consumers
C. decomposers
D. parasites

23. Animals that eat other animals are called

    A. browsers
    B. carnivores
    C. grazers
    D. herbovores

24. Some parts of machines need oil to reduce.......

    A. weight
    B. friction
    C. tyre wear
    D. bending

25. The force that is applied to a machine is called ....

    A. effort
    B. pivot
    C. load
    D. friction

26. One of the following animals is a mammal.

    A. crocodile
    B. hippo
    C. tortoise
    D. shark

27. One of the following animals is not a bird.

    A. penguin
    B. bat
    C. chicken
    D. duck

28. Which of these is not a mammal?

    A. cat
    B. man
    C. monkey
    D. lizard

29. Seeds dispersed by wind should be.....

    A. tiny and hard
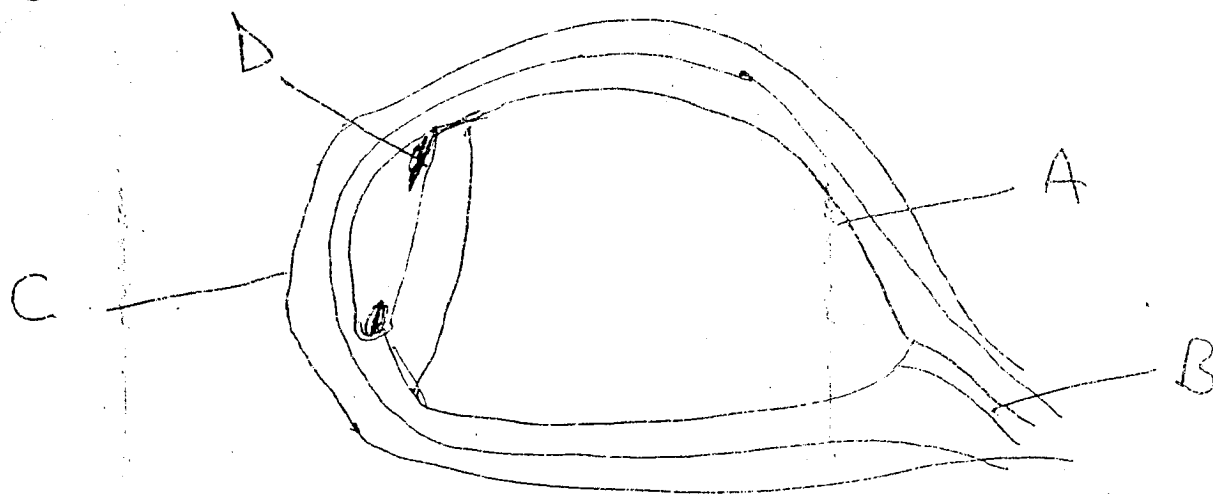   B. light and featherly
    C. heavy and featherly
    D. flat and hard

Use figure below to answer questions 30
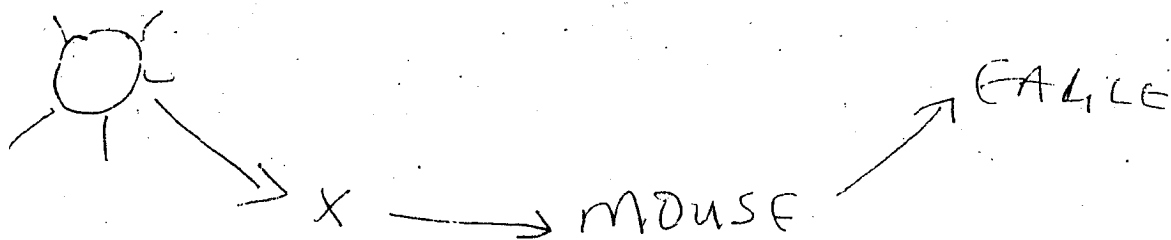
30. What part of food chain represented by x is missing?

