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PUPIL-TEACHER RATIO AND ITS IMPACT ON ACADEMIC PERFORMANCE IN PUBLIC PRIMARY SCHOOLS IN CENTRAL DIVISION, MACHAKOS COUNTY, KENYA

Kaloki Joseph Waita[2], Kasau Onesmus Mulei[1]
Kitoo Beth Mueni[1], Mutinda Julius Mutune[1],
Dr. Jeremiah Kalai[1]
[1]University of Nairobi, Kenya
[2]Kenyatta University, Kenya

Abstract:
The objectives of this study were (a) to assess the impact of PTR on academic performance in national examinations in public primary schools (b) establish if ideal PTR exist in public primary schools as recommended by TSC, UNESCO and other international standards. (c) to identify the major challenges faced in the attainment of appropriate PTR in the public schools in the Division. (d) to determine whether PTR influences academic performance. The study targeted the 78 public primary schools in which a total of 24 schools were sampled for the study. Descriptive survey design was used as the research design for the study. Questionnaires were used in collecting data for the study. The analysis involved use of simple regression to determine whether PTR predicts performance in national examinations. The relationship between PTR and performance was worked out using Pearson's product moment correlation coefficient R, the value of R calculated was -0.323. This negative correlation between the PTR and performance indicated that as PTR increases performance decreases and vice versa. A coefficient of determination R^2 of 0.104 was obtained. This revealed that 10.4% of the performance is due to PTR while the remaining 89.6 % is due to other intervening factors or error in the independent variable. An Anova table was generated ($p<0.05$) which indicated that the regression model applied was significantly good enough in predicting the outcome variable. A regression model [scores = 260.8-7.60(PTR)] was generated that could be used to predict the outcome variable. The findings of the study revealed that PTR significantly influences performance of pupils in national examinations. The study recommended to all Education sector stakeholders to pay

adequate attention to PTR since it affects performance of pupils in Primary Schools. It recommended to the government to employ more teachers to lower PTR and ease teacher workload. It also recommended to the government and the MOE to review the Education Act to enable schools admit pupils on basis of PTR to avoid over enrolment and congestion in classrooms.

Keywords: pupil-teacher ratio, performance, impact, class size, contract teacher

Introduction

Provision of quality basic Education to all school-going children poses a fundamental challenge to education and training systems in most countries, Kenya included. Despite the major strides achieved particularly in access to primary education, major challenges still remain. Among the challenges are the issue of improving quality and increasing learning achievement.

There have been widely publicized calls for improving education access for the World's children. Since the 1990 World Conference on Education for All (EFA) in Jomtien, there has been a five to seven per cent increase in school enrolments in primary Education (UNESCO, 2005). The Kenya government is one of the governments committed to the various international protocols including the 1990 Jomtien and the 2000 Dakar Declarations (MOEST, 2004). The Dakar 2000 goals included expanded access for early childhood, free and compulsory education. Of the set goals, many governments have made educational access central to their national development strategy. Kenya, in particular has made notable advances in the quest for Universal Primary Education (UPE) as a means of attaining the global target for EFA (Abagi & Olweya, 1999). Major landmarks in this regard include implementation of Free Primary Education by NARC government in 2003, which has been lauded as a success story in Africa. Other landmarks include increased enrolments from 6.06 million pupils 2002 to 7.16 million pupils in 2003, an increase of 18 percent, and an attempt to democratize education governance through decentralized management (Sifuna & Sawamura, 2008).

However, the road towards full attainment of UPE has been marked by increasingly complex internal inefficiencies inform of congested classrooms and severe shortage of teachers. As we are moving towards 2015, the target year of universalization of elementary education, the issue of EFA and its implications on quality of education is a matter of serious concern for the international community. Many developing countries, Kenya included have made tangible achievements in the provision of free primary education and subsequent increase in enrolments. The average net enrolments

for primary education in developing countries increased from 78% in 1990 to 83% in 2000 (Vander, 2003). Between 1990 and 2000, the world's primary school age population grew from 600 million to 648 million. Demographers argue that by 2015, the number will exceed 700 million (World Education Forum, 2000). Sub-Saharan Africa has recorded the largest increases in the primary school age group; up from 84 million in 1990 to 106 million in 2000, an average growth of 2.6 % per year.

While increased enrolments may suggest school systems have increased their capacity to accommodate more children, this did not necessarily translate into improved educational quality. The FPE was a noble idea, but the intended gains are being eroded by lack of effective teaching-learning process (Daily Nation, 2011: 19). Though developing countries have been able to improve the percentage of literacy to impress the international fraternity, the quality of education provided has been a major concern due to congested classrooms resulting from high enrolments. One of the major indicators of quality is the Pupil-Teacher ratio (PTR). The primary school PTR did not keep pace with rapid increase in enrolments. The greatest challenge facing developing countries in their efforts to attain the international goals of EFA and the MDGs have therefore been provision of quality education.

The PTR in most developing countries is in a worrying state. UNESCO (2006), estimated that over 84 per cent of classrooms had over 40 pupils per teacher. Majority of the countries that have PTR exceeding 40:1 are in Sub-Saharan Africa and Asia. Sub-Saharan Africa has the largest PTR with Congo having a PTR of 54:1, Mali 55:1, Mozambique 67:1, Rwanda 65:1, Ethiopia and Malawi hovering around 70:1, South Asian countries such as Afghanistan with 83:1,Cambodia 50:1, and Bangladesh 50:1. (UNESCO, Institute of statistics, 2008). The high PTR in many developing countries is as a result of large enrolments following the quest for universal primary education and the increasing teacher shortages. With such enrolments and reduced number of teachers, the available teachers face serious obstacles in an attempt to deal with over-crowded classes. These high enrolments have caused low efficiency in the schools which is one of the main reasons for the poor quality of education offered in many primary schools in the developing countries (UNESCO, 2006).

