EFFECTIVE SCHOOLS AND LEARNERS' ACHIEVEMENT IN BOTSWANA SECONDARY SCHOOLS: AN EDUCATION MANAGEMENT PERSPECTIVE

by

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DECLARATION

I declare that *Effective schools and learners' achievement in Botswana secondary schools: an education management perspective* is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

……. November 2008

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ABSTRACT

This thesis describes the background and findings of a study of effective schools and learners achievement in Botswana senior secondary schools from an education management perspective. The aim was to identify schools that promote learners' achievement when the students' initial intakes were considered. The study was guided by five research questions. The study adopted an ex post facto design and a quantitative value added methodology to answer the research questions. Simple random sampling was used to select a sample of 5662 from the population of 58 032 students who wrote the BGCSE examinations for 2005, 2006 and 2007. Two sets of data: prior and later achievements at individual student level were collected from BEC and Secondary Education. The statistical software, *MLwiN* 2.10 beta 4, which is based on hierarchical linear modelling or multilevel modelling, was used to analyse the data for the value added by schools. The findings indicated that a) schools differ in their effectiveness. Some schools were more effective than others; b) Ten characteristics of effective schools were identified from the literature review c) schools differed in their consistency across the three core curriculum areas of Setswana, English and Mathematics; d) schools differed in their stability from year to year and e) schools were differentially effective. They were effective for the mid ability students and boys more than the other groups.

The study confirmed that the use of a single statistic measure even in value added analysis could be misleading because of the internal variations between departments in schools. Furthermore, the uses of raw results for measuring school effectiveness were misleading. Some schools which were at the top in raw results were not doing so well in terms of value added and vice versa. The value added measures of school performance proved to be the most appropriate measure of school's contribution to students' learning. The value

added by schools is also a measure of schools' productivity. The study made recommendations to improve practice, such as the use of appropriate and fairer methods to evaluate and compare schools. The areas that need further attention were suggested based on the findings of the study.

Keywords: school effectiveness; value added; school performance; multilevel modelling; school improvement; league tables; effective schools; productivity; factors influencing achievement; school comparisons.

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CHAPTER ONE

INTRODUCTION AND BACKGROUND TO THE STUDY

1.1 INTRODUCTION

School effectiveness research emerged from virtual total obscurity to a now central position in the educational discourse that is taking place within many countries (Reynolds, Teddlie, Creemers, Scheerens & Townsend, 2000:3). The last decade has seen a rapid growth in research and in policy and practitioners' interest in school effectiveness and its potential as a catalyst for school improvement. Government policies in the United Kingdom and elsewhere have sought to draw on school effectiveness and school improvement research in an attempt to raise educational standards (Sammons, 2006:4).

School effectiveness research has its roots in the quantitative input-output studies and economic research on educational production functions by Coleman (in Marzano, 2000:2). The study set out to determine the effect of inputs such as school resources (financial and material) and student background characteristics such as socioeconomic status on school outputs. Coleman (in Marzano, 2000:2) reported that schools had very little influence on children's achievement. What mattered most was family background and societal contexts. The study concluded that the educational process was scarcely worth the relatively large resources poured into them. This 'schools did not matter' study formed the first phase which was from the mid 1960s to the early 1970s and came to be known as school effects. School effectiveness research then continued to evolve in distinct but overlapping phases which can be identified by the type of methodology involved.

There was a swift reaction to the above pessimistic conclusions from the education world. Numerous studies were carried out to refute the schools-don't-make- a -difference findings. The studies went beyond the input - output to include processes. The purpose was to identify the within school factors that affect students' achievement. The case study methodology was used to identify schools that produced favourable outputs when background characteristics were considered. What emerged from these studies were titles such as 'schools matter' by Mortimore, Sammons, Stoll, Lewis and Ecob (1988) and the 'schools make a difference' by Brookover, Beady, Flood, Schweitzer and Wisenbaker (1979) and that there are observable regularities in schools that 'add value'. The studies concluded that the task of educational policies was to improve all schools in general and the more ineffective schools in particular (Reynolds *et al*., 2000:3). This second phase came to be known as the effective schools research.

In the third phase from the late 1970s to the mid 1980s, the shift of school effectiveness research was from identifying effective schools to the creation of effective schools. 'If individual schools had the authority to make their schools effective, as suggested by the original effective school descriptions, then individual schools ought to accept the responsibility for doing so' (Lezotte, 1989:819). The reasoning was that when the effective school processes are followed appropriately, school improvement is effected. This was the school improvement research phase. These three phases: school effects, effective school research and school improvement are the major strands of school effectiveness research (Reynolds *et al*., 2000:4).

The fourth phase of the research, from the late 1980s to the present, has been the introduction of context variables to the input-process-output model and the use of advanced sophisticated methods which have an enhancing effect upon the quality of all the three strands of school effectiveness research (Reynolds *et al*., 2000:4). When the context variables and multilevel modelling were introduced within the input-output (school effects) strand in the mid 1980s, there emerged a distinctive school of value added or school effectiveness research (Jesson,

2000:9-10; Reynolds *et al.*, 2000:12). Peng, Thomas, Yang and Li (2006:137) assert that the latter school effectiveness research developments fed directly into new approaches to evaluate school performance and subsequently to wide ranging policy development into school evaluation in the United Kingdom and elsewhere.

1.2 BACKGROUND INFORMATION AND MOTIVATION OF THE RESEARCH

The value added measures of school effectiveness emerged as a result of the debate surrounding the publication and interpretation of examination results. There are several different strategies that can be used to interpret examination results for comparing schools and for accountability. Heck (2000:516) traces some of these strategies. The easiest way is to compare the schools' raw scores with each other or with the national average or local average to make statements about the effectiveness of each school. This is the standard model. It is the most commonly used approach, however, it provides a biased view of what schools contribute to students' learning because of its failure to consider the students' composition or the previous level of achievement. Heck (2000:516) contends that this approach incorrectly assumes that all the observed differences in raw scores are due to the differences between schools.

The second approach is to compare schools that have similar students' backgrounds and contextual factors. Although this approach attempts a more equitable comparison of schools by matching them in terms of key criteria, a disadvantage is that it often relies on arbitrary cut points within the data to form the comparison groups (Heck, 2000:516). This approach also ignores the hierarchical structure of data (students nested in classrooms within schools).

A third approach is to present exam results contextually based on the kind of students attending each school and hence allows for 'like with like' comparisons to be made. From a policy standpoint, this is an attractive means

of determining how much value a school adds to students' learning given its particular student challenges. The assumptions underlying a value added approach is that students' achievements are significantly affected by their backgrounds and contextual conditions. Heck (2000:516) asserts that this approach emphasises "net productivity".

The school effectiveness research has criticised the first two approaches to evaluating schools' performances and to make comparisons between schools. The major flaw in using raw results to make judgements about school performance is that they fail to take into account the intake differences between schools in terms of ability, motivation of students, family background and their communities (Sammons, 2006:6). It therefore, runs the risk of rewarding schools for producing 'good' results from the quality of their intakes whether they have taught or not. Although they are good in showing the actual performance in a subject, they however tell us more about the prior ability of the students in a school than the performance of the school *per se*. A high level of attainment could simply indicate a high quality intake (Gray & Wilcox, 1995:17; Schagen & Schagen, 2005:310). There is therefore no justification for publishing them alone since they provide little, if any, information about a school's performance.

In his report, the late Sir Ron Dearing has warned of the dangers of ignoring value added evaluations and the reliance on raw results. He argues in Strand (1997:472) that:

> Without a value added dimension, the obvious basis for judgement is that higher scores represent better practice and lower scores worse. This could lead to complacency on the part of some schools whose pupil population comprise more able students, and conversely, to despair on the part of others, who, however hard they try can never expect to raise the level of their pupils' scores to those obtained in schools with more able pupils.

Based on this interim report, a value added approach has received official recognition in England as a means of overcoming some deficiencies of raw results. A value added approach is now regarded as the fairest method of judging school performance and have been published annually for all government maintained secondary schools since 2002 (Sammons, 2006:6).

Goldstein and Thomas (1996:154) and Sammons, Thomas and Mortimore (1997:44) conclude that trying to make judgements about the effectiveness of schools from raw exam results lead to misleading conclusions. In their studies on the value added by schools and departments, they found that some schools that were identified as having below average raw results were found to be performing well in terms of the value they added, while the schools with very good raw results were performing below expectation when the students' intake was considered.

The school effectiveness research argues that any comparison of schools' results should be conducted fairly to ensure that 'like is compared with like'. Nuttall (1990:25) argues that:

Natural justice demands that schools are held accountable only for those things that they can influence (for good or ill) and not for all the pre-existing differences between their intakes. The investigation of differential school effectiveness, concentrating on the progress students make while at that school, therefore has a major role to play in the future.

What a school can influence and therefore could be held accountable for is the progress of learners. For nearly thirty years, research on school effectiveness has used progress made by students from their level of performance on entry to their level of performance at the time they leave, rather than their raw results (Mortimore, Sammons & Thomas, 1994:318). By focussing on progress or value added by the school, it is possible to investigate whether some schools are more

effective than others in promoting their students' progress and thus their final level of achievement (Sammons *et al*., 1997:7).

The Botswana government has set herself goals in every sector of the economy that need to be achieved by 2016 when the country attains fifty years of independence. These goals are known collectively known as Vision 2016. For the education sector, the goal to be achieved is "an informed and educated nation". The Ministry of Education and Skills Development realised that for this goal to be achieved, it will have to deliver its mandate effectively. To this end, the Department of Secondary Education introduced the pastoral system in all secondary schools in 2007 to improve the quality of education as a contribution towards achieving "an educated, informed nation" (Department of Secondary Education, 2007:1). Pastoral care is concerned with the psycho-social, academic and co-curricular development of the learner. The academic aspect deals with instructional delivery and reception of the curriculum. The pastoral policy states that 'central to the schools existence is the academic performance and measures of good performance should include the concept of **value addition'** (DSE, 2007:3). According to the policy, the key result areas are: improved school discipline; improved effectiveness and efficiency in leadership and management of schools; improved academic performance; and increase in stakeholder involvement. In addition, the policy outlines the key components that make the pastoral policy to be effective. Schools are to collect and report on these components every term to the inspectoral regions which in turn report to the Department of Secondary Education and to the Ministry of Education and Skills Development ultimately. The components are: leadership and management, school discipline; students' academic performance; guidance and counselling; stakeholder involvement in school governance; and co-curricular activities (DSE, 2007:5-6). The department believes that when the pastoral policy is implemented, it will lead to the best student academic performance and discipline and hence "an informed and educated nation by 2016".

A study of school effectiveness will help in identifying effective and ineffective schools. The effectiveness of schools will determine how far the Ministry of Education and Skills Development is from achieving the aforementioned goal of Vision 2016. The study will also help in identifying areas where schools will need to focus to improve students' achievement if the goal of Vision 2016 is to be attained.

There are twelve years of basic education in the Botswana education system. There are seven (7) years of primary education and at the end of this level, pupils write their Primary School Leaving Examinations. At the moment, there is a one hundred percent progression rate from primary school to the three years of junior secondary school (Form one to three). At the end of Form three, pupils write the Junior Certificate Education examinations. The performance at this level and the availability of spaces determine the progression into senior secondary level (Form four -five). To proceed to senior secondary, a pupil should have obtained grade C or better. The Ministry of Education and Skills Development has increased access into the senior secondary level by introducing the double shift programme in some schools. There are basically two schools in one school in this programme. The ultimate goal is to achieve one hundred percent progression into senior schools. This means that every year the pass mark is lowered in order to increase access. Therefore, a lot of pupils of lower ability level are being admitted into senior schools than before. The schools have no say in the type of students they get at whatever level. At the end of senior secondary school in Form Five, students write the Botswana General Certificate of Secondary Education (BGCSE) examinations. The grades that can be obtained in individual subjects are: A* to U. The point system , where A*=8, A=7, B=6, C=5, D=4, E=3, F=2, G=1 and U/X = 0 is used to determine the overall performance of each student. The higher the points are, the better the student's performance. Progression into tertiary institutions is largely determined by the performance at this level.

The Botswana Examination Council (BEC) publishes the BGCSE examination results using the percentage of students who have obtained five grade Cs or better. These are credit passes. The credit passes method is also known as raw results since the results have not been adjusted to take into account the students' background variables. Based on these credit passes, schools are ranked from highest to the lowest credit pass (*cf.* Appendix 10). This ranking produces a league table. The raw results and the league tables are being criticised by school effectiveness research. The use of the credit passes to make judgements about the effectiveness of schools has resulted in a number of issues. Firstly, it has led to unfair comparisons of schools with students from different backgrounds and different intake abilities. It makes intuitive sense to say that it is unfair to compare schools' BGCSE examination results when the initial intake cannot be compared. The playing ground is not levelled because 'like is not being compared with like'.

Secondly, while no self respecting education researcher would consider these raw scores to be indicative of the effectiveness status of a school, lay people, uninformed government officials and the media often use them as a means of judging the effectiveness of schools. What is worse is that, the very people who should inform the rest of the public use these raw scores as measures of effectiveness. Using the ranking in league tables, some schools were in 2004 identified by the Department of Secondary Education in the Ministry of Education and Skills Development, as schools whose performances have been below average for some years and were a concern. Some Education Officers were then attached to these schools to help them to improve their ranking on the league tables. In a recent pastoral policy meeting for Senior Management Teams for secondary schools, some schools were praised by the same department for consistently showing 'good' performance and once again this 'good' performance was equated with the position in the league table.

Although the credit passes were used to measure the performance of the 2007 BGCSE exams, BEC did not rank schools into position as in the previous years.

This left the media to rank schools and publish the results of the top ten schools using league tables. One educationist from one senior school attempted a "value added" analysis in which the value added was the difference between the school's final credit passes and the credit passes at intake. The schools were then ranked into position (Sealetsa, 2008:9) and this was published in one of the local newspapers. The 'value added' analysis produced inaccurate and misleading conclusions about the effectiveness of schools. Without a proper and accurate value added methodology, the effectiveness of senior secondary schools will remain unknown to the teachers, students, school administrators, the taxpayer, parents and indeed to the Ministry of Education and Skills Development.

It has already been mentioned that schools are expected to add value to students' prior achievement and that 'measures of good performance should include the concept of **value addition**' (emphasis supplied). A correspondence from the Central Region to the schools (REF CREOS 1/19/IV (175)) dated 22 May 2008, on the national performance target stated that:

> The national target set by the Department of Secondary Education was 80.1% for 2008. The region has adopted the set target and therefore all schools were argued to put strategies in place to help to achieve this target. A major component of this target is value addition. The performance of all students should be tracked to determine if there is any value addition.

The above statements lead the researcher to ask some questions. What do we understand by the concept of value addition? How should schools carry out value added analysis? Will the results by individual schools be a true indication of a school's effectiveness? At the moment, the schools which claim to be carrying it out, use a simple comparison of how many grade As, for example, have been raised into Merits? If a value added methodology has the potential of determining the effectiveness or ineffectiveness of schools, why is it left to

individual schools? There is therefore, a lot of talk about value addition but no whole hearted endorsement on helping schools to do it.

The use of credit passes to judge schools' effectiveness and the inappropriate 'value addition' methodologies being used in Botswana by some individual schools has motivated the researcher to explore the possibility of using appropriate value added methodology to determine the effectiveness of secondary schools in Botswana.

In a meeting held by the BEC (Examination Research and Testing Division by then) in March 2007, it was explained that the method that is being used to compare schools since 2000, was 'borrowed' from the UK but if any school had a better method to compare schools, BEC would be glad to embrace it. The credit passes have been supplemented by the value added methodology in England since 2002 because of the deficiency and inappropriateness of the credit passes. This crystallised the researcher's motivation to carry out the study.

The unadjusted or raw BGCSE exam results measure the students 'actual performance in the BGCSE exam and not the effectiveness of the school attended. Can we say with all the certainty that the schools at the top of the league table are more effective than those at the bottom? Can schools be held accountable on the basis of this information?

1.3 THE RESEARCH PROBLEM

From the afore-going background information on the school effectiveness debate and the situation in the Botswana education system, the following research problem has been identified:

1.3.1 What does the concept of school effectiveness mean and what are the characteristics of effective schools?

1.3.2 In what way can a value added approach to determining school effectiveness contribute to judging school performance?

1.3.3 How effective are secondary schools in Botswana? Are some schools more effective than others in promoting students' progress when the differences in student intake are considered? Are schools equally effective/ineffective for all the student groups? Are the schools consistently effective/ineffective across the core subjects? And are the schools stable in their effectiveness/ineffectiveness for 2005-2007?

1.3.4 What recommendations could improve the practice of determining effective/ineffective schools and the performance of secondary schools in Botswana?

The first question looks at the processes that make school X to be more effective than school Y as identified by more than two decades of empirical research and research reviews. The third question asks questions that are fundamental to any study on school effectiveness. The second part of the question asks whether schools make a difference. Is there any effect of attending school X than school Y? The third part of the question is on differential effectiveness. The fourth part of the question regards the issue of consistency across subjects. This is important regarding the internal variations in schools. The fifth part of the question on stability looks at outcomes across years. Are schools that produce exceptionally good results in one year just as effective in other years? This is important to determine if a school is improving or declining.

This investigation will answer three important questions that Sammons *et al*. (1997:57) and Sammons (2001:14; 2006:11) argue that they should be considered when making judgements about the effectiveness of schools: Effective in promoting which outcomes? (the what of effectiveness); effective for which student groups? (the who of effectiveness) and effective over what time period? (the when of effectiveness). These questions when answered, provide a focus for school self evaluation and review and development of improvement

initiatives (Sammons, 2007:12). These questions have implications for the attainment of "an educated and informed nation by 2016".

1.4 THE AIMS OF THE RESEARCH

From the above mentioned problem questions the following research aims for this investigation have been adopted:

1.4.1 To explore the concept of school effectiveness and identify the characteristics of effective schools.

1.4.2 To investigate the possibilities of a value added approach to school effectiveness in judging school performance.

1.4.3 To determine, on the basis of the literature reviewed and the methods adopted by a value added approach, the effectiveness/ineffectiveness of secondary schools in Botswana.

1.4.4 To make recommendations for the improvement of the practice of determining effective/ineffective schools and thereby the performance of secondary schools in Botswana.

1.5 RESEARCH DESIGN AND METHODOLOGY

In order to achieve the research aims, the methodology used to achieve each aim differed. In order to explore the concept of school effectiveness and the characteristics of effective schools, an extensive literature review was adopted. The review was based on the recent review of effective school characteristics by Reynolds and Teddlie (2000:141-144). This is because the review by Reynolds and Teddlie (2000:141-144) was based on the work by Levine and Lezotte (1990) and Sammons, Hillman and Mortimore (1995). Each of these two reviews referred to several hundred studies of effective school characteristics (Reynolds & Teddlie, 2000:141). In Chapter 3, the review of literature focussed on the characteristics of schools that add value to students' prior achievement. An extensive literature review was also carried out investigate the possibilities of a

value added approach to school effectiveness in judging school performance. In addition, multilevel modelling using a statistical package, MLwiN 2.10 Beta (4) was applied to the data set collected to investigate the possibility of a value added approach to judge the effectiveness of schools (*cf.* 5.3).

Other conditions necessary for a value added approach were also established (*cf.* 4.6). From the literature reviewed, a quantitative value added methodology was adopted to determine the effectiveness/ineffectiveness of secondary schools in Botswana (*cf.* 5.2).

To determine the effectiveness/ineffectiveness of secondary schools in Botswana, data was collected after students had finished their secondary schooling and therefore, this made the design to be ex post facto. Two sets of data were collected to determine the relationship between them. This specifically made the design to be correlational ex post facto. The two quantitative sets of data were the students' achievement in Junior Certificate Education examinations (on transfer to senior school) and the BGCSE examination results (two years later). These were obtained from the Department of Secondary Education (admissions) and Botswana Examinations Council respectively.

The data collected had a multilevel structure, that is, students in departments and departments in schools, thus multilevel techniques were used. The statistical package, MLwiN 2.10 Beta (4) based on multilevel modelling, developed by Rasbash, Steele, Browne and Prosser (2008) from the Centre of Multilevel Modelling, University of Bristol in the United Kingdom was used. The research design for the quantitative investigation will be further discussed in Chapter 4.

The target population was the final year students (Form five) for the 2005, 2006 and 2007 cohorts in all the twenty seven (27) government and government aided senior secondary schools. A representative sample of five thousand six

hundred and sixty six (5662) students was taken from the population of fifty eight thousand and thirty two (58 032) students using proportionate simple random sampling.

1.6 THE SIGNIFICANCE OF THE STUDY

The study has some contributions to make both locally and internationally. At the local level, it has already been mentioned in the introduction, the contribution this study will make towards the achievement of the "informed and educated nation" pillar of Vision 2016.

The findings of this study will make a contribution to the ongoing international debate surrounding the use of schools' raw exam results as a measure of the effectiveness of schools. The debate is almost over in developed countries like the UK where the value added performance by schools has been published since 2002. The debate is not yet over in developing and third world countries. The researcher is of the opinion that the study will inform policy development towards more accurate and reliable measures of school performance, that is, value added analysis.

Riddel (in Scheerens, 2004:23) observes that a third wave of school effectiveness research in developing countries is in danger of being lost without ever having been explored. By the third wave she was referring to the use of multilevel modelling to measure school effectiveness. This study contributes to school effectiveness research studies that use sophisticated technique of multilevel modelling in developing countries.

Scheerens (2000:91) contends that school effectiveness has the potential for "providing substance to school for the otherwise rather *procedure* oriented discipline of school improvement". The researcher hopes that the results will stimulate schools' self evaluation and practitioners' reflective enquiry to explore the possible explanations for the school's results. Schools can focus on changing

conditions at the school, department or classroom level for school improvement to be effective.

1.7 DELIMITATIONS AND LIMITATIONS OF THE STUDY

The study will be delimited to government and government aided senior secondary schools. It will be delimited to three subjects and three cohorts for 2005-2007. In addition, the value added results from the core subjects will not be generalised to optional subjects.

Multilevel modelling will give a quantitative measure of the value added by schools. The schools could be further scrutinised by means of intensive case studies in order to form a link between the quantitative measure and the qualitative investigation of processes that make schools to be effective. However, this study is limited to the quantitative analysis only.

Students' academic achievement is not the only important goal of education that can be used to judge school effectiveness. Multiple indicators of school effectiveness are required such as, attitude to learning, continuation in education (progression to tertiary level), employment, behaviour, social functioning and attendance. While these are desirable, academic achievement still remains the main indicator of school performance and selection into tertiary placement. The study is narrowed to students' academic achievement only.

1.8 DEMARCATION OF THE RESEARCH

The study reported here is on the fourth phase of school effectiveness research which employs sophisticated statistical methods of multilevel modelling to the study of school effects or value added. School effects research is concerned with the scientific properties of school effectiveness, namely; the existence of school effects, consistency, stability, differential effects and the magnitude of school

effects. The quantitative analysis will give answers to these scientific properties of school effectiveness.

1.9 DEFINITION OF TERMS

The following terms are defined in order to provide an understanding of how they will be used in this study. The definitions of other key concepts are presented in the relevant chapters.

School effectiveness

This study will use the most widely accepted operational definition in the school effectiveness research by Mortimore (1991:9) to define an effective school. In an effective school students progress further than might be expected from the consideration of the schools' intake. According to this definition, an effective school adds value to students' prior attainment (Stoll & Fink, 1996:26-27).

Value added

Value added is a quantitative measure of the relative progress made by learners in a school over a particular period of time in comparison to learners in other schools. Since this definition refers to academic achievement, precisely, value added refers to the relative boost that a school gives to students' previous level of attainment in comparison to similar students in other schools. When the students progress further than might be expected, the value added score is positive. When the progress is less than expected, the value added score is negative.

The terms school effectiveness, school effects, effective school and value added will be used interchangeably in the present research. Therefore, school effectiveness will be described as the value added effectiveness.

School effect

School effects will be defined as the unique effect of schools on individual students after adjusting for the intake characteristics of the school. There is an effect associated with attendance at a particular school. This effect is also technically known as a residual or value added.

Student

The term student will refer to a learner in a senior secondary school. It will be used interchangeably with pupil. A learner's achievement will be the Botswana General Certificate of Secondary Education attainment in core curriculum subjects and overall BGCSE attainment in all the subjects.

Raw results or credit passes

These are examination results that are aggregated at the school level, such as the percentage of students getting five grade A*-C (credits). These do not take into account students background characteristics and prior attainment. These are the results that are published by the Botswana Examination Council.

League tables

The ranking of schools into position using the percentage of students who have obtained five or more credit passes. The schools are then ranked from the top to the bottom with the highest credit passes at the top of the table and the lowest at the bottom. The league table and raw results will be used interchangeably.

Department of Secondary Education (DSE)

The Department of Secondary Education in the Ministry of Education and Skills Development has been mandated to plan, formulate programmes, implement, monitor and evaluate the National Secondary Education System. The major areas of function are the provision of facilities and quality assurance. At the moment, the department is challenged with increasing access into senior secondary schools. To do this, double shift programme has been introduced in some schools and this will roll unto more schools in due course. In this

programme, there is an evening and morning school in one school. To improve student discipline and academic performance and stakeholder involvement in secondary schools, the department introduced the pastoral policy in 2007.

Senior secondary school

A senior secondary school is a school that offers the last two years of the 12 years basic education in Botswana. Progression into the senior school depends on the attainment at the Junior Certificate Education examination and the availability of places. It offers the Botswana General Certificate of Secondary Education curriculum. The BGCSE examination is a subject based examination that was first introduced in 1999. The results from this exam are 'high stakes', that is, they determine placement of students into tertiary institutions.

School Head

A School Head is an individual who is charged with the overall supervision of a school and he/she is perceived as a leader with the responsibility of running the day to day functions of the school. In other contexts he/she is the principal or head teacher. The three titles will be used interchangeably.

1.10 THE STRUCTURE OF THE THESIS

The thesis is organised into six chapters. Chapter 1 provides an introduction to the study, the problem statement, the research questions and the aims of the study. The motivation, the significance of the study, research methods and the limitations are also stated.

Chapter 2 presents a literature review relating to the first research aim, which was to explore the concept of school effectiveness and identify characteristics of effective schools.

Chapter 3 presents a literature review relating to the second research aim, which was to investigate the possibilities of a value added approach to school

effectiveness in judging school performance. The chapter also identifies the characteristics of schools that add value to students' prior attainment. The chapter covers the fundamental concepts of school effectiveness research namely, consistency, differential effectiveness and stability of school effects. The conceptual model for academic effectiveness in secondary schools is presented based on Chapters two and three. The chapter links school effectiveness research with school improvement research.

Chapter 4 discusses the research design and methodology where the population, sampling procedure, data collection and data analysis methods are elaborated on. The chapter discusses the reliability and validity of the value added analysis used in the study.

Chapter 5 deals with the second and third research aims. The second research aim is to explore the possibilities of adopting a value added approach to judge schools' performances. The third research aim is to determine the effectiveness or ineffectiveness of secondary schools in Botswana, based on the literature reviewed and a value added approach. The chapter presents the findings from the quantitative analysis with their discussion.

Chapter 6 is the summary in which the main findings are discussed in the light of the guiding research questions and the literature review. The chapter makes recommendations for the improvement of the practice of determining effective/ineffective schools and thereby the performance of secondary schools in Botswana. The chapter also suggests areas for further research.

1.11 CONCLUSION

This chapter introduced the study and the background of the study. The study was motivated by the current use of credit pass method that is used the BEC to determine the effectiveness of schools. The debate against the use of this method and the appropriate method to determine schools' effectiveness were

discussed. Four problem questions and four research aims were stated. The study will make contributions both locally and internationally. One contribution at the local level will be towards achieving the Vision 2016 pillar of an "informed and educated nation" Section 1.8 demarcated the study as school effectiveness research. The next chapter reviews literature on the concept of school effectiveness.

CHAPTER TWO

A REVIEW OF THE LITERATURE ON SCHOOL EFFECTIVENESS

2.1 INTRODUCTION

Four research aims were stated in the preceding chapter. This chapter covers the first research aim (1.4.1) on the concept of school effectiveness and characteristics of effective schools. A review of literature serves different purposes. A review is conducted to generate a picture of what is known about a particular study and shares with the reader the results of other studies that are closely related to the study being reported (Creswell, 1994:20). The chapter reviews what effective school research has established about the characteristics of effective schools. The chapter discusses the concept of school effectiveness; nine characteristics of effective schools; and the conclusion from the literature review. The literature review from Chapters two and three will provide the conceptual framework that describes the different levels that are responsible for creating effective schools. The framework will be discussed in Chapter three.

2.2 THE CONCEPT OF SCHOOL EFFECTIVENESS

There are various definitions of effectiveness from different perspectives. Creemers and Scheerens (1989:696) assert that the way effectiveness is defined in the main stream of school effectiveness research conforms to the notion of organisational productivity and its theoretical background of economic rationality. The productivity view of effectiveness sees output as the criterion to judge goal attainment and emphasises the search for organisational characteristics that maximise output.

Scheerens (2000:18) defines school effectiveness as the "performance of the organizational unit called school". He also defines school effectiveness as the degree to which schools achieve their goals in comparison with other schools that are 'equalized' in terms of student intake through manipulation of certain conditions by the school itself or immediate school context. This definition implies that a school is effective only when it is compared to other schools serving similar students.

Stoll and Fink (1996:28) argue that a researcher's definition of school effectiveness affects his or her orientation to the study and may in turn have an impact on the results of such a study. The definition adopted in this study follows from the research design and orientation of the study, namely, value addition. For the purpose of this study, a senior secondary school is effective if it promotes the progress of its students beyond what is expected from them given their initial achievement and background factors (Mortimore, 1991:9). An effective school therefore, adds value to students' initial intake achievement (Stoll and Fink (1996:26-28). This definition follows from the economic rationality definition of effectiveness because value added looks at the output of an organisation and compares it to the input into the organisation. This definition has an impact on the methodology adopted for this study.

2.3 THE CHARACTERISTICS OF EFFECTIVE SCHOOLS

Research on school effectiveness has yielded an impressive number of school factors related to learners' achievement. Creemers and Reezigt (1996:200) argue that the consistency in the findings might be an indication of the robustness of these factors. However, they also argue that the similarity might also be due to researchers who continue to review the same literature, and that the similarity of the findings may also "point at a research artefact: because these factors were supposed to influence students' achievement, they were studied over and over again, and indeed were found to influence students' achievement from time to time". The reviews by Levine and Lezotte (1990) and Sammons, Hillman and

Mortimore (1995) have been comprehensive in that each review referred to several hundred studies of effective school characteristics (Reynolds & Teddlie, 2000:141). Reynolds and Teddlie (2000:144) distilled the correlates by Levine and Lezotte (1990:10) and Sammons *et al.*'s (1995) factors into nine process areas (*cf.* Table 2.1). These nine factors are adopted as the framework for effective schools in this study and will be discussed in details below.

Table 2.1 Characteristics of effective schools adapted from Reynolds and Teddlie (2000:144)

Process	**Component of the process**
1. The process of effective leadership	a. being firm and purposeful b. involving others in the process c. exhibiting instructional leadership d. frequent personal monitoring
2. The process of effective teaching	a. maximising class time b. exhibiting best teaching practices c. adapting practice to particulars of classroom
3. Developing a pervasive focus on learning	a. focusing on academics b. maximising school learning time
4. Developing staff skills at the school site	a. site based b. integrated with ongoing professional development
5. Creating high (and appropriate) expectations for all	a. for students b. for staff
6. Monitoring progress at all levels	a. at the school level b. at the classroom level c. at the student level
7. Emphasising student responsibilities and rights	a. responsibilities b. rights
8. Involving parents in productive and appropriate ways	a. encouraging productive interactions with parents
9. Producing a positive school culture	a. creating a shared vision b. creating an orderly environment c. emphasising positive reinforcement

2.3.1 Effective leadership

Hallinger (2007:2) and Stewart (2006:1) state that the past twenty five years have witnessed the emergence of new conceptual models which focus explicitly on educational leadership as the manner in which leadership exercised by school administrators and teachers impacts on students' outcomes. Two of such models are instructional and transformational leadership.

2.3.1.1 Instructional leadership

The leadership of the principal needs to focus on the organisational conditions of the school and in particular, on the way teaching and learning is conducted in schools. The responsibility of the principal to enhance the school's teaching and learning activities emerged in the 1980s as an area of emphasis from the effective schools research and was termed instructional leadership. Leithwood, Jantzi and Steinbach (1999:8) define it as an approach to leadership that emphasises the behaviour of teachers as they engage in activities directly affecting the growth of students.

Heck, Larsen and Marcoulides' (1990:120-121) study on the validation of a casual relationship between instructional leadership and students' achievement indicates that principals can directly influence the students' achievement through their leadership practices. They assert that their research confirm the earlier correlational studies, suggesting that strong instructional leadership is directly related to the school's performance at a higher or lower academic level. They conclude that the principal must be considered as one of the 'school effects' variable that directly influences students' achievement.

The National Staff Development Council (2000:3) asserts that principals who act as instructional leaders add a focus on helping teachers improve their classroom performance and make the academic instruction of the school a top

priority. Effective instructional leaders spend a lot of time in classrooms observing teaching and encouraging higher performance. They track students' test score results and other indicators of students' learning to help teachers focus attention where it is needed most. They also focus much of their time on staff development and help provide opportunities for teachers to share information and plan together for curriculum and instruction.

Hallinger and Murphy (in Leithwood, 2005:8-9) propose a model of instructional leadership that consists of twenty specific functions within three broad categories: defining the school mission; managing the instructional programme; and promoting school climate. There is considerable empirical support for this model particularly as it relates to students' outcomes (Hallinger & Heck, 1996:38; Hopkins, 2003:59). Leithwood (2005:8-9) describes this model as:

Dimension 1: Defining the mission of the school includes framing the school goals and communicating them to all members of the school community. The principal's role is to establish the vision, expectations and commitment to the goals.

Dimension 2: Managing the instructional programme includes knowing and coordinating the curriculum and instruction; supervising and evaluating instruction; and monitoring students' progress.

Dimension 3: At the heart of this model is promoting a positive school learning climate which includes setting standards and expectations; protecting instructional time from being disturbed; maintaining high visibility; providing incentives for learning and promoting professional development.

Waters, Marzano and McNulty (2004:48-52) report on a large quantitative study which involved 2,894 schools and approximately 1.1 million students and 14 000 teachers to analyse the effects of educational leadership on students'

achievement. The study identified 66 leadership practices that were embedded in 21 leadership responsibilities that emerged from the above mentioned three dimensions. They report that there were statistically significant relationship between these leadership practices and students' achievement. Some of the responsibilities were: a) A culture which promotes cooperation among staff and develops a shared vision of what the school could look like; b) Order. The principal provides and enforces clear structures; c) Discipline. The instructional time is protected from unnecessary interruptions; d) Resources. The teachers are provided with the necessary resources to enable them to carry out their role as educators; e) Focus. There is high expectation for students and teachers and this is communicated in the school; f) Visibility. The principal maintains high visibility in the school and visits classrooms; g) Input. The principal involves teachers in decision making; h) Contingency rewards. The principal monitors the effectiveness of school practices and their impact on students' learning; and i) Situational. The principal is aware of the details and undercurrent in the running of the school and uses the information to address current and potential problems. This makes the principal to be proactive.

The study also found that leadership can have different impact on students' achievement which they termed 'differential impact' of leadership. This is to say that leaders can have a positive and negative impact on students' achievement. According to this study, there are two variables that determine whether the leadership will have a positive or negative effect. The first is the focus of change, whether the change is focused on those aspects most likely to have an impact on students' achievement. The second is whether the leader understands the order of change he/she is leading and adjusts his/her leadership strategies accordingly (Waters *et al*., 2004:6). Hallinger and Heck (1996:38) assert that the principal's leadership that makes a difference is aimed towards influencing internal school processes that are directly linked to students' learning. These internal processes are concerned with school policies and norms (for example, academic expectations; school mission; students' opportunity to learn; monitoring; parental involvement, school climate; and

academic learning time); and the practice of teachers (instructional strategies, classroom management and curriculum design).

Hallinger (2007:3) observes that the focus on the improvement of teaching and learning has once again brought instructional leadership to the fore. After a period of decline in popularity during the 1990s, there has been a new and unprecedented global commitment among government agencies towards training principals to be instructional leaders. However, the demands on their time are unceasing and the majority of their work activities maybe unrelated to instructional leadership. Principals may not be welcomed in teachers' classrooms and the principals may not be experts in most subject areas. These make instructional leadership to be a challenge in secondary schools and principals distance themselves from it.

From what has been discussed above, it is not necessary for principals to be subject experts or to do classroom observation for them to be effective instructional leaders. The subject expertise can be left to the senior teachers. Principals can promote a positive school climate; maintain visibility; etc. The skills that matter in educational leadership are those that can lead to improved learners' achievement. Hopkins (2003:5-6) puts it succinctly by stating that "the prime function of leadership for authentic schools is to enhance the quality of teaching and learning". Effective schools, therefore, have strong instructional leaders who are sufficiently involved in, and are knowledgeable about what is going on in the classrooms and the individual progress of all pupils. This means that instructional leadership is not the domain of the principal only but for the school management team, which consists of the senior management and the subjects' senior teachers. The instructional role of the principal might be considered to be indirect. His or her role is to ensure that heads of departments and senior teachers monitor the teaching and learning in their respective departments (*cf.* 2.3.5; 2.3.6).

2.3.1.2 Transformational leadership

Traditionally, leadership in schools has been associated with positional authority and was primarily seen as 'top-down', that is, the province and responsibility of the principal. MacBeth (in Harris, 2003b:72) reports on a study where principals were asked to depict themselves in their schools. They depicted themselves as being at the top of an apex. This 'heroic' view of leadership as resting on only one person has been challenged. While it cannot be denied that leaders are inevitably in the midst of the action, effective leadership is not always derived at the top. Leaders lead from the centre of a complex myriad of complex relationships.

The second characteristic of effective leadership is the involvement of others in the process of leadership. Their leadership is dependent upon others and the relationship they have with others. The principal should make an effort to develop and secure leadership at different levels of the organisation to impact on students' learning. Leithwood, Louis, Anderson and Wahlstrom (2004:7) assert that successful leaders develop and count on the contributions of others in the organisation. Barth (1999:17) argues that when teachers lead, principals extend their own capacity and hence the teacher leadership will have a good influence on the school as well as within the classroom. Teachers exercise their leadership role in the classroom when they check on lesson attendance, implement school and departmental policies, monitor students' progress and take the necessary action when there is a need. Teachers themselves need to see and understand their role as leaders in their own classrooms and they need to be empowered and assisted to exercise their leadership role.

Shared leadership has been given different names by different scholars. Page and Wong (2000:2) refer to it as servant leadership, which they describe as turning the hierarchical pyramid upside down, with the leader at the base of the organizational roles. This is the opposite of how principals depicted themselves in the study reported earlier. The relationship between shared

leadership and students' achievement has been established by different studies. In a study to examine the relationship between servant leadership, school climate and students' achievement in 42 Michigan high schools, Kelley and Williamson (2006:6) found that the school climate became more open as the leader practiced more of servant leadership. The more of servant leadership the principal practiced the slight the increase in students' achievement. Although the relationship was weak, 1.4% of the variability of students' achievement could be explained solely by the servant leadership behaviour of the principal. Another finding was that the impact on students' learning was strongest when the principals combined servant leadership behaviour with an open school climate. What was most significant was that the actions of the principals had an impact on both. They finally concluded that, by adopting a servant leadership approach to their work and by creating a more open school climate, principals can positively impact the learning of their students. The study found that both could explain a 7.4% of the variability of students' achievement.

Shared leadership is also known as transformational leadership. Harris (2003a:17) argues that in transformational leadership, the leader uses power with or through other people rather than exercising control over them. Leithwood *et al*. (1999:39) and Leithwood and Jantzi (2000:114) define transformational leadership in schools along six dimensions: building the school vision and goals; providing intellectual stimulation; offering individualized support; symbolizing professional practices and values; demonstrating high performance expectations; and developing structures to foster participation in decision making. These behaviours encourage teacher collaboration, increase motivation and improve teacher self efficacy (Harris, 2003a:18). When these processes are integrated and aligned, school communities will be able to enhance their capacity to improve the learners' achievement.

Leithwood *et al* (2004:6) assert that transformational leadership draws attention to a broader array of school and classroom conditions that may need to be

changed if learning is to improve. This makes transformational leaders to be change agents. They specifically change the school culture to support students' learning.

In today's challenging and demanding educational climate of constant and turbulent change, no single person alone is likely to have the combined capacities necessary to engage in effective leadership. And it can be legitimately argued, that in empowering a range of people within the school community: teachers, students, parents and others as appropriate, a combined richness of educational thought and activity, superior to that of any single leader can be achieved. That is, leadership at its best is a shared venture engaged in by many. The pastoral policy in Botswana advocates for transformational leadership in schools that have become too big. The leadership should not be the jurisdiction of one person alone but a shared venture between students and teachers. Students' involvement in leadership is through the prefect system, school council, etc. (*cf.* 2.3.7). Principals are required to develop school cultures that empower the whole school community.

In conclusion, the leadership that makes a difference is both position based (principal) and distributive (administrative team and teachers). Schools need to be aware and avoid the observation made by Harris and Muijs (2002:3-4) that:

> One of the main barriers to teacher leadership is the top-down leadership model that still dominates in many schools. The possibility of teacher leadership in any school will be dependent upon whether the head and the Senior Management Team within the school relinquishes power to teachers and the extent to which teachers accept the influence of colleagues… heads will therefore need to become 'leader of leaders'.

2.3.2 Effective teaching

Creemers and Reezigt (1996:198) assert that in school effectiveness research, attention for the school is diminishing while classroom level gets more attention

than before. Reporting key findings from their different studies and in different countries, Rowe, Holmes, Smith and Hill (in Rowe, 2004:13); Wright, Horn and Sanders (1997:63) and Muijs and Reynolds (2001: vii) conclude that effective schools are only effective to the extent that they have effective teachers. Rowe (2004:13) reports that further evidence for the importance of teaching on students' achievement derived from the VCE Data project showed that there was more variation within schools than between schools, indicating that the quality of teaching and learning was by far the most salient factor accounting for variation in students' achievement at year 12. Such findings emphasise that, it is at the level of the classroom that learning takes place and that there can be very substantial differences in the progress made by students in different classes within the same school. This proves that teachers can make a difference and therefore, they have the moral obligation to impact on students' learning and it is incumbent upon the principal and the subject leaders through instructional leadership (*cf.* 2.3.1.1) to see to it that teachers do exactly that.