A. air
B. carnivores
C. plants
D. soil

Diagram for question 9

6.

MATHS - VERSION 1   GRADE 4

30 QUESTIONS - 60 MINUTES

1. What is the symbol used to show the "Union of sets"?

   A. C
   B. U
   C. N
   D. E

2. If set m = 1, 3, 5, 7, 9 , how many members are there in set m?

   A. 1
   B. 2
   C. 4
   D. 5

3. What is the value of 5 in the number 65?

   A. Tenths
   B. Tens
   C. Ones
   D. Zero

4. 3065

   A. Thirty hundreds, six tens and five ones
   B. Three thousand, six hundreds and five units
   C. Thirty six hundreds and five ones
   D. Three hundreds six tens and five ones

5. 3 tens plus 6 ones

   A. 36
   B. 30
   C. 9
   D. 306

6. Which symbol should be put in the space to make the sentence true?

   A. 20 ☐ 10 = 2

   A. +
   B. -
   C. ÷
   D. x

7. $\square$ + 20 = 80

    A. 50
    B. 60
    C. 90
    D. Not given

8.   453
  - 176

    A. 277
    B. 287
    C. 375
    D. Not given

9.   41
    87
    4
  + 17

    A. 139
    B. 149
    C. 170
    D. Not given

10.   194 + 239 + 54 =

    A. 308
    B. 487
    C. 1234
    D. Not given

11.   11 + 9 =

    A. 11
    B. 18
    C. 19
    D. 20

12.   76 − 65 =

    A. 9
    B. 10
    C. 11
    D. 12

13. **12 x 2 =**

    A. 14
    B. 12
    C. 24
    D. 48

14. **7 x 5 =**

    A. 33
    B. 35
    C. 42
    D. Not given

15. **58 x 8 =**

    A. 404
    B. 464
    C. 724
    D. Not given

16. **200 ÷ 10 =**

    A. 10
    B. 20
    C. 30
    D. 40

17. **64 ÷ [?] = 8**

    A. 7
    B. 8
    C. 9
    D. Not given

18. **90 ÷ 6 = [?]**

    A. 15
    B. 16
    C. 17
    D. Not given

19. Write the next number in the sequence: 1, 3, 5, 7. _____

    A. 8
    B. 9
    C. 10
    D. 11

20. | 21 | 26 | 31 | ? |

    A. 5
    B. 41
    C. 35
    D. 36

21. eight buns cost K64. What is the cost of one bun?

    A. K6.00
    B. K7.00
    C. K8.00
    D. Not given

22. If 12 pencils cost K24.00, how much would 15 such pencils cost?

    A. K30
    B. K35
    C. K39
    D. Not given

23. How many K500.00 stamps can be bouth *bought* for K2000.00?

    A. 2
    B. 3
    C. 4
    D. 5

24. $\dfrac{48}{8} =$

    A. 56
    B. $57\dfrac{3}{5}$
    C. 6
    D. Not given

25. $\dfrac{3}{5} - \dfrac{1}{5} =$

    A. $\dfrac{4}{25}$
    B. $\dfrac{2}{5}$
    C. 2
    D. Not given

26.   9.37
      + 2.85

       A. 8.93
       B. 11.22
       C. ~~101.22~~ 12·12.
       D. ~~Not given~~ 12:22

27.   K5.72
       x   2

       A. K1.144
       B. K11.44
       C. K11.54
       D. Not given

28.   61.38
       -36.70

       A. 24.68
       B. 25.68
       C. 246.8
       D. Not given

29.   1 metre 90 centimetres =

       A. 100 centimetres
       B. 90 centimetres
       C. 190 centimetres
       D. 150 centimetres

30.   What is the area of the rectangle below?

                              5cm
       A. 3cm^2
       B. 5cm^2
       C. 8cm^2 ┌──────────────┐
       D. 15cm^2 │   │ 3cm
                             └──────────────┘

5