In order to fulfill the international mandate, more and more developing countries in Sub-Saharan Africa, South and East Asia and Latin America regions are utilizing the services of less qualified teachers. In Cambodia, these teachers are given fancy names like 'Bare foot teachers', contract and Para-teachers and provide 'first aid' services into the education system (King and Schielman, 2004). Countries such as Niger, Mali, Togo, India and China have been recruiting contract teachers in order to cope with teacher shortages and high PTR (UNESCO, 2006).

The classroom conditions are particularly acute in a number of developing countries where large class sizes often swell up and go beyond 100 pupils (Ron, 2003). The reality, however, is that high PTR due to overcrowded classrooms affect the quality of education in resource poor schools. Brewe, Gamoran, Ehrenberg and Willms (2000) noted that PTR is a global measure of human resources brought to bear , both directly and indirectly, on children's learning. For the last one decade, the debate on PTR and teacher shortage in public schools in developing countries has caused much concern in both political and educational arena. Over the same period, concerns have been particularly raised regarding the alarming shortage of teachers, increased enrolments and raising PTR. This has been pointed to have detrimental impact on the quality of education pupils receive and has from time to time been addressed by political and educational leaders. The figures on PTR have been growing and the reasons for teachers leaving the profession are mounting thus compromising quality of education and performance in national examinations. The Global Monitoring Report on Education 2006 has projected that the number of Primary school children will increase by 24 million pupils (24 per cent) in Sub-Saharan Africa, and additional 5 million pupils (13 per cent) in Arab states between 2000 and 2015 (UNESCO, 2006)

In order to meet the challenge of increasing student population, beside the infrastructural facilities, countries will need additional teachers to lower the PTR to levels that can guarantee quality education. UNESCO (2006) estimates that more than 30 million new teachers will be needed to meet EFA goal by 2015. The greatest challenge lies in Central and West Asia and the Sub-Saharan countries that will need at least 10 per cent more teachers. The developing countries therefore have a dilemma; on one hand they have to endure internal pressure to universalize elementary education and on the other hand, they suffer from serious financial constraints. Across all regions, there are 76 countries that need to enlarge their teaching force. These countries are mostly found in Sub-Saharan Africa, Arab states, South and West Asia. According to report by UNESCO institute for statistics, Sub-Saharan Africa will need another 1.6 million teachers by 2015 to provide every child with quality education. The report also indicated that chronic teacher shortages are also expected in the Arab states, which will need to expand their teaching force by 26 % in less than a decade to achieve the same goal (UNESCO, 2005)

. Another report by UNESCO indicated that countries in the World need to recruit more than 28 million teachers in the next decade. The greatest challenge lies in Sub-Saharan Africa, which needs to expand its teaching force by 68 % over this period. Mozambique is an example of one of the worst hit countries by teacher shortages with the PTR of 67.4:1. The report further estimated that in Sub-Saharan Africa, the number

of primary school teachers must grow from about 2.5 million teachers to 3.7 million to fulfill the EFA commitment, indicating a gap of 1.2 million teachers, more than half of whom are needed in West Africa alone. It also estimated that for every two teachers available in 2006, there must be three others by 2015 (UNESCO, 2006).

In Kenya, since 1990's the country has been facing a daunting challenge of increasing PTR due to escalating teacher shortages. The situation grew worse with the introduction of FPE in 2003. The implementation of FPE programme witnessed a 10% increase in enrolment in primary schools nationally (MOEST, 2004). A record of 1.3 million children registered in various schools across the country, raising the enrolment from 5.9 million in 2002 to 7.2 million in 2003 (MOEST, 2004). This sharp increase in enrolment rejuvenated into challenges of FPE in the country (Wamukuru, Kamau and Ocholla., 2006). For instance, the number of pupils exceeded the available human and physical facilities in the country. The PTR steadily increased form the recommended 40:1 to between 60:1 and 90:1 (MOEST, 2004).

High enrolments were experienced in all primary schools in Kenya as the government introduced cost-free schooling. This noble idea came with many challenges such as lack of clear policy on the school going age, overcrowded classrooms, insufficient infrastructural facilities and shortage of teachers. The Kenya government was very positive in meeting the challenges and undertook major reforms in the education sector and also partnered with other stakeholders to ensure success in providing free primary education to all children (Wamukuru, Kamau and Ocholla, 2006)

The Table 1.1 below shows that enrolment in primary schools grew from 7.1 million pupils in 2004 to 7.6 million in 2008, translating to an increase of 7.0%.

Table 1.1: Public primary schools Enrolment by Province, 2003-2008

Province	2004	2005	2006	2007	2008
Coast	526,638	536,896	550,908	581,562	594,641
Central	851,347	833,401	811,490	802,922	822,664
Eastern	1,348,938	1,357,518	1,355,595	1,336,687	1,389,173
Nairobi	203,061	196,659	193,209	201,000	183,648
R.valley	1,773,881	1,868,082	1,914,292	1,975,180	1,973,213
Western	1,092,215	1,104,524	1,082,715	1,151,191	1,206,498
Nyanza	1,258,890	1,263,860	1,273,614	1,303,258	1,364,339
N.Eastern	67,347	73,258	78,295	89,156	105,453
Total	**7,122,407**	**7,234,199**	**7,260,118**	**7,440,956**	**7,639,629**

Source: EMIS, Ministry of Education 2009

The increase in enrolment occurred in the background of unexpanding teaching force (GOK, 2005). This saw several facilities being overstretched, including the human resource which was then thin on the ground following freezing of teacher recruitment in 1997. Since 1997, the TSC has been recruiting teachers to replace those exiting through natural attrition.

The plan not only affected the primary and secondary schools but as well as institutions of learners with disabilities. Out of such a move, recruitment of teachers is undertaken on the needs basis, filling the vacancies created due to death, retirement or resignations rather than mass employment. Often, head teachers of primary schools resort to diverting funds for supplies and construction to hiring more community teachers (Fleshman, 2005). The government has been taking stringent measures to contain the situation in the schools such as the introduction of contract teachers as the case in some countries such as Cambodia. Although such strategy has not been widely accepted by some section of the education sector stakeholders, it has been strongly criticized by teacher unions in Kenya with the argument that there are over 40,000 unemployed teachers (Anami, 2010). This factor together with the introduction of free primary education has over the recent year's exerted pressure on the teacher resource resulting to high PTR.