There are many variables associated with effective teaching. The school effectiveness research has endorsed the importance of direct or structured teaching. In structured teaching, the lesson is first introduced to give the learners what to expect. The material to be learnt is presented in small steps with clear and detailed explanations and active learners' practice after each step. Throughout the lesson, the teacher checks for understanding by asking questions and practice exercises where possible and makes summaries and concept maps to make explicit the connection between the various parts of the lesson (Creemers, 1994:5; 1996:52). Students need to see this link in order for learning to take place. The closing of the lesson is as important as the introduction and the lesson itself. To conclude the lesson, the main points and concepts will have to be brought together so that they will be organised and integrated with what students already know. When the lesson is presented in such steps, learning is maximised.

The effectiveness of teaching is also determined by the management of time: starting and finishing lessons on time; the preparation of lessons in advance; and the adaptation of the lesson to suit the level of the learners (Muijs & Reynolds, 2001:37; Reynolds & Teddlie, 2000:146).

2.3.3 Pervasive focus on learning

Reynolds and Teddlie (2000:147) posit that focusing on learning includes the academic emphasis and maximizing of available learning time which have been shown to be the core correlates of effective schools. An academic emphasis is seen through factors such as: use of homework by teachers, which are frequently checked by the Senior Management Team to ensure that homework is given and marked accordingly. Homework does not only check students' understanding but also maximises learning time because some students when they are not given some work just remain idle.

Effective schools and effective teachers take seriously the link between classroom practices and students' learning outcomes (Hopkins, 2001:113). The school, therefore, promotes effective teaching strategies through staff development as a sign of a pervasive focus on learning. Hopkins (2001:113) maintains that schools that add value to the learning, progress and attainment of their pupils are consistent in their teaching practice. Focussing on learning also includes high expectations for students and their positive response to the high demands placed upon them (*cf.* 2.3.5). The students' focus on learning is dependent upon their ability to respond effectively to the task set before them and also on how well they are able to control their learning. Schools can maintain a focus on learning by focusing on the positives rather than negatives, by celebrating success rather than failure, to ensure that this permeates the whole school rather than the classroom (Hopkins, 2001:172).

Blanchard (2002:29) argues that teachers with a high sense of instructional efficacy operate on the belief that difficult students are teachable through extra

effort and appropriate techniques. Such teachers devote more time to academic activities, provide students who encounter difficulties with the guidance they need to succeed and praise their academic achievement. By so doing, the teachers maintain a focus on learning. The researcher believes that if all teachers can maintain instructional efficacy, learners' achievement can be promoted.

Goddard (2000:686) describes academic emphasis as "the extent to which the school is driven by a quest for academic excellence". He asserts that in such schools, teachers set high but achievable goals; belief that their students can achieve; the school environment is orderly and serious; and students, teachers and principals pursue and respect academic success. As discussed earlier, the teachers' beliefs about students' capabilities and the importance of academic performance constitute norms that influence the actions and achievement of schools.

If a strong academic emphasis is positively associated with learners' achievement, it is therefore, imperative that schools should be led in a direction that will systematically develop more emphasis on academics that will lead to increased students' achievement. To lead schools in that direction, Goddard (2000:688) argues that the four sources that build up collective teacher efficacy can also be applied to academic emphasis: mastery experience; vicarious experience; social persuasion; and affective states (*cf.* 2.3.4). These convey information that influences the teacher's perception about academic emphasis. Academic emphasis which helps to shape the normative environment of the school will have a strong influence on teacher behaviour and, consequently students' achievement. In such a climate, both teachers and students are more likely to persist in their academic efforts. Thus a teacher joining the school with a high academic emphasis will exert greater effort on his/her work.

Goddard (2000:690-699) concludes that "academic emphasis is a unified construct that promotes students' achievement." In these studies, academic emphasis is a climate in which teachers believe that students have the

capabilities to achieve, and the students work hard to succeed. The learning atmosphere in such schools is orderly and serious. Academic emphasis is very similar to collective teacher efficacy (*cf.* 2.3.4). The only difference is that in academic emphasis, the students also believe that they can achieve. The students are then motivated and hence use teachers' expertise to their advantage. They also respond positively to the high expectations from the teachers (*cf.* 2.3.5).

2.3.4 Developing staff skills at the school site

Developing skills at the school is similar to staff development or a learning organisation. Sillins, Zarins and Mulford (2002:615) assert that the concept of schools as learning organisations evolved in response to the difficulties experienced in bringing about school reform. For this study, the terms organisational learning and learning organisation will be used interchangeably. Schools that function as learning organisations are those that have systems and structures in place that enable people at all levels to collaborate and continuously learn and put new learning to use (Sillins *et al*., 2002:616). People in a learning organisation work together in collaborative teams and engage in collective enquiry based on best practices for accomplishing their aims and the current reality of the conditions in their organisations. Any discrepancy between best practice and the reality of their school causes them to take action to reduce the discrepancies.

Leadership has emerged as a direct predictor of organisational learning. Sillins *et al*. (2002:635) conclude that the level of leadership operating throughout any one school and its community is a strong predictor of the level of organisational learning generated in a school. They also found that the level of organisational learning affected the work of the teachers in the classrooms. Organisational learning and the instructional work of teachers mediated the school effects on learners' achievement in their study. They assert that there is plenty of evidence to suggest that higher performing schools are functioning as learning

organisations. As such, schools that are serving students' of low academic ability should continuously learn methods that can be used to impact on students' achievement. A learning organisation learns from its mistakes through school self evaluation.

However, though collaboration and collegiality are advocated for in schools, both structural and normative factors promote isolation. The physical structures and layout of school facilities and restrictive time schedules usually hinder such interactions. The implications for this isolation have far reaching consequences in schools. Teachers who work in isolation rely on learning through trial and error approach. Even if they continue to learn by conducting inquiry alone, they are limited by their ability to recognise problems and personal biases, and the consequences of various choices of action.

Harris (1999:273) reports on the practices of ineffective departments in secondary schools. The teachers in these departments taught in isolation from each other and did not function as a teaching team. There was little opportunity to build and extend upon good practice within the department. Consequently, there were no opportunities for any type of pedagogic partnership amongst the teachers. There was little discussion of teaching approaches, methodologies or practice. There was also little evidence of sharing classroom practice through observation, discussion or demonstration. The absence of collegiality or collegiate working practices within the less effective departments contributed to their poor performance.

Harris (1999:275) suggests that time has to be set aside for the departments to engage in collaborative planning and sharing of ideas. To facilitate collaborative planning and sharing of ideas, the schools' Senior Management Teams will have to support the departments through attendance at departmental meetings, checking departmental documentation and policies to see whether collaboration is included in departmental plans. The timetable should be restructured to allow teachers to share, plan and observe one another's work. However, the

discussions about practices of teaching should be separated from judgements about competences of teachers or else teachers will resent it. Fullan (2001:126) asserts that once a culture of collaboration is established, teachers are more likely to trust, value, and legitimise sharing expertise, giving advice and getting help both inside and outside school. By so doing, the teachers sharpen their skills and are more likely to become better teachers on the job. This means that as they become better teachers, learners' achievement improves.

Mulford (2003:25) equates organisational learning with collective teacher efficacy and posits that organisational learning or collective teacher efficacy is the important intervening variable between leadership, teacher work and students' achievement. Bandura (1997:477) describes collective teacher efficacy as a "groups' shared belief in its cojoint capabilities to organise and execute courses of action required to produce a given level of attainment". Within an organisation, perceived collective efficacy represents the shared perceptions of group members concerning the performance capability of a social system as a whole (Bandura, 1997:469). Goddard, Hoy and Hoy (2000:496) describe collective teacher efficacy as a way of conceptualising the normative environment of a school and its influence on both personal and organisational behaviour. In other words, the teachers' beliefs that they can educate the learners, constitute a norm that will influence their actions and hence students' achievement. Based on the self efficacy theory, Goddard *et al* (2000:498) suggest that when collective teacher efficacy is high, teachers in a school believe they can reach their students and they can overcome negative external influences from the home or location.

According to Bandura (1997:478), collective teacher efficacy, as an important school property, develops when teachers practice the following concepts: a) Mastery experience. A resilient sense of collective teacher efficacy requires experience in overcoming difficulties through persistent effort; b) Vicarious experience. Teachers do not rely on direct experience as the only source of information about their collective efficacy. They listen to stories about success

in other schools because organisations can learn from observing others; c) Social persuasion. This is another venue of strengthening the faculty's conviction that they have the capabilities to achieve their goals. Talks, workshops, and professional development opportunities and feedback about achievement can influence teachers; and d) Affective states. Organisations learn how to adapt and cope with disruptive forces. The affective state of an organisation has much to do with how challenges are interpreted by the organisations.

Thus, when new teachers join a school with a strong collective teacher efficacy, they will be influenced by the culture of the school to exert effort as discussed earlier. Goddard *et al.*'s (2000:500-501) study found that collective teacher efficacy is a significant predictor of students' achievement and it is positively associated with the differences in students' achievement that occur between schools. The study showed that a one unit increase in collective teacher efficacy was equal to more than 40% of standard deviation in students' achievement. These results are consistent with Bandura's (1994:89) study which indicated that collective teacher efficacy was significantly and positively associated with school level students' achievement.

Collective teacher efficacy can be learnt through the concepts described above. Effective schools have high collective teacher efficacy and this propels teachers to act purposefully to enhance learners' achievement. School administrators can help improve students' learning by working towards raising the collective teacher efficacy so that it becomes the culture of the school. Ross and Gray (2006:184) like others, suggest that the timetable in schools should be restructured to provide opportunities to strengthen collective teacher efficacy.

2.3.5 Creating high and appropriate expectations for all

One of the most important factors in classroom climate and school effectiveness is the extent to which students feel that they are expected to learn and how this expectation is being reinforced. Mortimore (1993:295) and Moore (1998:247)

argue that students tend to perform at a level which is consistent with a teacher's expectation. Furthermore, they tend to perform better and feel more competent when teachers set high expectations; communicate these expectations and hold them responsible for achieving them through challenging teaching. These findings are often referred to as the self-fulfilling prophecy or Pygmalion effect which was first introduced by Merton in 1986 (Mortimore, 1993:295).

These expectations can either be positive or negative Teachers whether deliberately or not, communicate the expectations and reinforce them differently, for example, teachers tend to ask low achievers closed or convergent questions while open, divergent questions are for the high ability students. Moore (1998:245) lists ways in which teachers communicate expectations to students.

- Lows are called on less often to answer classroom questions and are given less wait time to answer questions. This shows that they are not expecting any answer from them.
- Lows are criticized more frequently for incorrect classroom responses and are praised less frequently for correct responses.

Harris (2001a:89) posits that negative expectations can be a particular problem in schools in disadvantaged areas. In these schools, low expectation can become endemic and contribute to consistent under performance. For a pupil who is regularly taught by a teacher with low expectations, the experience can be demoralising and too often leads to serious underachievement. This is because students internalise teacher's expectations over time and when that happens the students' self concept, motivation and achievement may decline gradually until the student's ability to achieve his or her potential is damaged. This is a situation that all teachers must avoid.

Muijs and Reynolds (2001:65) suggest ways of overcoming this problem: a) Teachers should remember that all students can learn and this should be

communicated to students (instructional efficacy, *cf.* 2.3.3); b) Teachers ensure that all students get the opportunity to participate in classroom activities such as questioning and discussion; c) Teachers should be aware of potential differences in their response to students; and d) Teachers should monitor how they distribute rewards and punishment to students.

Effective schools do not blame their student intakes but communicate high expectations to students. High expectation corresponds with a more active role for teachers in helping pupils to learn while low expectations lead to a passive approach to teaching. High expectations are more effective when they are part of a school culture that places demands on everyone in the school; for example, the principal has high expectations from the teachers through the senior teachers. Sammons (1999:207) contends that the implication for high expectation is that, when schools have high expectations for their pupils, they attempt wherever possible, to provide intellectually challenging lessons for all pupils in all lessons. However, Sammons (1999:207) argues that high expectations alone can do little to raise achievement. They are most likely to be effective when combined with a strong academic emphasis; collective teacher efficacy; a conducive learning environment; and monitoring of progress. When these are prevalent in schools, school members are more likely to act purposefully to enhance students' achievement.

2.3.6 Monitoring progress

Well-established mechanisms for monitoring the performance and progress of pupils, classes and the school as a whole are an important feature of effective schools (Sammons, 1999:209). Harris (2001a:96) notes that effective teachers give feedback on pupil performance. They diagnose learning needs and note the progress being made. They also ask specific questions to monitor students' progress and check their understanding during instructional time (*cf.* 2.3.2).

Monitoring progress can be done through target setting at all levels. Subjects' targets can be set based on the students' prior attainment. The targets should then be communicated to students. For targets to be realistic, they should be based on the students' ability. Through high expectations, academic emphasis and collective teacher efficacy discussed earlier, the students could be encouraged to reach their targets. The targets also help students to become more focussed on learning (*cf.* 2.3.3). Blanchard (2002:15) reports that more pupils indicated that their targets provided a focus for their efforts and a sense of progress and satisfaction. Individual students saw them as a great aid to making progress. He cautions that with individual students setting their own targets, the teachers must prevent the demotivation that can occur from failing to reach the targets by helping students to set realistic and achievable targets and helping them to adjust them where necessary.

Harris (2001b: 484) reports that monitoring students' progress offered an important means of self-review within the departments. In addition, it provided the opportunity to set departmental targets closely related to teaching and learning. Southworth (2004:60) asserts that monitoring progress includes analysing and acting on pupil progress and outcome data, for example, assessment and test scores; pupil attendance data; school performance trend; and evaluation data. Leadership is stronger when it is informed by data and such use of data applies to leadership at all levels: principal, deputy, subject head, and head of department. All of these people should be able to interpret data and take appropriate action. Action could be remedial teaching by teachers or classroom observation by senior teachers if students are failing. Monitoring involves visiting classrooms, observing teachers at work and providing them with feedback (Southworth, 2004:60). The monitoring of progress should compare students' intake performance with their performance in BGCSE tests and examinations as teaching progresses.

2.3.7 Emphasising students' responsibilities and rights

Students as the number one customer in schools have the right to be involved in the governance of schools. Effective schools emphasise students' rights as learners. The rights go hand in hand with responsibilities. In this study, students' right will mainly focus on students' involvement in school.

Cunningham, Wang & Bishop (2005:2) observe that a number of studies have highlighted the significant role that psychosocial factors, and particularly those that are associated with students' school involvement/engagement play in the learning process. Willms (2003:9) defines engagement as the extent to which students identify with and value schooling outcomes and participate in academic and non-academic school activities. In a broader sense, Willms (2003:9) also offered a broader definition of student engagement as the students' attitudes towards schooling and their participation in school activities or simply as the students' disposition towards learning. He argued that most recent studies of student engagement treat it as a predictor of academic achievement inferring that being disengaged or disaffected from school causes poor academic performance. These studies concluded that engagement and academic achievement go hand in hand.

Fredicks, Blumenfield and Paris' (2004:61) synthesis on research in school engagement put this body of research into a theoretical framework consisting of three types of engagement: behavioural engagement, cognitive engagement, and emotional engagement. Finlay (2006:2) describes behavioural engagement as doing schoolwork and following rules. The behavioural engagement consists of positive conduct through behaviours that illustrate effort, persistence, concentration, attention, asking questions, contributing to class discussion, following rules, studying, and completing homework. Behavioural engagement is very similar to focussing on academics discussed in section 2.3.3 above.

Cunningham *et al*. (2005:2) argue that elements of cognitive engagement include perceptions of connectedness to school, teachers and peers, motivation to learn, self-esteem and safety. Researchers have emphasised the link between students' perceptions of school and their motivation, achievement and behaviour. Factors that are associated with emotional engagement according to Rhodes (2007:9) include excitement, interest in learning and a sense of belonging. Finlay (2006:2) includes values and emotions, attitudes towards school and teachers, identification with school and appreciation of success in school. When a student achieves good grades the student engagement increases. It is very important for teachers to have instructional efficacy; high expectations; and positive reinforcement to increase students' motivation and subsequently their engagement.

Fredicks *et al*. (2004:61) maintain that these types of engagement are "dynamically interrelated…they are not isolated processes". The division is merely to show that engagement is a multi-dimensional construct. Fredicks *et al*. (2004:62) also discuss past research in terms of what associations have been found between the types of engagement and achievement. They conclude that, there is a body of evidence showing that the relationship between behavioural engagement and achievement exists but that there may be mediating factors that influence this relationship, while little convincing evidence has been found concerning a link between emotional engagement and achievement. This, however, may be due in part to inconsistent ways in which researchers have measured what Fredicks *et al*. (2004:63) conceptualise as emotional engagement. However, evidence of a relationship between cognitive engagement and achievement is much stronger (Finlay, 2006:4).

Voke (2002:4) argues that schools that maximise students' engagement should have the following characteristics:

- All students have opportunities to participate in decision-making process in the school.

- Schools should organise themselves as communities that foster caring relationships between all members of the school community and treat all students fairly.
- Schools should provide a psychologically and physically safe environment. A safe environment also means that the school should maintain high discipline.

Voke (2002:4) goes on to say that research on school engagement suggests that changes in the classroom should be coupled with school wide initiatives, one of which is the establishment of small schools or schools- within-a school. Small schools counter the anonymity, alienation, and student disengagement, which can be associated with large schools. It is believed that when the student body is reduced, schools are more likely to develop into caring, learning communities in which teachers and students come to know and care about one another. According to Akey (2006:5), schools that engage students promote a sense of belonging by personalising instruction and creating a supportive, caring social environment where adults are interested in students' lives. Students who report caring and supportive interpersonal relationships in schools have more positive academic attitudes and values and are more satisfied with school. Such students are more likely to attend school, learn more, and become more engaged in academic work.

To create the caring and social environment in schools and to promote the management of secondary schools that have become too large for one person to manage, the pastoral system has divided schools into mini schools. Each mini school has less than 500 students, head of house, deputy head of house, teachers and parents. It is believed that through genuine relationships between students and teachers, students can be supported and a positive climate will be generated in the school (Cunningham *et al*., 2005:3).

The pastoral policy recognises that learners' involvement in school governance is an integral part of an effective pastoral programme since schools exist for

them (DSE, 2007:6). The policy envisages that since they are the key customers, they should be involved in decision making in order to enhance ownership and accountability. The policy advocates for involvement of students in 70% of all school committees. This means that students have to be involved in almost every aspect of the running of the school. This involvement in decision making in schools is the students' rights and responsibilities. Harris (2001a:114) asserts that it is important that students are engaged and involved in highlighting areas for change and development because they are best placed to suggest improvement, particularly at the classroom level. Listening to students assists schools in understanding the smaller picture by eliciting their views. It also contributes to restoring the link between teachers, students and learning. Students' involvement in schools is through the prefect system, school pastoral council, class monitors/monitress, house captains, etc. Students are likely to develop negative attitudes when they are not involved in decisions that involve their welfare, and will resist innovations that might be introduced.

In the improving departments study, Harris (2001b: 483-484) reports that:

> Those departments that were improving recognised that without a central focus on teaching and learning, their improvement efforts would become marginalized…they also engaged in enquiry and had involved students by consulting them about the quality of teaching and learning process within the department.

A good practice to emulate from the above study will be for students to evaluate the quality of teaching in the classrooms. At the moment, students are doing it through the school council. When this is done formally and constructively in a class setting, it will assist the teacher improve the quality of their teaching. The pastoral policy envisages that every student must be engaged in at least one core curricular activity so as to promote students' identification with the school and have a sense of belonging. This will reduce the destructive behaviour of students to schools properties that is costing government a lot of money.

2.3.8 Involving parents in productive and appropriate ways

Reynolds and Teddlie (2000:151) contend that research generally supports the idea that parental involvement is productive in effective schools while some studies have failed to find such a relationship. Griffith (1996:39) found a positive and significant relationship between parental involvement and learners' achievement. He argues that parent's changes in attitude and behaviour might also be related to student attitude toward school and student readiness and motivation to learn. Fehrmann, Keith and Reimers (1987:334) found that parental involvement had a direct effect on the time students spent doing homework. This suggests that students can learn more when they spend more time doing homework than watching television, a practice that parents can monitor. The study also showed that parents can have an important influence on learning.

Henderson and Mapp examined 31 studies that addressed the connection between students' achievement and various parents and community involvement. The authors report four key findings from these studies which have been reproduced by the Appalachia Educational Laboratory (2005:5). The first key finding was that programs and interventions that engage families in supporting their children's learning at home are linked to higher students' achievement. The second key finding was that the continuity of family involvement at home appears to have a positive influence on children as they progress through the complex education system. This suggests that the more families support their children's learning and educational progress, the more their children tend to do well in school and continue their education. The third key finding was that families of all cultural backgrounds, education, and income levels encourage their children, talk with them about school, help them plan for higher education, and keep them focused on learning and homework. In other words, all types of families can and often do have a positive influence

on their children's learning. This was supported by findings from thirteen researches.

The fourth key finding was that parent and community involvement that is linked to student learning has a stronger association with achievement than more general forms of involvement. This suggests that involvement should be focussed on improving achievement and be designed to engage families and students in developing specific knowledge and skills. Parental involvement has also been associated with other key outcomes such as attendance and behaviour that are also related to achievement.

From the above findings, especially the fourth key finding, parental involvement that can impact on student learning can be through: checking homework, discussing progress with teachers during open days, or limiting viewing of TV on school nights. It will be a good practice to have schools to organise open days or report collection days whereby, parents and teachers discuss the performance and progress of students and ways of assisting the students to learn. Teachers have reported a change in students' attitude and behaviour and ultimately improved performance when there is a chance to talk to both parents and students.

Desforges and Abouchaar (2003:14) carried a literature review on the impact of parental involvement and learners' achievement. They argued that early research in the field showed a variety of inconsistencies and conflicting results in the field. Some studies found that parental involvement had no effect whatsoever on pupil achievement, others found striking positive effects whilst others found negative relationship. Desforges and Abouchaar (2003:14) assert that the inconsistencies are easy to explain. First, different researchers used different definitions of parental involvement such as 'good parenting', talking to teachers or through participation in school governance and functions. Secondly, even for a given definition, different researchers used different measures of parental involvement. They assert that measuring different things

under the same name and measuring the same thing with different metrics leads to the different inconsistencies.

Desforges and Abouchaar (2003:25) identify four components of parental involvement as a) parental aspirations for children's education (parents' hopes and expectations for the child's continuing education); b) parent-child communication about school related matters; c) home structure(the degree of discipline exerted by the parents to insist on homework completion and to limit potentially distracting activities, for example, watching TV); and d) parental participation in school related activities as referring to parent support for and participation in school and class functions.

According to Desforges and Abouchaar (2003:29), there is some indication that parental involvement decreases as children get older. This is because, as children grow older, the curricula become more difficult and parents lose their confidence in the ability to help. In such a case, parental involvement could be in the form of buying extra materials or extra tuition for children if the parent cannot cope. One other reason is that some schools are far away from the children's home and the students are admitted as boarders. The pastoral policy recognises parental involvement as an attribute of effective schools and advocates for involvement and active participation of parents in school governance and the education of their children (DSE, 2007:6). This means that schools should find ways of involving parents in productive ways even when the curriculum is beyond the parents. One other measure of parental involvement since the introduction of cost recovering in education, is the willingness of parents to pay the subsidised school fees

Reynolds and Teddlie (2000:51) suggest that parental involvement can take many different forms such as: synchronising school and home demands on students; using parents as unpaid teacher assistants; raising resources for the school; assisting with homework and checking homework to see that students do it and teachers mark it and leasing with their children's individual teachers.

Parents should be more involved with activities that impact more on students' learning and not only on raising funds, which most PTAs do and neglect the students' learning.

Whilst parents may have a desire for more involvement, there are some material and psychological barriers which operate differentially and discriminately across the social classes. One of the barriers is parental education which has been found to be positively related with parental involvement. The more educated the parents are, the greater is their involvement in their children's education. Parental involvement is higher when schools welcome parents and make it easy for them to be involved. The parents should not be intimidated by the teachers; neither should they look at each other as rivals but rather as partners whose main aim is to help in the education of the student.

2.3.9 Producing a positive school culture

Effective schools research has consistently shown that a positive school culture is essential for learning to take place. When a school opens its door to the students it begins to have its own culture. Schein (1985:6) defines the culture of an organisation as the "basic assumptions and beliefs that are shared by members of an organisation, that operate unconsciously, and that define in a basic 'taken for granted' fashion of an organisation's view of itself and its environment". Holly and Southworth (1989:100) define school culture as the context and setting of the school, its internal processes and the meaning by which staff members make sense of their working world. Both definitions imply a process that is on going and evolutionary in nature, and it is fuelled by "external pressures, internal potentials, responses to critical events, and …chance factors" (Schein, 1985:83-84).

Culture is the life-force that pulses through an organisation, the essence that enables people to work comfortably, to concentrate on their priorities, and to behave predictably based on organisational assumptions and beliefs. This

culture then influences everything in a school such as what people focus on, what they think, their motivation which in turn affects productivity. Since culture shapes everything about a school, understanding and shaping the school culture is pivotal to a school's success in promoting staff and students' learning.

The leader's role in culture building is paramount among other leadership functions, for it is the leader who drives and sustains the notion of a clear, shared vision defined and developed by all members of the school. Bulach, Boothe and Pickett's (2006:8) study on analysing the behaviour of school principals found a positive correlation between the overall culture and climate of the school and the principal style of leadership. Leadership is closely linked to culture. A study by Gruenert (2005:46) involving 81 schools in Indiana used a culture survey to investigate the relationship between a school's culture and student achievement. The study reports that learners' achievement in both Mathematics and language was positively correlated with a collaborative school culture. He concludes that a collaborative culture depends on the leadership of the principal. According to Schein (1985:2), leadership and culture are the sides of the same coin and neither can really be understood by itself. This means that culture, like the leadership of the principal, is the pulse that directs and reflects commitment made by the school community to teaching and learning.

The literature on school effectiveness includes reference to and overlaps with that of school culture. To this effect, Purkey and Smith (1982:68) argue that an academically effective school is recognised by its culture. Therefore, effective leadership by the principal is needed in building a positive school culture through the following: a) collaborative and collegial relationships between teachers; b) a focus on professional development, staff reflection and sharing of professional practice; c) traditions to celebrate success or positive reinforcement; d) shared sense of purpose and values that are consistent across staff members; e) collective teacher and instructional efficacy and a sense of responsibility towards students' learning; f) classroom learning environments

where students feel valued and accepted. This improves lesson attendance by students; g) a high level of discipline in the school; h) student and parental involvement; and i) a learning organisation. These are the school effectiveness characteristics that were discussed in this chapter.

Although the literature emphasises the importance of effective principal leadership in culture building, the researcher believes that building and maintaining a positive school culture is the responsibility of every member of the school community because it is through the culture of the school that the work of the school, which is effective teaching and learning, is accomplished.

2.4 CONCLUSION

Through the review of literature, this chapter defined the concept of school effectiveness, identified and discussed nine characteristics of effective schools that set them apart from the less effective schools. This was done with a view to answer the first problem question. The core factors that have been discussed in this chapter seem to be robust in that they have endured across various studies (Lezotte, 1989:819). However, the school effectiveness literature is not prescriptive but instructive in that it can help in guiding school practice because schools differ in the way they operate depending on the context they are in. Stoll and Fink (1996:41) observe that the characteristics of effective schools had an impact when combined into an overall concept of ethos than the impact of any individual characteristics.

From the review of literature, the researcher believes that the process in effective schools can be summed into two factors: effective leadership and a positive school culture. Reynolds and Teddlie (2000:141) observe that leadership is centrally synonymous with school effectiveness. The leadership at the school level by the principal should set the tone for the leadership by the other members of the school management team, teachers and students. Effective leadership is judged by what the leader does through articulating the

school's values and reinforcing them at every opportunity. These values need to be embedded within the institution and shared by staff, parents and students if they have to promote learners' achievement. An effective leader produces leadership in others. The principal is a leader of leaders. This transformational leadership style encourages teacher collaboration, increase motivation and improves teacher self efficacy. These constitute a positive school culture which is a prerequisite for learners' achievement.

When the leadership at the school management level is right, then all the other process variables such as student involvement, effective teaching, etc. will fall in place. The subject leaders will ensure that effective teaching takes place, students' progress is monitored through testing and homework, etc. the students will be involved in decisions that affect them and also voice their concerns in areas where teaching is not taking place as expected.

The literature on effective schools has had an impact on the development of educational policies for many countries including Botswana. The Department of Secondary Education has introduced a pastoral system in secondary schools in 2007 as a way of combating students' indiscipline and addressing the leadership of schools that have become too large. When these are improved, it is believed that learners' achievement will be improved as well. The pastoral system emphasised some concepts that were identified as characteristics of effective schools such as shared leadership, a school culture that should empower its community, parental involvement, student involvement, safe environment and a school as a learning organisation. The monitoring of students' progress is done monthly and sent to the inspectoral regions. This monthly monitoring of progress should enable the Department of Secondary Education to determine whether it is carrying its mandate effectively so as to achieve the Vision 2016 pillar of "an informed educated nation" (*cf.* 1.2).

This study defined an effective school as a school that adds value to students' prior attainment. The next chapter will review literature on the concept of value addition.

CHAPTER THREE

A REVIEW OF LITERATURE ON THE CONCEPT OF VALUE ADDITION

3.1 INTRODUCTION

The preceding chapter discussed the concept of school effectiveness and characteristics of effective schools, which is an aspect of the first problem aim as stated in Chapter one. This chapter is a continuation of Chapter two as it presents literature review on the concept of value addition and characteristics of schools that add value to learners' achievement. The fourth phase of the school effectiveness research, from the late 1980s to the present, has been the introduction of context variables to the input-process-output model and the use of advanced sophisticated methods (Reynolds *et al.*, 2000:4). When the context variables and multilevel modelling were introduced within the input-output (school effects) strand in the mid 1980s, there emerged a distinctive school of value added or school effectiveness research (Jesson, 2000:9-10; Reynolds *et al.*, 2000:12). This study defined school effectiveness as value added effectiveness. A review of literature on the concept of value addition is appropriate because of its origins in the economic tradition and therefore has to be defined in education terms. As stated in Chapter two (*cf.* 2.1), this review of literature will guide the study on the design and methodology used in the previous studies on value addition. The review of literature will partly address the second research aim which is to investigate the possibilities of a value added approach to school effectiveness.

The literature review may take different forms and one such form is integrative (Creswell, 1994:22), where the review is just a summary of past research. The review in 3.4 will be mainly integrative since the concepts were discussed in

Chapter two. The chapter deals with the following aspects: the concept of value addition; the development of value addition in education; characteristics of schools that add value; the conceptual model of secondary school effectiveness; school effectiveness and school improvement; the fundamental concepts of school effectiveness (stability, consistency and differential effects); size of school effects; and conclusion.

3.2 THE CONCEPT OF VALUE ADDITION

Mayston (2007:7) asserts that value addition in economic terms refers to the extent to which the value of the inputs into the production process is increased when these inputs are transformed into the output of the production process. In terms of education, inputs into the production process include not only resources but also pupils with different individual characteristics (*cf.* 3.7). Sammons *et al*. (1997:24) define value added as the "extent to which any given school has fostered the progress of all students in a range of subjects during a particular time period". This definition specifically refers to academic achievement and can be stated as the "relative boost a school gives to a student's previous level of attainment in comparison with similar students in other schools'' (Sammons *et al*., 1997:24).

Strand (1997:472) defines value added as "measures of the educational progress made by pupils in a school, relative to that made by similar pupils in other schools". McPherson (1997:185) uses the term 'value added' to refer to the extent to which schools performed above expectation after allowance has been made for both the prior achievement of the students and their background characteristics. He defines value added and added value interchangeably as the boost a school gives to a child's previous level of attainment.

Peng *et al*. (2006:137) define value added "as a quantitative measure of the relative progress made by pupils in a school over a particular period of time in comparison to similar pupils in other schools". They assert that it provides a

more valid and appropriate measure of a school's effectiveness rather than raw results or assessment results.

The above definitions of value addition have the common aim of assessing the quality and extent to which schools promote students' progress from the time of entry into schools to the time of exit at a particular point. In the above definitions, the concept of 'like compared with like' is used. Students are compared with similar students by gender, ability, ethnicity, socio economic status, etc. For the purpose of this study, value addition will be defined as a quantitative measure of the progress made by pupils in a school when compared to similar pupils in other schools, taking into consideration prior attainment and background factors.

3.3 THE DEVELOPMENT OF VALUE ADDED MEASURES IN EDUCATION

Sammons *et al*. (1997:25) assert that value added measures rose from a variety of sources rooted in both academic and policy related issues. One such source is the availability of sophisticated statistical techniques that were not available prior to the mid 1980s such as multilevel modelling. From the 1980s, an international trend towards accountability measures required schools to publish their results on standardised tests or examination results as an international trend towards holding schools accountable for the performance of their students and as a measure of school effectiveness. In the United Kingdom, the 1980 Education Act and the 1991 Schools Bill required schools to publish their 'raw' public examination results (Sammons *et al*., 1997:25). Subsequently, schools' performance tables were introduced in 1992 to inform parents on their choice of schools and to urge schools to raise their standards.

There was a reaction to the publication of unadjusted school league tables (raw results) from the school effectiveness research. The raw results were criticised for failing to recognise the impact that the initial intake of students can have on

later achievement. They were thought to reflect more on the initial intake of students than what schools contribute to students' achievement. This led to the search for fairer and more accurate measures of schools' performances. Value added measures were then developed to take into account schools' initial intakes when comparing schools' performances.

Value added measures do not only allow fairer comparisons of institutions to be made, they also have more benefits which have been identified by different scholars. Drury and Doran (2003:1) argue that value added measures when combined with other measures of performance, permit policy makers to hold teachers and administrators accountable for the value they add to students' educational experience without penalising or rewarding them for pre-existing differences in their students' background and ability. Downs and Vindurampulle (2007:4) outline the possible uses of value added measurement such as:

1. A tool for school improvement.

As a tool for school improvement, it can indicate in which areas and with which students schools are performing well or below expectation. This can assist in directing efforts and resources to improve learners' achievement. Value added information is therefore a tool for analysing a school's performance.

2. Informing policy making

Value added measures can be used to provide information on the effectiveness of policy initiatives. Since value added information yield indicators of school effectiveness, this can be most useful for education authorities in identifying schools which are performing significantly below or above expectation. Remedial action could be directed to the schools performing below expectation. Drury and Doran (2003:2) believe that value added performance data can play an important role in aligning district level policies, resources and instructional strategies with the needs of individual schools.

Drury and Doran (2003:2) note that some observers argue that the most effective teachers identified through value added should be given incentives to teach low achieving students while others advocate using value added indices of teacher effectiveness, along with supplementary measures of teacher quality as the basis for performance based compensation systems. When such time comes for the Botswana Government to implement performance based related pay, then value added measures can be very useful for rewarding effective teachers.

3. Reporting to parents and the community

A value added measure can inform parents and the wider public on the relative performance of each school. This will help parents to make informed choices when selecting schools for their children whenever there is that possibility. However, parents in Botswana do not have much choice to select schools because students are assigned to schools based on the catchment area. They can only transfer students from one school to another if there is space for such a transfer. Value added measures inform parents about the effectiveness of teachers in raising the achievement level of students.

4. Individualised professional development

Professional development in schools needs to move away from one size fits all, in which all teachers, regardless of experience and competence receive the same kind of training (Drury & Doran, 2003:2). Staff development in schools should reflect the differences in strengths and weaknesses of teachers. Value added analysis can play a potentially important role in this regard. Based on this, the Dallas Independent School District uses value added measures to structure in-service training for struggling teachers (Drury & Doran, 2003:2).

5. For accountability

Mayston (2007:10) argues that one of the potential roles of value added measures is to provide information to the wider public to promote accountability. When value added by schools is measured, schools could be

held accountable for their performances based on the ability of students at intake. Sammons *et al*. (1997:185) argue:

We believe strongly that the proper criterion for measuring school effectiveness is their impact on students' educational outcomes, and that measures of academic progress are important indicators. Schools are thus held accountable for what they are designed to influence- student progress- which can be seen as the fundamental pre-existing inequalities in education. They should not be held responsible for all the pre-existing inequalities in society.

However, the use of value added measures for accountability is still a controversial debate. Goldstein and Thomas (in Downs & Vindurampulle, 2007:4) argue that research into school effectiveness is a very useful activity in our attempts to obtain knowledge about a process of education, but a very poor tool for holding schools accountable. The more recent report by Organisation for Education Cooperation and Development (OECD) also came to the same conclusion, that a value added model 'could best be introduced as a tool to enhance school improvement efforts rather than as a basis for regulatory oversight' (Downs & Vindurampulle, 2007:4).

The researcher believes that value added measures could be used to hold schools' accountable for the students they get from the junior schools. Measuring schools' contribution to students' achievement is a central part of school accountability system. Regardless of the students' abilities at intake, it is possible through collective teacher efficacy; high expectations; and effective teaching to promote learners' achievement (*cf.* 2.3).

3.4 THE CHARACTERISTICS OF SCHOOLS THAT ADD VALUE TO LEARNERS' ACHIEVEMENT

For nearly thirty years, research on school effectiveness has used progress made by students from their level of performance on entry to their level of

performance at the time they leave, rather than just their raw results at the time of leaving to judge the effectiveness of schools (Mortimore *et al*., 1994:318). This is basically the value added approach although the term value addition was not used at that time. Although the study by Rutter, Maughan, Mortimore and Ouston (in Scheerens, 1992:124-126) was limited by the statistical techniques that were not available at that time, it is considered to be one of the first studies to determine the value added by schools (Mortimore *et al*., 1994:319).

The two main research questions of the study by Rutter *et al* (in Scheerens, 1992:124-126) were to find out the extent to which schools differed in their effects upon students and what processes could be attributed to the differences. The study being longitudinal was carried over four years in twelve secondary schools. The variables for the study were intake measurements; process characteristics of the functioning of schools; outcome measurement (lesson attendance, behaviour, delinquency, and examination results); and background factors of schools which included mean socio economic status, the balance of school intake regarding intelligence, and ethnicity. The research concluded that school characteristics strengthen and complement one another and that schools have either a positive or a negative climate or atmosphere. Their study also concluded that schools have a significant effect even when the socio economic status was taken into account. The following were characteristics that made schools to be more effective than others:

1. The use of rewards and punishment with ample use of rewards, praise and appreciation.
2. The school environment with good working conditions and good care and decorations of buildings.
3. High levels of pupils in positions of responsibility.
4. Academic press which involved use of homework, setting clear academic goals, and high expectations.
5. Effective classroom management, involving preparation of lessons, and rewarding of good behaviour
6. A combination of firm leadership and teacher involvement

7. Good models of behaviour provided by the teacher

The study also revealed the following results that are still relevant today.

1. The secondary schools studied differed in pupils' behaviour and educational achievement.
2. Schools which had good achievement also had fewer behavioural problems
3. The differences between schools in achievement in outcome criteria were related to the process characteristics in schools that can be manipulated by the school.
4. The differences in achievement in schools were also determined by the intake of schools.
5. The difference between schools could not be attributed to difference in physical and administrative characteristics of schools.
6. Even when intake differences were considered, net differences in schools remained. This implies that schools differ in their effectiveness.
7. The schools were stable in their differences.

The study's main conclusion was that schools differed in their effectiveness even when intake differences were accounted for.

One other value added study was by Mortimore *et al*. (1988) in fifty London primary schools. They identified a number of schools which were effective in both academic and social areas. The study culminated in the title 'schools matter'. The school that a pupil attends makes a difference and that some schools were more effective than others. The effective schools were effective for all student groups. The study identified twelve effective school characteristics as listed below. The researchers grouped them into characteristics that concern school policy (1 to 4), those that relate to classroom policy (5 to 9) and aspects relevant to school and classroom policy (10 to 12).

1. Purposeful leadership. This was revealed through active involvement of the head teacher in the school's work and understanding of the needs of

the school. The head teacher was not autocratic but involved others. The leadership was also demonstrated by an emphasis on the monitoring of pupils' progress. Teachers were allowed to attend relevant in-service courses.

2. Involvement of the deputy head. In schools where the deputy heads played a clear role, pupils progressed more.
3. Involvement of teachers. In successful schools, teachers were involved in curriculum planning and decision-making.
4. Consistency among teachers. In schools where all teachers followed guidelines in the same way, the impact on progress was positive. A negative impact resulted when there was variation between teachers.
5. Structured sessions. In effective schools, classes were characterised by work that was clearly arranged and organised by teachers.
6. Work centred environment. A quite work directed atmosphere prevailed.
7. Pupils progressed more where teachers spend more time discussing the content and less time on routine matters. The quality of teaching was very important in promoting pupils' progress and development. The progress was greater where students were stimulated and challenged. Enthusiasm and challenging teaching demonstrated high expectations by the teacher.
8. Sharp focus within sessions. It was beneficial to centre learning material on core theme rather than allow pupils to work in groups on different themes.
9. Maximum communication between teachers and pupils. Students progressed more when there was more communication and interaction with the teacher.
10. Record keeping for competent educational administration. Where teachers reported that they kept written records of work progress, there was a positive effect.
11. Parental involvement. Schools with open door policy which encouraged parents to be involved in reading at home; helping in the classroom;

school visits; and attendance at meetings to discuss progress tended to be more effective. However, formal Parents Teachers Associations (PTAs) were found not to be related to effective schooling. The researchers speculated that some parents found meetings to be intimidating and thus were deterred from involvement. They also found that some parents felt that the PTAs tend to be run by small cliques of parents.

12. A positive climate. An effective school had a positive ethos. The atmosphere was more pleasant in the effective school. There was less emphasis on punishment and criticism but more emphasis on rewarding pupils. Classroom management was seen to be firm but fair.

The other value added study which is germane to this study, was the *Forging Links* study by Sammons *et al*. (1997:1), conducted in ninety four secondary schools and thirty departments in London. The study was longitudinal and analysed examination data for three years. Multilevel modelling was used to determine the value added by different subjects at General Certificate in Secondary Education (GCSE). Sammons *et al*. (1997:125) found the following to be associated with a positive value added outcome.

1. High expectations. In Mathematics, the teachers' perceptions about the students' ability at intake were negative and this led to negative value added in the subject. The head teacher's expectation for both students' behaviour and performance were significantly correlated with the value added measures of departmental and school effectiveness. When the expectation was low, the value added results were negative. The Heads of Departments' perceptions about the ability of students at intake significantly correlated with the academic effectiveness measure. When the students were perceived to be of low ability at intake, the result was a negative achievement. The results indicate that teachers ought to always guard against negative perceptions of learners' ability because they these perceptions may depress the overall academic effectiveness of the schools (*cf.* 2.3.5).