Table 1.2: 2008 Primary Schools Scenario in PTR

Province	75th Percentile PTR	Median PTR	No. of schools with PTR>50	No. of schools with PTR >75
Coast	62.57	50.93	549	275
Central	47.51	40.34	887	444
Eastern	47.33	37.67	2073	1045
Nairobi	52.42	44.88	91	46
R. valley	52.75	41	2518	1253
Western	63.2	52.6	975	487
Nyanza	57.23	44.87	1740	870
N. Eastern	85.5	65.76	143	74
Total			**8976**	**4494**

Source: EMIS Teachers Service Commission 2009

From table 1.2 most schools in all the provinces have PTR above 40 pupils per class. North Eastern province is worst hit with most of the schools with PTR of 60:1. This is far above the ideal ratio of 40:1 as recommended by UNESCO. According to the Human Resource Report 2011, Kenya is in need of 52,335 more teachers in primary schools to attain the ideal PTR as required by UNESCO. The report also indicated that the issues of quality need to be addressed urgently.

The PTR in public primary schools was 34:1 in 2002 and increased to 44:1 in 2007 and 45:1 in 2008 (MOEST, 2009). This is a clear indication that either the number of

teachers is declining or the number of pupils is growing at a much faster rate than that of the teachers which may have serious negative implications on performance. The ratio may grow even worse with introduction of the new constitution which provides that 'Education is a basic right'. The recommended PTR for public primary schools in Kenya is 40:1 (TSC, 2006) which is also ideal ratio set by UNESCO and other international standards. This is not the case since the situation is grimmer in arid and semi-arid areas as well as in the slums of urban areas where the ratio is over 100 pupils per teacher (UNICEF, 2005). The quality of education in our primary schools was once again brought into focus by the September 2010 teachers strike. KNUT national secretary was quoted saying that schools have continued to post poor results in KCPE with high PTR taking the blame (Daily Nation, 2011:14).

Statement of the Problem

Despite the Kenyan government, effort to provide free primary education there has been a considerable success with regard to increased enrolments but the challenges have been enormous. This euphoric response of free primary education witnessed massive enrolments and deserves praises but of particular concern is the issue of quality which may be reflected in terms of performance. Since the government freezed teacher recruitment in Kenya in 1997, the available teachers in public primary schools have had to cope with large classes. This problem has become perennial and concern has now been over poor performance posted by the pupils each year in national examinations. The overburdened teachers due high enrolments are no doubt a concern as the number of teachers has not responded appropriately to the increased pupils' population. Even though the FPE programme is a noble idea, its intended gains may be eroded by poor performance due to lack of observance on the ideal number of pupils per teacher resulting from high enrolments and declining number of teachers.

LITERATURE REVIEW

The impact of class size and pupil-teacher ratio on educational outcomes is among the most researched areas in education. By 1980s, more than 200 studies had appeared on this topic (Hanushek, 1995). Some of the studies which have been conducted in different parts of the world that relates to this study include the following;

1. Class size reduction studies and the Meta-Analysis research in Far West Laboratory.
2. Large scale studies on class size and student achievement in America

3. Impact of large classrooms on student's academic achievement and engagement
4. Lessons Learnt from South African Consortium for Monitoring Education Quality (SACMEQ).
5. Studies on impact of large classrooms after implementation of FPE in Kenya.

Some early studies did not establish a connection between smaller class sizes and students achievement, but mainly attempted to weigh the value of small classes against larger classes. Most acceptable studies, however, supported the importance of small classes in promoting students success. In a review of early studies, Educational Research Service concluded that reducing class sizes in the primary grades to 22 or fewer appeared to have a beneficial effect on reading and mathematics' scores, especially for economically disadvantaged pupils'. Since that time, more sophisticated experiments have confirmed and extended this conclusion (Hanushek, 1995).

Class Size Reduction Studies and the Meta-Analysis Research in Far West Laboratory

The first refined analysis to connect reduced class size to academic achievement was the 1978 Meta-analysis by Glass and Smith for the Far West Laboratory for Educational Research and Development. Their study, ''Meta–Analysis of Research on the Relationship of Class size and Achievement' remains to be one of the most comprehensive on this issue. Unique in their approach, the two researchers examined and analyzed 77 empirical research studies, yielding more than 700 comparisons based upon data spanning 70 years of research performed in more than a dozen different countries (Glass and Smith, 1979).

Altogether, achievement test results of more than 900,000 pupils were incorporated into the study to yield a statistical synthesis revealing general trends (Glass and Smith, 1979).

This analysis found that not only did small classes improve the chances for academic achievement, but that small classes could also be used as a predictor of student's success. Glass and Smith (1978) showed that ''as class size increases, achievement decreases''. The results of their investigation suggested that a class size of 15 or fewer would be needed to make a noticeable improvement in classroom performance. Repeated studies provided evidence of important relationships between the number of students in the classrooms and students achievement. This research demonstrated that an appropriate class size was fewer than 20 students, and that the greatest benefits of small classes are obtained in the early grades.

The findings of the Meta-analysis study pointed out evidence between reduced class size and pupil achievement. More specifically, the results showed that as class size decreased, student achievement increased. The achievement of pupils in instructional

groups of 15 and fewer scored several percentile ranks above that of pupils in classes of 20 and 30 (Glass and Smith, 1979). The strength of the relationship varied according to the level of the reduction. Reductions in class size below 20 students resulted in larger improvements in student achievement than for reductions in the 20 to 30 range. Based on their findings, Glass and Smith (1978) concluded that 'there is little doubt that, other things equal, more is reamed in smaller classes'.

From the study undertaken by Glass and smith, there is need for further study in different environment and situation to reveal whether smaller classes have any relationship with student's achievement.

In another companion study Glass and Smith (1978), provided further insight about whether decreasing the size of class produces improvements on non-achievement outcomes such as teaching processes, student and teacher effects in effective domain.
Their findings answered the question in the affirmative with the following statement ''on all measures, reduction in class size was associated with higher quality schooling and more positive attitudes''.

It is in line with their findings this study has resulted to find support for their conclusions on the relationship between class size and student achievement and students behavior.

Large Scale Studies on Class Size and Student Outcome in America

Based on this early work, beginning in the mid-1980s some large-scale projections and an actual experiment in class size and student outcomes were started. Among them were, the Tennessee Student-Teacher Achievement Ratio (STAR) experiment, the Student Achievement Guarantee in Education (SAGE) program in Wisconsin, the California's Massive Class-size Reduction (CSR) effort, the Project Prime Time in Indiana, the Burke county Project in North Carolina and Federal Initiatives on Reducing Class-size,.

The Tennessee Student-Teacher Ratio (STAR) experiment

The STAR project, conducted in Tennessee in 1985-1989, provided the most convincing case for class size project (Bain, Johnson and Word, 1989). This gigantic study found that smaller class-size and the lower student-teacher ratio had impact on student achievement (Bain Johnson and Word, 1989). The findings of the study revealed that academic achievement was increased significantly in the smaller class size (lower student-teacher ratio) in the regular classes. This large-scale (n=11,600) longitudinal study provided the legislature and administrators with convincing data to support

small class size and lower student-teacher ratio for students statewide (Bain, Johnson and Word 1989).

The project was implemented in 79 schools for 7,000 K-3 students. At each grade level K-3 a strictly controlled study was set up to examine whether small (13-17) classes made a difference in student accomplishments in the early years, when compared to regular (22-25) classes, or regular classes with full-time teacher aide. Children and teachers were randomly assigned to one of the three types of classrooms: small (13-17) students, regular (22-25 students with one teacher) and regular with teaching aide (22-25 students with one teacher and one teaching aide). In evaluating the impact of these three scenarios, they concluded that small classes (i.e.13-17 students with one teacher) produced better student achievement in both reading and mathematics. Bain, Johnson and Word (1989) analyzed 50 of the most successful teachers (i.e. those whose students showed the greatest academic achievement) involved in the STAR study and revealed a core of common features of these classrooms. Perhaps the more revealing feature, however was that, of the 50 successful teachers exhibiting these qualities, all had either small class (i.e. not greater than 20 pupils).

Because of its magnitude and scientific rigor, the results of STAR carried more weight than earlier studies. The most important findings of the study were;

- The benefits of small classes were greater for minority students and students attending inner city schools than schools for white students or those in non-urban schools.
- In every grade level (K-3) students in small classes outperformed students in larger classes on every achievement test administered in all subject areas and on both norm-referenced and criterion-referenced achievement tests.
- Pupils who attended small classes in K-3 performed significantly better in all academic subjects in all subsequent grades 4, 6 and 8.

Additional strength was added to the STAR results by secondary analysts at the University of London, the University of Chicago and Princeton University who examined the STAR data using different statistical approaches. All approaches yielded the same conclusions (Bain, Johnson and Word, 1989). Other large-scale class size reduction efforts described below confirmed the basic findings of STAR in other locations. Research using the STAR data continues today. Besides the impact on academic achievement, project STAR revealed that:

- Teachers of small classrooms spend more time on active teaching and less on classroom management, a finding substantiated in other research in addition to STAR.

- Teacher's morale is increased in small classes, a finding consistent with all prior research.
- There are fewer disruptions in small classes and fewer discipline problems, a finding replicated in other studies.

Alderman, Orazem & Paterno (2001) contributed to this discussion, their study concluded that higher student-teacher ratio had a consistent negative effect on student achievement particularly on language skills. However, Graddy and Stevens (2003) in their study concluded that student-teacher ratio was important determinant of fees and parents choose schools with lower student-teacher ratio. Levacic (2005) concluded a study on Grade KS3 and found that reduction in the student-teacher ratio had statistically significant positive effect on mathematics achievement.

While the STAR project is often cited as the best evidence to reduce class sizes, there is equal evidence to the contrary. Ehrenberg (2001) conducted a meta-analysis of class size studies, examining its impact on student achievement. In contrast to the STAR evaluation, Ehrenberg concluded that there was no significant evidence that variations in class size explain improvements in student achievement. Even if some correlation did exist; Ehrenberg suggested that the benefits are too modest to warrant the high costs of class size reduction implementation.

The conclusions reached by Ehrenberg contradict earlier findings of the STAR project that small classes contribute positively to students' achievement. This contradiction therefore places the position of small classes and students achievement at a doubt whether there exist any significant relationship.

This study will therefore seek to find whether any relationship exist between low student teacher ratio and students achievement.

The SAGE Programme in Wisconsin

Another large scale study conducted in this area was the Student Achievement Guarantee in Education (SAGE) program in Wisconsin. This was a statewide effort to increase the academic achievement of children living in poverty by reducing the student- teacher ratio in Kindergarten through Grade 3 to 15:1. The program began as a five-year project in 1996-97 school years and tested the hypothesis that smaller classes in Elementary schools raised academic achievement. School districts in Wisconsin that had at least one school with 50% of children or more living below the poverty level were eligible to become a SAGE school. The program required that participating schools to implement four interventions among them being to reduce the pupil-teacher ratio within a classroom to 15 students per teacher. The longitudinal evaluation of the

SAGE program produced substantial scientific data on the effects of small classes in Grades K-3 (Molnar, Smith and Zahorik, 1999).

The positive impact of small classes on student achievement in SAGE classrooms was consistent four years and confirmed the earlier findings of the STAR. The greatest achievement gains were made in the first grade with second and third-grade students maintaining the gains. Perhaps of greater significance, SAGE provided guidance for policy makers and administrators about how best to implement small classes at the district and local level through extensive non-experimental data collection (Molnar, Smith and Zahorik, 1999).Even though the SAGE Programme reveals similar findings of the STAR project, the contradiction raised by the Ehrenberg findings in 2001 requires further research and clarification. Based on this argument the findings of this study will provide clarifications that small number of students per teacher is significant in improving performance.