2. Strong academic emphasis. There was emphasis placed on goals, homework and assessment.
3. Shared vision/goals throughout the school and with individual departments.
4. Clear leadership at the school and departmental levels.
5. An effective Senior Management Team which was evident through team work and better staff morale
6. Consistency in approach regarding school and departmental polices and practices.
7. Quality of teaching for all ability groups which was characterised by work focus; effective control; enthusiasm by the teacher; feedback to students; effective student groupings; and minimum staff absence. The staff absences also included dodging of lessons by teachers. In the effective schools, the dodging of lessons by teachers was not prevalent.
8. Student focused approach which was characterised by a good pastoral environment and effective staff/student relations.
9. Parental support and involvement was high.

A recent value added study by Heck (2000:538-539) examined the specific conditions that had an impact on school outcomes and improvement. Schools that were adding value to students' achievement were characterised by the following:

1. Strong instructional leadership by the principal. This was evident through making students' achievement a top goal; monitoring teachers' work; solving problems effectively; and involving others in decision making to improve the curriculum.
2. Strong emphasis on academics was manifested by the way in which teachers presented work in class; how students participated in class; and use of class time.
3. A high expectation for students' achievement was operational through teachers' belief about students; curricular emphasis on developing a wide range of skills and challenging academic work.

4. Frequent monitoring of students' progress through teacher grading practices and homework.
5. Positive school climate. The environment was safe and clean. The buildings were comfortable, and teacher demonstrated caring attitudes.
6. Positive home relations through regular communication. Parents felt welcomed at school and the school sought parental involvement in decision-making and school activities.

At the department level, Harris' (1999:22) research came up with the following as characteristics of departments that were adding value to the students' achievement: a) Having a collegiate management style; b) Sharing a strong vision for the subject; c) Being well organised in terms of assessment, record keeping, homework and good resource management; d) Having efficient systems for monitoring and evaluating pupils' progress which enables the provision of regular feedback to pupils; e) Operating clear routines and practices within lessons; and f) Having a strong pupil centred ethos that systematically rewards pupils and provides them with many opportunities for learning.

A more recent study by Rumberger and Palardy (2005:2016) on the impact of compositional effects and students' achievement in high school found that four process variables were significant in promoting students' progress: a) Teachers expectations about students' ability to learn. Teachers' expectations about students' ability to learn underscore the importance of teacher efficacy, instructional efficacy, and a sense of responsibility for student's learning; b) The average hours of homework that students completed per week; c) The average number of advanced courses taken by students in the school. This underscores the importance of a school's academic climate; and d) The percentage of students who reported feeling unsafe at school indicates the importance of creating a safe learning environment in schools.

Feistein and Symons' (1999:316) study of a value added approach to factors that have a positive effect on learners' achievement in secondary schools in Britain mentioned the influence by parental interest through motivation, discipline and support. The peer group also had significant effect on attainment.

From the literature reviews in Chapters two and three, it can be concluded that the following are characteristics of effective schools:

1. Effective leadership by the principal and the Senior Management Team
2. Effective teaching
3. Academic emphasis
4. A positive school culture
5. High expectations
6. Student involvement
7. Monitoring progress
8. A learning organisation
9. Parental involvement
10. Consistency in approach

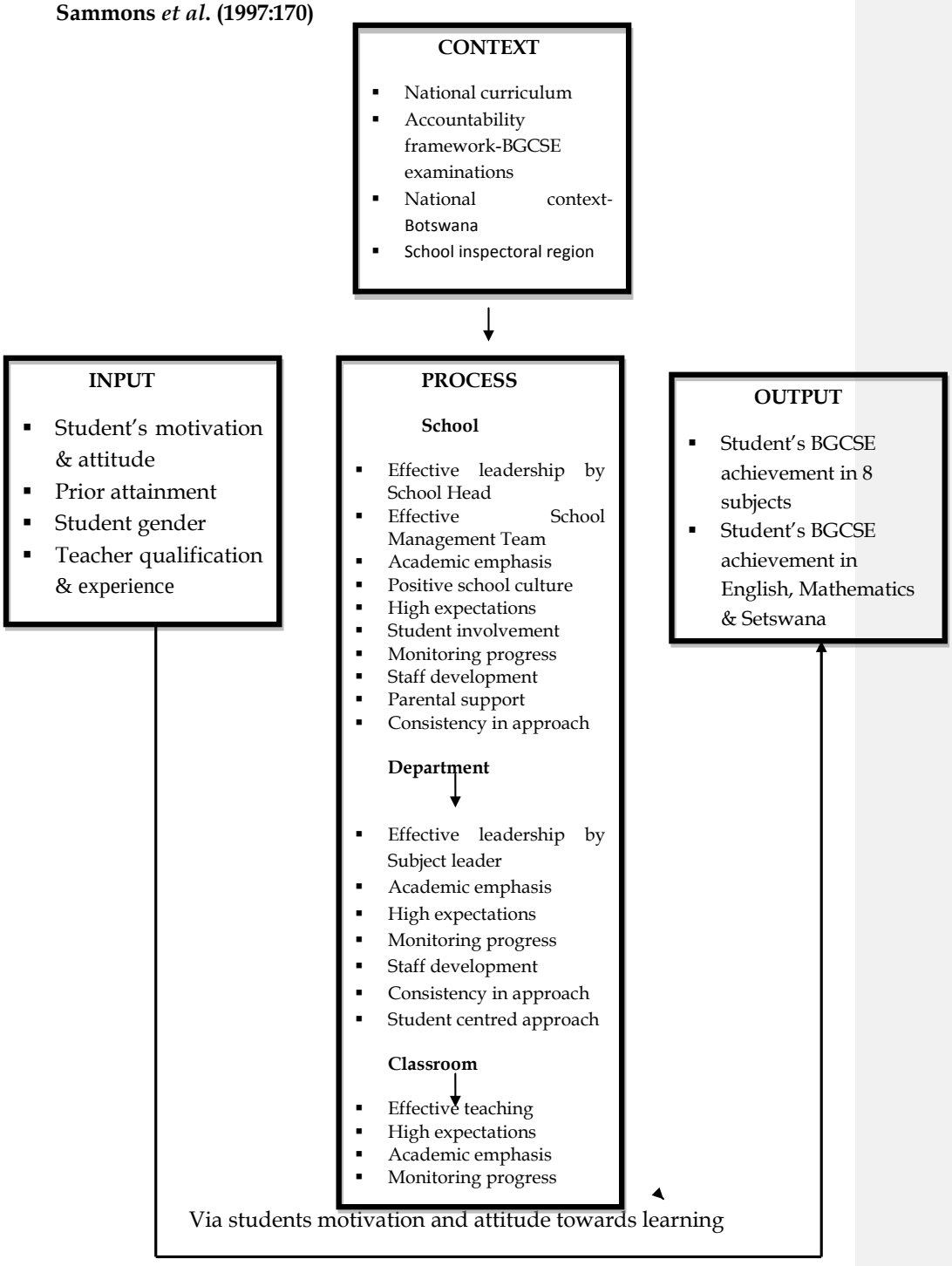
The above correlates constitute a set of characteristics which must be addressed collectively if a school is to be effective in promoting learners' achievement. For example, effective leadership on its own will not impact on students' achievement if effective teaching does not take place. Schools need to focus on the areas that make the biggest impact on learners' achievement. This is at the classroom level through instructional efficacy and changing students' attitude towards learning. The above factors can be mapped into a conceptual framework which shows factors at the different levels as shown in 3.5 below.

3.5 THE CONCEPTUAL FRAMEWORK GUIDING THE STUDY

This study has used the operational definition of school effectiveness as value added effectiveness. This definition depicts schools as production systems in which inputs are transformed into outputs. This is an economic rationality

definition of school effectiveness. Integrated models of school effectiveness adopt this economic rationality as a framework and the concept of net productivity as the key element to evaluate their fulfilment (Scheerens, 2000:23). Moreover, the integrated models incorporate elements of the organisational theory by studying how inputs and processes produce certain educational outcomes or output. From the integrated models, the conceptual framework adopts the Context-Input-Process-Output model. The framework is multilevel and includes the students, classroom, departmental and school levels. The underlying assumption in the model is that higher levels, for example, department and school, should provide facilitating conditions for learning and teaching at the classroom level (the lower levels). The framework is shown below as Figure 3.1.

Figure 3.1 A model of secondary school effectiveness adapted from Sammons *et al*. (1997:170)



The model assumes congruency between the different levels of school, department and classroom. Sammons *et al*. (1997:169) found this congruency to be an important feature of effective schools. The different components of the model are described below.

Context

The context at the national level is the national curriculum at BGCSE and the accountability framework is the BGCSE examinations. In this study, the context also includes the inspectoral region to which the school belongs and the country in which the study takes place.

Input

Inputs into the education system or school include students with certain background characteristics they bring to school. These include prior attainment, gender, age and ethnicity. Students' attitudes, motivation, behaviour and attendance can be regarded as inputs which can facilitate or hamper learning. Nash (2003:446) found that when ability was controlled, students who made relative progress at secondary school were distinguished by high aspirations, positive academic self concepts, and a willingness to accept the regime of schooling.

Creemers (1996:50) asserts that the students' backgrounds, motivation and aptitudes strongly determine their learning. Intrinsic motivation is internal and is what learners bring to the learning environment in terms of attitude, needs and personality factors. Extrinsic motivation is external and concerns the environmental factors that help shape students' behaviour. Teachers can have a very big effect on the external motivation through their teaching strategies (*cf*. 2.3.2). Every teacher should strive towards motivating and making students to be interested in the subject if learning has to take place.

The teachers' experience and qualification are inputs which can affect the quality of teaching at the classroom level. In senior secondary schools the

playing ground is levelled when it comes to teachers' qualifications. All teachers have first degrees. The experience of teachers is not the same; some schools have more inexperienced teachers than others. This aspect needs to be addressed by the supervisory and employing bodies since it can affect the output at the end of schooling. However, when a school has a good mentoring system in place, inexperienced teachers can be mentored by the more experienced and good teachers so that they can become good teachers as well.

Process

The processes are the characteristics that affect learners' achievement at the school, departmental and classroom levels discussed in Chapters two (*cf.* 2.3) and three (*cf.* 3.4). Classroom processes, especially the quality of teaching, can directly impact on students' learning and motivation, which in turn affect students' outcome. The behaviour and attendance by students and hence their learning can be influenced by what teachers do at the classroom level. The teacher's attitude, morale and motivation can affect their lesson attendance. As a Deputy School Head, the researcher has come across instances where teachers absented themselves from lessons and this led to students' negative attitude towards the teacher and consequently on the subject as well. This resulted in poor performance of the subject affected. This calls for effective supervision from the subject leaders at the department levels.

Whether or not the value of the output increases will be determined by the input and processes that are in place at the three levels as well as the learners' attitudes, motivation and abilities.

Output

The output is the students' achievement in English, Setswana and Mathematics. The output which is short term, affects the longer term effects known as outcomes. Outcomes include placement in tertiary education or job placement.

3.6 SCHOOL EFFECTIVENESS AND SCHOOL IMPROVEMENT

The researcher believes that the purpose of conducting a school effectiveness study is to impart on school improvement. Scheerens (2000:91) supports this view by stating that the most straightforward applications of the school effectiveness knowledge base would be the proactive use of the results in school improvement programmes. This section briefly discusses the relationship between school effectiveness and school improvement. These two complementary research traditions have been of interest to policy makers, practitioners and academics. The impetus to improve schools' performance and to raise standards has contributed to the prominence of both fields within the international research community. Both educators and researchers have attempted to answer two fundamental questions: What do effective schools look like? And how do schools improve and become more effective?

The effective school research has been concerned with answering the first question by identifying factors that make schools effective while school improvement has been concerned with the processes which enable schools to achieve their goals in an attempt to answer the second question. Although both paradigms have the same goal of aiding schools to better teach their students, there is a significant difference between them. They have different and parallel orientations intellectually, methodologically and theoretically. As an example, school effectiveness researchers considered themselves to be mainly quantitative while qualitative case studies were mainly used by school improvement researchers. As mentioned earlier, school effectiveness celebrated the end results of describing what an effective school looks like, while school improvement concern is to discover what it is that has been done to bring schools to that state, that is, the journey to effectiveness. These differences and others, made the traditions to develop separately for long periods of time. However, in recent years there have been calls from both fields to synthesise the two bodies of knowledge for mutual benefit.

Mortimore (1991:14) has argued for the transferring of 'the energy, knowledge and skills of school effectiveness research to the study of school improvement'. Both traditions have brought essential insights although each has some weaknesses and limitations. Reynolds and Stoll (1996:94) among others, aim at encouraging synergy and integration between the two perspectives for the benefit of the "integrated educational enterprise that we wish for". Scheerens (in Sammons *et al*., 1997:160) argue that "there is nothing more relevant for school improvement than a well designed programme... built upon the knowledge of school effectiveness".

In addition, Huber (1999:23) advocates for 'dovetailing' which brings the two disciplines together without making them lose their identities and that the need for converging or dovetailing has become urgent in order to proceed forward (Huber,1999:19). Creemers (2002:344) believes that as school effectiveness research provides insight and knowledge used in school improvement, school improvement then becomes a very powerful tool for the testing of theories. The school improvement can also provide new insights and new possibilities for effective school factors, which can be analysed further in effective school research. In recent years, there have been examples of productive operations between school effectiveness and school improvement in which new ways of merging the two traditions have been attempted by different researchers in different countries. Scheerens (2000:91) mentions the Slavin's Success for All Programme as a successful programme that integrated the two traditions.

Any new movement from this synergy should lead to effective improvement and improved effectiveness to provide high quality education for the benefit of the students. The Effective School Improvement (ESI) project which was funded by the European Commission, in which eight European Union countries participated, is another example of attempts to link school effectiveness and school improvement. The result was the concept of Effective School Improvement which is defined as "a planned educational change that enhances student learning outcomes as well as the school's capacity for managing

change" (Creemers, 2002:347). The aim of the project was to develop a strategy for school improvement that results in effective schools. In this project, the school effectiveness knowledge base makes clear which factors are important for effectiveness and it is used to evaluate the school improvement efforts. Creemers (2002:347) notes that the issue of school culture should not be neglected if school improvement has to be successful. He notes that when the school structure, which is often a sign of school improvement is changing while the school culture does not, the school improvement will be short lived. School improvement therefore, occurs when the school culture is favourable. The other requirements are collegiality, risk taking, mutual respect and support, openness, and an attitude for life long learning. School effectiveness and school improvement may be linked through school development planning process in which the focus is on effectiveness issues; readiness for change; ownership mentality; and a favourable school culture (Creemers, 2002:347).

The definition of ESI highlights the importance of school improvement as a process of changing school culture. Within the school improvement literature, the school is viewed as an organic and dynamic culture. The key assumption is that improvement strategies can result in changing the school culture and that leadership has an important part to play in defining and shaping culture. The type of culture that tends to support improvement are those that are collaborative, have collegial working relationships and have a climate of change. Therefore, establishing a climate for change is an important prerequisite for school improvement. The climate should support learning within the organisation. These factors were discussed in Chapter two as school effectiveness factors.

For effective school improvement, the change and development should be owned by the school rather than imposed from outside. This is why the involvement of all stakeholders is important in order to change the school culture. There should be commitment from all stakeholders. Without this commitment, school improvement efforts are likely to fail. This is because

school improvement involves a transformation of the attitudes, beliefs and values that operate within a school. Change should be multilevel, that is, it should occur at the school (leadership), teachers and students levels. The students must view the school as a place of learning as teachers improve their classroom teaching strategies. The focus should also be upon student outcomes in academic performance as the key success criteria (Harris, 2001a:32). This implies that the focus should be on the effective school characteristics and especially those that directly impact on students' learning such as effective teaching and learning. Effective school improvement involves some form of change and therefore requires the schools to manage and implement the change process. The introduction of the pastoral system in schools in Botswana is a form of change that schools need to implement carefully if it has to bring improvement in schools and hence improved learners' achievement and hence improved schools' effectiveness.

The literature on school improvement is emphatic on the following factors which were also evident from the school effectiveness literature, and were discussed in Chapter two (*cf.* 2.3). The following are from the works of Harris (2001a:116) and Joyce, Calhoun and Hopkins (1999:83).

- Effective leadership which is distributed among the teachers in the school. The leadership is also transformational because it imparts on the culture to change it or bring school improvement. Harris (2001a:116) notes that within improving schools, leadership is not a single responsibility of an individual but a collective responsibility. The leadership of the school enables the school to become a learning organisation.

- Instructional leadership
- Effective teaching and learning which involve teacher collaboration, reflection, action enquiry and classroom observation. These constitute teacher development which imparts on their classroom practice.
- Student involvement
- Positive school culture. It is assumed that school improvement strategies will lead to cultural changes through the modifications to their internal conditions. It is this cultural change that supports innovation in the teaching and learning processes that lead to enhanced students' outcomes.

The above factors indeed show that school improvement and school effectiveness can learn from each other. Knowledge of what makes schools to be effective alone will not help schools if schools do not embark on the improvement journey. Similarly, improvement on its own without knowing what to improve will be of no good to schools. School effectiveness focuses on what to change while school improvement focuses on how to change it. Huber (1999:23) depicts these two paradigms as two individual hands which are folded in order to balance each other's.

Effective schools use effective school characteristics in order to pursue their improvement efforts with a focus on the learning needs of students. School improvement is about raising student achievement through focussing on the teaching and learning process and all those conditions which determine and support it within the school and its system (Huber, 1999:13). School improvement strategies should focus on how to accelerate students' progress as well as establishing effective management practices within the school for authentic or lasting improvements to occur. School effectiveness and school improvement therefore, have the same focus of raising students' achievement.

3.7 THE FUNDAMENTAL CONCEPTS OF SCHOOL EFFECTIVENESS

Reynolds *et al*. (2000:15) assert that the study of school effectiveness research in the UK remains partially situated within the same intellectual cutting edge notably in the areas of stability of school effects over time; consistency of school effects on different outcomes; and differential effects of schools for different groups of students. Scheerens and Bosker (1997:97-123) consider these as foundations of school effectiveness (*cf.* 1.3.3).

3.7.1 Differential school effectiveness

A lot of studies have looked at the question of whether schools promote the progress of all the students' groups and whether all subjects foster the progress of all pupils. The interest has been stimulated by a number of factors. The most important was the recognition that schools not only differ in their overall effectiveness but also for different groups of pupils. Nuttall, Goldstein, Prosser & Rasbash (1989:771) found that some schools were more effective with particular sub-groups of students than other schools. In some schools, the effects on reading progress were positive for boys, but negative for girls.

Sammons, Nuttall, & Cuttance's (1993:402) reanalysis of the Inner London Education Authority Junior School Project found some evidence of differential school effectiveness for pupils of differing prior attainment levels. Effective schools boost the attainment of students from all ability levels, while in the less effective schools the attainment was lower than predicted for all groups of students. The same conclusions were later reached by Thomas, Sammons, Mortimore and Smees (1997:193) and Sammons *et al*. (1997:52). The differential effectiveness was prominent for pupils of different abilities at intake. Differential effects were also found for socio-economic status and gender.

Sammons' (1995:48) multilevel analysis of longitudinal data on educational performance of pupils over a nine year period from their year 3 performance in

primary school to GCSE performance in year 11, found that gender was an important predictor of value added in Mathematics. The overall disparities between boys' and girls' performances increased in secondary schooling up to GCSE.

A study by Office for Standards and Education (Ofsted, 2003: 7) observes that the gender gap between boys and girls has been apparent in GCSE in England. When boys enter secondary schools, they are already behind girls in English although they achieve marginally better than girls in Mathematics. Except in a number of schools, boys continue to achieve less well than girls in GCSE examinations. The report states that recent GCSE results show girls doing better than boys in nearly all the subjects. Even in traditionally male area like resistant materials, girls have overtaken boys at GCSE. Now it is only in Mathematics and Science that boys achieve as broadly as girls. Added value for girls is greater than for boys.

The opposite is true in Botswana schools. The 2006 BGCSE examination performance showed that the performance of boys (as measured by the % of students with five grade Cs or better) was slightly better than that of girls. The report states that this has been the pattern for sometime now. The gap between male and female candidates has increased between 2005 and 2006. Although credit passes were used, the results indicate that schools were differentially effective.

Differential effectiveness by schools can reveal the internal functioning in schools and classrooms. When schools promote the achievement of higher ability students only, the cause could be the low expectations for low ability students and the communication of those expectations to students. As discussed earlier (*cf.* 2.3.5), students tend to perform as expected. The progress of some students and not others has far reaching consequences. This gap in performance will lead to an imbalance in further education and employment opportunities. These findings on differential effectiveness point to a need for

any study of school effectiveness to examine in detail the value added performance of different groups of students especially by level of prior attainment and gender (*cf.* 5.4).

When considering whether schools promote the progress of all its pupils, there is a need to distinguish between contextual, situational or compositional effects from differential effects. Contextual effects relate to the overall composition of the student body, for example, the percentage of high socio economic status, percentage of high ability students in a given year or group. The research on contextual effects has suggested that contextual effects related to ethnicity, concentration of low ability and low socio economic status can be very important. Nuttall *et al*. (1989:774) report that the compositional effect was evident in their study.

Nuttall *et al*. (1989:774) and DeFraine, Van Damme and Onghena (2002:403-407) argue that the composition of the students has an effect over and above individual students' characteristics. This effect has greater impact than the individual students' impact. Schools with high social class or high ability intakes have some advantages associated with their contexts (Willms, 1992:4). This is because schools with high social class or high ability intakes are more likely to have greater support from parents; cooperation from teachers; fewer disciplinary problems; and an atmosphere conducive to learning; whereas greater concentrations of under performing groups will further depress performance. Low ability students usually give up easily in academics and mostly cause discipline problems in schools.

One explanation has been offered to explain why social composition matters in relation to students' achievement. The effects of composition are directly related to the influence by peers. Rumberger and Palardy (2005:2007) assert that students with high achievement and motivation levels can help create a "culture of success" in schools, while students with low achievement and motivation levels can create a sense of deprivation and despair. This school

wide culture can have a negative effect on otherwise high achieving students in low achieving schools because it means that the schools are organized around low expectations and less challenging curriculum. These high ability students lack competition from others. Even if they don't get very high marks, they know they will still be top students. On the other hand, such a school wide culture can have a positive affect on otherwise low achieving students in high achieving schools. The composition of schools directly affects students' achievement through three peer mechanisms: the influence of peers on learning through in-class and out-of class interactions (e.g., cooperative work groups, study groups), motivation and aspirations of fellow students. Hecker and Tymms (2004:179) posit that the general interaction between peers, in particular, their level of conversation, shared hobbies, books and out of class activities raises the overall academic performance.

Hecker and Tymms (2004:180) note that other researchers argue that the interaction between the types of students and the teaching staff results in changes to teaching techniques; school organization; disciplinary procedures; school climate or ethos; level of parental involvement; and teacher morale and commitment. This perspective suggests that the schools' provision of education is moulded by the nature of the student body in ways that influence the achievement of individual pupils within it. In other words, there is a reciprocal relationship, students 'react' to school structures or the process in schools as well as to their peers, and schools in turn 'react' to the composition of the student body. The nature of the relationship and expectations can lead to schools becoming differentially effective. Effective schools react positively to any students' composition. However, the assigning of learners to schools should be considered by admissions section in the secondary department. Schools should share learners of different ability levels to avoid having more students from the lower ability level in some schools than in others because these can depress the performance of schools due to the schools' reactions to them.

3.7.2 Consistency in effectiveness

The concept of consistency of school effects deals with the question of whether schools are consistent in promoting the progress of students across subjects in a school. Thomas *et al*.'s (1997:188-189) study on value added by different subjects in GCSE found that in some schools, some departments were less effective than others in promoting the progress of students. They attribute this difference to factors such as whole school policies, exam entry policies, school development planning or factors related to what teachers do in departments. Departmental policies such as remedial teaching, teamwork and effective leadership from the subject leader account for the differences between subjects within the same school.

3.7.3 Stability in effectiveness

Stability looks at whether schools or departments promote the progress of the different cohorts of students. Sammons *et al*. (1997:48) assert that the question of stability over time in school effects is of considerable practical as well as theoretical significance. It is of practical importance because it shows whether a school is improving or declining in performance which may lead to taking appropriate remedial action by the school or supervisory departments. Theoretically, it builds up on the evidence concerning the stability of school effectiveness. The evidence concerning stability of school effects has showed that schools results on total GCSE performance are more stable than subject measures. Subjects fluctuated over the three years and this pointed to the value and necessity of looking at results in more than just one year. From their study on differential school effectiveness, Nuttall *et al*. (1989:775-776) caution "any study of school effectiveness research that relies on measures of outcome in just a single year, or just a single cohort of students".

In terms of stability and consistency, Thomas *et al*. (1997:193) conclude that only a minority of schools perform consistently (across subjects) and with stability

(overtime). They assert that a reliance on only a single measure of GCSE performance may mask the differences between departments. This supported the conclusions reached by Smith and Tomlinson (1989:276); Luyten (1994:213) and Peng *et al*. (2006:146-147; 149).

3.7.4 The size of school effects

The school effectiveness research has established that schools differ in their effectiveness. The literature reviewed in the preceding sections has shown qualitative differences between effective and ineffective schools in terms of processes or characteristics. The difference between effective and ineffective schools can also be quantified, that is, by how much do schools differ? This study has adopted a quantitative definition of value addition. It is therefore appropriate to review what other studies have found to be the quantitative differences between schools.

Teddlie *et al*. (2000:90) observe that the estimation of the magnitude of school effects has been a controversial issue since the 1966 Coleman's report. Specific methodological decisions can influence the estimation of school effects. The magnitude of school effects varies across several different 'contexts'; by socioeconomic status of students; by phase of schooling; and the country in which the study was conducted (Teddlie *et al*., 2000:75). Teddlie *et al*.'s (2000:77-90) review of several studies has quantified the size of school effects as 5-18%. Some studies have reported effect sizes of around 2%. This has led a number of critics to argue that the effect sizes are trivial and thus conclude that schools have little impact compared to background characteristics. However, these effects determine the difference between success and failure and show that schools matter. There remains a significant impact of schools even when intake differences are controlled for.

Rutter *et al*. (1979:19) conclude from their study that after adjusting for intake characteristics, children at the most effective schools got four times as many

exam passes on average as children at the least effective schools. Scheerens (1992:71) concludes that the effects of schools equates to an entire year's difference in the experience of a student in the most effective school as compared with students who are unfortunate enough to attend one of the least effective schools.

When using the (B)GCSE point scale where A*=8, A=7, B=6, C=5, D=4, E=3, F=2, G=1, and U=0, Gray, Jesson and Sime (1995:145-147) report that the advantage of a student attending a more effective school was 4 points. In other words, pupils attending more effective schools could be expected to obtain grade enhancement from D to B in two subjects or one grade D to C in four subjects compared to pupils in less effective schools. Sammons *et al*. (1997:44) found that the difference in attainment between the most and least effective schools was 10 or more (B)GCSE points (difference between six grade Bs rather than six grade Ds) for a student of average ability. Hopkins' (2001:46) later research suggests that the difference in performance by the most and least effective schools is equivalent to 7 (B)GCSE grade Cs as compared to 7 grade Es. This is a difference of 14 points.

These differences are significant both statistically and educationally, especially in high stakes examinations like BGCSE which are used to classify, select or sort students for further tertiary placement. They can enhance or depress such placement and consequently employment prospects. Schools therefore, have a moral and professional obligation to enhance the quality of education offered to their students.

3.8 CONCLUSION

The chapter reviewed literature on the characteristics of schools that add value to students' achievement. The factors were similar to the nine factors identified and discussed in Chapter two. Consistency in approach was found to be an important characteristic of schools that add value to students' achievement.

Barker, Wendel and Richmond (1999:52) content that if schools want to move in the direction of providing value added outcomes, the ten characteristics of effective schools need to be addressed. From these two chapters, the study adopted a multilevel context- input-process-output model to explain the factors that promote learners' achievement in secondary education. The basic assumption is that the higher levels will support teaching and learning at the classroom level.

The chapter also reviewed the link between school effectiveness and school improvement and the review showed that the two traditions need each other for mutual benefit. The school effectiveness has identified factors that school improvement process needs to tackle in order to achieve positive learners' achievement and lasting school improvement. School improvement also emphasises a cultural change through transformational leadership for improvement to be effective and long lasting. School improvement emphasises on conditions that impact more on the classroom teaching and learning.

This chapter traced the development of the use of value added measures in education. They came as a reaction to the misleading nature and deficiencies of league tables. From the literature, it is apparent that value added measures have more benefits than the traditional method of using the proportion of students who obtained five or more credit passes to judge schools' effectiveness. They show the contribution schools make to learners' intake achievement.

It is evident that schools differ in their effectiveness for different groups of students. This is an important issue for those dealing with equity and equal opportunities. A challenge facing education sector in Botswana as we move towards Vision 2016 is equity. It is therefore very important that any study of school effectiveness should investigate whether the schools are effective for all student groups with the potential of schools' self review.

As indicated in 3.1, one purpose of a literature review is to guide a study on the appropriate research design and methodology that were adopted by previous studies. The review of literature indicated the appropriate design and methodology of a value added study. The next chapter will describe the research design and methodology of this study.

CHAPTER FOUR

RESEARCH DESIGN AND METHODOLOGY

4.1 INTRODUCTION

The previous chapter reviewed literature on the developments of value added measures in education and studies that have adopted value added methodology to measure schools' effectiveness. This chapter discusses the research design and methodology of the present study. Brink and Wood (1994:100) assert that the purpose of a research design is to provide a plan for answering the research questions. It is therefore a framework or blue print with a set of instructions to the researcher which details what data is needed and how to collect and measure it to ensure its accuracy and reliability. The research design is usually based on previous research findings (Brink & Wood, 1994:102) and hence can guide the procedure for data analysis. The research design and methodology outlined in this chapter are based on the value added studies reviewed in Chapter three. Before the quantitative can be carried out, it is necessary to describe the data and how it was obtained. Specifically, the chapter will describe the research design and methodology; the population; sample and sampling procedure; data collection procedure; data analysis technique; reliability and validity of the statistical technique used to analyse the data; and conclusion.

4.2 THE RESEARCH DESIGN AND METHODOLOGY

Brink and Wood (1994:105) argue that all data can be described according to whether it is collected via qualitative (qualities) or quantitative (numerical) methods. Therefore, all studies can be classified as either qualitative or

quantitative depending on the type of data collected. This research used numerical measures of students' prior and later attainments. This is quantitative data and therefore it makes the research to be mainly quantitative. A quantitative research enables the researcher to make generalisations from the sample to the target population (Gunter, 2002:227).

Sammons *et al*. (1997:14; 25) and Teddlie, Reynolds and Sammons(2000:123) argue that the most appropriate studies of school effectiveness adopt a longitudinal approach and look at the full period of time students are in secondary schools. In a similar vein, Goldstein (1997:376) reiterates that studies of school effectiveness should be longitudinal so that pre - existing students' differences and subsequent contingent events among institutions can be taken into account. Longitudinal studies follow subjects for a period of time to obtain repeated measures (Brink & Wood, 1994:104). The changes in the variables or achievement are established. However, a longitudinal study was not possible for this study because the time students spend in senior secondary schools is short and only one national examination is administered at the end of the two years in Form five and hence it was not possible to obtain repeated measures of standardised national examinations.

According to Brink and Wood (1994:103), the research design can be named based on the timing of the data collection. The studies that focus on the events that have occurred in the past are retrospective or ex post facto. Cohen and Manion (1994:146) assert that ex post facto indicates that data are collected after a presumed cause has occurred. The researcher takes the effect or dependent variable and examines the data retrospectively to find out what factors seem to be associated with certain occurrences, conditions or aspects of behaviour. In ex post facto design, the researcher cannot manipulate the possible antecedents of events that have already happened. The research design of this study is ex post facto in that the data collected focussed on the students' outcomes at the end of their secondary schooling and so the results relate to a previous period of each school's history (Sammons *et al*., 1997:30). The design is specifically, casual or

co-relational ex post facto. Casual ex post facto involves the collection of two sets of data, one of which will be retrospective, with a view of determining the relationship between them (Cohen & Manion, 1994:147). The two sets of data collected for this study were retrospective in that they referred to past performances in JCE exams and BGCSE exams (*cf.* 1.5). To determine the relationship between the two sets of data, namely the JCE and BGCSE exam results, a quantitative value added methodology was adopted (*cf.* 1.5). The research design was therefore quantitative ex post facto.

4.3 DETERMINING THE SAMPLE SIZE

4.3.1 Target population

The target population for this study was the Form Five students in all twenty-seven government and government aided senior secondary schools located in five inspectoral regions in Botswana who wrote the BGCSE examinations in 2005, 2006 and 2007. Three years is the minimum required to identify a linear trend in effectiveness (Sammons *et al*., 1997:49). The number of students for the three years was 17,855; 18,101 and 22,067 respectively. The population therefore, consisted of fifty eight thousand and twenty three (58,023) students. Mertens (1998:255) makes a distinction between the target population and the experimentally accessible population. The latter is the list of people or elements (sampling frame) that fit the conceptual definition of the target population and the researcher has access to. When the accessible population represents the target population, population validity is established Mertens (1998:255). In this study, the validity was established since the researcher had access to all the names of students in the accessible population which was also similar to the target population.

4.3.2 Sample size

Researchers are often faced with the question of how large a sample must be. Cohen and Manion (1994:89) assert that there is no clear cut answer to this question, for the correct sample size depends on the purpose of the study and the nature of the population under scrutiny. The size of the sample depends on a number of factors which can include cost, time, energy and statistical power (Hill, 1998:3). However, different scholars have given different guidelines which researchers can follow when deciding the sample size. Leong and Austin (1996:102) posit that a pragmatic rule of thumb is to adopt the sample sizes observed during the review of literature while Hill (1998:3) asserts that the number of respondents accepted for a study depends on the type of research involved.

Hill (1998:3) maintains that when a researcher is faced with making a choice between different factors such as between the economy and convenience of small samples, replicability and representativeness of large samples, the best choice will be to balance practical considerations against statistical power and generalisability. He goes further to say that increasing sample size will increase the statistical power. A few others believe that the larger the population, the larger the sample should be (Cohen & Manion, 1994:90; Bryman & Cramer, 1997:103). Choosing a big enough sample is critical when a researcher wants to use inferential statistics. My Environmental Education Evaluation Resource Assistant (MEERA, 2007:5) points out that inferential statistics allows the researcher to test whether there are significant differences between groups, for example, girls versus boys. On the other hand, Krejcie and Morgan (in Hill, 1998:3) produced a table that researchers can use to select samples that will be representative of the population.

Table 4.1 Determining the sample size (S) from a given population (N)

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	246
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	351
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	191	1200	291	6000	361
45	40	180	118	400	196	1300	297	7000	364
50	44	190	123	420	201	1400	302	8000	367
55	48	200	127	440	205	1500	306	9000	368
60	52	210	132	460	210	1600	310	10000	373
65	56	220	136	480	214	1700	313	15000	375
70	59	230	140	500	217	1800	317	20000	377
75	63	240	144	550	225	1900	320	30000	379
80	66	250	148	600	234	2000	322	40000	380
85	70	260	152	650	242	2200	327	50000	381
90	73	270	155	700	248	2400	331	75000	382
95	76	270	159	750	256	2600	335	100000	384

Source: Hill (1998:3)

Krejcie and Morgan (in MEERA, 2007:3) further specified the population size and the percentage required for the different population sizes at the 95 percent confidence interval and 5 percent sampling error as shown in Table 4.2.

Table 4.2 Population, sample size and percentage required

Population	Sample size	Percentage required
10	10	100
20	19	95
50	44	88
100	80	80
250	152	61
500	217	43
1,000	278	28
2,500	333	13
5,000	350	7
10,000	370	4

Source: MEERA (2007:3)

Although the views as set out in Table 4.1.and 4.2 were considered, the recommendation of larger sample sizes was followed in this study to reduce sampling error and increase the generalisability of results and since inferential statistics were used in the analysis, a sample of five thousand six hundred and sixty two (5662) students was chosen.

4.3.3 Sampling procedure

Brink and Wood (1994:99) posit that it is rare that perfectly representative samples can be created, but the chances of getting a representative sample can be increased by the sampling technique used. Probability sampling is the most useful technique in obtaining a representative sample (Hopkins, 2000:4; Cohen, Manion & Morrison, 2001:94). The method involves selecting at random from a list of the population (a sampling frame) the required number of subjects for the sample. This technique ensures that each student in the population, with certain

distinguishing characteristics- male or female, high or low intelligence has an equal chance of being included in the sample (Brink & Wood, 1994:104; Cohen & Manion, 1994:87; Bryman & Cramer, 1997:99).

On admission to senior secondary schools, schools receive students' admission lists stratified by ability from the highest to the lowest achieving student. For this study, 70-100% was considered as high ability, 60%-69% as middle ability and less than 60% as low ability. A proportionate representative sample from each stratum and from each school, and thus a general representative sample, was required to ensure generalisation of results to all students (the population) in general, and to students within a particular school. A proportionate sample means that the sample size was chosen according to the number in each ability group, gender and school size. This means larger schools had larger samples and vice versa. To ensure representation, proportionate simple random sampling, based on probability sampling was used to select students as shown in Table 4.3.

Table 4.3 Sample size

Year	Female	Male	High ability	Mid ability	Low ability	Total	Population
2005	959	891	614	658	578	1850	17 855
2006	995	916	624	604	665	1911	18 101
2007	990	911	689	637	575	1901	22 067
						5662	58 032

4.4 DATA COLLECTION

Permission was sought from the Ministry of Education to carry out the analysis of BGCSE exam results for value added to the JCE intake scores. The aim of the study was explained to the Department of Secondary Education in the Ministry of Education and to BEC by the researcher in person. The BGCSE exam results

were obtained from BEC while the JCE exam results were obtained from the Department of Secondary Education- student admissions between March and April 2008. Both datasets were collected as text data files on the Microsoft Excel platform. The biographical data at entry to senior school namely, average JCE score, grades for English Language, Setswana Language and Mathematics and gender represent the explanatory or independent variables at the individual student level.

The dependant or response variables were the individual student's average score for BGCSE best eight subjects, grades for English Language, Setswana Language and Mathematics.

4.5 DATA ANALYSIS

The data collected had a hierarchical structure: students in departments, departments in schools and schools located in inspectoral regions. From a statistical perspective, such data requires the use of the statistical techniques of multilevel modelling (Goldstein, 1999:2) which should incorporate the hierarchical structure of data. The data was analysed via the statistical software package MLwiN 2.10 Beta (4), which is based on multilevel modelling (Rasbash *et al.*, 2008). Within the hierarchical data, multilevel modelling allowed the researcher to examine the differential effectiveness of schools and departments for different students' groups in detail.

The analysis approaches that a researcher could follow include descriptive and inferential analysis (Brink & Wood, 1994:212). Descriptive analysis describes the sample data and any conclusions reached refer only to the sample. On the other hand, inferential statistics provides statistical validation of research hypothesis, which allows the researcher to draw inferences about the larger population from the sample data (Brink & Wood, 1994:212). As such, descriptive statistics were used to compare the exam means of gender at intake and at school departure and to describe the sample. Multiple regression analysis, which is a

form of inferential statistics, was used to make inferences or generalisations from sample analysis to the population in order to generalise the research findings to the target population. Hills (1998:2) and Terns (2008:1) maintain that inferential statistics works well when a random and representative sample is obtained as was the case in this study.

4.6 RELIABILITY AND VALIDITY

Reliability and validity refer specifically to the measurement of data as used to answer the research question (Brink & Wood, 1994:170). The concept of reliability is concerned with the consistency of results when the same variable is measured in the same person. The reliability and validity in value added measures depend on the value added methodology employed to give consistent results. For the results to be reliable and valid, certain conditions have to be fulfilled as laid down by school effectiveness researchers such as, Gray and Wilcox(1995:92); Sammons *et al.*(1997:30); Jesson (2000:10); Schagen and Schagen (2005:312). The conditions are:

- The data should be collected at the individual student level as a measure of what each student got in each subject expressed for example in point scores where A*=8, A=7, B=6, C=5, D=4, E=3, F=2, G=1 and U/X =0. The data should not be aggregated or summarised at the school level using for example, the percentage of students getting five grade Cs or better
- Secondly, appropriate 'contextualisation' is required. This should reflect the student background characteristics such as student abilities, socio-economic status and gender. However, strong preference should be given to data that indicates prior attainment, as prior attainment is the most important co-variate to adjust or compensate for differences in intake which then allows value added to be measured reliably (Sammons *et al.*, 1997:43).
- In the absence of pupil's prior attainment, several additional biographical variables on pupils' background should be included such as measures of social advantage.

- The data analysis technique should use the statistical technique known as multi level modelling.
- Three years is the minimum to establish any trend in effectiveness (*cf.* 4.3.1)

Sammons *et al*. (1997:25) argue that it is essential that, wherever possible, value added systems should measure progress where both baseline and the outcome are measured in terms of what is taught in schools: the national curriculum. In this study, the baseline (prior attainment) and outcome measures were collected at the individual student level from the national examination data. This is very reliable data. The prior attainment intake was also known for each individual student from the JCE results. The statistical software used was based on multilevel modelling. The researcher believes that the results of this study are reliable and valid because the data analysis technique employed is applicable and appropriate for the data structure and satisfies the conditions for value added analysis. The above conditions indicate that when the necessary conditions are met, it is possible to adopt a value added methodology to determine schools' effectiveness. This partly covered the second research aim.

4.7 CONCLUSION

The chapter discussed the research design and methodology for the study and the justification for using multi level modelling. The sampling procedure and the sample size were outlined. Proportionate simple random sampling was used to reduce sampling error and increase the representativeness of the population which enabled generalisability of the results from the sample to the population. Since the study adopted a value added methodology, the necessary conditions for any school effectiveness study using a value added methodology were described and the study met the set criteria. This set criteria established the reliability and the validity of the results of the study. Chapter five presents the results of the data analysis and the discussion of the results.

CHAPTER FIVE

DATA ANALYSIS AND DISCUSSION

5.2 INTRODUCTION

Chapter four discussed the research design and value added methodology for this study. The statistical analysis was discussed. In Chapter one, four research aims (*cf.* 1.4) were stated. The first research aim on the concept of school effectiveness and characteristics of effective schools was answered by the literature review in Chapters two and three. The aim of this chapter is to address the second and third research aims. The second research aim was to investigate the possibilities of a value added approach to school effectiveness in judging school performance (*cf.* 1.4.2). The third research aim was to determine, on the basis of the literature reviewed and the methods adopted by a value added approach, the effectiveness/ineffectiveness of secondary schools in Botswana (*cf.* 1.4.3).

The chapter addresses the following problem questions (*cf.* 1.3.3)

- In what way can a value added approach to determining school effectiveness contribute to judging school effectiveness?
- How effective are secondary schools in Botswana? Are some schools more effective than others in promoting students' progress when the differences in student intake are considered?
- Are schools equally effective/ineffective for all the student groups?
- Are the schools consistently effective/ineffective across the core subjects?
- And are the schools stable in their effectiveness/ineffectiveness for 2005-2007?

The results of the quantitative data analysis are presented according to the research questions. In answering the research questions, the chapter will cover

the description of the data and the regression model; overall school effectiveness; differential school effectiveness; consistency in effectiveness; stability in effectiveness; and conclusion.

5.2 THE DATASET AND THE REGRESSION MODEL

The data set comprised of the BGCSE examination results for 2005-2007 matched to the corresponding JCE examination results for 2004-2006 for 5,662 students in twenty seven (27) senior secondary schools as described in Chapter 4 (*cf.* 4.3). The sample demographics are shown in Table 5.2.1 below. There was a fair representation of male and female students and for the different ability groups.

Table 5.2.1 Demographics of the sample

Year	Boys	Girls	Total	High	Mid	Low
2005	891	959	1850	614	658	578
2006	916	955	1911	642	604	665
2007	911	990	1901	689	637	575

The statistical model used throughout the analysis was MLwiN 2.10 Beta (4). A random coefficient model of school effectiveness relating the final exam score at BGCSE to the initial JCE score, with pupils (indexed by i) at level 1 and school (indexed by j) at level 2 (Rasbash *et al.*, 2008:54), was given by Model 5.3 shown below:

Model 5.3 A random coefficient model of school effectiveness

$$\text{TBGCSE}_{ij} = \beta_{0j} + \beta_{1j}\text{TJC}_{ij} + e_{ij}$$
$$\beta_{0j} = \beta_0 + u_{0j}$$
$$\beta_{1j} = \beta_1 + u_{1j}$$
$$\begin{bmatrix} u_{0j} \\ u_{1j} \end{bmatrix} \sim \text{N}(0,\ \Omega_u) \ :\ \Omega_u = \begin{bmatrix} \sigma^2_{u0} & \\ \sigma_{u01} & \sigma^2_{u1} \end{bmatrix}$$
$$e_{ij} \sim \text{N}(0, \sigma^2_e)$$

Where:

TBGCSE_{ij} represents the exam score for child *i* in school *j*,

β_{oj} represents the intercept for school *j*,

β_{1j} represents the slope for school *j*,

β_1 represents the slope coefficient for the prior ability variable,

TJC_{ij} represents the prior ability (JCE score) for child *i* in school *j* and

e_{ij} represents the departure of child *i* in school *j* from the school's predicted line

The intercept for school *j*, β_{oj} can be decomposed into $\beta_{oj} = \beta_0 + u_{0j}$

Where β_0 is the average intercept for all the schools in the sample, u_{0j} is a random departure for each of the schools

The slope for school *j*, β_{1j} can be decomposed into $\beta_{1j} = \beta_1 + u_{1j}$

Where β_1 is the slope coefficient for the prior ability variable, u_{1j} is a random departure for each of the schools.

The terms u_{0j} and u_{1j} are random departures from β_0 and β_1, or residuals at the school level.

The terms u_{0j} and u_{1j} follow a multivariate or a bivariate normal distribution with mean vector 0 and covariance matrix Ω_u. In this model, there are two random variables at level 2; Ω_u is a 2 by 2 covariance matrix. The elements of Ω_u are

$\text{var}(u_{0j}) = \sigma^2_{u0}$ (the variation in the intercepts across the schools' summary line)

$\text{var}(u_{1j}) = \sigma^2_{10}$ (the variation in the slopes across the schools' summary line)

$\text{cov}(u_{0j}, u_{1j}) = \sigma u_{o1}$ (the covariance between the schools' intercepts and slopes)

The students' scores depart from their school's summary line by an amount e_{ij}, which is assumed to be normally distributed with mean 0 and a variance σ^2_e.

The response variables used for each student were the final results at BGCSE, namely BGCSE average, the Setswana BGCSE mark, the English BGCSE mark and the Mathematics BGCSE mark. The explanatory variables were the initial achievement scores namely JCE average, the Setswana JCE mark, the English JCE mark, Mathematics JCE mark, learners ability level and gender. These variables were coded as shown below in Table 5.2.2. The subjects' averages for 2005 and 2006 for JCE and BGCSE respectively, are given as examples. The marks were different for different years (*cf.* Appendix 1-3).

Table 5.2.2 The variables and their descriptions

Variable	Coding	Description
School	1-27	School identified by name
Student	1-5662	Student identified by name
TBGCSE	6.25%-100%	Total score for BGCSE subjects (depending on the year)
TJC	43.75%-97.47%	Total score for JCE subjects (depending on the year)
Cons	1	Vector of 1 specifying constants in models
Ability	1-3	Students' ability based on TJC: (70-100=high=1;60-69=mid=2;below 60%=low=3)
Girl	0 and 1	Students' gender: 0=male, 1=female
Engbgcse	41%-58.7%	Schools' average BGCSE English mark for 2006
Setsbgcse	48.1%-62.2%	Schools' average BGCSE Setswana mark for 2006
Mathsbgcse	26%-46.3%	Schools' average BGCSE Mathematics mark for 2006
Mathsjc	54%-62.1%	Schools' average Mathematics mark at JCE for 2005
Setsjc	53%-61.5%	Schools' average Setswana mark at JCE for 2005
Engjc	54%-64.8%	Schools' average Setswana mark at JCE for 2005

5.3 THE OVERALL EFFECTIVENESS OF SCHOOLS

The research question 1.3.3 (*cf.* 1.3) can be formulated as follows: **How effective are secondary schools in Botswana? Are some schools more effective than others in promoting the progress of students?** This question requires us to take into account students' intake achievements in order to make value added comparisons between schools (Rasbash *et al*., 2008:42). Do differences in schools remain after adjusting for a measure of achievement on entry to senior secondary school? To answer this question, a random intercept 2 level model was used. The slope for schools in this particular model is fixed, and in the Model 5.3 below.

Model 5.3 General model to determine the effectiveness of schools

$$\text{TBGCSE}_{ij} = \beta_{0j} + \beta_1 \text{TJC}_{ij} + e_{ij}$$
$$\beta_{0j} = \beta_0 + u_{0j}$$
$$u_{0j} \sim \text{N}(0, \sigma^2_{u0})$$
$$e_{ij} \sim \text{N}(0, \sigma^2_e)$$

TBGCSE_{ij}, refers to the dependent variable which is the average for the best 8 BGCSE subjects for student *i* in school *j*, and

TJC refers to the response variable, the average JCE score for student i in school j,

β_{oj} represents the intercept for the school *j*,

β_1 represents the slope coefficient for the JCE score,

TJC_{ij} represents the prior intake score for child *i* in school *j* and

e_{ij} represents the departure of the child *i* in school *j* from the school's predicted line

The intercept for the school j, β_{oj} can be decomposed into

$\beta_{oj} = \beta_0 + u_{0j}$

where β_0 is the average intercept for all the schools in the sample, u_{0j} is a random departure for each school

The slope for the school *j*, β_{1j} can be decomposed into

$\beta_{1j} = \beta_1 + u_{1j}$ (but it is kept constant in this model to control for intake)

5.3.1 School effectiveness in 2005

In the analysis of the fixed slope model, an example of the sampled data format is given in Appendix 1, Table 1. The analysis results yield the following model for the 2005 data subset:

$$\text{TBGCSE}_{ij} = \beta_{0j} + 1.386(0.017)\text{TJC}_{ij} + e_{ij}$$
$$\beta_{0j} = -32.946(1.190) + u_{0j}$$

$$u_{0j} \sim \text{N}(0, \sigma^2_{u0}) \quad \sigma^2_{u0} = 4.565(1.482)$$
$$e_{ij} \sim \text{N}(0, \sigma^2_e) \quad \sigma^2_e = 59.866(1.983)$$
$$-2*loglikelihood = 12869.772(1850 \text{ of } 1850 \text{ cases in use})$$

The log likelihood is a measure of the goodness of fit. In the 2005 model equation, the comment on the number of cases used, (1850 of 1850) implies that there were no missing values in the sample. The figure in brackets, for example, 0.017 indicates the standard errors. From the above equation, the value added by schools is given by:

$\text{TBGCSE}_{ij} = (-32.946 + u_{0j}) + 1.386 * \text{TJC}_{ij}$

The u_{0j} technically known as a residual or value added for the different schools is given in Appendix 1, Table 1.2. The table consists of 27 rows representing the

27 schools. From the table, school 1 has a residual value of 1.201 and was ranked position 23 as shown in column 6. The values reported in Table 5.3.1 below are the different schools' value added scores and their inverted ranks obtained from Appendix 1, Table 1.2. For example, when the rank is inverted (28-23), school 1 is ranked position 5 in Table 5.3.1. School 23 which is ranked position 27 in Appendix 1, Table 1.2 is now ranked position 1, that is, (28-27). The percentage credit pass and their ranking were obtained from Appendix 10.

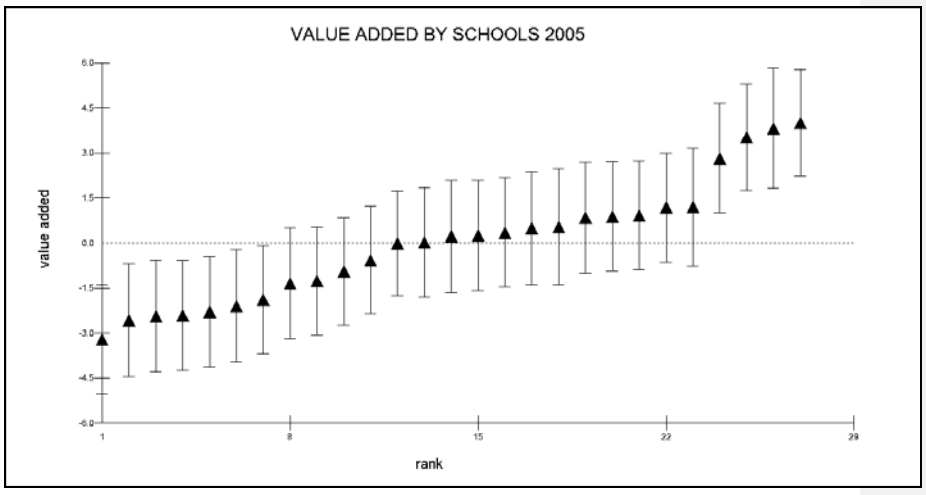
Table 5.3.1 The value added by schools in 2005

School	Value added(u_{0j})	Ranking(28-c305)	%Credit passes	Ranking
23	3.99	1	48.14	5
20	3.82	2	55.75	2
25	3.52	3	53.75	3
12	2.82	4	60.21	1
1	1.20	5	49.42	4
27	1.18	6	42.72	10
11	0.92	7	36.94	14
10	0.88	8	35.21	15
6	0.84	9	47.16	7
4	0.54	10	26.72	26
8	0.49	11	44.43	8
14	0.36	12	40.74	12
2	0.26	13	47.81	6
15	0.22	14	38.2	13
5	0.03	15	27.87	24
3	-0.01	16	32.66	19
21	-0.57	17	34.39	16
9	-0.94	18	43.08	9
22	-1.27	19	41.15	11
7	-1.34	20	28.78	23
24	-1.90	21	33.39	17
19	-2.09	22	27.55	25
18	-2.29	23	30.48	20
26	-2.42	24	33.33	18
16	-2.43	25	29.6	21
13	-2.57	26	26.45	27
17	-3.21	27	29.05	22

Pearson Correlation Coefficient between rankings = 0.75

One other useful way of illustrating the differences between schools is through using plots. The value added by the schools and their ranks were plotted as shown in the caterpillar plot, Figure 5.3.1 with 95 % confidence limits shown. If the ranking order of Appendix 1, Table 1.2 is taken into consideration, the schools are plotted from the highest value added (highest ranking) to the lowest value added (lowest ranking). Reference to ranking order in Table 2.1 can be used to identify schools' value added contribution. For example, the school with the highest value added (3.997) and the highest ranking- position 27 can be identified as school 23. The school with the lowest value added (-3.207) and lowest ranking -position 1 can be identified as school 17. In Table 5.3.1, the ranking order was reversed from that in Appendix 1, Table 1.2. Position 1 shows more value added and 27 least value added. This will enable the value added ranking to be compared with the percentage credit pass ranking, since with credit passes; the school with the highest credit passes is ranked position 1.

Figure 5.3.1 The value added by schools and their rankings in 2005



The results from Table 5.3.1 and Figure 5.3.1 indicate that in 2005, 15(55.6%) schools had a positive value added score. They were effective in promoting the progress of their students. 12(44.4%) had a negative value added score. In these

schools the students did worse than expected when their intake scores were considered.

The credit passes for 2005 are also shown in Table 5.3.1 to compare school's performance on credit passes (raw results) against their value added results. The correlation between the two rankings is high (0.75), but not perfect. This shows that a lot of schools changed their rankings in raw results and value added results. Only 3 schools did not change their rankings. Some schools which were considered good in terms of raw results were not doing so well in value addition. School 9 in the top ten in raw results at position 9, added negative value to its students and moved down to position 19 in the value added ranking. This is a big difference. Similarly, school 22 with a negative value added score moved from 11 down to 19 in value added. The other schools which ranked high in raw results but were lower in positive value added were school 12 from top 1 to 4, school 6 from 7 to 9, school 2 from 6 to 13, and school 9 from 9 to 18.

Similarly, some schools which were doing not so well in raw results did well in terms of adding positive value to students. School 4 at position 26 moved up to position 10; school 5 at 24 moved up to 15; school 11 from 14 to 7; school 10 moved from 15 to 8; school 27 moved from 10 to 6 and school 23 moved from 5 to 1. A similar comparison can be made with the remaining schools and it can be concluded that raw results on their own have a potential of misleading. The schools at the top may be 'flattered' by their positions which may lead to complacency while the schools at the bottom can be taken to be poor schools and this might lead them to despair. Raw results therefore, do not tell us enough about how good the schools are in promoting the progress of their students.

5.3.2 School effectiveness in 2006

The data for the 2006 sample is shown in Appendix 2, Table 2.1. The analysis results yield the following model for the 2006 data subset:

$$\mathbf{TBGCSE}_{ij} = \beta_{0j} + 1.403(0.014)\mathbf{TJC}_{ij} + e_{ij}$$
$$\beta_{0j} = -34.434(1.108) + u_{0j}$$

$$u_{0j} \sim N(0, \sigma^2_{u0}) \quad \sigma^2_{u0} = 8.789(2.616)$$
$$e_{ij} \sim N(0, \sigma^2_e) \quad \sigma^2_e = 58.152(1.895)$$
$$-2*\textit{loglikelihood} = 13254.024(1911 \text{ of } 1911 \text{ cases in use})$$

From the above equation, the value added is given by the equation: $\mathbf{TBGCSE}_{ij} = (-34.43 + u_{0j}) + 1.403*\mathbf{TJC}_{ij}$ Table 5.3.2 below gives the value added by schools and their inverted rankings obtained from Appendix 2, Table 2.2 The credit pass was obtained from Appendix 11.

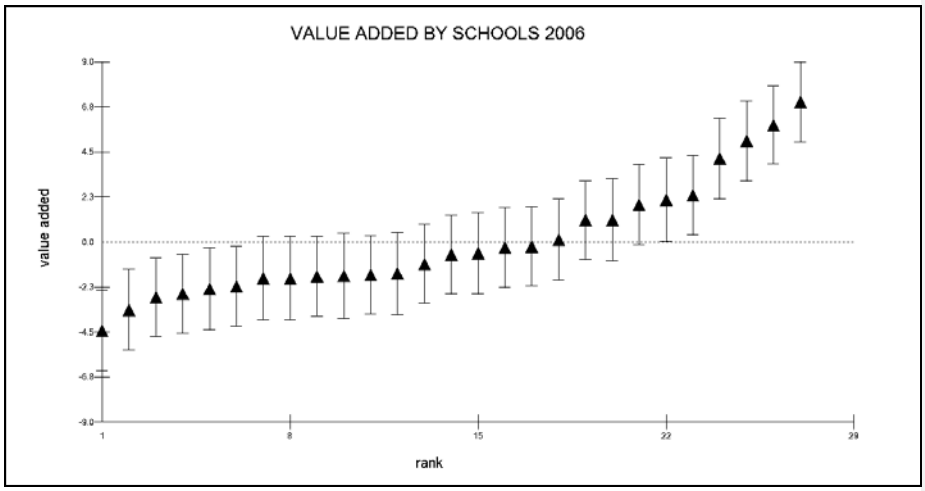
Table 5.3.2 The value added by schools in 2006

School	Value added (u_{0j})	Ranking (28-c305)	% Credit passes	Ranking
23	7	1	57.73	3
20	5.85	2	63.11	2
25	5.05	3	65.17	1
12	4.17	4	59.68	3
11	2.33	5	39.65	12
10	2.11	6	38.58	17
27	1.87	7	46.49	7
21	1.11	8	39.19	14
24	1.09	9	44.46	8
13	0.13	10	31.34	24
6	-0.22	11	46.81	6
18	-0.27	12	38.74	16
4	-0.55	13	32.61	22
1	-0.62	14	38.91	15
8	-1.09	15	42.62	9
5	-1.58	16	34.78	21
16	-1.63	17	30.03	25
2	-1.69	18	48.85	5
15	-1.72	19	40.69	11
14	-1.80	20	36.5	18
19	-1.81	21	34.85	20
22	-2.20	22	41.48	10
7	-2.34	23	29.68	26
3	-2.58	24	26	27
17	-2.75	25	39.22	13
26	-3.40	26	32.27	23
9	-4.42	27	36.26	19

Pearson Correlation Coefficient between rankings =0.61

The value added by the schools and their ranks were plotted as shown in the caterpillar plot, Figure 5.3.2 with 95 % confidence limits shown. If the ranking order of Appendix 2, Table 2.2 is taken into consideration, the schools are plotted from the highest value added (highest ranking) to the lowest value added (lowest ranking). The highest ranking school (rank 27), with the highest value added score (7.00) can be identified in Table 2.2 as school 23. The lowest ranking school with the lowest value added score (-4.419) at position 1, can be identified as school 9. In Table 5.3.2, the ranking order was reversed from that in Appendix 2, Table 2.2. Position 1 shows more value added and 27 least value added. This will enable the value added ranking to be compared with the percentage credit pass ranking.

Figure 5.3.2 The value added by schools and their rankings in 2006



The results in Table 5.3.2 and Figure 5.3.2 show that in 2006, some schools were more effective than others. Students made more progress in these schools when compared to similar students in other schools. 10 (37%) schools added positive value to student prior achievement. In 17(63%) of schools students did not progress as expected. The value added was negative.

The 2006 credit pass ranking order recorded in Table 5.3.2 and value added schools' ranking order were compared and correlated. The correlation between the rankings was significantly positive and moderate (0.61). This means that some schools changed ranking positions when value added was considered. Some schools which in terms of raw results were thought to be doing well were actually performing badly in terms of the progress made by their students. If we consider the schools in the top ten in credit pass, we find that four of the schools namely, 2, 6, 8 and 22 did badly in terms of added value. On the other hand, school 13 doing badly in credit passes at position 24, added value and moved to the top ten at position 10. Schools 11, 21 and 10 also moved to the top ten in value added. School 3 at position 27, moved to position 24 although the value added was negative. In addition, school 23 at position 3 in raw results, was doing well in terms of value added and moved to position 1 while school 25 at position 1 in raw results was at position 3 in value added.

5.3.3 School effectiveness in 2007

The data for the 2007 sample is shown in Appendix 3, Table 3.1.The analysis results yield the following model for the 2007 data subset:

$$\mathrm{TBGCSE}_{ij} = \beta_{0j} + 1.374(0.014)\mathrm{TJC}_{ij} + e_{ij}$$
$$\beta_{0j} = -30.388(1.131) + u_{0j}$$

$$u_{0j} \sim N(0, \sigma^2_{u0}) \quad \sigma^2_{u0} = 8.261(2.473)$$
$$e_{ij} \sim N(0, \sigma^2_e) \quad \sigma^2_e = 56.024(1.830)$$
$$-2*\mathit{loglikelihood} = 13113.475(1901 \text{ of } 1901 \text{ cases in use})$$

The value added equation for 2007 schools in the fixed school slope model was determined as $\mathbf{TBGCSE_{ij} = (-30.39 + u_{0j}) + 1.37*TJC_{ij}}$. Table 5.3.3 below shows the value added scores and their inverted rankings as calculated in Table 3.2 from Appendix 3. The credit passes reported were obtained from Appendix 11.

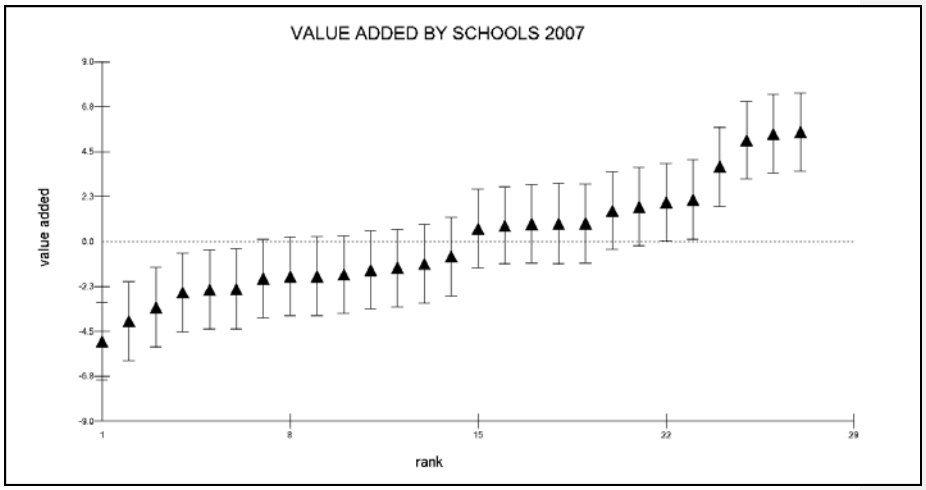
Table 5.3.3 The value added by schools in 2007

School	Value added((u_{0j}))	Ranking (28-c305)	%Credit passes	Ranking
20	5.47	1	58.66	2
23	5.39	2	54.7	3
27	5.07	3	53.61	4
11	3.75	4	50.5	7
12	2.11	5	60	1
16	1.96	6	43.63	10
25	1.75	7	51.78	6
17	1.55	8	52.29	5
9	0.91	9	38.48	13
2	0.90	10	46.66	8
6	0.90	11	44.64	9
8	0.80	12	40.95	11
13	0.65	13	26.97	22
4	-0.76	14	34.21	18
5	-1.12	15	23.89	26
19	-1.32	16	35.97	15
15	-1.42	17	34.68	17
14	-1.65	18	38.26	14
24	-1.73	19	32.12	19
18	-1.75	20	35.71	16
22	-1.86	21	40.67	12
10	-2.37	22	30.24	21
1	-2.41	23	24.95	25
7	-2.55	24	31	20
3	-3.28	25	25.27	24
21	-3.99	26	26.24	23
26	-4.99	27	21.89	27

Pearson Correlation Coefficient between rankings = 0.87

If the ranking order of Appendix 3, Table 3.1 is taken into consideration, the schools are plotted from the highest value added (highest ranking) to the lowest value added (lowest ranking).

Figure 5.3.3 The value added by schools and their rankings in 2007



The caterpillar plot illustrates the ranking order and value added by individual schools. The highest ranking school (rank 1, Table 5.3.3) with the highest value added (5.472) was at position 27 on the caterpillar plot being school 20 while school 26, with the smallest value added (-4.995, rank 27, Table 5.3.3) was at position 1 on the caterpillar plot.

The 2007 value added results as obtained from Table 5.5.3 and Figure 5.5.3 show that 13(48%) schools were more effective than others. The students in these schools made more progress when their intake scores were taken into consideration by the analysis model. 14(52%) schools were less effective. These schools added negative value considering students' initial attainment.

The correlation between added value and credit passes rating levels for 2007 was not perfect (0.87). Some schools which were ranked high in terms of raw results were doing well in terms of value added and vice versa. School 12 which

was at position 1 in raw results was lower at position 5 in value added. School 17 moved down from 5 on raw results to 8 in value added while School 22 at position 12 in credit pass ranking, was in fact adding negative value and moved further down to position 21. School 11 moved from position 7 up to 4 in value added ranking and school 9 from 13 up to 9. School 13 which was one of the schools at the bottom in raw results at position 22, was doing well in terms of progress made by students and moved further up to position 13. School 5 at position 26 moved up to 15 in value added ranking.

When the effect of the years is considered, 2006 had the least effective schools (10%), followed by 2007(13%) and 2005 had more effective schools (15%). The fluctuations due to years were next removed by taking the average value added by the schools for the three year period combined as shown in Table 5.3.4. The average values yielded a single measure of schools' effectiveness. The schools inspectoral regions are also taken into consideration in order for comparisons to be made between regions since the inspectoral region is contextual as mentioned in Chapter 3 (*cf.* 3.5).

Table 5.3.4 The overall value added by schools for 2005-2007

School	Value added 2005	Value added 2006	Value added 2007	Value added average	Inspectoral region
23	4.00	7	5.39	5.46	D
20	3.82	5.85	5.47	5.05	C
25	3.52	5.05	1.75	3.44	C
12	2.82	4.17	2.11	3.03	D
27	1.178	1.87	5.07	2.71	D
11	0.92	2.3	3.75	2.33	D
6	0.84	-0.22	0.89	0.50	C
10	0.88	2.11	-2.37	0.21	A
8	0.49	-1.09	0.79	0.07	C
2	0.26	-1.69	0.90	-0.18	C
4	0.54	-0.55	-0.76	-0.26	C
13	-2.57	0.13	0.65	-0.60	B
1	1.20	-0.62	-2.41	-0.61	D
16	-2.43	-1.63	1.96	-0.70	C
24	-1.90	1.09	-1.73	-0.85	A
5	0.03	-1.58	-1.12	-0.89	C
15	0.22	-1.72	-1.42	-0.97	E
14	0.36	-1.80	-1.65	-1.03	A
21	-0.57	1.11	-3.99	-1.16	B
18	-2.29	-0.27	-1.75	-1.44	C
17	-3.21	-2.8	1.55	-1.47	A
9	-0.94	-4.42	0.91	-1.48	A
19	-2.09	-1.81	-1.32	-1.74	B
22	-1.27	-2.20	-1.86	-1.78	A
3	-0.01	-2.58	-3.28	-1.958	E
7	-1.34	-2.34	-2.55	-2.08	A
26	-2.42	-3.40	-4.99	-3.60	A

The value added means indicate that some schools were more effective than others when initial intake was taken into consideration by the fixed slope analysis model. 9(33%) schools were more effective than others. Pupils in these schools progressed further than expected from their initial intake grading. However, a lot of schools 18(67%) were ineffective. Students in these schools made less progress than similar students (ability and gender) in other schools.

This finding demonstrates that schools do indeed make a difference. Some schools exhibit a significant effect on students' performance even after adjusting for intake grading (Sammons *et al*., 1997:44). Two students with similar initial intake levels can make different progress depending on which school she/he is sent to. In the most effective school, the school actually added 5.46 points to learners' achievement, considering learners' prior attainment. In the least effective school, the school actually contributed to students performing 3.6 points below what they could have obtained, taking into account their prior attainment. This indicates that effective schools have a competitive advantage.

The analysis also shows that some schools in which students appear to make good progress in terms of raw results were in fact doing poorly in terms of promoting learners' progress while the reverse was true for other institutions once allowance was made for the nature of their students' intake grades. The findings support the ongoing debate against the use of schools' raw results as indicators of school effectiveness and as a valid method for comparing schools. On their own, raw results can be misleading (Sammons *et al*., 1993: 401; Mortimore, Sammons & Thomas, 1994:321; Goldstein, 1996: 199; Goldstein & Spiegelhalter, 1996:388; McPherson, 1997:190; Sammons *et al*., 1997:44; Saunders, 1997:197; Wilson, 2003:17). Ranking schools on raw results only may 'flatter' the schools with high raw averages and depress those with low averages. The results point to the value of utilising the value added approach of multilevel models to compare schools. Dearing (in Strand, 1997:472) has warned of the dangers of ignoring value added evaluations and the reliance on raw results. He argues that:

> …without a value added dimension, the obvious basis for judgement is that higher scores represent better practice and lower scores worse and this could lead to complacency on the part of some schools whose pupil population comprise more able students, and conversely, to despair on the part of others, who, however hard they try can never expect to raise the level of their pupils' scores to those obtained in schools with more able pupils.

It is hypothesized that value added by schools is a function of the student's motivation, aptitude, behaviour and attitude towards learning (*cf.* Figure 3.1). Tables 5.4.1 and 5.4.2 indicate that school 3 was effective only for girls in 2005 and 2006. The boys' behaviour in school 3, where the researcher was Deputy School Head in 2006-2007, was of such a nature that in 2007 the Form Four boys were admitted as day scholars only. It is not surprising that the school was effective for girls only. This is in line with the findings by Sammons *et al*. (1997:154) who noted that teachers in their study on school and departmental effectiveness reported that the students' behaviour had to change for the better before the schools could add value. They concluded that "the positive effects on student learning are likely to operate through patterns of better attendance, behaviour and motivation" (Sammons *et al*., 1997:172). The findings in the present study seem to confirm the fact that the differences in the value added by schools are systematically related to variations in schools' climate, culture and ethos. It will be worthwhile to investigate why school 16 was effective in 2007 while school 13 was becoming more effective

Schools also seem to become effective through a combination of factors which were mentioned in the literature reviews and will be recapped briefly These are effective leadership by the school management team (*cf.* 2.3.1); effective teaching (*cf.* 2.3.2); academic emphasis (*cf.* 2.3.3); a positive school culture (*cf.* 2.3.9); high expectations (*cf.* 2.3.5); student involvement (*cf.* 2.3.7); monitoring the progress of all students (*cf.* 2.3.6); a learning organisation (*cf.* 2.3.4): the school continuously seeks ways of improving; parental involvement (*cf.* 2.3.8);

and consistency in approach to teaching discipline and enforcing rules and regulations (*cf.* 3.4). Consistency in the school implies that the school function as a team and not as fragmented units. It seems most likely that effective schools in this study possess more of the processes found in the literature than the less effective schools. Teachers and schools have the ability to change into becoming effective when they adopt these effective school processes.

During the pastoral workshop for school management teams in 2007 when the pastoral policy was introduced to schools (*cf.* 1.9), an example was given of a school that used to be poor performer. The teachers in the school believed that the students were 'unteachable'. The school then got a new principal who shared her vision for the school with the staff (a necessary component of effective leadership). Through high expectations and collective teacher efficacy, the leader and the teachers turned the school around to be one of the best in the country. Indeed school 23, was top on the list of effective schools (*cf.* 5.3.2 and 5.3.3).

In the present study, another example of influential factor combinations mentioned in the literature (*cf.* 2.3.5) reflect the expectations by teachers, across subjects in one of the least effective schools, which revealed that teachers' expectations and students' behaviour can hinder achievement. Going through teachers' comments on the performance in their subjects in 2006, the following combinations of the factors were revealed, namely:

> **Setswana**: They were academically weak, didn't care much about school work. Their result is a true reflection.
>
> **Setswana**: both classes were academically weak
>
> **Chemistry**: Single and double science students have a negative attitude towards the subjects.
>
> **Chemistry**: Generally the students did not do well especially the single science. This is because of their negative attitude towards the subject.
>
> 5C was a single science class who are not gifted in academics. Most of them were not gifted but a few could do better if they worked very hard.

They did not care much about their school work and there was a problem of indiscipline.

5B was a dull lot and they were too silent in class. These results are their true reflection

Mathematics: 5K was a double science that consistent of notorious students who did not have learning time. Very rude and disruptive students; law breakers of the school. They couldn't even have time for Mathematics clinics.

Biology: 5R students performed to my expectation, they were generally clever students.

Biology: 5H was the worst, they were low ability students as compared to others.

English: …and I associate this with the student attitude towards learning.

Literature in English: The students' immutable attitudes not only excel in the above noted course to pursue other texts extensively paid dividends at the end.

Schools in Botswana are located within five inspectoral regions (A-E). Table 5.3.4 shows that region E has two schools which are both ineffective regarding average value added. Region A has one effective school out of eight schools while region C with eight schools has three effective schools and region B has one effective school out of the four schools. Region D has more effective schools: four out of five. It might be difficult to reach conclusions based on the inspectoral area. However, influential factors might be operational in the areas such as: parental involvement and students' motivation. The effective schools might have had greater parental interest and involvement in their children's education not enjoyed by the less effective schools. However, it will be more appropriate to investigate which factors were operating at the regional level such as those listed above and other factors such as assistance to schools by the Education Officers and Teacher Training and Development in the regions. What is however apparent in this regard is that, some Education Officers at whatever

level concerned with school improvement have more work to do than others especially in regions E and A.

5.4 DIFFERENTIAL EFFECTIVENESS

The third research question (*cf.* 1.3.3) posed in Chapter one was: **Are schools equally effective/ ineffective for all student groups?** The question of differential effectiveness addresses the issue of whether schools vary systematically in their effectiveness for specific student groups. Additional multilevel models were analyzed to establish whether there was any evidence of differential effects at school level for pupils of different groups. The explanatory variables were gender and ability level at intake (Rasbash *et al.*, 2008:68). The "Boy" category was the reference group when modelling the effects of schools on gender and the "high ability" category was the reference level when the explanatory variable was intake ability (Rasbash *et al.*, 2008:70-73). The explanatory variables were estimated differently. The model used is shown below as Model 5.4.

Model 5.4 Multilevel model effectiveness by gender and ability

$$\text{TBGCSE}_{ij} = \beta_{0j} + \beta_{1j}\text{TJC}_{ij} + \beta_2\text{girl}_{ij} + \beta_3\text{mid}_{ij} + \beta_4\text{low}_{ij} + e_{ij}$$

$$\beta_{0j} = \beta_0 + u_{0j}$$

$$\beta_{1j} = \beta_1 + u_{1j}$$

$$\begin{bmatrix} u_{0j} \\ u_{1j} \end{bmatrix} \sim \text{N}(0,\ \Omega_u) \ :\ \Omega_u = \begin{bmatrix} \sigma^2_{u0} & \\ \sigma_{u01} & \sigma^2_{u1} \end{bmatrix}$$

$$e_{ij} \sim \text{N}(0, \sigma^2_e)$$

Where:

TBGCSE $_{ij}$ is the average score for BGCSE exams for child *i* in school *j* and represents the dependent variable,

β_{oj} represents the intercept for school *j*, and

β_1 represents the slope coefficient for the prior intake score.

TJC_{ij} represents the JCE exam score for child *i* in school *j* and as such the independent variable.

$\beta_2 girl_{ij}$ represents the explanatory variable for gender and

$\beta_3 mid_{ij}$ and $\beta_4 low_{ij}$ represent the explanatory variables for the middle and low intake abilities.

e_{ij} represents the departure of child *i* in school *j* from its school's predicted linear regression line. The intercept for school *j*, β_{oj}, can be decomposed into $\beta_{oj} = \beta_0 + u_{0j}$, where β_0 represents the average intercept for all the schools in the sample and u_{0j} represents a random departure for each of the schools.

The slope for school *j*, β_{1j} can be decomposed into $\beta_{1j} = \beta_1 + u_{1j}$, where $\beta 1$ represents average slope for all schools in the sample and u_{1j} represents random departure for each school.

5.4.1 Differential effectiveness in 2005

Model 5.4.1 below shows the differential effectiveness by gender for 2005

Model 5.4.1 The differential effectiveness by gender for 2005

$$TBGCSE_{ij} = \beta_{0j} + \beta_{1j} TJC_{ij} + -1.273(0.359) girl_{ij} + e_{ij}$$

$$\beta_{0j} = -31.517(1.889) + u_{0j}$$

$$\beta_{1j} = 1.374(0.027) + u_{1j}$$

$$\begin{bmatrix} u_{0j} \\ u_{1j} \end{bmatrix} \sim N(0, \Omega_u) : \Omega_u = \begin{bmatrix} 60.060(25.648) & \\ -0.819(0.365) & 0.012(0.005) \end{bmatrix}$$

$$e_{ij} \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 58.007(1.935)$$

$$-2*loglikelihood = 12838.311(1850 \text{ of } 1850 \text{ cases in use})$$

The reference group, which is the 'boys' category has a value of (- 31. 517) from Model 5.4.1. The above differential equation shows that girls performed 1.273 points lower than the boys in 2005.

Likewise, the overall differential effectiveness for intake ability is given by Model 5.4.2

Model 5.4.2 Overall differential effectiveness by ability for 2005

$$\text{TBGCSE}_{ij} = \beta_{0j} + \beta_{1j}\text{TJC}_{ij} + 1.317(0.781)\text{mid}_{ij} + -0.111(1.494)\text{low}_{ij} + e_{ij}$$

$$\beta_{0j} = -32.439(4.666) + u_{0j}$$

$$\beta_{1j} = 1.371(0.060) + u_{1j}$$

$$\begin{bmatrix} u_{0j} \\ u_{1j} \end{bmatrix} \sim N(0,\ \Omega_u)\ :\ \Omega_u = \begin{bmatrix} 60.809(25.868) & \\ -0.829(0.368) & 0.012(0.005) \end{bmatrix}$$

$$e_{ij} \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 57.953(1.934)$$

$$-2*\textit{loglikelihood} = 12837.430(1850 \text{ of } 1850 \text{ cases in use})$$

The high ability category has a value of - 32.439. The mid ability students performed 1.317 better than the high ability students, indicated by '1.317' mid level ability coefficient in effectiveness equation. The low ability students performed 0.111 lower than the high ability students as indicated by '-0.111' low level ability coefficient in effectiveness equation. This means that schools differentiated between their students. The boys and mid ability students progressed further than expected while the girls and the low ability students did not progress as expected from their intake scores.

A further effectiveness model incorporating both the effects of gender and input ability analysis was carried out to determine the individual school's differential effectiveness as shown by Appendix 4. The results are indicated in Table 5.4.1 below. The final analysis was deemed necessary because a single measure of all

the schools might mask the individual school's differential effectiveness as in the two previous models discussed.

Table 5.4.1 Differential effectiveness by gender and ability in 2005

School	Boy	Girl	High	Mid	Low
1	-23.08	-3.83	-49.58	+3.01	+8.78
2	-34.20	-3.12	-29.80	-0.25	-3.2
3	-31.57	+0.46	+7.37	-13.15	-18.11
4	-29.32	-0.95	-12.35	-1.10	-6.57
5	50.39	-0.91	-42.98	-0.61	-2.70
6	-25.10	+0.37	-35.75	+1.40	+3.73
6	-26.25	-1.78	-3.016	-4.90	-7.38
8	-20.61	-2.45	-14.54	+0.35	-3.88
9	-37.45	-0.32	-6.39	+14.54	+7.38
10	-25.17	-3.55	-12.49	-0.03	-5.07
11	-24.51	-1.79	-46.60	+1.61	+6.30
12	-23.35	+4.47	-96.69	+16.60	+24.21
13	-26.49	+0.60	+20.08	-5.38	-12.79
14	-37.17	-3.28	-50.46	+0.87	+4.22
15	-19.43	-2.03	-34.64	+6.00	+4.27
16	-46.67	+1.30	-27.30	+0.09	-5.22
17	-25.98	-4.76	-18.57	-2.05	-4.37
18	-50.74	+0.004	+2.89	-8.88	-20.01
19	29.27	-3.42	-94.00	+11.08	+24.37
20	-32.14	-1.90	+21.75	-2.55	-17.69
21	-45.77	-2.27	-64.54	+5.72	+6.30
22	-48.02	+2.69	-148.95	+22.53	+30.20
23	-23.28	-2.72	-63.20	+9.64	+14.15
24	-18.93	-1.26	+115.68	-14.35	-48.40
25	-34.51	-0.94	+15.07	-1.44	-19.53
26	-37.69	-3.37	-97.35	+10.01	+21.56
27	-25.52	-0.24	-97.38	+10.02	+21.57

The girls performed better than boys in only 7 (25.9%) schools. The majority of schools, 20 or 74.1%, promoted the achievement of boys better than girls. In terms of ability, 11(40.7%) schools were effective for high ability students, 15(55.6%) were effective for mid ability and 14(51.9%) were effective for low ability students. A school could be effective for more than one ability level.

5.4.2 Differential effectiveness in 2006

The differential effectiveness by gender for 2006 was given by the Model 5.4.2.1

Model 5.4.2.1 Differential effectiveness by gender

$$TBGCSE_{ij} = \beta_{0j} + \beta_{1j}TJC_{ij} + -1.140(0.344)girl_{ij} + e_{ij}$$

$$\beta_{0j} = -33.565(2.027) + u_{0j}$$

$$\beta_{1j} = 1.399(0.026) + u_{1j}$$

$$\begin{bmatrix} u_{0j} \\ u_{1j} \end{bmatrix} \sim N(0,\ \Omega_u) \ :\ \Omega_u = \begin{bmatrix} 85.962(29.810) & \\ -1.006(0.375) & 0.013(0.005) \end{bmatrix}$$

$$e_{ij} \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 55.848(1.844)$$

$$-2*loglikelihood = 13206.857(1911 \text{ of } 1911 \text{ cases in use})$$

The reference group, which is the 'boys' category has a value of (- 33. 565) from Model 5.4.2.1. The above differential equation shows that girls performed 1.140 points lower than the boys in 2006.

To determine the differential effectiveness for the different ability groups, the Model used was 5.4.2.2 as shown below.

Model 5.4.2.2 Differential effectiveness by ability in 2006

$$TBGCSE_{ij} = \beta_{0j} + \beta_{1j}TJC_{ij} + 1.724(1.157)mid_{ij} + -2.577(2.356)low_{ij} + e_{ij}$$

$$\beta_{0j} = -27.879(6.645) + u_{0j}$$

$$\beta_{1j} = 1.310(0.082) + u_{1j}$$

$$\begin{bmatrix} u_{0j} \\ u_{1j} \end{bmatrix} \sim N(0, \Omega_u) : \Omega_u = \begin{bmatrix} 87.734(30.173) & \\ -1.028(0.379) & 0.013(0.005) \end{bmatrix}$$

$$e_{ij} \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 54.264(1.781)$$

$$-2*loglikelihood = 13153.107(1911 \text{ of } 1911 \text{ cases in use})$$

The high ability category has a value of – 27.879. The mid ability students performed 1.724 better than the high ability students, indicated by '1.724' mid level ability coefficient in effectiveness equation. The low ability students performed 2.577 lower than the high ability students as indicated by '-2.577' low level ability coefficient in effectiveness equation. This means that schools differentiated between their students. The boys and mid ability students progressed further than expected while the girls and the low ability students did not progress as expected. The schools were therefore differentially effective, with the mid ability group performing better than the other two groups. The schools again differentiate by gender and ability.