California Massive Class Size Reduction

In California, a class size reduction programme began in 1996. Within a period of several months, new teachers were hired and placed in Grade K-3 classrooms across the state, reducing class sizes to 20 pupils or fewer. In three years of operation, this largest class size reduction initiative resulted in 28,000 new teachers being deployed and virtually every classroom in Grades 1-2 being reduced in sizes. Since the program was implemented so quickly, very few large classes were available to serve as a comparison group for evaluators. The evaluation focused on Grade 3, in which small but statistically significant achievement gains were reported in reading, language and mathematics. The benefits of small classes were in the range 0.05 to 0.10 standard deviations (Bohrnstedt, Stecher & Wiley, 2000).

Although these were considered small effects, the results replicated those of the STAR for pupils who entered small classes at Grade 3. In STAR, the largest effects were obtained for students who entered small classes in earlier years (Bohrnstedt, Stecher & Wiley, 2000).

California's experience provided important insight into the types of planning needed before implementing a large-scale Class-Size Reduction Initiative, the current study will further clarify whether such initiatives were worthwhile or not.

Project Prime Time Indiana

The Indiana legislature instituted Class-Size Reductions (CSR) in 1981 with its Project Prime Time. According to Chase, Muller & Walden (1986), the state provided funds in 1984 for school corporations to ''reduce first grade classes to an average of 18 students

(or 24 with an instructional assistant.)''. The fall of 1985 saw second-grade added to Prime time, and the final addition came in the fall of 1986 with Indiana School Corporations given choice of adding third-grade. The result from Project Prime Time demonstrated modest gains. The largest gains came in first grade reading with 50 % of Indiana school reporting higher student achievement outcomes. Secondly with reduced classrooms the Indiana school project revealed that teachers were more quickly able to diagnose student's needs in small classes than large classes (Chase, Muller & Walden, 1986). The findings of this study will be important in revealing and supporting the conclusions reached by the Indiana initiative concerning diagnosis of students needs in small classes.

The Burke County Project in North Carolina

Studies of the effects of small classes in Burke County, North Carolina, reinforced SAGE and STAR findings while addressing questions about financial and educational policy implications of class size reductions. With the goal of improving education in relatively poor Burke County, a pilot program in 1991-1992 reduced class to 18 in Grade 1 in four schools, and in Grades 2 and 3 in subsequent years (Egelson & Harmon, 2000). Pilot program results were highly positive. On the strength of these findings, the program was extended in 1995-1996 to all elementary schools, Grades 1-3, providing the same positive findings. By 2000, classes of about 17 were in all 17 schools with Grades 1-3. By comparing the class size reductions with control classes, researchers reported higher rates of time on task for students and more emphasis on student interaction. The smaller classes significantly outperformed regular classes in Math and reading at the end of Grades 1, 2 and 3. (Sharp, 2002).

The Burke county programme emphasized the importance of student interaction and revealed that performance was higher when interaction was intensive. This study therefore has the objective of comparing performance in schools with large enrolments and those with low enrolments for the sake of making comparisons with the Burk County programme.

Federal Initiatives Class-Size Reduction Programme

In its first-year report, the class-size Reduction programme ''Boosting Student Achievement in schools across the Nation'', the U.S Department of Education highlighted the expected benefit of class-size reduction (Hanushek, 1999). Federal class-size reduction funds were aimed at helping to make classrooms more manageable so that teachers could focus on teaching and learning. The federal class-size reduction program permitted schools to implement several models of small classes, including

some that were not small at all. The later included large classes (e.g., 32- 40 pupils) that were team- taught by two full-time teacher, and pairs or triplets of larger classes (e.g. 30 pupils) that shared a ''rotating'' teacher who would spend part of the day in each classroom. Both of these models reduced the pupil-teacher ratio in classrooms. In its first year of operation, approximately 29,000 teachers were hired under federal class-size reduction initiative. However, the ensuing calendar year saw a change in administration in Washington. President Bush's education Plan, ''No child left Behind'' targeted federal class size reduction money thus disregarding class size reduction. But nevertheless it was noted from the initiative that small classes were becoming standard practice in many states across U.S and were producing noticeable benefits to both teachers and pupils (Hanushek, 1999).

Impact of Large Classrooms on Students Academic Achievement

Reducing class size has been found to have academic benefit in all subject areas. Studies published since the mid-1980s showed that classroom behavior and test scores improve while students are small in classes (Bain, Johnson & Word, 1989). The advantages of small classes have been touted by educators throughout modern history. Only in recent years, however, has there been a significant impetus for reducing class sizes in American schools. This is due to the fact that teachers, parents, and policy makers understand the importance of small classes for teaching and learning. This understanding has made education to rise to the top of state and national agenda since high quality research has demonstrated the academic and behavioral benefits of small classes (Vander, 2003).

Within the literature on large classrooms in North America and Western Europe, there is equivocation about the point at which classes become too large and negatively impact education quality. In Western countries, class sizes of 30 are considered large and in need of reduction. To complicate the issue further, there are examples of very large classrooms with excellent student learning outcomes. South Korea, who placed second on the 1996 Third International Mathematics and Science Study (TIMSS), has an average of 56.9 students per class in mathematics and 48.8 in science. Similar conditions have been observed in both Japan and Singapore, where students are also excelling in larger classes. Numerous analyses of classroom data many of which are documented have been unsuccessful in making definitive statements about the effect of large classrooms on learning outcomes. Some have argued that, intuitively smaller classes have a positive impact on student achievement, while others conclude that there is no significant impact (Vander, 2003). In Europe and North America contexts there is agreement that small classes benefits occur due to a number of factors, including

increased teacher- pupil contact, differentiated instruction, improved classroom management, and improved teacher morale (VanderArk, 2003). Researchers have also noted that the academic gain seen in young children from smaller classes tends to persist into higher grades. Where research on large classrooms in developing countries does exist, it is just as inconclusive. Hanushek (1995) reviewed 96 studies that attempted to link various educational inputs to student performance in developing countries. Nearly a third of the reviewed studies (n=31) specifically investigated the effect of pupil-teacher ratio. Of these, only eight studies found reductions in class size significantly explain improved academic achievement. In another study, Hanushek (1999) noted that smaller class size i.e low pupil-teacher ratio had a stronger positive effect in secondary schools as compared to elementary schools. Of the 277 estimates attempting to capture the effects of pupil-teacher ratio on student performance, only 15% of the estimates were significant and positive. Virtually the same percent, 13% were negative and significant suggesting that lowering the pupil-teacher ratio resulted in poorer student performance.