The differential effectiveness by gender and ability for each school was calculated as shown in Appendix 5 and shown in Table 5.4.2 below.

Table 5.4.2 Differential effectiveness by gender and ability in 2006

School	Boy	Girl	High	Mid	Low
1	-41.11	-0.52	+26.61	-12.23	-25.51
2	-28.08	-1.52	-39.52	+6.78	+3.28
3	-36.34	+0.40	+1.15	-3.45	-12.3
4	-41.76	+0.58	-69.80	+5.48	+9.84
5	-46.80	+1.19	-35.58	-1.28	-4.47
6	-41.58	+2.26	-84.06	+10.32	+17.32
7	-27.28	-1.74	+19.95	-10.69	-17.03
8	-36.93	-1.44	16.37	-10.02	-20.73
9	-35.86	+2.63	-29.49	+0.50	-2.01
10	-40.65	-2.29	30.22	-8.94	-26.44
11	-23.44	-2.52	-60.90	+6.97	+12.20
12	-23.63	-2.14	-56.16	+9.97	+11.91
13	-27.68	-1.41	-37.34	+3.01	+2.99
14	-36.80	-1.15	-18.65	+4.35	-7.39
15	-28.57	-5.04	-116.88	+18.64	+31.91
16	-53.59	+1.15	-55.85	+1.65	+0.97
17	-29.22	-6.38	-79.47	+11.83	+15.90
18	-32.91	-2.09	-48.60	+4.61	+5.34
19	-27.24	-0.36	-62.76	+8.07	+12.76
20	-14.44	-0.52	+23.86	-0.75	-14.63
21	-38.45	-0.82	+37.74	-9.57	-29.05
22	-52.32	-0.45	-45.19	-0.99	-2.99
23	-16.76	-3.33	+8.88	+3.82	-10.51
24	-12.79	-1.48	+24.49	-2.53	-11.40
25	-50.29	-3.68	-15.25	-2.80	-13.63
26	-22.03	+0.55	-26.95	+6.35	+1.38
27	-34.85	-0.38	-26.55	+4.15	-3.49

In 2006, 7 (25.9%) schools promoted the progress of girls more than boys while in the majority of schools, 20 or 74.1% the opposite was true. In terms of ability, 11 (40.7%) schools promoted the progress of high ability students, 12 (44.4%) promoted achievement for the low ability students and the majority, 16 (59.3%) promoted the progress for mid ability students. Once again a school could be effective for more than one group, for example, school 2 was effective for the mid and low ability students.

5.4.3 Differential effectiveness in 2007

The differential effectiveness by gender in 2007 for all the schools is given by Model 5.4.3.1.

5.4.3.1 Differential effectiveness by gender in 2007

$$\text{TBGCSE}_{ij} = \beta_{0j} + \beta_{1j}\text{TJC}_{ij} + \text{-1.814(0.342)girl}_{ij} + e_{ij}$$

$$\beta_{0j} = \text{-29.285(1.412)} + u_{0j}$$

$$\beta_{1j} = \text{1.371(0.018)} + u_{1j}$$

$$\begin{bmatrix} u_{0j} \\ u_{1j} \end{bmatrix} \sim \text{N}(0,\ \Omega_u) \ :\ \Omega_u = \begin{bmatrix} \text{27.100(14.385)} & \\ \text{-0.245(0.176)} & \text{0.003(0.002)} \end{bmatrix}$$

$$e_{ij} \sim \text{N}(0, \sigma_e^2) \quad \sigma_e^2 = \text{54.776(1.802)}$$

$$\textit{-2*loglikelihood} = \text{13082.718(1901 of 1901 cases in use)}$$

The reference group, which is the 'boys' category has a value of - 29.285 from Model 5.4.3.1. The above differential equation shows that girls performed 1.814 points lower than the boys in 2007.

5.4.3.2 Differential effectiveness by ability in 2007

$$TBGCSE_{ij} = \beta_{0j} + \beta_{1j}TJC_{ij} + 2.269(1.128)mid_{ij} + -0.522(2.307)low_{ij} + e_{ij}$$

$$\beta_{0j} = -29.712(6.431) + u_{0j}$$

$$\beta_{1j} = 1.354(0.080) + u_{1j}$$

$$\begin{bmatrix} u_{0j} \\ u_{1j} \end{bmatrix} \sim N(0, \Omega_u) : \Omega_u = \begin{bmatrix} 28.090(14.595) & \\ -0.251(0.177) & 0.003(0.002) \end{bmatrix}$$

$$e_{ij} \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 54.181(1.783)$$

$$-2*loglikelihood = 13062.141(1901 \text{ of } 1901 \text{ cases in use})$$

The high ability category has a value of – 29.712. The mid ability students performed 2.269 better than the high ability students, indicated by '2.269' mid level ability coefficient in effectiveness equation. The low ability students performed 0.522 lower than the high ability students as indicated by '-0.522' low level ability coefficient in effectiveness equation. This means that schools differentiated between their students. The boys and mid ability students progressed further than expected while the girls and the low ability students did not progress as expected.

The differential effectiveness by gender and ability for each school were calculated in Appendix 6 and are presented in Table 5.4.3 below.

Table 5.4.3 Differential effectiveness by gender and ability in 2007

School	Boys	Girls	High	Mid	Low
1	-36.17	-1.75	2.25	-3.5	-1.5
2	-31.01	-1.6	-40.16	2.2	+3.31
3	-28.21	-0.3	-12.54	+0.48	-5.76
4	-36.52	-0.12	-52.9	+9.53	+5.58
5	-31.25	-1.47	62.30	-14.25	-35.47
6	-36.8	-0.22	7.24	-5.58	-17.39
7	-31.56	-2.87	-7.93	-3.47	-9.34
8	-23.04	-3.09	-37.8	+2.58	+4.63
9	-30.04	-0.76	-30.68	+0.86	+0.008
10	-24.05	-7.35	-37.99	+3.43	+4.3
11	-22.02	-3.8	-26.83	+3.39	+0.90
12	-29.22	-0.68	-45	+6.20	+5.67
13	-34.35	-2.19	-32.57	+3.87	-1.40
14	-30.78	-4.34	-48.72	+4.41	+5.33
15	-18.80	+1.52	+9.70	-1.47	-10.55
16	-31.98	-3.75	-20.64	+0.80	-5.33
17	-21.45	-3.72	-67.12	+10.38	+14.24
18	-36.46	-1.28	-1.67	+25.43	+47.14
19	-28.86	-0.86	-21.56	+0.22	-3.22
20	-21.61	+1.85	-52.62	+9.09	+11
21	-40.0	-2.93	-27.13	+0.84	-5.73
22	-39.69	-2.56	-35.06	+1.29	-1.03
23	-12.22	-2.98	40.68	-6.46	-18.51
24	-22.48	-3.20	-54.13	+5.77	+9.99
25	-15.94	+1.90	+14.37	-1.24	-11.40
26	+40.28	+0.63	+14.46	-8.68	-20.87
27	-30.32	-4.07	-42.56	+5.60	+4.00

The differential effectiveness by individual schools shows that only 4 (14.8%) schools were effective for girls. The majority, 23 or 85.2% of schools promoted the achievement of boys. In terms of ability, 6 (22%) promoted the achievement of high ability students, the middle ability progressed more than others in 19 (70.3%) schools whereas 13 (48.1%) schools promoted the achievement of low ability students. More schools therefore, promoted the achievement of the middle ability students and that is why the overall result shows that the schools were more effective for mid ability students than any other group. The progress made by middle and low students was greatest in school 18.

These results show that for some institutions, there were substantial differences in the average progress of the most able and the least able students and that a single measure of effectiveness may mask the important differences within an institution. These findings are in line with the findings of some earlier work on differential effectiveness. Nuttall *et al*. (1989:775-776) and Goldstein (1996:200) found that schools were differentially effective for different student groups and therefore, it would be misleading to try to summarise the differences in a single quantity.

Smith and Tomlinson (in Sammons *et al*., 1993:382-383) also found some evidence for the existence of differential effectiveness for pupils of different levels of prior attainment. Jesson and Gray (1991:246) conclude from their work that it was of no doubt that "pupils of whatever prior attainment level did better in some schools than in others". Later studies supported these earlier conclusions, for example, Goldstein and Thomas (1996:157-158) note that there were some substantial differences between the most and least able students in some institutions. Since there is a substantial evidence for differential effectiveness in schools, Sammons *et al*. (1997:51-52) conclude that "there is a need for schools to examine in detail the value added performance of different groups of students in terms of gender, prior attainment, low income and ethnicity".

The issue of differential effectiveness was further explored by considering the differences between the means of the different groups at intake and BGCSE for the three years of study. To test whether there is a gender difference in the mean exam scores at JCE and BGCSE in the population, a t test may traditionally be carried out. Instead of a t test, a normal distribution test in the basic statistics menu in MLwiN 2.10 Beta (4) was used (Rasbash *et al.*, 2008:15).

Table 5.4.4 Mean differences in 2007

i) Performance by gender

Year 2007	**JCE**		**BGCSE**	
	Boy	**Girl**	**Boy**	**Girl**
Numbers	911	990	911	990
Mean	67.1	67.1	62.7	60.9
SDs	12.0	11.8	18.7	17.7
Mean difference	0		1.8	
Total	1901		1901	

ii) Performance by ability

YEAR 2007	**JCE**				**BGCSE**			
Ability	High	Mid	Low	Total	High	Mid	Low	Total
Numbers	689	637	575	1901	689	637	575	1901
Means	80.2	66.9	51.5	61.8	79.0	63.2	39.5	61.8
SDs	3.52	1.02	1.05	8.57	8.55	8.29	8.89	8.57
Mean difference		13.3	28.7			15.8	39.5	

Table 5.4.4(i) indicates that at intake the boys and girls means were the same. At BGCSE, the boys performed better than the girls with a mean difference of 62.7-60.9=1.8. In terms of ability, Table 5.4.4 (ii) indicates that the mean differences for high and mid, high and low students were 13.3 and 28.7 respectively. At BGCSE, the differences were 15.8 for mid and 39.5 for low. The difference between high and low students had increased further than between the high and mid students.

Table 5.4.5 Mean differences in 2006

i) Performance by gender

Year 2006	**JCE**			**BGCSE**		
	Boy	**Girl**	**Total**	**Boy**	**Girl**	**Total**
Numbers	916	995	1911	916	995	1911
Means	66.3	65.7	66.0	59.2	57.3	58.2
SD	12.5	12.2	12.4	19.5	18.9	19.2
Mean difference	**0.6**			**1.9**		

The difference between the means for the genders at intake and BGCSE is 0.6 and 1.9 respectively. The difference increased three times.

ii) Performance by different ability

YEAR 2006	**JCE**				**BGCSE**			
Ability	High	Mid	Low	Total	High	Mid	Low	Total
Numbers	642	604	665	1901	642	604	665	1911
Means	80.5	66.9	51.2	66.0	77.6	61.5	36.6	58.2
SDs	3.91	0.91	1.67	2.52	8.49	8.46	9.34	8.79
Mean difference		13.6	29.3			16.1	41.0	

The differences between high and mid, high and low students at intake were respectively 13.6 and 29.3. At BGCSE the differences were 16.1 and 41. The gap between the high and the low ability students increased by a large amount compared to that between high and mid.

Table 5.4.6 Mean differences in 2005

i) Performance by gender

Year 2005	**JCE**			**BGCSE**		
	Boy	Girl	Total	Boy	Girl	Total
Numbers	891	959	1850	891	959	1850
Means	66.8	65.7	66.2	60.4	57.4	58.8
SDs	11.1	10.7	10.9	17.6	16.4	17.0
Mean difference	**1.1**			**3.0**		

ii) Performance by the different ability groups

YEAR 2005	**JCE**				**BGCSE**			
	High	Mid	Low	Total	High	Mid	Low	Total
Number	614	658	578	1850	614	658	578	1850
Means	78.5	66.7	52.7	66.2	75.2	60.2	39.8	58.8
SDs	4.57	2.18	3.25	3.45	9.68	8.72	9.70	9.35
Mean difference		1.8	25.8			15.0	35.4	

From Table 5.4.5 (i), the mean difference between boys and girls at intake was 1.1 and at BGCSE it was 3 having almost tripled. Table 5.4.5 (ii) indicates that the mean difference between high and mid and high and low were 11.8 and 25.8 respectively at intake. At BGCSE the differences are 15 and 35.4 between high and mid, high and low respectively. The gap between the high and low ability groups had widened substantially.

What emerges from the study is that at intake the girls' means are lower than the boys'. At BGCSE, the performance gap widened up to three times. This could only happen if it were expected of girls not to perform as good as boys do. These findings contribute to similar findings on gender equity. It has been observed that in the Botswana education sector, more girls enter primary education than boys but the number gets depleted at the senior secondary, tertiary and technical education levels. This causes women to be disadvantaged in their employment opportunities and to be under represented in key decision making positions (Vision 2016, 1997:19). The findings have implications concerning the differential learning experiences of girls which schools might not be taking into consideration, as well as the expectations that teachers might have for girls. To this end, Vision 2016 (1997:31) notes that teachers need to change attitudes that discriminate against female students. The gender equity is a major challenge that might hinder the attainment of the goal of educational equity.

The use of raw results in a competitive quasi marketplace like education where having high ranks is seen as good practice, may put pressure on schools to concentrate efforts only on those students on the grade C/grade D borderline in order to increase the credit passes and neglect the high or low performing students (Goldstein, 1996:202). This might explain why the schools in this study were more effective for the mid ability group more than any other group.

5.6 CONSISTENCY ACROSS THE DEPARTMENTS

Are the schools consistent in their effectiveness/ineffectiveness across subjects? This is research question posed in Chapter 1 (*cf.* 1.3.3). The issue of consistency looks at the internal variation within the departments in the same school. The departments considered were English Language, Mathematics and Setswana. The average for the subject at BGCSE is the dependent variable and the average for the corresponding subject at JCE is the explanatory variable. The appropriate model used to determine the value added by subjects is shown as Model 5.5 below.

Model 5.5 The value added by subjects

$$\mathbf{Ebgcse}_{ij} = \beta_{0j} + \beta_1 \mathbf{engjc}_{ij} + e_{ij}$$
$$\beta_{0j} = \beta_0 + u_{0j}$$
$$u_{0j} \sim \mathrm{N}(0, \sigma^2_{u0})$$
$$e_{ij} \sim \mathrm{N}(0, \sigma^2_e)$$

Where:

$Ebgcse_{ij}$ is the average for all students *i* in school *j* for any of the subjects;

β_{oj} represents the intercept for school *j*,

β_1 represents the slope coefficient for the JCE score,

eng_{ij} represents the prior intake score for all the students in school *j* for English Language or any of the subjects and

e_{ij} represents the departure of all the students in school *j* from its school's prediction line

The intercept for the school *j*, βoj can be decomposed into: $\beta_{oj} = \beta_0 + u_{0j}$, where β_0 represents the average intercept for all the schools in the sample and u_{0j} is a

random departure for each school or value added. The slope for the school j, β_{1j} can be decomposed into, $\beta_{1j} = \beta_1 + u_{1j}$

5.5.1 Consistency among departments in 2005

The above equation (Model 5.5) becomes $\mathbf{EBGCSE_{ij}} = \beta_0 + u_{0j} + \beta_{1j} * \text{engjc}_{ij} + e_i$. The value added, u_{0j} for each subject can then be calculated.

For the 2005 data subset, the above equation for Mathematics becomes:

$$\text{mathsbgcse}_{\bar{i}} = -1.135(1.905) + 0.880(0.404)\text{mathsjc}_{\bar{i}} + e_{\bar{i}}$$

$$e_{\bar{i}} \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 0.059(0.016)$$

$$-2*\text{loglikelihood} = 0.269(27 \text{ of } 27 \text{ cases in use})$$

The value added scores by the different subjects in different schools in 2005 are given in Appendix 7 and compared in Table 5.5.1 to determine the consistency between subjects.

Table 5.5.1 Consistency across subjects in 2005

School	English 2005	Mathematics 2005	Setswana 2005
1	0.28	-0.05	0.03
2	0.29	0.35	0.174
3	-0.54	-0.48	-0.21
4	0.02	-0.19	-0.003
5	-0.05	-0.22	0.11
6	-0.29	0.06	0.08
7	0.13	-0.29	-0.34
8	0.09	0.15	0.37
9	0.13	-0.05	0.08
10	-0.05	0.152	-0.28
11	0.53	0.38	-0.12
12	0.13	0.325	-0.19
13	-0.19	0.135	-0.02
14	-0.02	0.14	-0.29
15	-0.17	-0.09	-0.03
16	-0.39	-0.22	0.02
17	-0.08	-0.25	-0.12
18	-0.19	-0.25	0.08
19	0.17	-0.23	0.13
20	0.41	0.18	0.47
21	-0.11	-0.26	0.07
22	-0.24	-0.07	0.04
23	-0.37	0.16	0.08
24	-0.13	-0.16	-0.13
25	0.15	0.42	0.4
26	0.27	-0.03	-0.2
27	0.22	0.40	-0.21

8 (30%) schools showed consistency across the departments. From these 8, four schools were consistent in their ineffectiveness which means in all the departments, students did not progress as expected. These included schools 3, 15, 17 and 24. Four schools were consistently effective, namely schools 2, 8, 20 and 25. The majority of schools 19 (70%) were inconsistent across the outcomes. In these schools, there were ineffective and effective departments coexisting. These included schools 1, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 16, 18, 19, 21, 22, 23, 24 and 26.

5.5.2 Consistency across departments in 2006

The different equations used to determine the value added by the different subjects appear in Appendix 8 and the results reported in Table 5.5.2 below were taken from Appendix 8 as well.

Table 5.2.2 Consistency across subjects in 2006

School	English 2006	Mathematics 2006	Setswana 2006
1	0.31	0.38	0.24
2	-0.09	-0.36	-0.04
3	-0.22	-0.54	-0.51
4	0.24	-0.03	-0.08
5	0.17	-0.008	0.05
6	-0.39	-0.02	0.18
7	-0.15	-0.11	-0.22
8	0.18	0.16	-0.23
9	-0.05	-0.59	-0.19
10	0.03	0.26	-0.32
11	-0.02	0.13	0.08
12	0.27	0.31	0.11
13	-0.11	0.01	0.08
14	-0.28	-0.09	-0.12
15	-0.07	-0.17	-0.19
16	-0.34	-0.27	0.1
17	-0.13	0.18	-0.01
18	-0.03	-0.41	0.02
19	0.07	0.018	0.07
20	0.34	0.20	0.11
21	-0.01	-0.08	0.28
22	-0.22	-0.13	0.10
23	0.30	0.36	0.42
24	-0.15	0.20	-0.07
25	0.11	0.40	0.49
26	0.12	-0.13	-0.06
27	0.13	0.31	-0.28

12 (44%) schools were consistent across the departments. All departments were effective in six of these schools. These included schools 1, 12, 19, 20, 23 and 25. In an equal number of schools (6), all the departments were ineffective. These included schools 2, 3, 7, 9, 15 and 14. 15 (56%) schools were inconsistent across the departments with some departments being more effective than others. These included schools 4, 5, 6, 8, 10, 11, 13, 16, 17, 18, 21, 22, 24, 26 and 27.

5.5.3 Consistency across departments in 2007

Appendix 9 shows the data set, the equations and the value added by the different subjects. The results are compared in Table 5.5.3 to determine the consistency across the subjects.

Table 5.5.3 Consistency across subjects in 2007

School	English 2007	Mathematics 2007	Setswana 2007
1	0.02	-0.17	-0.14
2	0.17	-0.32	-0.16
3	-0.26	-0.22	-0.10
4	0.17	0.10	-0.01
5	0.07	-0.007	-0.01
6	-0.11	-0.09	-0.09
7	0.16	-0.04	-0.04
8	-0.01	0.27	0.17
9	-0.03	-0.11	-0.15
10	-0.07	0.13	-0.16
11	0.05	0.36	0.54
12	-0.04	-0.04	-0.02
13	-0.04	0.08	0.08
14	-0.16	0.17	-0.26
15	-0.17	-0.26	-0.08
16	-0.23	-0.11	0.17
17	0.16	0.13	0.22
18	0.05	-0.25	-0.22
19	0.07	0.02	0.09
20	0.07	-0.15	0.39
21	0.10	-0.14	0.22
22	0.11	-0.19	-0.16
23	0.51	0.29	0.31
24	0.02	0.27	-0.21
25	-0.08	0.46	0.30
26	-0.15	-0.37	-0.49
27	0.04	0.26	-0.18

10 (37%) schools were consistent in their outcomes. Of these, four schools were consistently effective and these included schools 11, 17, 19 and 23. Six schools were consistently ineffective. These included schools 3, 6, 9, 12, 15, and 26. In the majority of schools, 17 (63%) it was a combination of effective and ineffective departments. Schools 1, 2, 4, 5, 7, 8, 10, 13, 14, 16, 18, 20, 21, 24, 25, 27 and 7 fell within this group.

5.5.4 Overall consistency across the departments for 2005-2007

To determine the overall consistency by schools over the three years, the average value added by each department over the years was calculated to resulting in a single figure of departmental effectiveness in Table 5.5.4.1.

Table 5.5.4.1 The overall consistencies across departments for 2005-2007

School	English	Setswana	Mathematics
1	0.20	0.04	0.05
2	0.12	-0.01	-0.11
3	-0.34	-0.27	-0.41
4	0.14	-0.03	-0.04
5	0.06	0.05	-0.08
6	-0.27	0.06	-0.02
7	0.04	-0 .20	-0.14
8	0.09	0.10	0.19
9	0.02	-0.09	-0.25
10	-0.03	-0.25	0.18
11	0.19	0.17	0.29
12	0.12	-0.03	0.20
13	-0.11	0.05	0.08
14	-0.15	-0.22	0.07
15	-0.14	-0.10	-0.17
16	-0.32	0.10	-0.20
17	-0.02	0.03	0.17
18	-0.06	-0.04	-0.30
19	0.11	0.09	-0.06
20	0.27	0.32	0.08
21	-0.001	0.19	-0.16
22	-0.12	-0.005	-0.13
23	0.15	0.27	0.27
24	-0.09	-0.14	0.10
25	0.06	0.40	0.43
26	0.06	-0.25	-0.18
27	0.13	-0.22	0.32

Only 10 (37%) schools were consistent in their effects across the departments. All the departments were consistently ineffective in four of these schools namely schools: 3, 15, 18 and 22. The remaining six schools had effective departments namely schools: 1, 8, 11, 20, 23 and 25.

17 (63 %) schools showed inconsistency across the departments. This implies that certain schools have ineffective and effective departments coexisting. These included schools 2, 4, 5, 6, 7, 9, 10, 12, 13, 14, 16, 17, 19, 21, 24, 26 and 27.

Since 17 schools were not consistent across the three subject departments, Table 5.5.4.2 shows the internal variation by departments. This answers the question that was posed in Chapter one (*cf.* 1.3) as: Which schools are effective for which outcomes?

Table 5.5.4.2 Variations within schools

School	Effective for	Ineffective for
2	English	Mathematics, Setswana
4	English	Mathematics, Setswana
5	English, Setswana	Mathematics
6	Setswana	English, Mathematics
7	English	Mathematics, Setswana
9	English	Mathematics, Setswana
10	Mathematics	English, Setswana
12	English, Mathematics	Setswana
13	Setswana, Mathematics	English
14	Mathematics	English, Setswana
16	Setswana	English, Mathematics
17	Setswana	English, Mathematics
19	English, Setswana	Mathematics
21	Setswana	English, Mathematics
School	Effective for	Ineffective for
24	Mathematics	English, Setswana
26	English	Mathematics , Setswana
27	English, Mathematics	Setswana

The schools were further grouped by the subjects' effectiveness in Table 5.5.4.3.

Table 5.5.4.3 Schools' effectiveness by subjects

English	Setswana	Mathematics
1	1	1
8	8	8
11	11	11
20	20	20
23	23	23
25	25	25
2	5	12
4	13	13
5	16	14
7	17	24
9	19	27
12	21	
19		
26		
27		

15 (56%) schools were effective for English Language while 12 (44%) were not and the opposite was true for Setswana. 11 (41%) were effective for Mathematics and 16 (59%) were ineffective for Mathematics.

The results of the consistency by departments in schools reveal that there are internal variations within schools and this implies that reporting the performance of schools using a single measure even in value added analysis is not adequate. The overall value added measure by schools reported in Table 5.3.4, revealed that there were nine effective schools. On the other hand, the departmental effectiveness results show that only six schools were effective across all the departments. School 1 which was not effective in overall was effective in the three subjects (*cf.* Table 5.5.4.1). Schools 11, 12, 27, 6 and 10 which were effective schools, were differentially effective across the

departments. Other schools which were not effective overall were however, effective in one or two subjects, for example, school 13 for Setswana and English and school 19 for English and Setswana.

The correlation for the value added by the subjects is one other way to determine the consistency between departments as is shown in Table 5.5.4.4.

Table 5.5.4.4 The Pearson Correlation Coefficients for subjects' value added in 2005-2007

	English	**Mathematics**	**Setswana**
English		0.49	0.36
Mathematics			0.40

The correlations between the subjects were positive but low and weak. This means that in most schools the departments were not consistent in their outcomes. These findings are in line with earlier empirical studies on the consistency across different subject areas. Thomas and Mortimore (1996:29) similarly found strong evidence that schools were not consistently effective in the two areas they analysed, Mathematics and English, with a correlation of 0.46.

Teddlie *et al*. (2000:118) report on the results of several studies on the consistency of school effects at secondary level (Cuttance, 1987; Smith & Tomlinson, 1989; Willms & Raundenbush, 1989; Fitz- Gibbon, 1991b; Nuttall *et al*., 1992; Thomas & Nuttall, 1993; Thomas *et al*., 1993). These studies reported smaller correlations of about 0.40 to 0.50 between subjects. Luyten (1994:214) concludes that the variation between schools is due to the difference between subjects. This shows that departments play an important role in secondary schools and that the role should be thoroughly investigated. Sammons *et al*. (1997:165) believe that the concept of school effectiveness needs to be qualified

at the school level to the term school and departmental effectiveness. The use of only a single overall measure of value added may hide these differences that have important messages for departmental self evaluation. Trower and Vincent (in Mayston, 2007:40) came to the same conclusion from their empirical study of pupil value added by GCSE results when matched to KS3 prior attainment that "a value added indicator based on an outcome measure which combined all subjects would hide the substantial differences in success between different departments within the school". The difference between departments in the same school may be due to a variety of departmental factors such as departmental policies (homework, team teaching, remedial teaching, targets etc), consistency in approach, the leadership by the subject leader and the quality of teaching.

Effective departments promote effective teaching strategies through staff development as a sign of a pervasive focus on learning. Hopkins (2001:113) asserts that schools that add value to learning, progress and attainment of their pupils are consistent in their teaching practice which Blanchard (2002:29) calls instructional efficacy (*cf.* 2.3.3). This operates on the belief that difficult students are teachable through extra effort and appropriate techniques, and that they can enlist family support and overcome negating community influences through effective teaching. Such teachers devote more time to academic activities, provide students who encounter difficulties with the guidance they need to succeed and praise their academic achievement. By so doing, the teachers maintain a focus on learning. This can only happen through effective leadership by the department leader and team work. Harris (1999:22) notes that effective departments possess the following: a) Having a collegiate management style; b) Sharing of a strong vision for the subject; c) Being well organized in terms of assessment, record keeping, homework and good resource management; d) Having efficient systems for monitoring and evaluating pupil progress which enables the provision of regular feedback to pupils; e) Operating clear routines and practices within lessons; and f) Having a strong pupil centred ethos that

systematically rewards pupils and provides them with many opportunities for learning.

The results on the internal variation within a school should lead to departmental self evaluation against the above mentioned factors in order to improve practice. Less effective departments should become learning organisations by soliciting help from the more effective departments within the same school or from other schools.

5.6 STABILITY ACROSS THE YEARS

Are the schools stable in their effectiveness/ineffectiveness for 2005-2007? This is research question posed in Chapter 1 (*cf.* 1.3.3).The issue on stability compares schools and departments' performances for the different cohorts of students. To compare the stability across the different years, the results from Table 5.3.4 on the value added by schools were reproduced in Table 5.6.1 below.

5.6.1. Schools' stability for 2005-2007

Table 5.6.1 Stability across the years for 2005-2007

School	Value added 2005	Value added 2006	Value added 2007
23	4.0	7	5.40
20	3.82	5.85	5.47
25	3.52	5.05	1.75
12	2.82	4.17	2.11
27	1.18	1.87	5.07
11	0.92	2.33	3.75
6	0.84	-0.22	0.89
10	0.88	2.11	-2.37
8	0.49	-1.09	0.80
2	0.26	-1.69	0.90
4	0.54	-0.56	-0.76
13	-2.57	0.13	0.65
1	1.20	-0.62	-2.41
16	-2.43	-1.63	1.96
24	-1.90	1.09	-1.73
5	0.03	-1.58	-1.12
15	0.22	-1.72	-1.42
14	0.36	-1.80	-1.65
21	-0.57	1.11	-3.99
18	-2.29	-0.27	-1.75
17	-3.21	-2.75	1.55
9	-0.94	-4.42	0.91

School	Value added 2005	Value added 2006	Value added 2007
19	-2.09	-1.81	-1.32
22	-1.27	-2.20	-1.86
3	-0.01	-2.58	-3.28
7	-1.34	-2.34	-2.55
26	-2.42	-3.40	-4.99

Only 6 (22%) schools were stable in their effectiveness, that is, they added value from year to year. These included schools 23, 20, 12, 25, 27 and 11. Although these were stable in their effectiveness, the actual value added was not consistent. Schools 27 and 11 showed an increase in the value added from year to year while schools 25 and 12 showed a decline. 6 (22%) were stable in their ineffectiveness. This means that students in these schools performed below what was expected from their intake grades from year to year. These included schools 3, 7, 22, 26, 18 and 19. The last three schools in the table, namely schools 3, 7 and 26 were also increasingly becoming ineffective. More schools 15 (56%) were unstable in their effectiveness. To these schools, the question of effective for which cohort of students is applicable. Therefore, the schools were further divided as follows to indicate the school effects on the different years.

Table 5.6.2 School effects for different cohorts

School	2005	2006	2007
9	X	x	✓
17	X	x	✓
21	X	✓	x
14	✓	X	X
15	✓	X	X
5	✓	X	X
24	X	✓	X
16	X	X	✓
1	✓	X	X
13	X	✓	✓
4	✓	X	X
2	✓	X	✓
8	✓	X	✓
10	✓	✓	X
6	✓	X	✓

✓ = effective; X= ineffective

The results show that school effects may not be stable even over relatively short periods of time, for instance, three years considered in this study. Schools may be effective one year and not the other. The results also show that some schools were declining in their effectiveness and this included schools 14, 15, 5, 4 and 1 while school 13 was increasingly becoming effective. Schools which have developed a positive school culture and in which a tradition of high achievement has been encalturated may experience greater stability than others.

5.6.2 Departmental stability

The departmental stability from year to year was compared using the results from Tables 5.5.1, 5.5.2 and 5.5.3. The results are shown in tables that follow.

Tables 5.6.2.1; 5.6.2.2 and 5.6.2.3 for English Language, Setswana and Mathematics respectively.

Table 5.6.2.1 English department

School	English 2005	English 2006	English 2007
1	0.2	0.31	0.02
2	0.29	-0.10	0.17
3	-0.54	-0.22	-0.26
4	0.02	0.24	0.17
5	-0.05	0.17	0.07
6	-0.29	-0.39	-0.11
7	0.13	-0.15	0.16
8	0.09	0.18	-0.01
9	0.13	-0.05	-0.03
10	-0.05	0.03	-0.07
11	0.53	-0.02	0.05
12	0.13	0.27	-0.04
13	-0.19	-0.11	-0.04
14	-0.02	-0.28	-0.16
15	-0.17	-0.07	-0.17
16	-0.39	-0.34	-0.23
17	-0.08	-0.13	0.16
18	-0.19	-0.03	0.05
19	0.17	0.07	0.07
20	0.41	0.34	0.07
21	-0.11	-0.01	0.10
22	-0.24	-0.22	0.11
23	-0.37	0.30	0.51
24	-0.13	-0.15	0.02
25	0.15	0.11	-0.08
26	0.27	0.12	-0.15
27	0.22	0.13	0.04

The results show that 12 schools (44%) were stable in their departmental effectiveness. Of the twelve schools, 8 showed stability in negative value added and these included schools 3, 6, 13, 14, 15, 16, 21 and 22 and 4 schools were stable in positive value added. These included schools 4, 19, 20 and 27. 15 schools (56%) were unstable in their departmental effectiveness. These included schools 1, 2, 5, 7, 8, 9, 10, 11, 12, 17, 18, 23, 24, 25 and 26.

Table 5.6.2.2 Stability by Setswana Department

School	Setswana 2005	Setswana 2006	Setswana 2007
25	0.4	0.49	0.30
20	0.47	0.11	0.39
23	0.08	0.42	0.31
21	0.07	0.28	0.22
11	-0.12	0.08	0.54
8	0.37	-0.23	0.17
16	0.02	0.1	0.17
19	0.13	0.07	0.09
6	0.08	0.18	-0.09
5	0.11	0.05	-0.01
13	-0.02	0.08	0.08
1	0.03	0.24	-0.14
17	-0.12	-0.01	0.22
22	0.04	0.10	-0.16
2	0.17	-0.04	-0.16
4	-0.003	-0.08	-0.01
12	-0.19	0.11	-0.02
18	0.08	0.02	-0.22
9	0.08	-0.19	-0.15

School	Setswana 2005	Setswana 2006	Setswana 2007
15	-0.03	-0.19	-0.08
24	-0.13	-0.07	-0.21
7	-0.34	-0.22	-0.04
14	-0.29	-0.12	-0.26
27	-0.21	-0.28	-0.18
26	-0.2	-0.06	-0.49
10	-0.28	-0.32	-0.16
3	-0.21	-0.51	-0.10

15 schools (56%) were stable in their effects for the subjects. 9 of the schools had negative effects and these included schools 3, 4, 7, 10, 14, 24, 26, 27 and 15. 6 of the 15 schools had positive stable effects. These included schools 16, 19, 20, 21, 23 and 25.

12 schools (44%) out of 27 showed instability across the years for Setswana language. These included schools 1, 2, 5, 6, 8, 9, 11, 12, 13, 17, 18 and 22.

Table 5.6.2.3 Stability by Mathematics department

School	Mathematics 2005	Mathematics 2006	Mathematics 2007
25	0.42	0.40	0.46
27	0.40	0.31	0.26
11	0.38	0.13	0.36
23	0.16	0.36	0.29
12	0.33	0.31	-0.04
8	0.15	0.16	0.27
10	0.15	0.26	0.13
24	-0.16	0.20	0.27
20	0.18	0.20	-0.15
13	0.14	0.01	0.08
14	0.14	-0.09	0.17
1	-0.05	0.38	-0.17
17	-0.25	0.18	0.13
6	0.06	-0.02	-0.09
4	-0.19	-0.03	0.10
19	-0.23	0.02	0.02
5	-0.22	-0.008	-0.007
2	0.35	-0.36	-0.32
22	-0.07	-0.13	-0.19
7	-0.29	-0.11	-0.04
21	-0.26	-0.08	-0.14
15	-0.09	-0.17	-0.26
26	-0.03	-0.13	-0.37
16	-0.22	-0.27	-0.11
9	-0.05	-0.59	-0.11
18	-0.25	-0.41	-0.25
3	-0.48	-0.54	-0.22

The results of the stability in Mathematics indicate that 17 schools (63%) were stable from year to year. Out of these, 10 schools showed negative stability and these included schools 3, 5, 7, 9, 15, 16, 18, 21, 22 and 26 while 7 schools showed stable positive value added. The schools included schools 8, 10, 11, 13, 23, 25 and 27

10 schools (37%) showed instability across the years. These included schools 2, 4, 6, 12, 14, 17, 19, 20, 24 and 1.

The correlations within the subject across the years were 0.35, 0.49 and 0.53 for English, Mathematics and Setswana respectively. The correlations were from weak to moderate. This indicates that subjects were not stable from year to year and this shows that the departmental effects can vary for relatively short periods of time. The results demonstrate that it is helpful to look at subjects and overall value added scores for more than one year, with three years being the minimum as mentioned earlier (*cf.* 4.3.1).

The results on differential effectiveness by gender and ability in Table 5.4.3 showed that schools 11 and 12 were stable in promoting the progress of low ability students and 7 schools were constantly effective for mid ability students. These included schools 16, 19, 27, 9, 11, 12 and 14. Schools 7 and 24 showed stability in promoting the progress of high ability students at the expense of the other groups.

The results of the study showed that it is possible with the right data and appropriate statistical methods to use a value added methodology to determine the effectiveness/ineffectiveness of secondary schools in Botswana. Therefore, the two research aims stated in 5.1 were achieved.

5.8 CONCLUSION

This chapter answered the five problem questions that were stated at the beginning of the chapter (*cf.* 5.1). The chapter answered questions on the effectiveness of secondary schools in Botswana and the fundamental issues of school effectiveness: differential effectiveness, consistency across different subjects and stability across the years. The size of school effects by the more and less effective schools was determined.

The results of the study add weight to the argument supporting the use of value added as a more accurate method for evaluating school performances. The raw results on their own were misleading because some schools which were ranking high in raw results were not doing well in terms of the value added and vice versa. Value added gave an indication of a school's effectiveness in promoting students' achievement. Value added measures are an indication of how well a school is doing in promoting students' achievement. It compares outcomes after adjusting for the differences in intake and reflects the relative boost a school gives to pupils' prior level of achievement in comparison to similar students in other schools.

Schools differed in their effectiveness. Only a few schools (9) were effective in promoting the achievement of learners while the majority (18) were not. 12 schools were stable in their effects. From these, 6 schools were stable in their effectiveness across the years and 6 were stable in their ineffectiveness. The results of consistency showed that 10 schools were consistent in their effects. From these ten, 6 schools were consistently ineffective across the subject while 4 were consistently effective across the different subjects. Schools were also differentially effective for the different students' groups. The schools were generally more effective for boys than girls and for the mid ability rather than the low and high ability students. The study indicated that prior attainment and

student background characteristics such as gender are important predictors of attainment at BGCSE.

The chapter revealed that the concept of school effectiveness needs to include departmental effectiveness at the secondary school because in one school there might be effective and ineffective departments coexisting as shown by the results of the study on the consistency across subjects (*cf.* 5.5). The chapter answered some of the most important questions that any study of school effectiveness should address: Effective for which student groups, effective for what outcomes and for which cohort. It is important that these questions be tackled by any study on school effectiveness because a single outcome measure even in value added analysis can mask the important internal differences within a school.

Chapter six will present the summary of the findings of thesis, make recommendations on the appropriate and accurate method of evaluating school effectiveness and suggest areas for further research on the effectiveness of schools in Botswana.

CHAPTER SIX

SUMMARY, RECOMMENDATIONS AND CONCLUSION

6.1 INTRODUCTION

Chapter one presented four research aims. The aim of this final chapter is to address the fourth research aim, which is to make some recommendations for the improvement of the practice of determining effective/ineffective schools and thereby the performance of secondary schools in Botswana (*cf.* 1.4). Before the recommendations are made, the chapter will look at the research problem; the research questions; and summaries of the findings from Chapters two to five. The chapter ends with the concluding remarks.

The current situation in the judgement of school effectiveness has led the researcher to undertake this study. The Botswana Examination Council publishes the BGCSE exam results using the percentage of candidates who have obtained five or more credit passes. The credit passes are also known as raw results because they have not been adjusted to take into consideration the differences in the students' intake. Schools are then ranked from the highest to the lowest credit passes and this ranking produces a league table. The effectiveness of schools and hence their performances are judged based on the position in the league table. The schools at the top of the league are taken to be effective, while the ineffective schools are those at the bottom. The use of raw results and league tables has been criticised by the school effectiveness research for a number of reasons. Firstly, the intake of schools is different and to compare their BGCSE exam results while the initial intakes cannot be compared is flawed. 'Like' is not being compared with 'like'. Secondly, the raw results do not show the contribution that a school has made to the students' initial

achievement. Some schools that are favoured by their intakes may not be making any contribution to students' learning, but whether they have taught or not, they will still be at the top of the league table. On the other hand, some schools which may be making a contribution to students' learning or adding value, but unable to increase their credit passes, may still be ranked low in league tables. The above situation may result in complacency in the former schools and demoralisation in the latter schools. The use of raw results leads to misleading conclusions about the effectiveness of schools when used on their own.

Schools are required to add value to students' prior attainment and that measures of good performance should include the concept of value addition (*cf.* 1.2). However, the value added is not measured by the Botswana Examination Council. This has resulted in different schools using different methods of value added analysis, which may also lead to wrong conclusions about the effectiveness and performance of schools because the appropriate statistical packages are not used.

The above situation in the judgement of school effectiveness, led to the following research problems (*cf.* 1.3):

1. What does the concept of school effectiveness mean and what are the characteristics of effective schools?
2. In what way can a value added approach to determining school effectiveness contribute to judging school performance?
3. How effective are secondary schools in Botswana? Are some schools more effective than others in promoting students' progress when the differences in students' intake are considered? Are schools equally effective/ineffective for all the student groups? Are the schools consistently effective/ineffective across the core subjects? And are the schools stable in their effectiveness/ineffectiveness for 2005-2007?

4. What recommendations could improve the practice of determining effective/ineffective schools and the performance of secondary schools in Botswana?

From the above problem questions, the following research aims were adopted by the study.

1. To explore the concept of school effectiveness and identify the characteristics of effective schools.
2. To investigate the possibilities of a value added approach to school effectiveness in judging school performance.
3. To determine, on the basis of the literature reviewed and the methods adopted by a value added approach, the effectiveness/ineffectiveness of secondary schools in Botswana.
4. To make recommendations for the improvement of the practice of determining effective/ineffective schools and thereby the performance of secondary schools in Botswana.

To achieve the abovementioned goals, different methods were employed. To explore the concept of school effectiveness and identify the characteristics of effective schools, a literature review was carried out in Chapters two and three (*cf.* 2.3 & 3.4).

The literature was also reviewed to investigate the possibilities of a value added approach to school effectiveness in judging the performance of schools. The literature reviewed spelled out the necessary data and the appropriate statistical procedures to carry out a value added analysis (*cf.* 4.6). Through the use of the statistical package of MLwiN 2.10 Beta (4) and the data set collected, the possibility of a value added approach to judge the effectiveness of schools was investigated (*cf.* 5.3).

To determine the effectiveness or ineffectiveness of secondary schools, two sets of data: JCE scores (at entry) and BGCSE scores (at exit) were collected (*cf.* 4.4).

Different multilevel models were employed through the use of MLwiN 2.10 Beta (4) to determine the value added by the schools and the different core subjects (*cf.* 5.3-5.6).

6.2 SUMMARIES OF THE RESEARCH FINDINGS

6.2.3 The concept of school effectiveness and characteristics of effective schools

The question posed was: **What does the concept of school effectiveness mean and what are the characteristics of effective schools?** (*cf.* 1.3.1).

This study adopted the most widely accepted definition in the school effectiveness research to define an effective school. A school is effective when students progress further than might be expected when the school's intake and students' background factors are considered. This definition implies that an effective school adds value to students' prior attainment. Therefore, school effectiveness in this study was synonymous with value added effectiveness. This definition had an impact on the methodology adopted by this study (*cf.*. 2.2).

Ten characteristics were identified as making a contribution towards the effectiveness of schools. The consistency in the findings is an indication of the robustness of these factors. The characteristics as identified in Chapters two and three (*cf.* 2.3 & 3.4) were:

1. Effective leadership by the School Head and the School Management Team
2. Effective teaching
3. Academic emphasis
4. A positive school culture
5. High expectations
6. Student involvement

7. Monitoring progress
8. A learning organisation
9. Parental involvement
10. Consistency in approach

These factors do not work in isolation, but collectively. The higher levels, for example, the school level, must provide facilitating conditions for the lower levels, for example, the classroom level. Thus the leadership by the principal must produce a positive school culture that will enable effective teaching and learning to take place. These factors were presented in a model of secondary school effectiveness (*cf.* 3.5) which adopted the context - input - process - output chain. The input into the education system includes students with different abilities and attitudes. Thus for a school to add value, it is important that the schools should work on producing a positive attitude towards learning by students. This can be achieved through the contribution made by parents.

The leadership by the principal is a critical factor in producing an effective school. The leadership should involve other stakeholders in the school: parents, teachers and students. The principal should also be an instructional leader (*cf.* 2.3.1.1). At the heart of school effectiveness is teaching and learning (*cf.* 2.3.3). The teachers through instructional efficacy believe that difficult students can be taught and so they exert more effort in their teaching through various ways. The students themselves view a school as a place of learning and exert effort on their school work.

6.2.2 The effectiveness of secondary schools in Botswana

How effective are secondary schools of Botswana? Are some schools more effective than others in promoting student progress when the difference in student intake is considered? (*cf.* 1.3.3) By focussing on the relative progress of students with similar characteristics (ability and gender), in different schools, the study was able to make a comparison of 'like with like'. The findings of this

research indicated that there was a marked difference in the effectiveness of schools in Botswana in promoting the student progress after controlling for students' intakes. 9 or 33% of schools were more effective than others while the majority, 18 or 67% were less effective. The learners in the more effective schools progressed further than expected when compared with the students from the least effective schools. The results indicated that indeed, schools make a difference to students' final achievement, which may impact on the students' tertiary education. There is an advantage of attending a more effective school than a less effective school. In the most effective school, a student had an enhancement of +5.46 points while in the least effective school, the school contributed to students performing 3.6 points below what they could have attained (*cf.* Table 5.3.4).

When the inspectoral regions were considered, region D had more effective schools than other regions (with four schools out of five). The two schools in region E were both ineffective. Region C had three effective schools out of the eight while region B with four schools had only one effective school and region A with eight schools had only one effective school.

The other major finding by the study was the misleading nature of unadjusted raw results. Some schools that were considered to be doing well in terms of raw results were not doing so well in terms of value added to students and vice versa (*cf.* 5.3.1 -5.3.3). The results of this study contribute to the ongoing debate about the use of unadjusted raw results. What was also evident is the fact that the correlations between schools' ranking in raw results and value added results were not perfect. Schools changed ranking positions depending on which indicator was used. This proved that the ranking of schools into position is sensitive to the performance indicator used. This shows that a school's performance is to be judged not only on the raw results but also on the contribution the school made to those results. Without a value added component, the effectiveness of schools will remain unknown to all stakeholders.

The results of this study make a contribution to the practice of evaluating a school's effectiveness. The results indicate that it is possible to adopt a value added approach to determine the effectiveness or ineffectiveness of schools and make judgements about their performances (*cf.* 1.4.2). It is therefore possible through a value added approach, to hold schools accountable for what they are supposed to influence, that is, students' progress.

6.2.3 Differential school effectiveness for the different student groups

Are the schools equally effective/ineffective for all the student groups? (*cf.* 1.3.3) This question seeks to answer the question: Effective for which student groups? (*cf.* 1.3.)

There was a significant evidence of differential effectiveness for students with different ability levels and gender. The overall results indicated that schools promoted the progress of boys more than girls and mid ability students better than the high and low ability students (*cf.* 5.4). The question on differential effectiveness shows that it is very important to investigate differential school effectiveness whenever answering questions on school effectiveness. This is important because the use of a single measure of school effectiveness can result in misleading conclusions about the effectiveness of schools. This shows that the issue of differential effectiveness is very important when making judgements about the effectiveness of schools. It looks at how equitable the provision of quality education is to all the student groups.

The performance gap between boys and girls widened further at BGCSE than at intake. This adds to similar findings in Botswana where it was realised that although more girls than boys enter primary education, few go up to tertiary education level. This leads to under representation of women in key decision making roles because few women make it into tertiary education. This equity issue is a challenge facing Vision 2016 (*cf.* 5.4) and it needs to be addressed.

6.2.4 Consistency across the core curriculum subjects.

Are the schools consistently effective/ineffective across the core subjects? (*cf.* 1.3.3). This question seeks to answer the question: Effective in promoting which outcomes? (*cf.* 1.3).

Consistency was determined among the three core subjects of English language, Setswana language and Mathematics. Ten schools showed some consistency across the subjects. Four schools out of these ten were effective across all the three departments while six schools were ineffective. The consistency in ineffectiveness across all the departments may reflect on the whole school processes that need to be looked into. In seventeen (17) schools, there was some evidence of internal variations among the departments. These schools had effective and ineffective departments coexisting. (*cf.* Table 5.5.3.1 & 5.5.3.2).

The findings on consistency across the departments contribute to the practice of determining school effectiveness. The results demonstrate that it is helpful to look at both the overall and subject value added scores when evaluating secondary schools academic performance. The use of an overall single measure to determine the effectiveness of schools could be misleading because a school can have effective and ineffective departments in a given year. It is therefore important that the internal variations should be investigated to show the individual department's effectiveness rather than to label all the departments as either effective or ineffective. This underscores the importance of departmental effectiveness in models of academic effectiveness in secondary schools (*cf.* 3.5). Departmental effectiveness/ ineffectiveness can lead to the overall effectiveness or ineffectiveness of a school.

6.2.5 Stability in effectiveness for the three years

Are the schools stable in effective/ineffective for 2005-2007? (*cf.* 1.3.3) This answers the third important question on school effectiveness: Effective over what time period? (*cf.* 1.3.3).

Schools are not static institutions. They are subject to internal and external changes that affect their functioning. Good performance in one year, may not necessarily guarantee good performance for years that follow. The value added by individual schools was compared from year to year. Twelve schools were stable in their effects. Out of the twelve schools, six schools were stable from year to year in adding positive value to students' achievements although the value added scores were not stable. In one year, a school could add more value than in the other years. Some schools showed an increase in the value added scores from year to year while others showed a decline. Six schools were stable in adding negative value to students' prior attainment. Three of these schools were increasingly becoming ineffective from year to year. Fifteen schools were unstable in their value added scores. They added both negative and positive value in the three years. Two schools were improving in their effectiveness while one school was becoming ineffective though it was effective for the 2005 cohort (*cf.* 5.6.1). The findings show that school effectiveness can be unstable even in a relatively short period of time and that an ineffective school can be made effective.

The study answered three important questions that were posed in Chapter one that any study of school effectiveness should address. This is because effectiveness is a retrospective, relative concept that is time and outcome specific (Sammons, 2007:12). The questions answered were: Effective in promoting which outcomes? Effective for which student groups? And for what time period? (*cf.* 1.3). These questions provide a focus for schools' self evaluation and review which can aid schools in identifying areas to tackle for improvement. It is also worth mentioning that by means of the afore mentioned

strategies (*cf.* 6.1), the research aims stated in Chapter one, were achieved and the problem questions were answered.

Peng *et al*. (2006:198) note that researchers indicate that there is an observable trend of school effectiveness research towards internationalisation that cannot be ignored and that it has been argued convincingly that the findings of school effectiveness research in developing countries can make significant contributions to the international debate. This study employed the state of art school effectiveness research methods used in industrialised countries to make a contribution to studies from third world countries that have explored the scientific properties of school effectiveness, such as the size of school effects, stability and consistency of school effects and differential effects of schools (*cf.* 1.8). These are fundamental issues underlying school effectiveness (*cf.* 3.7). Differential school effectiveness is a topic of increasing interest in school effectiveness research, especially for equity. The result on the differential effectiveness of schools has contributed some important evidence to the ongoing debate about gender equity. It is evident even in Botswana that schools promote the progress of boys more than girls. Vision 2016 has acknowledged this as a major challenge as it states that: "the other challenge facing the education sector as we move towards Vision 2016 is the equity dimension" (Vision 2016:18-19). Although more girls enter primary school, the number decreases sharply at the upper levels including tertiary and technical.

The results of the study made a contribution to the development of theoretical models of secondary school effectiveness. The evidence for the existence of internal variations by different departments within the same school supports the recommendations for the incorporation of departmental level in models of school effectiveness (Sammons *et al*., 1997:179). Sammons *et al*. and Thomas *et al*. (in Sammons *et al*., 1997:165) assert that the term school effectiveness needs to be qualified at the secondary level to the term school and departmental effectiveness.

6.3 RECOMMENDATIONS

The research findings have important implications for those working in schools and with schools. Some recommendations to improve practice and for further research are made based on the results of the study.

6.3.1 Recommendation to improve school effectiveness

It is of major concern that only 9 out of the 27 schools were effective. There are interventions that could be put in place to raise the effectiveness of schools and those for the ineffective ones in particular. The measures that could be put in place include the reduction of class sizes so that teachers have few students to concentrate on. The other intervention would be to have assistant teachers or remedial teachers who could assist the academically challenged students. This is very important as the Ministry of Education is increasing access every year with the aim of achieving a twelve year basic education.

The results of the study can inform schools' self reviews. Since they take into account students' prior attainment, value added results can be used as a regular process of schools' self evaluation and review. This is what is expected by the Department of Secondary Education from schools as the pastoral policy states: "The school should consciously promote active monitoring and supervision of its academic programme and institutionalise continuous self evaluation by both staff and its students. The ultimate expectation of its customers is academic excellence" (DSE, 2007:3). The individual teachers should have students' prior achievement. When monitoring the progress of students, each student's prior attainment in a particular subject must be taken into account. By focussing on the subject results as well as the overall effectiveness, the school management team can identify strengths and weaknesses and appropriate measures be employed.

Schools can use the results on the characteristics of effective schools to check whether they are moving towards effectiveness or not.

The role of the School Head is very pivotal in school effectiveness; therefore, School Heads need to be educated on the characteristics of effective schools during their induction into headship.

The inspection process should be informed by the students' intakes. Information about the attainment of students at entry should be used to contextualise the inspection process. During the inspection, schools should be evaluated on the progress made by the different student groups.

6.3.2 Recommendations for the practice of determining the effectiveness of schools

The results of the study have shown that it is possible to adopt a value added approach to investigate the effectiveness of schools and hence their performance. It has been argued in this thesis that the use of the credit passes as an indicator of performance is flawed. The research recommends that appropriate value added measures be developed nation-wide which will provide schools with good quality comparative information about their effectiveness and performance on yearly basis. Once the effectiveness of schools is known, the Department of Secondary Education will know how far it is from achieving the goal of "an informed and educated nation by 2016". Appropriate interventions could be put in place to assist schools lagging behind.

6.3.3 Recommendations for further research

Further research is needed to determine the link between school effectiveness factors and the quantitative value added scores by the schools. In other words, what factors were prevalent in schools and departments that made them to be

more or less effective which ultimately led to the differences in the overall effectiveness of schools and the internal variations within a school?

The research needs to be extended to other subjects like Social Studies and Agriculture which are core curricular subjects at JCE and are taken by many students as optional subjects at BGCSE.

Differential effectiveness has important implications for the achievement of Vision 2016. The study has indicated that schools are differentially effective for the different students' groups, namely gender and ability. There are other students' groups that should be researched on. Further research is needed to determine how effective schools are with students from different ethnic backgrounds and socio economic status. This will also enable the Department of Secondary Education to know how far it is from providing quality education to all the various student groups. Further research is also needed to determine the differential effectiveness of the subjects for the different students' groups in terms of ability, gender and socio economic status. The differential effectiveness by ability and gender challenges the objective of the Revised National Policy on Education (1994:5) which states that the goal of the national education is "to provide life long education to all sectors of the population".

There are limitations to any study of school effectiveness that adopts a value added methodology and these need to be mentioned here.

- The validity of background factors. The study could not control for the factors outside the school, for example, private tuition. The study assumed that the value added was entirely due to the school and departments.
- The study recognises that progress is not the only criteria that should be employed in judging school effectiveness. Other qualitative measures are needed and could be more fruitful than just using one method.

- The retrospective nature of the data which focuses on students' outcome at the end of BGCSE means that the results indicate the schools' past performance.

6.4 CONCLUDING REMARKS

Saunders (2000:241-242) observes that value added performance is now a major feature in the educational landscape and it is here to stay. The academic debate on school effectiveness and how to measure it is now integrally linked with the national political agenda for educational quality in many countries. This means that the range of parties interested in value added extends from politicians to school managers and from academic researchers to lay governors, thus making it one of the biggest growth areas in educational research over the past thirty years. The flourishing knowledge base resulting from this expansion reflects a trend towards internationalisation and globalisation, and Botswana is not an exception. It is now regarded as a normal practice in Botswana for schools to report on their performances every month and that their measures should indicate the value added by the school.

The study has proved that with the advancement of modern statistical methods that are available, it is possible to adopt the state of art school effectiveness that is guided by the input- process- output-context categorisation of variables that is oriented towards 'value added' (Scheerens, 2001:368). It is upon the Ministry of Education to adopt the value added methodology fully, as an appropriate measure of schools' effectiveness and performances in order to improve the quality of education. This will inform all the stakeholders about the productivity of senior secondary schools in Botswana. This will also protect the schools from inappropriate comparisons that are usually injected into public debates by the media and others.

The performance of all the different groups needs to be enhanced in order to achieve the Vision 2016 pillar of an "informed and educated nation."

The conceptual framework on the academic effectiveness of secondary schools (*cf.* 3.5), has teachers as inputs into the education system in the form of teachers' qualifications and experience which can directly influence the quality of teaching at the classroom level. The Teaching Service Management (TSM) as the employing body for teachers must ensure that teachers do not overstay in one area. This might result in teachers' demotivation which might lead to lower performance by such teachers.

The flourishing knowledge base of the school effectiveness research discussed in Chapters two and three, has informed the pastoral policy system in Botswana. The pastoral policy has six components that schools should report on every month or every term. The components are: **academic performance**; **student discipline** which implies the creation of a safe and orderly environment; **stakeholder involvement** (parents, students and community); **leadership and management** which is measured by factors such as the degree of delegation in the school; **core curricular activities** whereby each student should be involved in at least one school activity; and **guidance and counselling.** This means that if schools were to implement this pastoral policy which includes some characteristics of effective schools, then the schools will be moving in the direction of becoming effective. School effectiveness does not come by chance and once a school becomes effective, it has to keep on working to maintain the effectiveness status. This requires the strong leadership of the principal, effective School Management Teams that really function as teams and the contribution of both staff and students. It is incumbent upon the Department of Secondary Education to see to it that schools report as needed on the above issues. This will be used as a yard stick by the Department to see how far it is from achieving its mandate and thereby its contribution to the Vision 2016 pillar of "an informed and educated nation".

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Field Code Changed

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Field Code Changed

Field Code Changed

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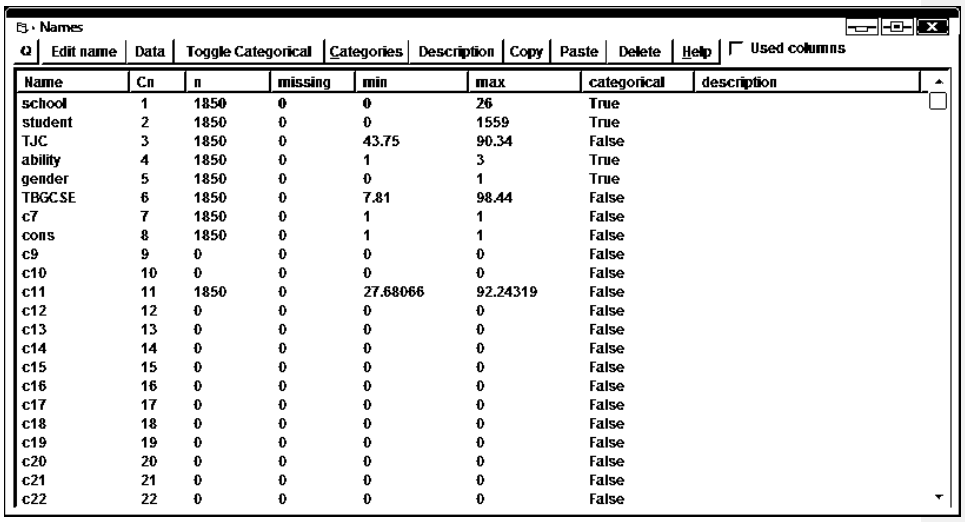
APPENDICES

Appendix 1 Calculation of the value added by schools in 2005

Table 1.1. The sample window for 2005



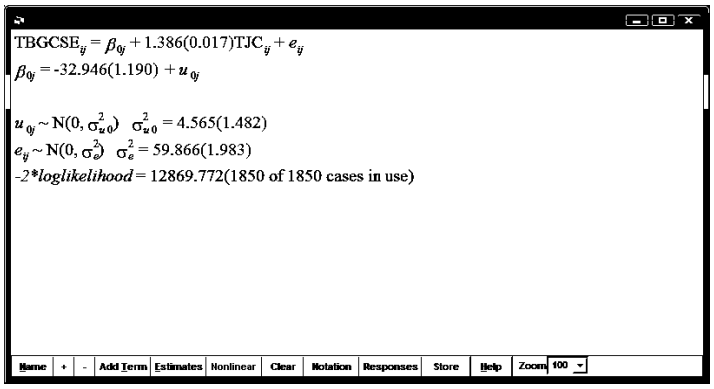
Names

Edit name | Data | Toggle Categorical | Categories | Description | Copy | Paste | Delete | Help | Used columns

Name	Cn	n	missing	min	max	categorical	description
school	1	1850	0	0	26	True	
student	2	1850	0	0	1559	True	
TJC	3	1850	0	43.75	90.34	False	
ability	4	1850	0	1	3	True	
gender	5	1850	0	0	1	True	
TBGCSE	6	1850	0	7.81	98.44	False	
c7	7	1850	0	1	1	False	
cons	8	1850	0	1	1	False	
c9	9	0	0	0	0	False	
c10	10	0	0	0	0	False	
c11	11	1850	0	27.68066	92.24319	False	
c12	12	0	0	0	0	False	
c13	13	0	0	0	0	False	
c14	14	0	0	0	0	False	
c15	15	0	0	0	0	False	
c16	16	0	0	0	0	False	
c17	17	0	0	0	0	False	
c18	18	0	0	0	0	False	
c19	19	0	0	0	0	False	
c20	20	0	0	0	0	False	
c21	21	0	0	0	0	False	
c22	22	0	0	0	0	False	

The sample window shows that the sample size is 1850 students. The explanatory variables and their coding are: TJC (score at intake range from 43.75% -90.34%); ability level(coded as 1=high, 2=mid, 3=low); gender (coded as 1=girl, 0=boy); TBGCSE score is the dependent variable and ranges from 7.81% to 98.44%.

Equation 1. The value added model for 2005



$TBGCSE_{ij} = \beta_{0j} + 1.386(0.017)TJC_{ij} + e_{ij}$

$\beta_{0j} = -32.946(1.190) + u_{0j}$

$u_{0j} \sim N(0, \sigma^2_{u0})$ $\sigma^2_{u0} = 4.565(1.482)$

$e_{ij} \sim N(0, \sigma^2_e)$ $\sigma^2_e = 59.866(1.983)$

*-2*loglikelihood* = 12869.772(1850 of 1850 cases in use)

Name | + | - | Add Term | Estimates | Nonlinear | Clear | Notation | Responses | Store | Help | Zoom 100

The 1850 of 1850 cases in use indicates that there were no missing values in the sample. All the students' data sets have been matched.

In the above equation, $\mathbf{u_{0j}}$, the residual or value added is the only unknown quantity. The window below shows how the residuals/value added and their rankings were calculated. The residuals are displayed in column c300 while the rankings are at c305. The window can also be used to plot the graphs for value added and their rankings. The residuals were calculated at the school level.

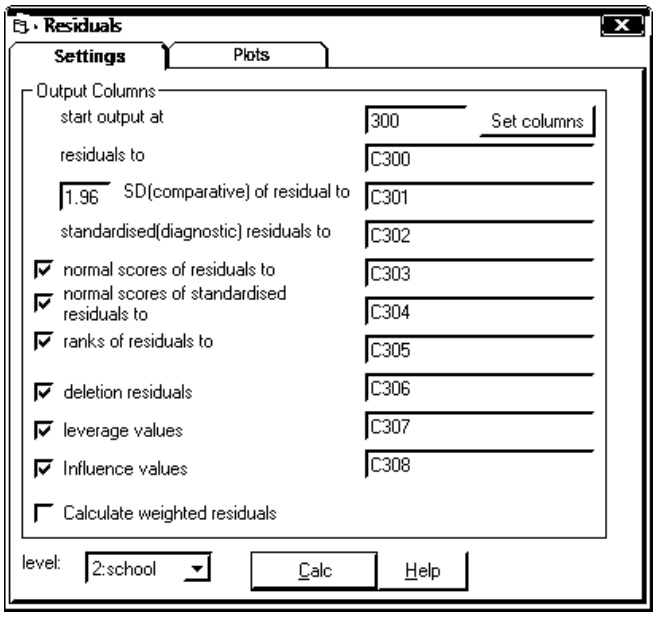
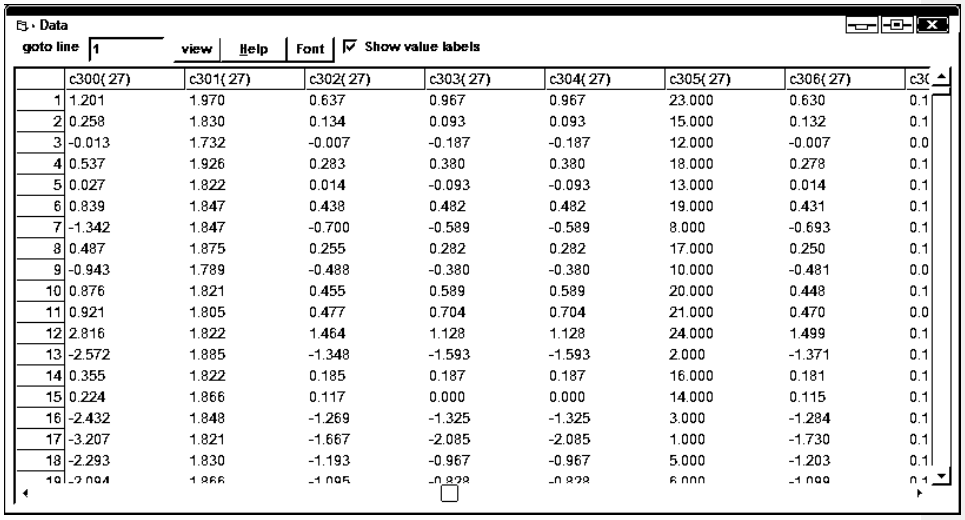


Table 1 2 below shows that school 1 had a residual of 1.201 ranked 23th largest of all residuals.

Table 1.2. The schools' residuals and rankings for 2005.



Data

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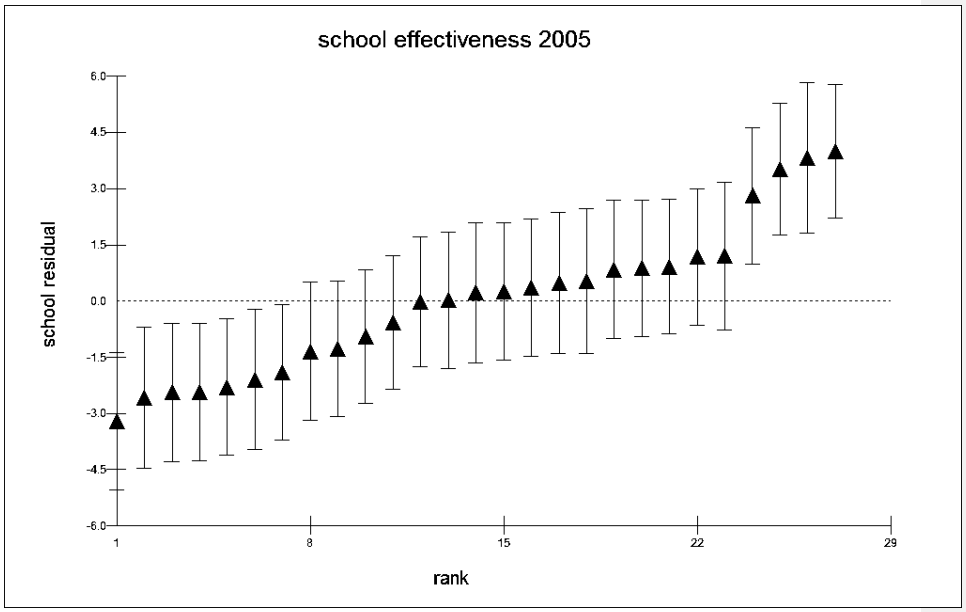
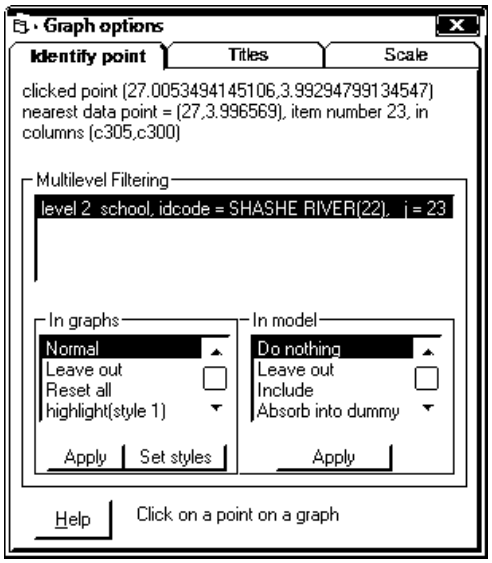
	c300(27)	c301(27)	c302(27)	c303(27)	c304(27)	c305(27)	c306(27)	c3(
1	1.201	1.970	0.637	0.967	0.967	23.000	0.630	0.1
2	0.258	1.830	0.134	0.093	0.093	15.000	0.132	0.1
3	-0.013	1.732	-0.007	-0.187	-0.187	12.000	-0.007	0.0
4	0.537	1.926	0.283	0.380	0.380	18.000	0.278	0.1
5	0.027	1.822	0.014	-0.093	-0.093	13.000	0.014	0.1
6	0.839	1.847	0.438	0.482	0.482	19.000	0.431	0.1
7	-1.342	1.847	-0.700	-0.589	-0.589	8.000	-0.693	0.1
8	0.487	1.875	0.255	0.282	0.282	17.000	0.250	0.1
9	-0.943	1.789	-0.488	-0.380	-0.380	10.000	-0.481	0.0
10	0.876	1.821	0.455	0.589	0.589	20.000	0.448	0.1
11	0.921	1.805	0.477	0.704	0.704	21.000	0.470	0.0
12	2.816	1.822	1.464	1.128	1.128	24.000	1.499	0.1
13	-2.572	1.885	-1.348	-1.593	-1.593	2.000	-1.371	0.1
14	0.355	1.822	0.185	0.187	0.187	16.000	0.181	0.1
15	0.224	1.866	0.117	0.000	0.000	14.000	0.115	0.1
16	-2.432	1.848	-1.269	-1.325	-1.325	3.000	-1.284	0.1
17	-3.207	1.821	-1.667	-2.085	-2.085	1.000	-1.730	0.1
18	-2.293	1.830	-1.193	-0.967	-0.967	5.000	-1.203	0.1
19	-2.094	1.866	-1.095	-0.828	-0.828	6.000	-1.099	0.1

A plot of the school residuals plotted with 'error bars' enable the comparison of schools to be made. The schools whose error bars did not overlap were significantly different at the 5% significant level. The length of the error bar is influenced by the number of learners in the sample. Wider intervals occur with fewer numbers of students and narrow intervals for schools with more students.

Graph 1: The Value added by schools and their ranks in 2005



The graph options window that follows was used to identify schools. The school at the top is the most effective school with the largest value added and is given the highest ranking (27) on graph 1. This was school 23.



Appendix 2 Calculation of the value added by schools in 2006

Table 2.1 The sample window for 2006

Names

Edit name | Data | Toggle Categorical | Categories | Description | Copy | Paste | Delete | Help | Used columns

Name	Cn	n	missing	min	max	categorical	description
school	1	1911	0	0	26	True	
student	2	1911	0	0	1614	True	
TJC	3	1911	0	49.91	97.47	False	
Ability	4	1911	0	1	3	True	
gender	5	1911	0	0	1	True	
TBGCSE	6	1911	0	8.13	98.88	False	
c7	7	1911	0	1	1	False	
cons	8	1911	0	1	1	False	
girl	9	1911	0	0	1	False	
c10	10	0	0	0	0	False	
c11	11	1911	0	35.60933	102.3548	False	
c12	12	0	0	0	0	False	
c13	13	0	0	0	0	False	
c14	14	0	0	0	0	False	
c15	15	0	0	0	0	False	
c16	16	0	0	0	0	False	
c17	17	0	0	0	0	False	
c18	18	0	0	0	0	False	
c19	19	0	0	0	0	False	
c20	20	0	0	0	0	False	
c21	21	0	0	0	0	False	
c22	22	0	0	0	0	False	

The sample window shows that the sample size is 1911 students. The explanatory variables and their coding are: TJC (score at intake ranges from 49.91% -97.47%); ability level(coded as 1=high, 2=mid, 3=low); gender (coded as 1=girl, 0=boy); TBGCSE score is the dependent variable and ranges from 8.13% to 98.88%.

Equation 2 The value added model for 2006

Equations

$$TBGCSE_{ij} = \beta_{0j} + 1.403(0.014)TJC_{ij} + e_{ij}$$

$$\beta_{0j} = -34.434(1.108) + u_{0j}$$

$$u_{0j} \sim N(0, \sigma^2_{u0}) \quad \sigma^2_{u0} = 8.789(2.616)$$

$$e_{ij} \sim N(0, \sigma^2_e) \quad \sigma^2_e = 58.152(1.895)$$

$$-2*loglikelihood = 13254.024(1911 \text{ of } 1911 \text{ cases in use})$$

Name | + | - | Add Term | Estimates | Nonlinear | Clear | Notation | Responses | Store | Help | Zoom 100

The 1911 of 1911 cases in use indicates that there were no missing values in the sample. All the students' data sets have been matched.

The window below shows how the residuals and their rankings were calculated. The residuals will be displayed column 300 while the rankings are at c305. The window can also be used to plot the graphs for value added and their rankings.

The window to calculate the residual

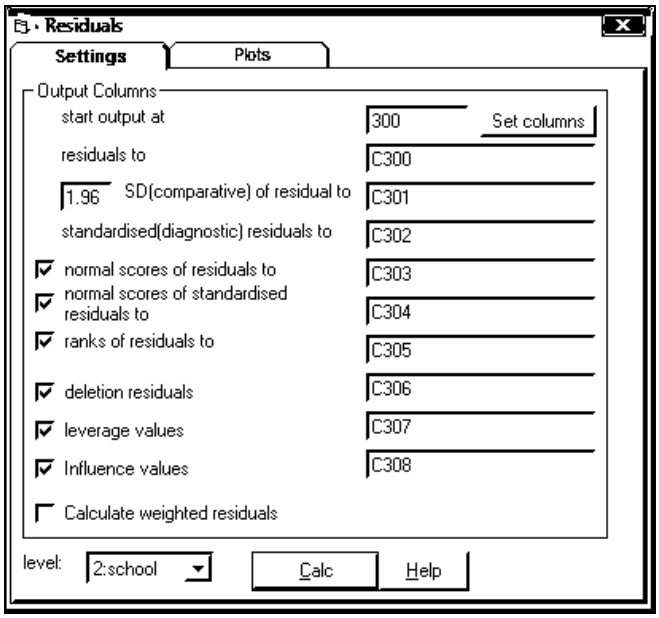


Table 2.2 The schools' residuals and the rankings for 2006

Data

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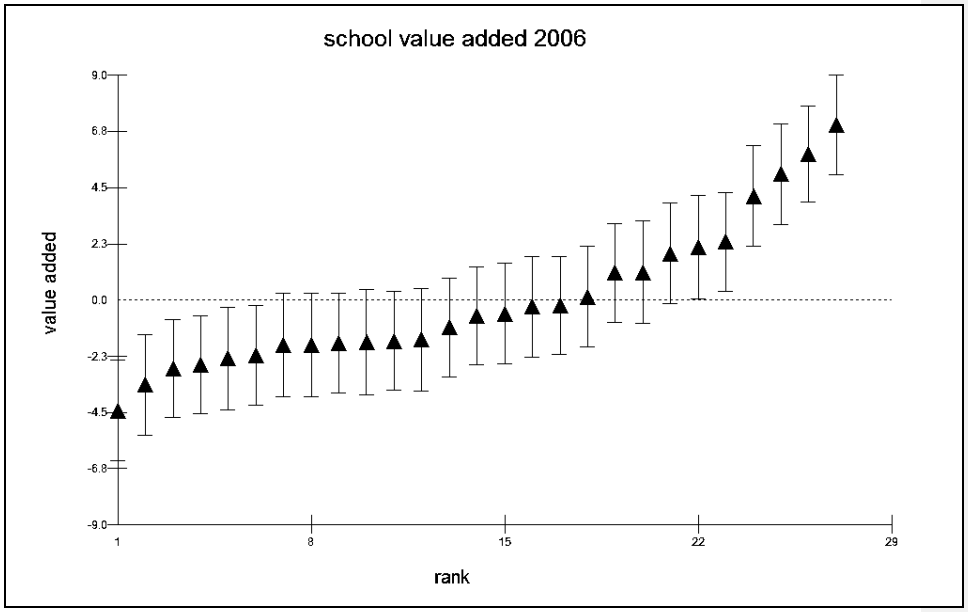
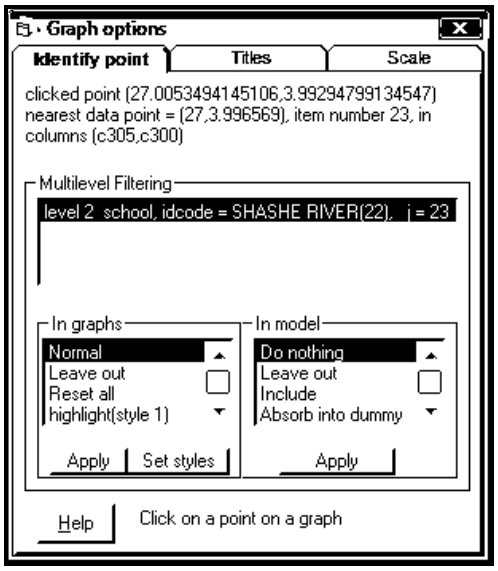
	c300(27)	c301(27)	c302(27)	c303(27)	c304(27)	c305(27)	c306(27)	c3
1	-0.622	1.965	-0.223	0.000	0.000	14.000	-0.219	0.0
2	-1.690	2.103	-0.612	-0.380	-0.380	10.000	-0.604	0.0
3	-2.583	1.965	-0.926	-1.128	-1.128	4.000	-0.923	0.0
4	-0.555	2.015	-0.200	0.093	0.093	15.000	-0.196	0.0
5	-1.583	2.051	-0.571	-0.187	-0.187	12.000	-0.563	0.0
6	-0.224	1.965	-0.080	0.282	0.282	17.000	-0.079	0.0
7	-2.339	2.061	-0.844	-0.967	-0.967	5.000	-0.839	0.0
8	-1.087	1.981	-0.390	-0.093	-0.093	13.000	-0.384	0.0
9	-4.419	2.006	-1.588	-2.085	-2.085	1.000	-1.639	0.0
10	2.109	2.081	0.762	0.828	0.828	22.000	0.755	0.0
11	2.327	1.989	0.835	0.967	0.967	23.000	0.830	0.0
12	4.166	2.015	1.498	1.128	1.128	24.000	1.537	0.0
13	0.125	2.015	0.045	0.380	0.380	18.000	0.044	0.0
14	-1.804	2.071	-0.651	-0.589	-0.589	8.000	-0.644	0.0
15	-1.723	1.989	-0.619	-0.482	-0.482	9.000	-0.611	0.0
16	-1.631	1.965	-0.585	-0.282	-0.282	11.000	-0.577	0.0
17	-2.751	1.965	-0.986	-1.325	-1.325	3.000	-0.985	0.0
18	-0.268	2.006	-0.096	0.187	0.187	16.000	-0.095	0.0
19	-1.809	2.081	-0.653	-0.704	-0.704	7.000	-0.646	0.0

A plot of the school residuals was plotted with 'error bars' to enable the comparison of schools to be made in Graph 2 below.

Graph 2 The value added by schools and their ranks in 2006.



The graph options enabled us to identify the schools. The school at the top is the most effective school with a value added of 7 points and ranking 27. This was school 23.



Appendix 3 Calculation of the value added by schools in 2007

Table 3.1 The sample window for 2007

Names

Edit name | Data | Toggle Categorical | Categories | Description | Copy | Paste | Delete | Help | Used columns

Name	Cn	n	missing	min	max	categorical	description
school	1	1901	0	0	26	True	
student	2	1901	0	0	1617	True	
TJC	3	1901	0	50	91.06	False	
ability	4	1901	0	1	3	True	
gender	5	1901	0	0	1	True	
TBGCSE	6	1901	0	6.25	100	False	
c7	7	1901	0	1	1	False	
cons	8	1901	0	1	1	False	
c9	9	0	0	0	0	False	
c10	10	0	0	0	0	False	
c11	11	1901	0	32.65945	99.80869	False	
c12	12	0	0	0	0	False	
c13	13	0	0	0	0	False	
c14	14	0	0	0	0	False	
c15	15	0	0	0	0	False	
c16	16	0	0	0	0	False	
c17	17	0	0	0	0	False	
c18	18	0	0	0	0	False	
c19	19	0	0	0	0	False	
c20	20	0	0	0	0	False	
c21	21	0	0	0	0	False	
c22	22	0	0	0	0	False	

The sample window shows that the sample size is 1901 students. The explanatory variables and their coding are: TJC (score at intake ranges from 50% -91.06%); ability level(coded as 1=high, 2=mid, 3=low); gender (coded as 1=girl, 0=boy); TBGCSE score is the dependent variable and ranges from 6.21% to 100%.

Equation 3 The value added model for 2007

Equations

$$TBGCSE_{ij} = \beta_{0j} + 1.374(0.014)TJC_{ij} + e_{ij}$$

$$\beta_{0j} = -30.388(1.131) + u_{0j}$$

$$u_{0j} \sim N(0, \sigma^2_{u0}) \quad \sigma^2_{u0} = 8.261(2.473)$$

$$e_{ij} \sim N(0, \sigma^2_e) \quad \sigma^2_e = 56.024(1.830)$$

$$-2*loglikelihood = 13113.475(1901 \text{ of } 1901 \text{ cases in use})$$

Name | + | - | Add Term | Estimates | Nonlinear | Clear | Notation | Responses | Store | Help | Zoom 100

The 1901 of 1901 cases in use indicates that there are no missing values in the sample. All the students' data sets have been matched.

The window below shows how the residuals and their rankings are calculated. The residuals will be displayed column 300 while the rankings are at c305. The window can also be used to plot the graphs for value added and their rankings.