Table 2.1: Percentage Distribution of Estimated Influence of Pupil-Teacher Ratio on Student Performance by level of Schooling

School level	Statistically significant		Statistically insignificant		
	Positive %	Negative %	Positive	Negative	Unknown
All schools	15	13	27	25	20
Elementary schools	13	20	25	20	23
Secondary schools	17	7	28	31	17

Source: Hanushek 1999

Note: A positive sign implies that low pupil-teacher ratio enhance student Performance. From table 2.1, it appears that low pupil-teacher ratio (small class size) has stronger positive effects in secondary schools as compared to elementary schools (17% to 13% respectively).

These results are evidence against the widely held belief that smaller classes are more effective during the early years of the education process. Most of the studies carried out on small classes favored them on the basis of discipline and class management. The arguments that small classes enhance performance received little attention from earlier studies. Studies on teaching large classes noted that it was easy to

ignore the importance of human interaction when instructing large classes (Hanushek, 1999).

Table 2.2: Percentage Distribution of Effect of Class size on Student Performance, Based on Value Added Models of Individual Student Performance

	Statistically significant		Statistically insignificant		
Universe of studies	**Positive %**	**Negative %**	**Positive**	**Negative**	**Unknown**
All value added studies	12	8	21	26	35
Value added studies within a single state	4	13	30	39	13

Source: Hanushek (1999)

Note: A positive sign implies that smaller classes enhance student performance

In Table 2.2, Hanushek (1999) pointed out that, of the best available studies, single-state, value-added studies of individual classroom achievement, only 1 of 23 or 4% result in positive and significant small class effects. In fact, more studies indicate a negative and significant relation (13%), suggesting that small classes result in poorer student performance. Hanushek (1995) noted that the most effective way to use time efficiently in a large class was to prepare typed notes for pupils in advance. Large classes took a toll on the teacher's ability to manage time, requiring more time to be devoted to instructions i.e. how to complete an exercise rather than substantive instruction. In lager classes, teachers were also found to devote less time to Math instruction, reading and writing tasks. Other research indicates that small classes were more likely to cover a range of subjects, such as social studies. Hanushek (1999) indicated unfavorable results in terms of small class sizes increasing student performance.

Hanushek summarizes:

(i) The econometric evidence as a whole gives little support to the idea that smaller classes will lead to general improvements in performance.

(ii) The best studies that concentrate on differences in performance across individual classrooms with varying numbers of students and that separate out other possible influences on student performance offer no support whatsoever for general gains in achievement through class size policies.

Michael lowa (2001) carried out studies in five Franco Sub-Saharan African countries (Cameroon, Cote d' Ivoire, Burkina Faso, Madagascar and Senegal). From her analysis, she concluded that there was an inverse relationship between class size and

learning outcome. She further noted that 62 students per teacher was a threshold number. The study therefore found that academic achievement was increasingly high in smaller class size (lower student-teacher ratio) in regular classes.

Class size has many effects on students' engagement, behavior and retention. Finn (2003) reviewed studies that examined the link between student engagement and class size. He conceptualized student engagement into two forms: social engagement and academic engagement. He concluded that when students are placed in smaller classes they become more engaged, both academically and socially. With strong social and academic engagement, he argued that academic achievement increased. Pupil attention is an area of particular concern that affects academic engagement. Researchers have shown that students tend to spend less time on class assignments when in large classes. (Blatch, Ford & Mortimore, 1994, Cahen, 1989). It has also been shown that students in smaller classes tend to participate more (Cahen, 1989). While there have been few students systematic observations on the interaction, some have argued that:

- Smaller classes allow teachers to engage their students in a differentiated fashion in which teachers can cater their instruction in ways that engage individual students.
- With smaller numbers of students, teachers are able to pay closer attention to all students, thereby holding them accountable for participations rather than ignoring those that are passive (Blatch ford and Mortimore, 1994).

Impact of Large Classrooms after Implementation of FPE in Kenya

A study that was conducted after the introduction of Free Primary Education in Kenya revealed that the country witnessed 10 % increase in enrolment in primary schools nationally. A record of 1.3 million children registered in various schools across the country, rising the enrolment from 5.9 million in 2002 to 7.2 million in 2003 (MOEST, 20004)

However, the sharp increase in enrolment rejuvenated the challenges of FPE in the country (Wamukuru, Kamau & Ocholla, 2006), for instance, the number of pupils exceeded the available human and physical facilities in the primary schools in the country. The pupil-teacher ratio increased steadily from the recommended 40:1 to over 60:1 in 2008 (MOEST, 2009).

In their study on the effect of class-size on classroom interaction during mathematics discourse in the wake of free primary education in Nakuru Municipality, Majanga, et al (2010) revealed that the FPE policy created high pupil-teacher ratio, congested classrooms, teacher shortage and huge teacher work-load. They noted that

these factors affected classroom interaction because teachers found it difficult to give personalized attention to all the pupils.