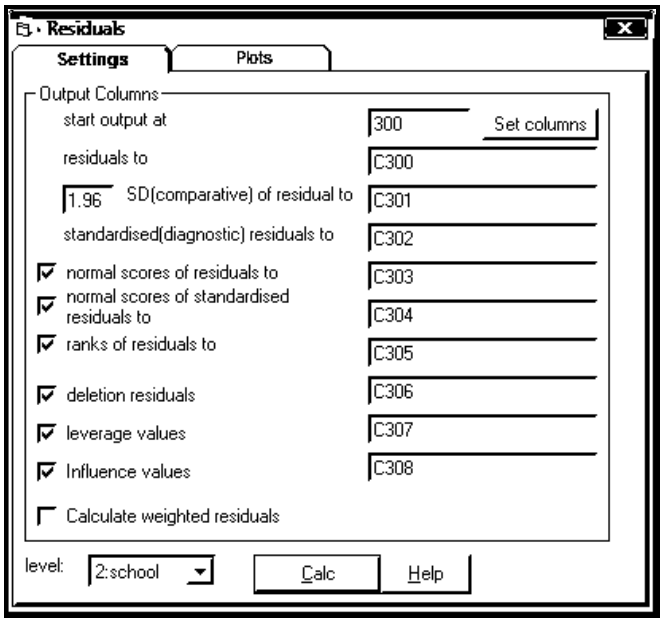


Table 3.2 The schools' residuals and rankings for 2007

Data

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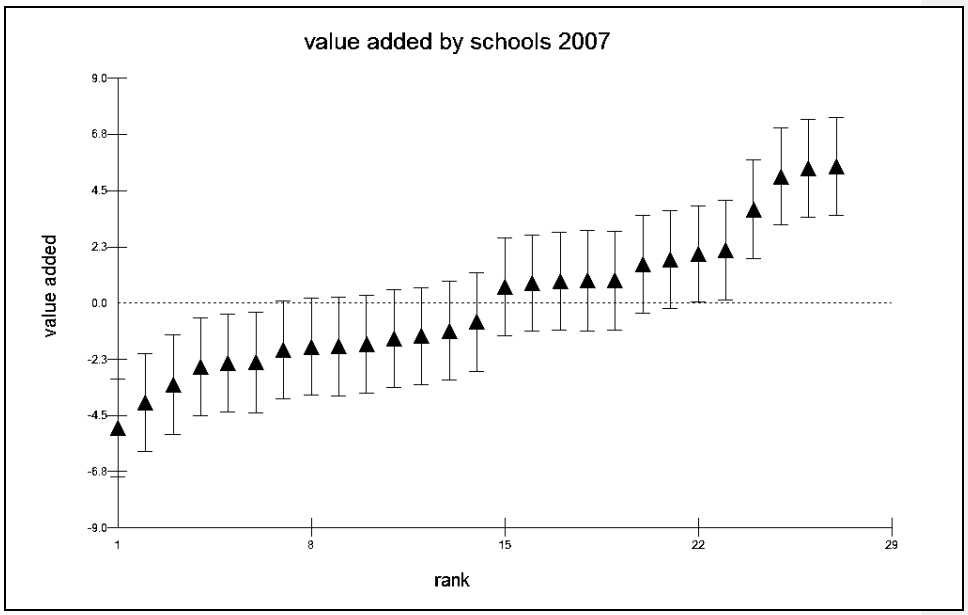
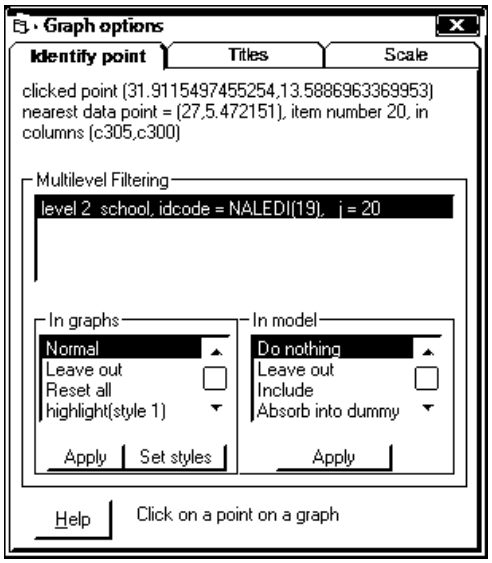
	c300(27)	c301(27)	c302(27)	c303(27)	c304(27)	c305(27)	c306(27)	c3(
1	-2.414	1.960	-0.896	-0.967	-0.967	5.000	-0.892	0.0
2	0.899	2.014	0.335	0.380	0.380	18.000	0.329	0.0
3	-3.279	1.995	-1.220	-1.325	-1.325	3.000	-1.232	0.0
4	-0.758	1.968	-0.281	0.000	0.000	14.000	-0.276	0.0
5	-1.116	1.977	-0.415	-0.093	-0.093	13.000	-0.408	0.0
6	0.889	1.960	0.330	0.282	0.282	17.000	0.324	0.0
7	-2.550	1.968	-0.947	-1.128	-1.128	4.000	-0.945	0.0
8	0.795	1.928	0.294	0.187	0.187	16.000	0.289	0.0
9	0.910	1.977	0.338	0.482	0.482	19.000	0.332	0.0
10	-2.367	2.014	-0.882	-0.828	-0.828	6.000	-0.878	0.0
11	3.750	1.977	1.393	1.128	1.128	24.000	1.420	0.0
12	2.110	1.995	0.785	0.967	0.967	23.000	0.779	0.0
13	0.648	1.969	0.241	0.093	0.093	15.000	0.236	0.0
14	-1.652	1.952	-0.613	-0.380	-0.380	10.000	-0.605	0.0
15	-1.421	1.960	-0.527	-0.282	-0.282	11.000	-0.520	0.0
16	1.962	1.935	0.727	0.828	0.828	22.000	0.720	0.0
17	1.549	1.943	0.574	0.589	0.589	20.000	0.567	0.0
18	-1.746	1.951	-0.648	-0.589	-0.589	8.000	-0.640	0.0
19	-1.321	1.943	-0.490	-0.187	-0.187	12.000	-0.483	0.0

The table shows that school 1 has a value added score of -2.414 and is ranked position 5. The schools' residuals and their rankings were then plotted in Graph 3.

Graph 3: The value added by schools and their ranks in 2007



The graph identifier can be used to identify the schools



The most effective school is the school at the top with a value added score of 5.47 and was identified as school 20.

Appendix 4: Differential effectiveness of schools by gender and ability for 2005

School 1

$$Tbgcse_i = -23.078(6.158) + 1.288(0.089)Tjc_i + -3.825(2.031)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 55.559(10.692)$$

*-2*loglikelihood* = 370.188(54 of 54 cases in use)

$$Tbgcse_i = -49.576(28.962) + 1.595(0.362)Tjc_i + 3.014(4.934)mid_i + 8.781(9.931)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 58.202(11.201)$$

*-2*loglikelihood* = 372.697(54 of 54 cases in use)

School 2

$$Tbgcse_i = -34.202(5.082) + 1.437(0.076)Tjc_i + -3.124(1.923)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 63.153(10.752)$$

*-2*loglikelihood* = 481.857(69 of 69 cases in use)

$$Tbgcse_i = -29.804(38.095) + 1.357(0.458)Tjc_i + -0.251(10.296)mid_i + -3.200(14.977)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 64.684(11.012)$$

*-2*loglikelihood* = 483.509(69 of 69 cases in use)

School 3

$$Tbgcse_i = -31.565(8.441) + 1.383(0.134)Tjc_i + 0.455(2.056)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 62.351(11.118)$$

*-2*loglikelihood* = 439.151(63 of 63 cases in use)

$$Tbgcse_i = 7.365(36.870) + 0.981(0.484)Tjc_i + -13.152(7.411)mid_i + -18.105(13.237)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 59.203(10.548)$$

*-2*loglikelihood* = 435.887(63 of 63 cases in use)

School 4

$$Tbgcse_i = -29.318(6.772) + 1.350(0.097)Tjc_i + -0.945(2.051)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 55.097(10.181)$$

*-2*loglikelihood* = 403.971(59 of 59 cases in use)

$$Tbgcse_i = -12.354(14.981) + 1.119(0.197)Tjc_i + -1.097(2.795)mid_i + -6.573(4.926)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 53.159(9.787)$$

*-2*loglikelihood* = 401.859(59 of 59 cases in use)

School 5

$$Tbgcse_i = -50.394(5.883) + 1.647(0.085)Tjc_i + -0.906(1.820)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 54.124(9.181)$$

*-2*loglikelihood* = 478.041(70 of 70 cases in use)

$$Tbgcse_i = -42.975(21.178) + 1.548(0.267)Tjc_i + -0.606(3.494)mid_i + -2.699(6.960)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 54.130(9.200)$$

*-2*loglikelihood* = 478.049(70 of 70 cases in use)

School 6

$$Tbgcse_i = -25.099(5.723) + 1.280(0.083)Tjc_i + 0.375(1.727)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 48.579(8.399)$$

*-2*loglikelihood* = 450.312(67 of 67 cases in use)

$$Tbgcse_i = -35.746(25.044) + 1.417(0.315)Tjc_i + 1.399(4.428)mid_i + 3.732(8.253)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 48.419(8.407)$$

*-2*loglikelihood* = 450.091(67 of 67 cases in use)

School 7

$$\text{Tbgcse}_i = -26.254(7.475) + 1.276(0.107)\text{Tjc}_i + -1.778(1.737)\text{girl}_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 45.488(7.859)$$

*-2*loglikelihood* = 445.906(67 of 67 cases in use)

$$\text{Tbgcse}_i = -3.016(21.902) + 0.973(0.288)\text{Tjc}_i + -4.889(3.386)\text{mid}_i + -7.378(5.917)\text{low}_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 44.805(7.741)$$

*-2*loglikelihood* = 444.893(67 of 67 cases in use)

School 8

$$\text{Tbgcse}_i = -20.610(6.712) + 1.226(0.094)\text{Tjc}_i + -2.453(2.213)\text{girl}_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 70.592(12.479)$$

*-2*loglikelihood* = 454.067(64 of 64 cases in use)

$$\text{Tbgcse}_i = -14.539(40.946) + 1.133(0.501)\text{Tjc}_i + 0.349(7.915)\text{mid}_i + -3.881(15.390)\text{low}_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 70.618(12.484)$$

*-2*loglikelihood* = 454.091(64 of 64 cases in use)

School 9

$$\text{Tbgcse}_i = -37.449(4.991) + 1.438(0.071)\text{Tjc}_i + -0.321(1.363)\text{girl}_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 33.451(5.503)$$

*-2*loglikelihood* = 469.748(74 of 74 cases in use)

$$\text{Tbgcse}_i = -60.393(14.554) + 1.719(0.185)\text{Tjc}_i + 4.543(2.628)\text{mid}_i + 7.379(4.577)\text{low}_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 32.151(5.286)$$

*-2*loglikelihood* = 466.816(74 of 74 cases in use)

School 10

$$Tbgcse_i = -25.170(5.846) + 1.313(0.086)Tjc_i + -3.547(1.684)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 48.408(8.241)$$

*-2*loglikelihood* = 463.510(69 of 69 cases in use)

$$Tbgcse_i = -12.492(20.358) + 1.118(0.262)Tjc_i + -0.033(3.512)mid_i + -5.068(6.344)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 49.771(8.474)$$

*-2*loglikelihood* = 465.426(69 of 69 cases in use)

School 11

$$Tbgcse_i = -24.514(7.795) + 1.287(0.117)Tjc_i + -1.790(1.863)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 61.322(10.220)$$

*-2*loglikelihood* = 500.689(72 of 72 cases in use)

$$Tbgcse_i = -46.596(24.742) + 1.571(0.328)Tjc_i + 1.605(3.576)mid_i + 6.297(6.649)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 60.965(10.161)$$

*-2*loglikelihood* = 500.268(72 of 72 cases in use)

School 12

$$Tbgcse_i = -23.353(6.265) + 1.259(0.092)Tjc_i + 4.465(1.900)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 61.715(10.432)$$

*-2*loglikelihood* = 487.229(70 of 70 cases in use)

$$Tbgcse_i = -96.687(27.465) + 2.171(0.338)Tjc_i + 16.595(5.192)mid_i + 24.216(9.081)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 57.521(9.723)$$

*-2*loglikelihood* = 482.302(70 of 70 cases in use)

School 13

$$Tbgcse_i = -26.429(8.639) + 1.240(0.128)Tjc_i + 0.601(2.024)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 62.032(11.157)$$

*-2*loglikelihood* = 431.863(62 of 62 cases in use)

$$Tbgcse_i = 20.075(30.244) + 0.623(0.412)Tjc_i + -5.376(3.437)mid_i + -12.788(8.055)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 59.473(10.682)$$

*-2*loglikelihood* = 429.251(62 of 62 cases in use)

School 14

$$Tbgcse_i = -37.165(5.451) + 1.478(0.079)Tjc_i + -3.279(1.550)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 41.538(7.021)$$

*-2*loglikelihood* = 459.514(70 of 70 cases in use)

$$Tbgcse_i = -50.464(21.101) + 1.625(0.265)Tjc_i + 0.870(3.697)mid_i + 4.219(6.321)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 43.529(7.358)$$

*-2*loglikelihood* = 462.791(70 of 70 cases in use)

School 15

$$Tbgcse_i = -19.433(8.520) + 1.202(0.126)Tjc_i + -2.034(2.287)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 78.477(13.766)$$

*-2*loglikelihood* = 468.044(65 of 65 cases in use)

$$Tbgcse_i = -34.640(21.043) + 1.362(0.283)Tjc_i + 6.003(3.369)mid_i + 4.269(6.222)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 74.688(13.101)$$

*-2*loglikelihood* = 464.828(65 of 65 cases in use)

School 16

$$\text{Tbgcse}_i = -46.670(7.986) + 1.533(0.115)\text{Tjc}_i + 1.299(1.916)\text{girl}_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 52.678(9.164)$$

*-2*loglikelihood* = 455.739(67 of 67 cases in use)

$\text{Tbgcse}_i = -27.302(16.564) + 1.283(0.221)\text{Tjc}_i + 0.093(2.575)\text{mid}_i + -5.220(4.178)\text{low}_i + e_i$

$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 50.670(8.755)$

*-2*loglikelihood* = 453.136(67 of 67 cases in use)

School 17

$$\text{Tbgcse}_i = -25.979(5.336) + 1.263(0.076)\text{Tjc}_i + -4.762(1.779)\text{girl}_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 53.990(9.126)$$

*-2*loglikelihood* = 477.867(70 of 70 cases in use)

School 18

$\text{Tbgcse}_i = 2.888(68.144) + 0.952(0.849)\text{Tjc}_i + -8.832(10.367)\text{mid}_i + -20.012(25.345)\text{low}_i + e_i$

$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 73.735(12.554)$

*-2*loglikelihood* = 492.547(69 of 69 cases in use)

$\text{Tbgcse}_i = -50.735(5.756) + 1.614(0.085)\text{Tjc}_i + 0.004(2.097)\text{girl}_i + e_i$

$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 74.554(12.693)$

*-2*loglikelihood* = 493.309(69 of 69 cases in use)

School 19

$$Tbgcse_i = -29.266(5.422) + 1.320(0.077)Tjc_i + -3.416(1.879)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 54.564(9.646)$$

*-2*loglikelihood* = 437.583(64 of 64 cases in use)

$$Tbgcse_i = -97.048(46.728) + 2.145(0.581)Tjc_i + 11.081(8.682)mid_i + 24.336(17.468)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 55.584(9.826)$$

*-2*loglikelihood* = 438.770(64 of 64 cases in use)

School 20

$$TBGCSE_i = -32.139(5.890) + 1.464(0.093)TJC_i + -1.903(2.066)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 53.829(10.557)$$

*-2*loglikelihood* = 354.831(52 of 52 cases in use)

$$TBGCSE_i = 21.745(36.032) + 0.722(0.485)TJC_i + -2.546(4.913)mid_i + -17.689(11.604)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 50.798(9.962)$$

*-2*loglikelihood* = 351.818(52 of 52 cases in use)

School 21

$$TBGCSE_i = -45.772(4.314) + 1.593(0.064)TJC_i + -2.274(1.583)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 45.471(7.475)$$

*-2*loglikelihood* = 492.467(74 of 74 cases in use)

$$TBGCSE_i = -64.537(32.018) + 1.800(0.400)TJC_i + 5.718(6.171)mid_i + 6.300(11.997)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 45.092(7.413)$$

*-2*loglikelihood* = 491.847(74 of 74 cases in use)

School 22

$TBGCSE_i = -148.529(44.860) + 2.812(0.550)TJC_i + 22.517(9.432)MID_i + 38.182(16.988)LOW_i + e_i$

$e_i \sim N(0, \sigma_e^2)$ $\sigma_e^2 = 41.971(6.995)$
*-2*loglikelihood* = 473.390(72 of 72 cases in use)

$TBGCSE_i = -48.017(4.267) + 1.568(0.063)TJC_i + 2.688(1.562)GIRL_i + e_i$

$e_i \sim N(0, \sigma_e^2)$ $\sigma_e^2 = 43.713(7.286)$
*-2*loglikelihood* = 476.318(72 of 72 cases in use)

School 23

$TBGCSE_i = -63.198(40.367) + 1.797(0.508)TJC_i + 9.644(6.482)mid_i + 14.150(14.875)low_i + e_i$

$e_i \sim N(0, \sigma_e^2)$ $\sigma_e^2 = 47.750(7.746)$
*-2*loglikelihood* = 509.493(76 of 76 cases in use)

$TBGCSE_i = -23.279(4.666) + 1.331(0.069)TJC_i + -2.717(1.617)girl_i + e_i$

$e_i \sim N(0, \sigma_e^2)$ $\sigma_e^2 = 49.574(8.042)$
*-2*loglikelihood* = 512.342(76 of 76 cases in use)

School 24

$TBGCSE_i = -19.295(5.241) + 1.153(0.076)TJC_i + -1.173(1.829)girl_i + e_i$

$e_i \sim N(0, \sigma_e^2)$ $\sigma_e^2 = 58.710(9.785)$
*-2*loglikelihood* = 497.555(72 of 72 cases in use)

$TBGCSE_i = 85.620(49.657) + -0.204(0.631)TJC_i + -10.652(7.117)mid_i + -38.001(17.795)low_i + e_i$

$e_i \sim N(0, \sigma_e^2)$ $\sigma_e^2 = 52.389(8.732)$
*-2*loglikelihood* = 489.354(72 of 72 cases in use)

School 25

$TBGCSE_i = 15.067(46.363) + 0.820(0.580)TJC_i + -1.442(7.974)mid_i + -19.530(17.159)low_i + e_i$

$e_i \sim N(0, \sigma_e^2)$ $\sigma_e^2 = 47.894(7.719)$
*-2*loglikelihood* = 516.428(77 of 77 cases in use)

$$TBGCSE_i = -34.513(5.219) + 1.478(0.076)TJC_i + -0.944(1.795)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 61.290(9.878)$$
*-2*loglikelihood* = 535.419(77 of 77 cases in use)

School 26

$TBGCSE_i = -97.351(43.472) + 2.153(0.533)TJC_i + 10.014(8.131)mid_i + 21.561(16.574)low_i + e_i$

$e_i \sim N(0, \sigma_e^2)$ $\sigma_e^2 = 55.729(9.488)$
*-2*loglikelihood* = 473.228(69 of 69 cases in use)

$$TBGCSE_i = -37.689(5.154) + 1.437(0.071)TJC_i + -3.372(1.829)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 54.429(9.267)$$
*-2*loglikelihood* = 471.599(69 of 69 cases in use)

School 27

$$TBGCSE_i = -25.516(4.798) + 1.296(0.071)TJC_i + -0.235(1.703)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 50.728(8.575)$$
*-2*loglikelihood* = 473.505(70 of 70 cases in use)

$$TBGCSE_i = -47.081(45.831) + 1.561(0.578)TJC_i + 3.919(6.726)mid_i + 7.838(16.615)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 50.423(8.523)$$
*-2*loglikelihood* = 473.082(70 of 70 cases in use)

Appendix 5 Differential effectiveness of schools by gender and ability for 2006

School 1

$$TBGCSE_i = -41.115(4.323) + 1.498(0.063)TJC_i + -0.512(1.530)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 44.238(7.187)$$

*-2*loglikelihood* = 503.686(76 of 76 cases in use)

$$TBGCSE_i = 26.616(28.450) + 0.649(0.356)TJC_i + -12.231(5.442)mid_i + -25.512(10.526)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 41.094(6.666)$$

*-2*loglikelihood* = 498.085(76 of 76 cases in use)

School 2

$$TBGCSE_i = -28.077(5.033) + 1.296(0.071)TJC_i + -1.518(1.964)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 57.858(10.579)$$

*-2*loglikelihood* = 420.648(61 of 61 cases in use)

$$TBGCSE_i = -39.352(38.765) + 1.401(0.459)TJC_i + 6.776(8.194)mid_i + 3.284(15.335)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 52.735(9.549)$$

*-2*loglikelihood* = 414.992(61 of 61 cases in use)

School 3

$$TBGCSE_i = -36.339(5.339) + 1.387(0.079)TJC_i + 0.403(1.617)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 47.709(7.797)$$

*-2*loglikelihood* = 502.724(75 of 75 cases in use)

$$TBGCSE_i = 1.154(38.300) + 0.884(0.512)TJC_i + -3.446(5.399)mid_i + -12.300(12.464)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 46.652(7.618)$$

*-2*loglikelihood* = 501.045(75 of 75 cases in use)

School 4

$$TBGCSE_i = -41.764(5.534) + 1.501(0.086)TJC_i + 0.584(1.935)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 62.938(10.729)$$

*-2*loglikelihood* = 481.622(69 of 69 cases in use)

$TBGCSE_i = -69.810(55.276) + 1.857(0.707)TJC_i + 5.843(9.033)mid_i + 9.847(19.261)low_i + e_i$

$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 62.397(10.623)$

*-2*loglikelihood* = 481.026(69 of 69 cases in use)

School 5

$$TBGCSE_i = -49.676(5.942) + 1.595(0.087)TJC_i + 1.819(2.027)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 65.062(11.413)$$

*-2*loglikelihood* = 455.859(65 of 65 cases in use)

$TBGCSE_i = -35.582(66.893) + 1.425(0.843)TJC_i + -1.284(10.221)mid_i + -4.465(23.982)low_i + e_i$

$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 65.759(11.535)$

*-2*loglikelihood* = 456.552(65 of 65 cases in use)

School 6

$$TBGCSE_i = -41.583(3.578) + 1.486(0.050)TJC_i + 2.259(1.377)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 32.878(5.369)$$

*-2*loglikelihood* = 474.802(75 of 75 cases in use)

$TBGCSE_i = -84.075(32.518) + 2.003(0.393)TJC_i + 10.130(6.048)mid_i + 17.319(12.651)low_i + e_i$

$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 32.319(5.278)$

*-2*loglikelihood* = 473.516(75 of 75 cases in use)

School 7

$$TBGCSE_i = -27.283(5.386) + 1.267(0.081)TJC_i + -1.736(1.875)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 55.991(9.898)$$

*-2*loglikelihood* = 439.236(64 of 64 cases in use)

$TBGCSE_i = 19.945(66.187) + 0.674(0.839)TJC_i + -10.694(10.191)mid_i + -17.028(23.617)low_i + e_i$

$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 53.663(9.486)$

*-2*loglikelihood* = 436.519(64 of 64 cases in use)

School 8

$$TBGCSE_i = -36.931(4.237) + 1.436(0.061)TJC_i + -1.438(1.601)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 46.040(7.621)$$

*-2*loglikelihood* = 486.719(73 of 73 cases in use)

$TBGCSE_i = 16.368(43.673) + 0.785(0.528)TJC_i + -10.019(7.993)mid_i + -20.729(16.579)low_i + e_i$

$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 45.559(7.541)$

*-2*loglikelihood* = 485.953(73 of 73 cases in use)

School 9

$$TBGCSE_i = -35.864(4.168) + 1.333(0.060)TJC_i + 2.631(1.667)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 48.396(8.180)$$

*-2*loglikelihood* = 470.211(70 of 70 cases in use)

$TBGCSE_i = -29.486(44.870) + 1.266(0.532)TJC_i + 0.498(9.357)mid_i + -2.010(17.845)low_i + e_i$

$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 49.617(8.387)$

*-2*loglikelihood* = 471.955(70 of 70 cases in use)

School 10

$$TBGCSE_i = -40.649(5.042) + 1.551(0.073)TJC_i + -2.290(1.742)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 46.571(8.364)$$

*-2*loglikelihood* = 414.089(62 of 62 cases in use)

$$TBGCSE_i = 30.223(51.137) + 0.632(0.650)TJC_i + -8.943(7.413)mid_i + -26.440(18.547)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 46.006(8.263)$$

*-2*loglikelihood* = 413.333(62 of 62 cases in use)

School 11

$$TBGCSE_i = -23.446(4.720) + 1.292(0.070)TJC_i + -2.523(1.528)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 41.275(6.879)$$

*-2*loglikelihood* = 472.185(72 of 72 cases in use)

$$TBGCSE_i = -60.905(41.169) + 1.752(0.540)TJC_i + 6.971(4.984)mid_i + 12.196(13.914)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 40.742(6.790)$$

*-2*loglikelihood* = 471.249(72 of 72 cases in use)

School 12

$$TBGCSE_i = -23.633(4.867) + 1.326(0.070)TJC_i + -2.135(1.841)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 58.453(9.952)$$

*-2*loglikelihood* = 476.521(69 of 69 cases in use)

$$TBGCSE_i = -56.155(37.409) + 1.686(0.452)TJC_i + 9.971(6.848)mid_i + 11.910(14.434)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 54.584(9.293)$$

*-2*loglikelihood* = 471.795(69 of 69 cases in use)

School 13

$$TBGCSE_i = -27.679(5.601) + 1.310(0.085)TJC_i + -1.413(1.742)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 51.731(8.891)$$

*-2*loglikelihood* = 468.092(69 of 69 cases in use)

$TBGCSE_i = -37.339(49.299) + 1.418(0.655)TJC_i + 3.013(5.955)mid_i + 2.968(16.011)low_i + e_i$

$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 51.402(8.751)$

*-2*loglikelihood* = 467.652(69 of 69 cases in use)

School 14

$$TBGCSE_i = -36.795(4.589) + 1.418(0.068)TJC_i + -1.149(1.655)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 42.763(7.678)$$

*-2*loglikelihood* = 415.394(63 of 63 cases in use)

$TBGCSE_i = -18.646(32.835) + 1.149(0.409)TJC_i + 4.347(5.849)mid_i + -7.393(12.094)low_i + e_i$

$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 29.414(5.241)$

*-2*loglikelihood* = 391.820(63 of 63 cases in use)

School 15

$$TBGCSE_i = -28.571(5.118) + 1.323(0.074)TJC_i + -5.040(1.871)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 61.865(10.311)$$

*-2*loglikelihood* = 501.324(72 of 72 cases in use)

$TBGCSE_i = -116.882(67.989) + 2.362(0.832)TJC_i + 18.636(12.563)mid_i + 31.914(25.869)low_i + e_i$

$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 64.283(10.714)$

*-2*loglikelihood* = 504.084(72 of 72 cases in use)

School 16

$$TBGCSE_i = -53.585(5.046) + 1.661(0.076)TJC_i + 1.146(1.818)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 61.815(10.148)$$

*-2*loglikelihood* = 522.152(75 of 75 cases in use)

$TBGCSE_i = -55.845(35.368) + 1.691(0.449)TJC_i + 1.654(5.585)mid_i + 0.968(12.652)low_i + e_i$

$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 61.824(10.096)$

*-2*loglikelihood* = 522.163(75 of 75 cases in use)

School 17

$$TBGCSE_i = -29.222(5.286) + 1.333(0.076)TJC_i + -6.377(1.796)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 59.201(9.668)$$

*-2*loglikelihood* = 518.911(75 of 75 cases in use)

$TBGCSE_i = -79.467(38.057) + 1.896(0.466)TJC_i + 11.826(7.704)mid_i + 15.904(13.735)low_i + e_i$

$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 65.627(10.717)$

*-2*loglikelihood* = 526.640(75 of 75 cases in use)

School 18

$$TBGCSE_i = -32.913(4.178) + 1.391(0.060)TJC_i + -2.089(1.531)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 40.963(6.924)$$

*-2*loglikelihood* = 458.538(70 of 70 cases in use)

$$TBGCSE_i = -48.602(33.854) + 4.608(6.282)mid_i + 5.342(12.849)low_i + 1.561(0.416)TJC_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 40.994(6.929)$$

*-2*loglikelihood* = 458.591(70 of 70 cases in use)

School 19

$$TBGCSE_i = -27.235(5.314) + 1.267(0.077)TJC_i + -0.355(1.829)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 51.775(9.305)$$

*-2*loglikelihood* = 420.656(62 of 62 cases in use)

$$TBGCSE_i = -62.759(56.464) + 1.697(0.707)TJC_i + 8.068(9.116)mid_i + 12.761(20.673)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 50.028(8.985)$$

*-2*loglikelihood* = 418.529(62 of 62 cases in use)

School 20

$$TBGCSE_i = -14.442(4.903) + 1.206(0.071)TJC_i + -0.520(1.706)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 56.721(9.036)$$

*-2*loglikelihood* = 543.206(79 of 79 cases in use)

$$TBGCSE_i = 23.861(29.871) + 0.698(0.379)TJC_i + -0.747(4.953)mid_i + -14.628(10.808)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 49.337(7.850)$$

*-2*loglikelihood* = 532.187(79 of 79 cases in use)

School 21

$$TBGCSE_i = -38.448(4.679) + 1.492(0.070)TJC_i + -0.820(1.734)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 48.436(8.525)$$

*-2*loglikelihood* = 436.678(65 of 65 cases in use)

$$TBGCSE_i = 37.736(60.219) + 0.528(0.742)TJC_i + -9.572(11.352)mid_i + -29.052(22.517)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 42.123(7.389)$$

*-2*loglikelihood* = 427.602(65 of 65 cases in use)

School 22

$$TBGCSE_i = -52.322(4.618) + 1.639(0.066)TJC_i + -0.449(1.805)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 57.727(9.697)$$

*-2*loglikelihood* = 489.445(71 of 71 cases in use)

$$TBGCSE_i = -45.192(61.494) + 1.549(0.735)TJC_i + -0.991(12.482)mid_i + -2.988(24.355)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 57.706(9.706)$$

*-2*loglikelihood* = 489.420(71 of 71 cases in use)

School 23

$$TBGCSE_i = -16.756(5.537) + 1.274(0.082)TJC_i + -3.332(2.020)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 72.334(12.140)$$

*-2*loglikelihood* = 505.461(71 of 71 cases in use)

$$TBGCSE_i = 8.822(56.276) + 0.896(0.702)TJC_i + 3.820(9.933)mid_i + -10.511(20.809)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 58.710(9.854)$$

*-2*loglikelihood* = 490.644(71 of 71 cases in use)

School 24

$$TBGCSE_i = -12.787(7.178) + 1.108(0.106)TJC_i + -1.480(2.026)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 75.329(12.473)$$

*-2*loglikelihood* = 529.820(74 of 74 cases in use)

$$TBGCSE_i = 24.487(32.261) + 0.618(0.407)TJC_i + -2.523(5.710)mid_i + -11.405(9.260)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 71.195(11.704)$$

*-2*loglikelihood* = 525.644(74 of 74 cases in use)

School 25

$$TBGCSE_i = -22.031(4.609) + 1.300(0.067)TJC_i + 0.547(1.815)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 57.496(9.731)$$

*-2*loglikelihood* = 482.271(70 of 70 cases in use)

$$TBGCSE_i = -26.950(69.749) + 1.335(0.818)TJC_i + 6.348(15.156)mid_i + 1.380(28.307)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 50.118(8.472)$$

*-2*loglikelihood* = 472.658(70 of 70 cases in use)

School 26

$$TBGCSE_i = -50.292(4.273) + 1.612(0.064)TJC_i + -3.675(1.585)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 43.011(7.270)$$

*-2*loglikelihood* = 461.954(70 of 70 cases in use)

$$TBGCSE_i = -15.248(58.098) + 1.141(0.722)TJC_i + -2.804(10.100)mid_i + -13.626(21.470)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 43.409(7.337)$$

*-2*loglikelihood* = 462.599(70 of 70 cases in use)

School 27

$$TBGCSE_i = -34.854(5.059) + 1.443(0.073)TJC_i + -0.381(1.696)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 49.517(8.430)$$

*-2*loglikelihood* = 465.073(69 of 69 cases in use)

$$TBGCSE_i = -26.553(40.875) + 1.309(0.513)TJC_i + 4.148(6.500)mid_i + -3.490(14.806)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 42.222(7.188)$$

*-2*loglikelihood* = 454.077(69 of 69 cases in use)

Appendix 6 Differential effectiveness of schools by gender and ability for 2007

School 1

$TBGCSE_i = 2.254(37.678) + -3.469(7.635)mid_i + -15.906(14.459)ow_i + 0.943(0.459)TJC_i + e_i$

$e_i \sim N(0, \sigma_e^2)$ $\sigma_e^2 = 71.547(12.008)$

*-2*loglikelihood* = 504.684(71 of 71 cases in use)

$TBGCSE_i = -36.177(5.559) + -1.745(2.092)girl_i + 1.435(0.079)TJC_i + e_i$

$e_i \sim N(0, \sigma_e^2)$ $\sigma_e^2 = 76.377(12.819)$

*-2*loglikelihood* = 509.322(71 of 71 cases in use)

School 2

$TBGCSE_i = -31.014(4.620) + 1.410(0.068)TJC_i + -1.614(1.760)girl_i + e_i$

$e_i \sim N(0, \sigma_e^2)$ $\sigma_e^2 = 50.118(8.791)$

*-2*loglikelihood* = 438.897(65 of 65 cases in use)

$TBGCSE_i = -40.157(43.083) + 2.223(8.293)mid_i + 3.310(16.802)low_i + 1.507(0.521)TJC_i + e_i$

$e_i \sim N(0, \sigma_e^2)$ $\sigma_e^2 = 50.646(8.884)$

*-2*loglikelihood* = 439.578(65 of 65 cases in use)

School 3

$TBGCSE_i = -28.214(6.607) + 1.288(0.097)TJC_i + -0.304(2.147)girl_i + e_i$

$e_i \sim N(0, \sigma_e^2)$ $\sigma_e^2 = 76.719(13.259)$

*-2*loglikelihood* = 480.928(67 of 67 cases in use)

$TBGCSE_i = -12.541(34.785) + 1.073(0.453)TJC_i + 0.479(5.260)mid_i + -5.761(11.987)low_i + e_i$

$e_i \sim N(0, \sigma_e^2)$ $\sigma_e^2 = 74.959(12.951)$

*-2*loglikelihood* = 479.373(67 of 67 cases in use)

School 4

$$TBGCSE_i = -36.518(4.817) + 1.455(0.071)TJC_i + -0.121(1.692)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 50.069(8.464)$$

*-2*loglikelihood* = 472.590(70 of 70 cases in use)

$$TBGCSE_i = -52.909(54.873) + 1.626(0.688)TJC_i + 9.528(8.754)mid_i + 5.581(20.020)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 38.880(6.572)$$

*-2*loglikelihood* = 454.883(70 of 70 cases in use)

School 5

$$TBGCSE_i = -31.253(4.480) + 1.381(0.065)TJC_i + -1.466(1.578)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 42.146(7.175)$$

*-2*loglikelihood* = 453.952(69 of 69 cases in use)

$$TBGCSE_i = 64.298(39.001) + 0.181(0.488)TJC_i + -14.246(5.701)mid_i + -35.471(14.243)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 39.075(6.653)$$

*-2*loglikelihood* = 448.731(69 of 69 cases in use)

School 6

$$TBGCSE_i = -36.800(5.800) + 1.486(0.085)TJC_i + -0.217(2.131)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 80.043(13.436)$$

*-2*loglikelihood* = 512.651(71 of 71 cases in use)

$$TBGCSE_i = 7.237(57.174) + 0.936(0.697)TJC_i + -5.580(10.794)mid_i + -17.389(21.944)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 77.548(13.015)$$

*-2*loglikelihood* = 510.403(71 of 71 cases in use)

School 7

$$TBGCSE_i = -31.565(4.652) + 1.371(0.067)TJC_i + -2.873(1.562)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 42.273(7.145)$$

*-2*loglikelihood* = 460.741(70 of 70 cases in use)

$$TBGCSE_i = -7.929(36.758) + 1.057(0.465)TJC_i + -3.471(5.230)mid_i + -9.338(13.146)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 43.998(7.437)$$

*-2*loglikelihood* = 463.541(70 of 70 cases in use)

School 8

$$TBGCSE_i = -23.037(5.423) + 1.303(0.077)TJC_i + -3.094(1.771)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 58.476(9.549)$$

*-2*loglikelihood* = 517.987(75 of 75 cases in use)

$$TBGCSE_i = -37.803(25.919) + 1.465(0.329)TJC_i + 2.581(3.921)mid_i + 4.634(9.315)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 60.492(9.878)$$

*-2*loglikelihood* = 520.529(75 of 75 cases in use)

School 9

$$TBGCSE_i = -30.042(4.112) + 1.390(0.060)TJC_i + -0.755(1.522)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 39.534(6.755)$$

*-2*loglikelihood* = 449.537(69 of 69 cases in use)

$$TBGCSE_i = -30.681(35.524) + 1.389(0.441)TJC_i + 0.863(6.395)mid_i + 0.008(13.309)low_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 39.523(6.729)$$

*-2*loglikelihood* = 449.518(69 of 69 cases in use)

School 10

$$TBGCSE_i = -24.047(5.645) + 1.293(0.084)TJC_i + -7.345(1.891)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 57.631(10.109)$$

*-2*loglikelihood* = 447.976(65 of 65 cases in use)

$TBGCSE_i = -37.999(48.046) + 1.411(0.609)TJC_i + 3.428(7.337)mid_i + 4.300(17.024)low_i + e_i$

$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 70.315(12.334)$

*-2*loglikelihood* = 460.906(65 of 65 cases in use)

School 11

$$TBGCSE_i = -22.018(5.096) + 1.333(0.075)TJC_i + -3.796(1.680)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 47.446(8.078)$$

*-2*loglikelihood* = 462.125(69 of 69 cases in use)

$TBGCSE_i = -26.826(33.510) + 1.361(0.428)TJC_i + 3.386(5.262)mid_i + 0.902(11.610)low_i + e_i$

$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 48.951(8.334)$

*-2*loglikelihood* = 464.279(69 of 69 cases in use)

School 12

$$TBGCSE_i = -29.221(4.644) + 1.396(0.065)TJC_i + -0.681(1.785)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 53.066(9.188)$$

*-2*loglikelihood* = 456.231(67 of 67 cases in use)

$TBGCSE_i = -45.344(46.039) + 1.571(0.548)TJC_i + 6.197(9.363)mid_i + 5.672(18.016)low_i + e_i$

$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 50.750(8.768)$

*-2*loglikelihood* = 453.241(67 of 67 cases in use)

School 13

$$TBGCSE_i = -34.352(6.340) + 1.463(0.094)TJC_i + -2.193(1.819)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 57.440(9.709)$$

*-2*loglikelihood* = 482.204(70 of 70 cases in use)

$TBGCSE_i = -32.569(30.694) + 1.404(0.403)TJC_i + 3.876(4.689)mid_i + -1.402(9.683)low_i + e_i$

$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 53.980(9.124)$

*-2*loglikelihood* = 477.855(70 of 70 cases in use)

School 14

$$TBGCSE_i = -30.778(4.638) + 1.381(0.066)TJC_i + -4.340(1.596)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 45.224(7.537)$$

*-2*loglikelihood* = 478.765(72 of 72 cases in use)

$TBGCSE_i = -48.715(34.359) + 1.574(0.425)TJC_i + 4.414(6.562)mid_i + 5.326(12.392)low_i + e_i$

$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 49.121(8.187)$

*-2*loglikelihood* = 484.715(72 of 72 cases in use)

School 15

$$TBGCSE_i = -18.798(6.009) + 1.169(0.085)TJC_i + 1.516(2.005)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 69.672(11.788)$$

*-2*loglikelihood* = 502.799(71 of 71 cases in use)

$TBGCSE_i = 9.701(62.473) + 0.809(0.775)TJC_i + -1.472(10.747)mid_i + -10.552(22.749)low_i + e_i$

$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 67.367(11.307)$

*-2*loglikelihood* = 500.410(71 of 71 cases in use)

School 16

$$\mathbf{TBGCSE_i = -31.981(4.532) + 1.460(0.066)TJC_i + -3.748(1.595)girl_i + e_i}$$

$$\mathbf{e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 45.629(7.501)}$$

***-2*loglikelihood* = 492.723(74 of 74 cases in use)**

$TBGCSE_i = -20.638(36.281) + 1.278(0.449)TJC_i + 0.804(6.749)mid_i + -5.326(13.468)low_i + e_i$

$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 46.329(7.616)$

*-2*loglikelihood* = 493.850(74 of 74 cases in use)

School 17

$$\mathbf{TBGCSE_i = -21.450(5.037) + 1.296(0.071)TJC_i + -3.719(1.576)girl_i + e_i}$$

$$\mathbf{e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 44.781(7.412)}$$

***-2*loglikelihood* = 484.695(73 of 73 cases in use)**

$TBGCSE_i = -67.116(33.887) + 1.828(0.425)TJC_i + 10.375(5.614)mid_i + 14.238(11.627)low_i + e_i$

$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 44.045(7.290)$

*-2*loglikelihood* = 483.486(73 of 73 cases in use)

School 18

$$\mathbf{TBGCSE_i = -36.458(4.202) + 1.445(0.062)TJC_i + -1.281(1.446)girl_i + e_i}$$

$$\mathbf{e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 37.321(6.220)}$$

***-2*loglikelihood* = 464.936(72 of 72 cases in use)**

$TBGCSE_i = -167.695(41.120) + 3.038(0.504)TJC_i + 25.429(7.785)mid_i + 47.137(14.797)low_i + e_i$

$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 32.851(5.475)$

*-2*loglikelihood* = 455.748(72 of 72 cases in use)

School 19

$$TBGCSE_i = -28.859(5.042) + 1.337(0.071)TJC_i + -0.875(1.573)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 43.850(7.289)$$

*-2*loglikelihood* = 483.161(73 of 73 cases in use)

$TBGCSE_i = -21.557(18.348) + 1.234(0.233)TJC_i + 0.220(3.431)mid_i + -3.220(6.238)low_i + e_i$

$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 43.254(7.159)$

*-2*loglikelihood* = 482.163(73 of 73 cases in use)

School 20

$$TBGCSE_i = -21.611(4.234) + 1.316(0.062)TJC_i + 1.851(1.568)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 39.843(6.735)$$

*-2*loglikelihood* = 456.597(70 of 70 cases in use)

$TBGCSE_i = -52.617(56.185) + 1.696(0.684)TJC_i + 9.088(10.742)mid_i + 11.008(20.975)low_i + e_i$

$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 37.732(6.378)$

*-2*loglikelihood* = 452.787(70 of 70 cases in use)

School 21

$$TBGCSE_i = -40.033(4.750) + 1.475(0.069)TJC_i + -2.930(1.537)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 41.133(6.953)$$

*-2*loglikelihood* = 458.829(70 of 70 cases in use)

$TBGCSE_i = -27.173(39.151) + 1.280(0.487)TJC_i + 0.842(7.199)mid_i + -5.729(13.632)low_i + e_i$

$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 39.825(6.732)$

*-2*loglikelihood* = 456.566(70 of 70 cases in use)

School 22

$$TBGCSE_i = -39.693(4.293) + 1.501(0.061)TJC_i + -2.559(1.647)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 46.845(7.862)$$

*-2*loglikelihood* = 474.616(71 of 71 cases in use)

$TBGCSE_i = -39.057(49.057) + 1.469(0.587)TJC_i + 1.294(9.671)mid_i + -1.026(19.375)low_i + e_i$

$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 47.717(8.009)$

*-2*loglikelihood* = 475.924(71 of 71 cases in use)

School 23

$$TBGCSE_i = -12.220(5.355) + 1.214(0.077)TJC_i + -2.983(1.623)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 45.979(7.772)$$

*-2*loglikelihood* = 466.624(70 of 70 cases in use)

$TBGCSE_i = 40.679(46.314) + 0.522(0.587)TJC_i + -6.456(6.522)mid_i + -18.505(15.504)low_i + e_i$

$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 46.986(7.942)$

*-2*loglikelihood* = 468.140(70 of 70 cases in use)

School 24

$$TBGCSE_i = -22.475(5.248) + 1.252(0.076)TJC_i + -3.196(1.611)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 45.242(7.647)$$

*-2*loglikelihood* = 465.494(70 of 70 cases in use)

$TBGCSE_i = -54.130(33.931) + 1.627(0.432)TJC_i + 5.768(5.486)mid_i + 9.986(11.417)low_i + e_i$

$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 46.938(7.934)$

*-2*loglikelihood* = 468.070(70 of 70 cases in use)

School 25

$$TBGCSE_i = -15.936(6.348) + 1.170(0.092)TJC_i + 1.903(2.153)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 80.311(13.479)$$

*-2*loglikelihood* = 512.889(71 of 71 cases in use)

$TBGCSE_i = 14.365(36.350) + 0.787(0.459)TJC_i + -1.237(6.376)mid_i + -11.397(13.191)low_i + e_i$

$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 76.927(12.911)$

*-2*loglikelihood* = 509.833(71 of 71 cases in use)

School 26

$$TBGCSE_i = -40.280(4.854) + 1.433(0.067)TJC_i + 0.630(1.722)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 50.530(8.379)$$

*-2*loglikelihood* = 493.512(73 of 73 cases in use)

$TBGCSE_i = 14.456(58.876) + 0.768(0.712)TJC_i + -8.682(11.887)mid_i + -20.870(22.058)low_i + e_i$

$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 48.660(8.054)$

*-2*loglikelihood* = 490.760(73 of 73 cases in use)

School 27

$$TBGCSE_i = -30.324(4.200) + 1.480(0.062)TJC_i + -4.069(1.568)girl_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 42.199(6.985)$$

*-2*loglikelihood* = 480.360(73 of 73 cases in use)

$TBGCSE_i = -42.557(32.870) + 1.589(0.400)TJC_i + 5.601(6.720)mid_i + 3.996(12.465)low_i + e_i$

$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 43.296(7.166)$

*-2*loglikelihood* = 482.234(73 of 73 cases in use)

Appendix 7 The value added by subjects in 2005

Table 7.1 The data set

Data

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	school(27)	setsjc(27)	engjc(27)	mathsjc(27)	engbgcse(27)	setsbgcse(27)	mathsbgcse(27)	c8(
1	moeng	4.800	4.460	4.690	3.630	4.330	2.740	1.0
2	swaneng	4.690	4.620	4.720	4.120	4.240	2.990	1.0
3	gaborone	4.160	5.100	4.480	4.590	4.590	3.160	1.0
4	stjoseph	4.460	4.970	4.740	4.330	4.830	3.460	1.0
5	moeding	4.660	4.660	4.610	3.500	4.460	2.700	1.0
6	materspei	4.520	4.990	4.770	4.330	4.240	3.390	1.0
7	shashe	4.460	4.970	4.740	3.810	4.510	3.200	1.0
8	molefi	4.600	4.720	4.690	3.750	4.520	2.740	1.0
9	seepapitso	4.880	4.630	4.700	3.750	4.520	2.740	1.0
10	kgari	4.810	4.650	4.760	3.830	4.560	2.840	1.0
11	lobatse	4.730	4.770	4.900	4.080	4.810	3.330	1.0
12	tutume	4.560	4.560	4.790	4.020	4.220	3.480	1.0
13	madiba	4.550	4.850	4.660	4.020	4.150	3.120	1.0
14	maun	4.610	4.750	4.820	3.810	4.410	3.020	1.0
15	selibe	4.730	4.840	4.940	3.820	4.480	3.140	1.0
16	lotsane	4.920	4.740	4.820	4.100	4.530	3.060	1.0
17	ledumang	4.650	5.080	4.800	3.990	4.520	3.150	1.0
18	francistown	4.410	4.920	4.710	4.410	4.460	2.960	1.0
19	kanjse	4.530	4.430	4.350	3.700	4.430	2.510	1.0

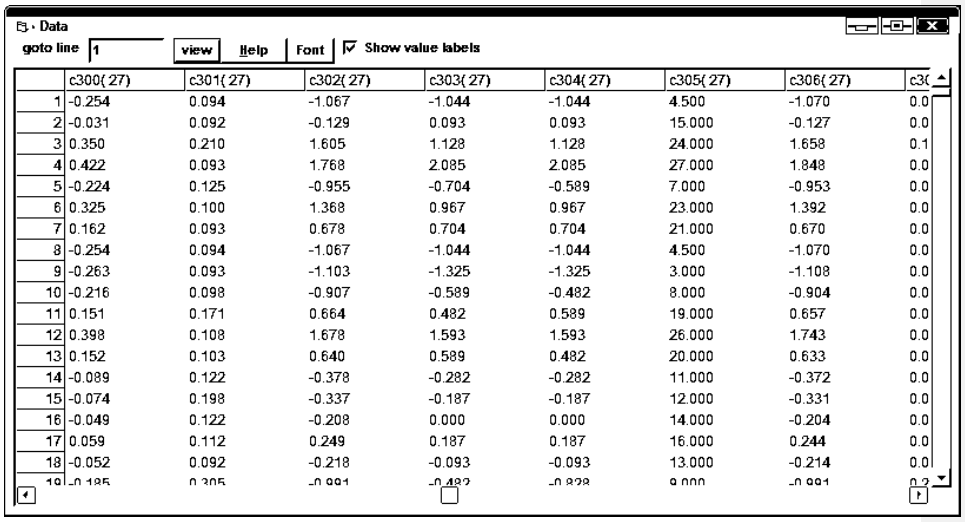
Equation 1 The value added by Mathematics department

$$\mathbf{mathsbgcse}_i = -1.135(1.905) + 0.880(0.404)\mathbf{mathsjc}_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 0.059(0.016)$$

$$-2*loglikelihood = 0.269(27 \text{ of } 27 \text{ cases in use})$$

Table 7.2 The value added by Mathematics in 2005 (c300) and the ranking (c305).