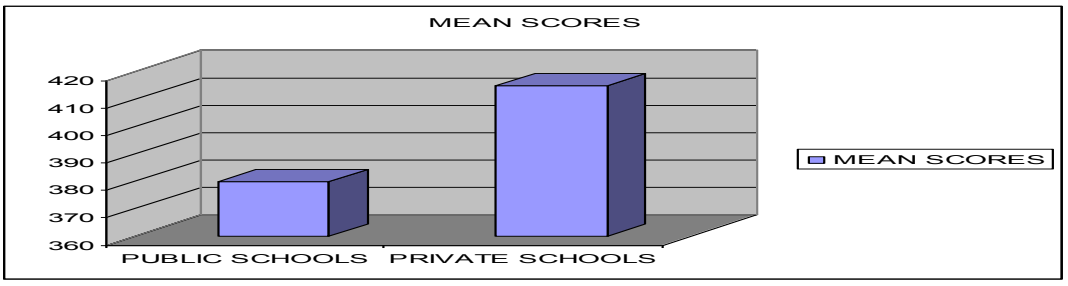
In their study Majanga, et al (2010) noted that in schools where pupil-teacher ratios are high, performance of pupils is very low compared to schools with low pupil-teacher ratio. This was found to be true with learner's discipline. Schools with high number of pupils per teacher were found to have discipline problems. They argued that teachers did not have total control of the pupils' population, and in many occasions, many discipline cases were not noted for correction. This study also found that privately managed schools achieved greater performance or academic value than the publicly managed schools. They cited the reason behind this argument as less bureaucracy, individualized attention to pupils due to small classes and closer to the locus of information about school processes. The current study ought to find basis of support to the findings reached on the differences of performance in schools with low and those with high PTRs.

The results of the study showed that the number teachers remained the same between 2000 and 2006. Some schools witnessed big drop in the number of teachers between 2000 and 2001. The number of teachers remained constant until 2005.The study also revealed that the pupil-teacher classroom interaction activities in the lower classes were not exploited to the full because teachers relied on traditional lecture method of teaching. Teachers in the lower classes did not involve all the pupils during classroom interaction, for example teachers rushed over lessons interacting only with bright pupils ignoring weaker and slow learners, avoided group work which promotes pupil-pupil interaction.

The study also noted that due to over enrollment leading to high pupil-teacher ratio this resulted to decline in general performance in most schools. It was also revealed that minimal pupil-teacher interaction negatively influenced teaching and learning of core subjects like mathematics which require frequent teacher interaction. On average, the PTR for the sampled schools was 80:1 for lower classes and 50:1 for the upper classes (Majanga et al. 2010).

A study by Boy (2006) noted that over enrolment caused poor performance in public schools. This was evident from the comparison of the Kenya national examination results for 2006 and 2007. Performance of primary school pupils in public schools in K.C.PE declined compared to those in private primary schools (Too, 2005).

Figure 2.1: Mean score of candidates in public and private primary schools in K.C.P.E 2006 in Kenya



Source: KNEC Examinations 2006

The reality of teachers trying to teach over 100 pupils become too common in public schools and raised concern about academic standards and therefore questioned the effectiveness of public schools (Abagi & Olweya, 1999).

Sifuna (2003) noted that free primary education in public primary schools stretched the teaching and learning facilities as a result of high influx of new pupils. In the year 2007, the performance of pupils in public and private primary schools reflected disparity with private institutions producing more candidates in the top 100 positions nationally compared to public schools in some selected provinces in Kenya.

The study revealed that teachers complained of increased pupil-teacher ratios and the increased workloads. The findings of the study also pointed out that many primary schools became understaffed as a result of the FPE programme (Too, 2005).

In a study, UNESCO (2005) showed that the average ratio in 162 schools sampled was 58:1 against the required 40:1. Such class sizes in public schools make it difficult for the teachers to teach lessons effectively as compared to their counterparts in private schools who handle a smaller number of pupils.

A study in Nyamaiya Division on performance determinants of K.C.S.E found out that teacher adequacy and quality are among the key variables that predict academic performance in mathematics (Odhiambo, 2006). He pointed out that there is a shortage of mathematics teachers in Kenya but in urban schools, the problem is not as pronounced. He further revealed that the student-teacher ratio in many secondary schools in Kenya is 40:1 and proposed that for effective teaching of mathematics, it should be 25:1 hence recommended the need to employ more mathematics teachers. The study also revealed that high teaching workload led to ill preparation of teachers and students hence lowering performance in national examinations.

In a study on school sizes in Nairobi area of Korogocho, Viwandani, Jericho and Harambee on ‘‘Quality of primary education children are receiving in urban schools’’ Ngware, et al (2008) noted that the teaching load in schools varied by school ownership

and location. They revealed that teachers in public schools had huge workload compared to their counterparts in private schools.

From Table 2.5, on average in public schools, teachers teach for 32 lessons in a week while those in private individual schools 17 lessons in a week. Teachers in public schools not only teach large class sizes, but also teach more hours than their peers in non-government schools.

Arnold (2000) revealed that large schools experience wider gaps in achievement. He noted that because they result in less communication, interaction, and coordination throughout the school this contributes to lower student achievement. While comparing large schools and small schools, Arnold, Gaddy & Dean (2004) argued that in small schools, the curriculum is limited and directed to average pupil rather than the full range of pupils with varied learning needs.

The finding that small class-size matter however has been criticized in a number of studies. In his submission, Hanushek (1999) in another study argued that small classes do not yield better student outcomes. The SACMEQ in a paper presented to the conference on Investment choices for Education in Africa in September 2006 raised doubts on the relationship between class-size and student achievement. After apartheid, another study was conducted in which the authors revealed that Pupil-teacher ratio had a significant negative relationship with educational achievement for black students while there were no similar findings for whites. In his submission, Garry (1996) pointed out that small classes do not yield better student outcomes. However, scholars have dismissed his submission arguing that his analysis relied more on typical education production function studies using large and non-specific data set not established for class size research (Greenwald, Hedges & Lain, 1996).