Data

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	c300(27)	c301(27)	c302(27)	c303(27)	c304(27)	c305(27)	c306(27)	c30
1	-0.254	0.094	-1.067	-1.044	-1.044	4.500	-1.070	0.0
2	-0.031	0.092	-0.129	0.093	0.093	15.000	-0.127	0.0
3	0.350	0.210	1.605	1.128	1.128	24.000	1.658	0.1
4	0.422	0.093	1.768	2.085	2.085	27.000	1.848	0.0
5	-0.224	0.125	-0.955	-0.704	-0.589	7.000	-0.953	0.0
6	0.325	0.100	1.368	0.967	0.967	23.000	1.392	0.0
7	0.162	0.093	0.678	0.704	0.704	21.000	0.670	0.0
8	-0.254	0.094	-1.067	-1.044	-1.044	4.500	-1.070	0.0
9	-0.263	0.093	-1.103	-1.325	-1.325	3.000	-1.108	0.0
10	-0.216	0.098	-0.907	-0.589	-0.482	8.000	-0.904	0.0
11	0.151	0.171	0.664	0.482	0.589	19.000	0.657	0.0
12	0.398	0.108	1.678	1.593	1.593	26.000	1.743	0.0
13	0.152	0.103	0.640	0.589	0.482	20.000	0.633	0.0
14	-0.089	0.122	-0.378	-0.282	-0.282	11.000	-0.372	0.0
15	-0.074	0.198	-0.337	-0.187	-0.187	12.000	-0.331	0.0
16	-0.049	0.122	-0.208	0.000	0.000	14.000	-0.204	0.0
17	0.059	0.112	0.249	0.187	0.187	16.000	0.244	0.0
18	-0.052	0.092	-0.218	-0.093	-0.093	13.000	-0.214	0.0
19	-0.185	0.305	-0.991	-0.482	-0.828	9.000	-0.991	0.2

Equation 2 The value added by English department

$$\mathbf{engbgcse}_i = -0.419(1.176) + 0.925(0.248)\mathbf{engjc}_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 0.063(0.017)$$

$$-2*loglikelihood = 2.080(27 \text{ of } 27 \text{ cases in use})$$

Table 7.3 The value added by English department

Data

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	c300(27)	c301(27)	c302(27)	c303(27)	c304(27)	c305(27)	c306(27)	c3(
1	-0.077	0.165	-0.325	-0.282	-0.282	11.000	-0.320	0.0
2	0.265	0.111	1.081	0.967	0.967	23.000	1.085	0.0
3	0.291	0.200	1.265	1.325	1.325	25.000	1.281	0.0
4	0.151	0.147	0.630	0.589	0.589	20.000	0.622	0.0
5	-0.392	0.102	-1.594	-1.593	-1.593	2.000	-1.645	0.0
6	0.133	0.155	0.556	0.380	0.482	18.000	0.548	0.0
7	-0.369	0.147	-1.537	-1.325	-1.325	3.000	-1.581	0.0
8	-0.198	0.095	-0.801	-0.828	-0.704	6.000	-0.795	0.0
9	-0.114	0.108	-0.466	-0.380	-0.380	10.000	-0.459	0.0
10	-0.053	0.104	-0.215	-0.187	-0.187	12.000	-0.211	0.0
11	0.086	0.096	0.349	0.187	0.187	16.000	0.343	0.0
12	0.220	0.128	0.908	0.828	0.828	22.000	0.905	0.0
13	-0.048	0.109	-0.195	-0.093	-0.093	13.000	-0.192	0.0
14	-0.165	0.095	-0.670	-0.589	-0.589	8.000	-0.663	0.0
15	-0.239	0.107	-0.972	-0.967	-0.967	5.000	-0.971	0.0
16	0.134	0.095	0.543	0.482	0.380	19.000	0.535	0.0
17	-0.291	0.191	-1.254	-1.128	-1.128	4.000	-1.269	0.0
18	0.277	0.130	1.143	1.128	1.128	24.000	1.150	0.0
19	0.021	0.177	0.088	0.093	0.093	15.000	0.086	0.0

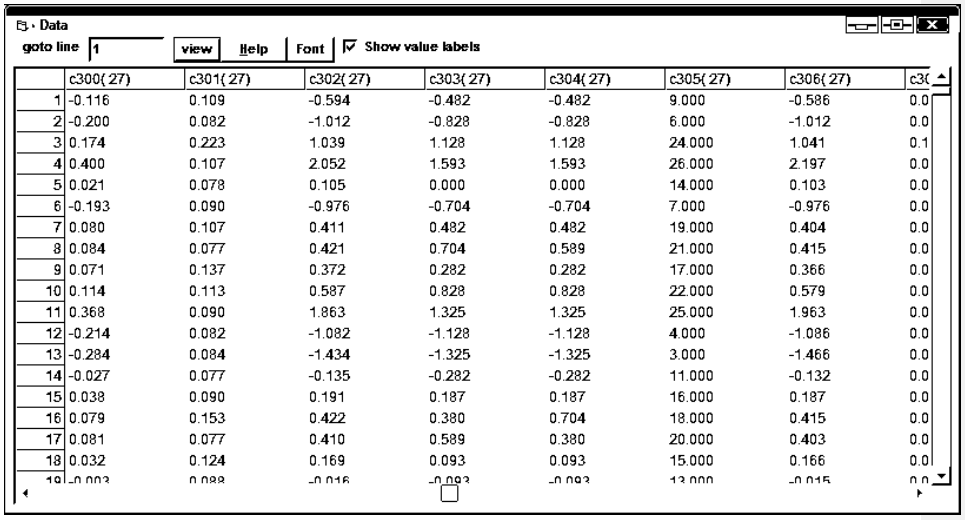
Equation 3 The value added by Setswana department

$$\mathbf{setsbgcse}_i = 4.223(1.062) + 0.046(0.229)\mathbf{setsjc}_i + e_i$$

$$\mathbf{e}_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 0.041(0.011)$$

$$-2*\textit{loglikelihood} = -9.609(27 \text{ of } 27 \text{ cases in use})$$

Table 7.4 The value added by Setswana department


Data

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	c300(27)	c301(27)	c302(27)	c303(27)	c304(27)	c305(27)	c306(27)	c3
1	-0.116	0.109	-0.594	-0.482	-0.482	9.000	-0.586	0.0
2	-0.200	0.082	-1.012	-0.828	-0.828	6.000	-1.012	0.0
3	0.174	0.223	1.039	1.128	1.128	24.000	1.041	0.1
4	0.400	0.107	2.052	1.593	1.593	26.000	2.197	0.0
5	0.021	0.078	0.105	0.000	0.000	14.000	0.103	0.0
6	-0.193	0.090	-0.976	-0.704	-0.704	7.000	-0.976	0.0
7	0.080	0.107	0.411	0.482	0.482	19.000	0.404	0.0
8	0.084	0.077	0.421	0.704	0.589	21.000	0.415	0.0
9	0.071	0.137	0.372	0.282	0.282	17.000	0.366	0.0
10	0.114	0.113	0.587	0.828	0.828	22.000	0.579	0.0
11	0.368	0.090	1.863	1.325	1.325	25.000	1.963	0.0
12	-0.214	0.082	-1.082	-1.128	-1.128	4.000	-1.086	0.0
13	-0.284	0.084	-1.434	-1.325	-1.325	3.000	-1.466	0.0
14	-0.027	0.077	-0.135	-0.282	-0.282	11.000	-0.132	0.0
15	0.038	0.090	0.191	0.187	0.187	16.000	0.187	0.0
16	0.079	0.153	0.422	0.380	0.704	18.000	0.415	0.0
17	0.081	0.077	0.410	0.589	0.380	20.000	0.403	0.0
18	0.032	0.124	0.169	0.093	0.093	15.000	0.166	0.0
19	-0.003	0.088	-0.016	-0.093	-0.093	13.000	-0.015	0.0

Appendix 8 The value added by subjects in 2006

Table 8.1 The data set for 2006

Data

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	school(27)	engbgcse(27)	setsbgcse(27)	mathsbgcse(27)	setsjc(27)	engjc(27)	mathsjc(27)	c8(
1	francistown	3.970	4.520	2.800	4.240	4.520	4.350	1.0
2	gaborone	4.610	4.490	2.870	4.690	5.180	4.920	1.0
3	ghanzi	3.380	3.850	2.080	4.380	4.480	4.490	1.0
4	kagiso	3.960	4.390	2.650	4.570	4.560	4.530	1.0
5	kgari	4.030	4.670	2.910	4.860	4.650	4.700	1.0
6	ledumang	4.090	4.660	3.140	4.590	5.040	4.870	1.0
7	letlhakane	3.810	4.190	3.010	4.470	4.710	4.840	1.0
8	lobatse	4.300	4.340	3.290	4.760	4.810	4.850	1.0
9	lotsane	4.070	4.470	2.540	4.920	4.810	4.850	1.0
10	madiba	4.120	4.160	3.160	4.590	4.790	4.690	1.0
11	masunga	3.690	4.440	2.850	4.370	4.550	4.560	1.0
12	materspei	4.360	4.540	3.380	4.510	4.790	4.810	1.0
13	matsha	3.230	4.480	2.690	4.460	4.320	4.530	1.0
14	matshekge	3.490	4.400	2.840	4.670	4.590	4.710	1.0
15	maun	3.760	4.270	2.710	4.560	4.630	4.670	1.0
16	moeding	3.290	4.570	2.450	4.580	4.500	4.560	1.0
17	moeng	3.700	4.600	3.210	4.840	4.630	4.780	1.0
18	molefi	4.040	4.540	2.490	4.680	4.780	4.690	1.0
19	moshupa	3.760	4.620	2.950	4.730	4.540	4.710	1.0

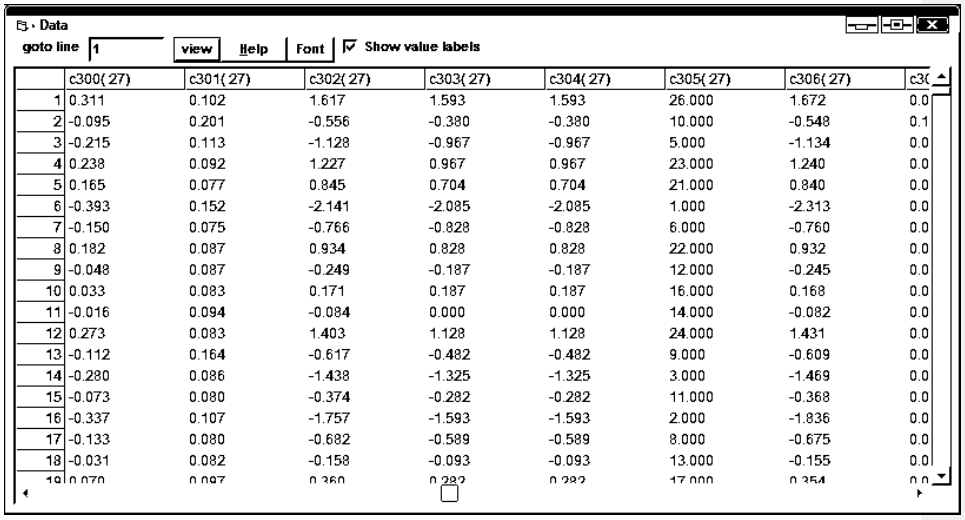
Equation 1 The value added by English

$$\mathbf{engbgcse}_i = -3.507(0.927) + 1.585(0.197)\mathbf{engjc}_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 0.040(0.011)$$

$$-2*\textit{loglikelihood} = -10.450(27 \text{ of } 27 \text{ cases in use})$$

Table 8.2 The value added by English department in 2006



Data

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	c300(27)	c301(27)	c302(27)	c303(27)	c304(27)	c305(27)	c306(27)	c3(
1	0.311	0.102	1.617	1.593	1.593	26.000	1.672	0.0
2	-0.095	0.201	-0.556	-0.380	-0.380	10.000	-0.548	0.1
3	-0.215	0.113	-1.128	-0.967	-0.967	5.000	-1.134	0.0
4	0.238	0.092	1.227	0.967	0.967	23.000	1.240	0.0
5	0.165	0.077	0.845	0.704	0.704	21.000	0.840	0.0
6	-0.393	0.152	-2.141	-2.085	-2.085	1.000	-2.313	0.0
7	-0.150	0.075	-0.766	-0.828	-0.828	6.000	-0.760	0.0
8	0.182	0.087	0.934	0.828	0.828	22.000	0.932	0.0
9	-0.048	0.087	-0.249	-0.187	-0.187	12.000	-0.245	0.0
10	0.033	0.083	0.171	0.187	0.187	16.000	0.168	0.0
11	-0.016	0.094	-0.084	0.000	0.000	14.000	-0.082	0.0
12	0.273	0.083	1.403	1.128	1.128	24.000	1.431	0.0
13	-0.112	0.164	-0.617	-0.482	-0.482	9.000	-0.609	0.0
14	-0.280	0.086	-1.438	-1.325	-1.325	3.000	-1.469	0.0
15	-0.073	0.080	-0.374	-0.282	-0.282	11.000	-0.368	0.0
16	-0.337	0.107	-1.757	-1.593	-1.593	2.000	-1.836	0.0
17	-0.133	0.080	-0.682	-0.589	-0.589	8.000	-0.675	0.0
18	-0.031	0.082	-0.158	-0.093	-0.093	13.000	-0.155	0.0
19	0.070	0.097	0.360	0.282	0.282	17.000	0.354	0.0

Equation 2 The value added by Setswana department

$$\text{setsbgcse}_i = 1.966(1.189) + 0.547(0.257)\text{setsjc}_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 0.048(0.013)$$

$$-2*\text{loglikelihood} = -5.534(27 \text{ of } 27 \text{ cases in use})$$

Table 8.3 The value added by Setswana department

Data

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	c300(27)	c301(27)	c302(27)	c303(27)	c304(27)	c305(27)	c306(27)	c3(
1	0.235	0.211	1.238	1.128	1.128	24.000	1.252	0.1
2	-0.041	0.089	-0.190	-0.187	-0.187	12.000	-0.186	0.0
3	-0.511	0.148	-2.495	-2.085	-2.085	1.000	-2.805	0.0
4	-0.075	0.087	-0.351	-0.482	-0.482	9.000	-0.345	0.0
5	0.046	0.144	0.226	0.093	0.093	15.000	0.222	0.0
6	0.184	0.084	0.860	0.967	0.967	23.000	0.855	0.0
7	-0.220	0.114	-1.046	-0.967	-0.967	5.000	-1.048	0.0
8	-0.229	0.107	-1.082	-1.128	-1.128	4.000	-1.086	0.0
9	-0.186	0.170	-0.929	-0.704	-0.828	7.000	-0.927	0.0
10	-0.316	0.084	-1.475	-1.593	-1.593	2.000	-1.511	0.0
11	0.084	0.153	0.414	0.380	0.380	18.000	0.407	0.0
12	0.108	0.101	0.508	0.828	0.828	22.000	0.501	0.0
13	0.075	0.117	0.358	0.282	0.282	17.000	0.352	0.0
14	-0.120	0.085	-0.559	-0.589	-0.589	8.000	-0.551	0.0
15	-0.189	0.089	-0.887	-0.828	-0.704	6.000	-0.883	0.0
16	0.100	0.085	0.465	0.482	0.482	19.000	0.458	0.0
17	-0.013	0.136	-0.061	-0.093	-0.093	13.000	-0.060	0.0
18	0.015	0.087	0.070	0.000	0.000	14.000	0.068	0.0
19	0.068	0.098	0.318	0.187	0.187	16.000	0.312	0.0

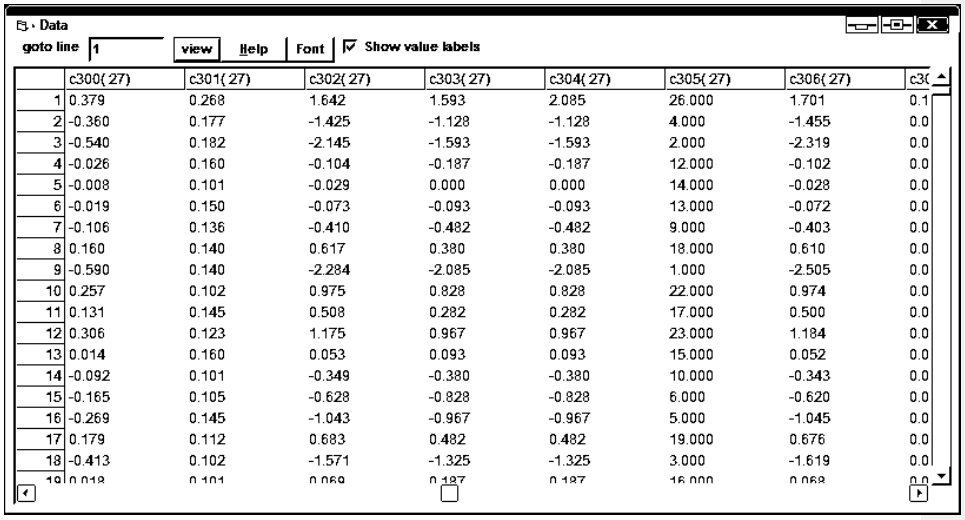
Equation 3: The value added by Mathematics

$$\text{mathsbgcse}_i = -3.749(1.663) + 1.419(0.353)\text{mathsjc}_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 0.072(0.020)$$

$$-2*\text{loglikelihood} = 5.566(27 \text{ of } 27 \text{ cases in use})$$

Table 8.4 The value added by Mathematics c300 and ranking c305



Data

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	c300(27)	c301(27)	c302(27)	c303(27)	c304(27)	c305(27)	c306(27)	c3
1	0.379	0.268	1.642	1.593	2.085	26.000	1.701	0.1
2	-0.360	0.177	-1.425	-1.128	-1.128	4.000	-1.455	0.0
3	-0.540	0.182	-2.145	-1.593	-1.593	2.000	-2.319	0.0
4	-0.026	0.160	-0.104	-0.187	-0.187	12.000	-0.102	0.0
5	-0.008	0.101	-0.029	0.000	0.000	14.000	-0.028	0.0
6	-0.019	0.150	-0.073	-0.093	-0.093	13.000	-0.072	0.0
7	-0.106	0.136	-0.410	-0.482	-0.482	9.000	-0.403	0.0
8	0.160	0.140	0.617	0.380	0.380	18.000	0.610	0.0
9	-0.590	0.140	-2.284	-2.085	-2.085	1.000	-2.505	0.0
10	0.257	0.102	0.975	0.828	0.828	22.000	0.974	0.0
11	0.131	0.145	0.508	0.282	0.282	17.000	0.500	0.0
12	0.306	0.123	1.175	0.967	0.967	23.000	1.184	0.0
13	0.014	0.160	0.053	0.093	0.093	15.000	0.052	0.0
14	-0.092	0.101	-0.349	-0.380	-0.380	10.000	-0.343	0.0
15	-0.165	0.105	-0.628	-0.828	-0.828	6.000	-0.620	0.0
16	-0.269	0.145	-1.043	-0.967	-0.967	5.000	-1.045	0.0
17	0.179	0.112	0.683	0.482	0.482	19.000	0.676	0.0
18	-0.413	0.102	-1.571	-1.325	-1.325	3.000	-1.619	0.0
19	0.018	0.101	0.069	0.187	0.187	16.000	0.068	0.0

Appendix 9 The value added by subjects in 2007

Table 9.1 The dataset for 2007

Data

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	school(27)	engbgcse(27)	setsbgcse(27)	mathsbgcse(27)	setsjc(27)	engjc(27)	mathsjc(27)	c8(
1	francistown	3.730	4.130	2.320	4.210	4.460	4.390	1.0
2	gaborone	4.540	4.370	3.070	4.520	5.020	4.820	1.0
3	ghanzi	3.420	4.210	2.000	4.260	4.430	4.250	1.0
4	kagiso	3.940	4.400	2.850	4.380	4.510	4.510	1.0
5	kgari	3.700	4.490	2.440	4.490	4.390	4.390	1.0
6	ledumang	4.250	4.430	3.300	4.510	5.010	4.820	1.0
7	letlhakane	3.880	4.390	2.780	4.400	4.470	4.540	1.0
8	lobatse	3.970	4.790	3.330	4.630	4.690	4.660	1.0
9	lotsane	3.770	4.520	2.600	4.690	4.530	4.490	1.0
10	madiba	3.800	4.340	2.760	4.480	4.590	4.450	1.0
11	masunga	3.890	4.970	3.200	4.400	4.570	4.550	1.0
12	materspei	4.350	4.590	3.430	4.620	5.030	4.860	1.0
13	matsha	3.450	4.500	2.460	4.390	4.270	4.330	1.0
14	matshekge	3.540	4.340	3.010	4.600	4.450	4.550	1.0
15	maun	3.670	4.360	2.580	4.410	4.570	4.550	1.0
16	moeding	3.720	4.720	2.870	4.550	4.660	4.620	1.0
17	moeng	4.070	5.010	3.350	4.840	4.630	4.740	1.0
18	molefi	4.080	4.430	2.980	4.670	4.730	4.740	1.0
19	moshupa	3.740	4.730	2.940	4.660	4.420	4.590	1.0

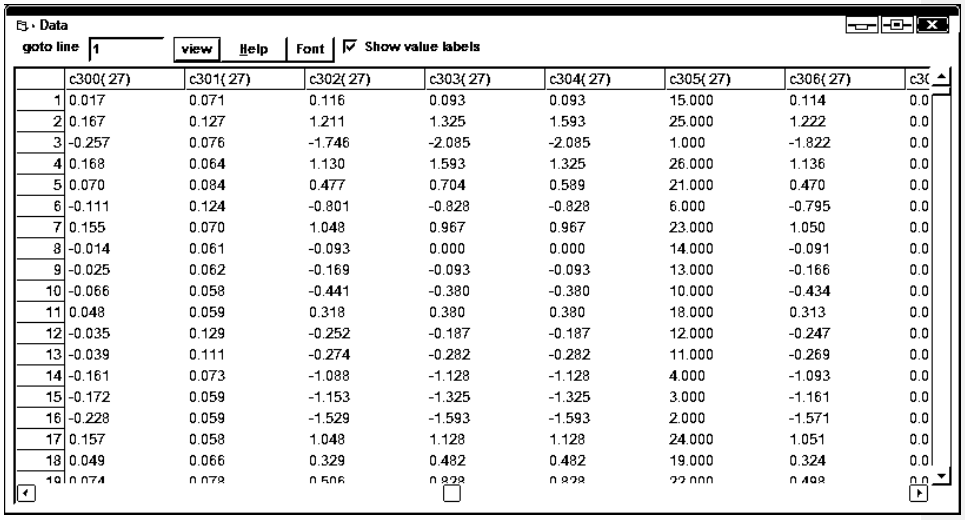
Equation 1 The value added by English department

$$\mathbf{engbgcse}_i = -1.544(0.653) + 1.179(0.141)\mathbf{engjc}_i + e_i$$

$$e_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 0.023(0.006)$$

$$-2*loglikelihood = -24.933(27 \text{ of } 27 \text{ cases in use})$$

Table 9.2 The value added by English department



Data

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	c300(27)	c301(27)	c302(27)	c303(27)	c304(27)	c305(27)	c306(27)	c3
1	0.017	0.071	0.116	0.093	0.093	15.000	0.114	0.0
2	0.167	0.127	1.211	1.325	1.593	25.000	1.222	0.0
3	-0.257	0.076	-1.746	-2.085	-2.085	1.000	-1.822	0.0
4	0.168	0.064	1.130	1.593	1.325	26.000	1.136	0.0
5	0.070	0.084	0.477	0.704	0.589	21.000	0.470	0.0
6	-0.111	0.124	-0.801	-0.828	-0.828	6.000	-0.795	0.0
7	0.155	0.070	1.048	0.967	0.967	23.000	1.050	0.0
8	-0.014	0.061	-0.093	0.000	0.000	14.000	-0.091	0.0
9	-0.025	0.062	-0.169	-0.093	-0.093	13.000	-0.166	0.0
10	-0.066	0.058	-0.441	-0.380	-0.380	10.000	-0.434	0.0
11	0.048	0.059	0.318	0.380	0.380	18.000	0.313	0.0
12	-0.035	0.129	-0.252	-0.187	-0.187	12.000	-0.247	0.0
13	-0.039	0.111	-0.274	-0.282	-0.282	11.000	-0.269	0.0
14	-0.161	0.073	-1.088	-1.128	-1.128	4.000	-1.093	0.0
15	-0.172	0.059	-1.153	-1.325	-1.325	3.000	-1.161	0.0
16	-0.228	0.059	-1.529	-1.593	-1.593	2.000	-1.571	0.0
17	0.157	0.058	1.048	1.128	1.128	24.000	1.051	0.0
18	0.049	0.066	0.329	0.482	0.482	19.000	0.324	0.0
19	0.074	0.078	0.506	0.828	0.828	22.000	0.498	0.0

Equation 2 The value added by Setswana department

$$\mathbf{setsbgcse}_i = 0.783(1.448) + 0.829(0.321)\mathbf{setsjc}_i + e_i$$

$$\mathbf{e}_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 0.051(0.014)$$

$$-2*\mathit{loglikelihood} = -3.939(27 \text{ of } 27 \text{ cases in use})$$

Table 9.3 The value added by Setswana department

Data

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	c300(27)	c301(27)	c302(27)	c303(27)	c304(27)	c305(27)	c306(27)	c3(
1	-0.141	0.209	-0.713	-0.380	-0.589	10.000	-0.707	0.1
2	-0.158	0.085	-0.717	-0.828	-0.704	6.000	-0.710	0.0
3	-0.103	0.180	-0.501	-0.282	-0.282	11.000	-0.494	0.0
4	-0.012	0.119	-0.057	0.282	0.282	17.000	-0.055	0.0
5	-0.013	0.086	-0.061	0.187	0.187	16.000	-0.060	0.0
6	-0.090	0.085	-0.408	-0.187	-0.187	12.000	-0.401	0.0
7	-0.039	0.111	-0.178	0.000	0.000	14.000	-0.175	0.0
8	0.171	0.112	0.784	0.704	0.704	21.000	0.778	0.0
9	-0.149	0.140	-0.699	-0.482	-0.380	9.000	-0.692	0.0
10	-0.155	0.087	-0.703	-0.589	-0.482	8.000	-0.696	0.0
11	0.541	0.111	2.486	2.085	2.085	27.000	2.791	0.0
12	-0.021	0.108	-0.097	0.093	0.093	15.000	-0.095	0.0
13	0.079	0.115	0.366	0.380	0.380	18.000	0.360	0.0
14	-0.255	0.101	-1.162	-1.593	-1.593	2.000	-1.171	0.0
15	-0.077	0.107	-0.353	-0.093	-0.093	13.000	-0.347	0.0
16	0.167	0.088	0.757	0.589	0.589	20.000	0.751	0.0
17	0.217	0.222	1.115	0.828	0.967	22.000	1.120	0.1
18	-0.223	0.130	-1.035	-1.325	-1.325	3.000	-1.037	0.0
19	0.086	0.125	0.398	0.482	0.482	19.000	0.391	0.0

Equation 3 The value added by Mathematics department

$$\mathbf{mathsbgcse}_i = -6.496(1.158) + 2.051(0.252)\mathbf{mathsjc}_i + e_i$$

$$\mathbf{e}_i \sim N(0, \sigma_e^2) \quad \sigma_e^2 = 0.048(0.013)$$

$$-2*\textit{loglikelihood} = -5.641(27 \text{ of } 27 \text{ cases in use})$$

Table 9.4 The value added by Mathematics c300 and ranking c305

Data

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	c300(27)	c301(27)	c302(27)	c303(27)	c304(27)	c305(27)	c306(27)	c3
1	-0.187	0.128	-0.901	-0.828	-0.828	6.000	-0.898	0.0
2	-0.319	0.141	-1.552	-1.593	-1.593	2.000	-1.598	0.0
3	-0.220	0.186	-1.123	-0.967	-0.967	5.000	-1.129	0.1
4	0.096	0.091	0.453	0.380	0.380	18.000	0.446	0.0
5	-0.067	0.128	-0.324	-0.093	-0.093	13.000	-0.319	0.0
6	-0.089	0.141	-0.434	-0.187	-0.187	12.000	-0.427	0.0
7	-0.035	0.086	-0.164	0.093	0.093	15.000	-0.161	0.0
8	0.269	0.090	1.261	0.967	0.967	23.000	1.276	0.0
9	-0.113	0.095	-0.530	-0.380	-0.380	10.000	-0.522	0.0
10	0.130	0.107	0.614	0.589	0.589	20.000	0.606	0.0
11	0.364	0.084	1.705	1.593	1.593	26.000	1.775	0.0
12	-0.041	0.158	-0.204	0.000	0.000	14.000	-0.200	0.0
13	0.076	0.152	0.371	0.282	0.282	17.000	0.365	0.0
14	0.174	0.084	0.816	0.704	0.704	21.000	0.811	0.0
15	-0.256	0.084	-1.196	-1.325	-1.325	3.000	-1.207	0.0
16	-0.109	0.084	-0.511	-0.282	-0.282	11.000	-0.503	0.0
17	0.125	0.111	0.593	0.482	0.482	19.000	0.585	0.0
18	-0.245	0.111	-1.166	-1.128	-1.128	4.000	-1.174	0.0
19	0.022	0.082	0.105	0.187	0.187	16.000	0.103	0.0

Appendix 10 The schools' credit passes and ranking for 2005

Republic of Botswana

10 CANDIDATES IN GOVERNMENT SCHOOLS AWARDED 5 GRADE C's OR BETTER

The following table shows the percentage of candidates in each of the Government Schools who were awarded Grade C or better in 5 or more subjects in the period from 2001 to 2005. The change in the percentage between one year and the next is also shown for the same period. The data includes only candidates in full-time attendance at the School who were awarded a grade in at least one subject.

	2005 % with 5 C's or better	2004 % with 5 C's or better	2003 % with 5 C's or better	2002 % with 5 C's or better	2001 % with 5 C's or better	Change in % between 2004 and 2005	Change in % between 2003 and 2004	Change in % between 2002 and 2003	Change in % between 2001 and 2002
BW805 Mater Spei College	**60.21**	57.36	48.51	51.44	52.83	2.85	8.85	-2.93	-1.38
BW822 Naledi Senior Secondary School	**55.75**	50.88	47.01	41.24	39.31	4.87	3.87	5.77	1.93
BW803 St Joseph's College	**53.75**	55.77	56.02	49.11	39.63	-2.02	-0.25	6.91	9.48
BW818 Francistown Senior Secondary School	**49.42**	47.54	47.41	41.05	48.26	1.88	0.13	6.36	-7.21
BW806 Shashe River School	**48.14**	46.84	53.86	34.72	34.15	1.30	-7.02	19.14	0.57
BW802 Gaborone Secondary School	**47.81**	36.48	43.32	47.98	39.79	11.33	-6.84	-4.66	8.19
BW817 Ledumang Senior Secondary School	**47.16**	48.23	41.75	44.85	50.23	-1.07	6.48	-3.1	-5.37
BW811 Lobatse Secondary School	**44.43**	38.93	42.25	37.57	26.94	7.50	-5.32	4.68	10.64
BW816 Lotsane Senior Secondary School	**43.08**	43.09	40.53	38.97	34.03	-0.01	2.56	1.56	4.94
BW812 Tutume McConnell Community College	**42.72**	44.13	40.94	36.92	40.15	-1.41	3.19	4.02	-3.23
BW815 Selibe Phikwe Senior Secondary School	**41.15**	43.38	45.04	41.65	37.26	-2.23	-1.66	3.39	4.40
BW824 Matshekge Hill Senior Secondary School	**40.74**	41.63	46.56	43.24	35.12	-0.89	-4.93	3.32	8.12
BW814 Maun Secondary School	**38.20**	41.57	39.07	36.01	41.34	-3.37	2.50	3.06	-5.33
BW826 Masunga Senior Secondary School	**36.94**	32.54	38.52	31.31	27.64	4.40	-5.98	7.21	3.68
BW813 Madiba Senior Secondary School	**35.21**	39.37	33.21	33.20	36.81	-4.16	6.16	0.01	-3.61
BW808 Seepapitso Secondary School	**34.39**	28.08	34.27	38.11	36.34	6.31	-6.19	-3.84	1.77
BW825 Shoshong Senior Secondary School	**33.39**	28.44	28.78	32.13	24.29	4.95	-0.34	-3.35	7.83
BW801 Swaneng Hill School	**33.33**	31.45	41.74	31.99	32.54	1.88	-10.29	9.75	-0.55
BW827 Ghanzi Senior Secondary School	**32.66**	26.79	24.52	24.03	24.90	5.87	2.27	0.49	-0.87
BW807 Molefi Senior Secondary School	**30.48**	33.75	28.85	32.41	29.87	-3.27	4.9	-3.56	2.53
BW804 Moeding College	**29.60**	35.67	39.00	38.24	38.63	-6.07	-3.33	0.76	-0.4
BW800 Moeng College	**29.05**	38.83	39.85	37.37	24.22	-9.78	-1.02	2.48	13.16
BW820 Letlhakane Senior Secondary School	**28.78**	28.97	40.79	35.58	26.96	-0.19	-11.82	5.21	8.62
BW810 Kgari Sechele Senior Secondary School	**27.87**	24.28	25.27	20.90	27.23	3.59	-1.99	5.37	-6.34
BW821 Moshupa Secondary School	**27.55**	36.41	31.72	31.79	39.12	-8.86	4.69	-0.07	-7.33
BW819 Kagiso Senior Secondary School	**26.72**	38.43	41.78	27.05	33.08	-11.71	-3.35	14.73	-6.03
BW823 Matsha Community College	**26.45**	17.83	17.37	22.38	25.29	8.62	0.46	-5.01	-2.91
All Schools	**38.81**	**38.44**	**39.18**	**36.38**	**35.39**	**0.37**	**-0.74**	**2.8**	**0.99**

Appendix 11 The schools' credit passes in 2006 and 2007

BOTSWANA EXAMINATIONS COUNCIL

9 CANDIDATES IN GOVERNMENT SCHOOLS AWARDED 5 GRADE C's OR BETTER

The following table shows the number of candidates in each Government School who were awarded Grade C or better in 5 or more syllabuses in 2007 and 2006. The number of candidates is also expressed as a percentage of the total number of students. The data includes only candidates in full-time attendance at the School who completed examinations in at least one syllabus.

	2007		2006	
	Number of candidates awarded 5 C's or better	% of candidates awarded 5 C's or better	Number of candidates awarded 5 C's or better	% of candidates awarded 5 C's or better
BW800 Moeng College	376	52.29%	274	39.37%
BW801 Swaneng Hill School	215	21.89%	222	32.27%
BW802 Gaborone Secondary School	391	46.66%	361	48.85%
BW803 St Joseph's College	378	51.78%	406	65.17%
BW804 Moeding College	373	43.63%	230	30.03%
BW805 Mater Spei College	492	60.00%	453	59.68%
BW806 Shashe River School	413	54.70%	377	57.73%
BW807 Molefi Senior Secondary School	296	35.71%	294	38.74%
BW808 Seepapitso Secondary School	259	26.24%	290	39.19%
BW810 Kgari Sechele Senior Secondary School	252	23.89%	249	34.78%
BW811 Lobatse Secondary School	328	40.95%	303	42.62%
BW812 Tutume Mcconnell Community College	446	53.61%	344	46.49%
BW813 Madiba Senior Secondary School	199	30.24%	196	38.58%
BW814 Maun Secondary School	378	34.68%	328	40.69%
BW815 Selibe Phikwe Senior Secondary School	327	40.67%	292	41.48%
BW816 Lotsane Senior Secondary School	289	38.48%	248	36.26%
BW817 Ledumang Senior Secondary School	354	44.64%	330	46.81%
BW818 Francistown Senior Secondary School	264	24.95%	200	38.91%
BW819 Kagiso Senior Secondary School	273	34.21%	210	32.61%
BW820 Lethlakane Senior Secondary School	253	31.00%	149	29.68%
BW821 Moshupa Secondary School	300	35.97%	245	34.85%
BW822 Naledi Senior Secondary School	481	58.66%	438	63.11%
BW823 Matsha Community College	178	26.97%	178	31.34%
BW824 Matshekge Hill Senior Secondary School	285	38.26%	246	36.50%
BW825 Shoshong Senior Secondary School	221	32.12%	269	44.46%
BW826 Masunga Senior Secondary School	353	50.50%	247	39.65%
BW827 Ghanzi Senior Secondary School	164	25.27%	150	26.00%
All Schools	**8,538**	**38.69%**	**7,529**	**41.59%**

The total number of students with 5 C's or better increased by 1,009 from 7,529 in 2006 to 8,538 this year. This suggests that a significant number of the additional students admitted to the Senior Secondary Schools in 2006 achieved grade C or better in 5 or more syllabuses. The percentage of students awarded 5 C's or better decreased by 2.90%.

Curriculum vitae

Name: Ms Irene Lemphorwana Mohiemang

Education qualifications

Diploma in Secondary Education (Science) -University of Botswana- 1986-1989

Bachelor of Education (Science Education) -University of Botswana- 1994-1996

Master in Education (Education Management) -University of Botswana- 1999-2001

Doctor of Education (Education Management) –UNISA- 2005-2008

Work experience

General science teacher (Tshwaragano Community Junior School)

1994-1996 Senior Teacher Science Makalamabedi/Gantsi Senior Secondary School

1997-2005 Assistant School Head (Gantsi Senior Secondary School)

2006-2007 Deputy School Head (Gantsi Senior Secondary School)

2008- Deputy School Head (Letlhakane Senior Secondary School)