According to Benbow et al (2007), an ideal Pupil-teacher ratio should be 40:1. In a study done in Ethiopia, Verwimp (1999) argued that there is a negative correlation between the quality of teaching and the Pupil-teacher ratio. However, the Ethiopian study was quick to acknowledge that class-size is not a relevant variable in the quality debate. A study covering 11 of the 19 countries in the World Economic Indicators (WEI) programmes reported a lower Pupil-teacher ratio for the participating countries. Most WEI- countries (India, Philippines, Malaysia, Sri Lanka, Tunisia, Peru, Argentina, Brazil, Chile, Paraguay & Uruguay) had in average a Pupil-teacher ratio in the range of 20 to 30. India had the highest number (59) especially in the villages while Malaysia had the lowest number, with a Pupil-teacher ratio of 18. In the WEI-Countries Zhang, et al (2008) revealed that there was slight difference in students' achievements across the countries despite variations in Pupil-teacher ratio. The Pupil-teacher ratio in public primary schools in Kenya was 43 in 2005 and 50 in 2007 (GOK, 2008). An indication that

either the number of teachers is declining or the number of pupils is growing at a much faster rate than that of the teachers.

A study in Kenya by Duflo, Dupas & Kremer (2008) revealed that at the sample mean, in lower grades, reducing class size from 80 to 40 without any change does not lead to a significant increase in test scores. A similar finding was reported by Banerjee et al (2007) in India where no impact of the reduction in class size was achieved through the hiring of remedial education teachers for students who remained with a regular teacher.

Sweeney (2004) asserted that in Mississippi the problem of teaching mathematics needed adequate and qualified teachers and recommended to the Ministry of Education to equip schools with enough teachers. Teacher shortage in South Africa was found to be the stumbling block to performance of mathematics (Mji & Makgato, 2006). A study on the effect of class size on classroom interaction after the implementation of FPE in Kenya revealed that increased enrolments in schools created increased class sizes and high Pupil-teacher ratio, factors that hindered Teacher-pupil interaction and negatively affected performance in national examinations (Majanga, et al 2010).

RESEARCH METHODOLOGY

Research Design

The study employed descriptive /non-experimental survey design. This is because the researcher had no control over the independent variables i.e. PTR. According to Creswell (1994), such a design intends to present facts about the nature and status of a situation as it exists at the time of the study. Therefore, the design was helpful in order to describe the current condition and situations based on data collected on PTR and pupils performance. Both quantitative and qualitative data were gathered for the study, this ensured that both statistical and non-statistical analysis was used in order to support the findings of the results of the study.

Target Population

The target population from which the sample was drawn consisted of the 78 public primary schools that are in the Division. The respondents of the study included, head teachers of primary schools who represents the administrative authority in the schools and act as secretaries of school management committees, the subject teachers who deliver syllabus content to pupils, the County staffing officer who is in charge of the staffing matters in the division, the District Examination Officer who handles examination matters in the whole County where the Division is located, the County

Quality Assurance and Standards Officer (QASO) who is in charge of implementation of quality standards in schools in the Division.

Discussions of Research Findings

The study revealed that the FPE policy created high enrolments. After 2003 and the two consecutive years, schools with pupils population of 600 pupils and less ceased while schools with populations of 700 and 800 pupil increased abruptly in the year 2003. This is a clear indication that since the year 2003 there has been an upward trend in school enrolment in the primary schools. This factor resulted to large class sizes, high PTR, congested classrooms, teacher shortage and huge teacher work-load. Most schools were found to have teachers' population of between 10 and 15.

The statistical data drawn indicates that since the year 2002 the number of teachers has been varying at very dismal rate, for instance in average this grew from 11 in 2002 to 15 in 2012 representing 36.6%. A comparison from the schools indicated that pupils' enrolment increased from year to year from 2002 representing 52.3% increase. This is evidence to support the view that pupils enrolments did not keep pace with teacher increments.

Table 3.1: Summary of the Distributions of PTR and Performance (scores) 2002-2011)

Year	PTR	Mean scores
2002	46.6:1	229.4
2003	54.7:1	227.2
2004	53.3:1	224.4
2005	53.5:1	219.3
2006	50.2:1	222.4
2007	54.5:1	221.7
2008	51.3:1	221.9
2009	52.9:1	209.1
2010	51.9:1	217.3
2011	52.1:1	219.5
Total	**47.3**	**221.22**

Source: field data

The PTR which was the main focus of this study was analysed for the sampled schools. This was in line with the objectives of the study. Based on evidence in Table 3.1 for the PTR in the selected schools in 2002- 2012, there is evidence that after 2002, the PTR went up to as high as 54.5:1 in 2007 up from 46.6:1 in 2002. This shows that either the enrolment of pupils increased without due regard to the number of teachers or the

number of teachers declined. This scenario created an ugly picture on the PTR in the primary schools where the findings found some schools have PTR as high as over 80 pupils per teacher. The study found that high PTR affected classroom interactions because teachers found it difficult to give personalised attention to all pupils, give adequate assignments, often mark pupils' assignments and take full control of the classes. This finding supports an earlier study conducted in Nyamaiya Division on performance determinants of KCSE where Odhiambo (2006) found that teacher adequacy was among the key factors of performance.

The results show that the number of teachers remained the same between the year 2006 and 2009. The mean number of teachers remained the same for all sampled schools between the year 2002 to 2003 and 2010 to 2012. The figures in the table show that after 2002, the number of teachers did not commensurate with the increase in enrolments.

Assessment of the impact of PTR on pupils' performance was the key objective of this study. The Table 3.1 indicated that since 2002 the average scores of pupils in the sampled schools were below the average score of 250 marks. The table shows that in average the schools recorded slight differences in performance in the consecutive years since 2002.

This study revealed that teachers teach more lessons than recommended. In most schools it was found that teachers for the lower primary teach 35 out of the 35 lessons per week. This is a clear indication that such teachers are over loaded in their teaching assignments. Table 3.2 shows that 70.8% of schools have teachers teaching 30-35 lessons per week while the rest (29.2%) of schools having teachers handling over 35 lessons per week.

Table 3.2: Teacher Teaching Load

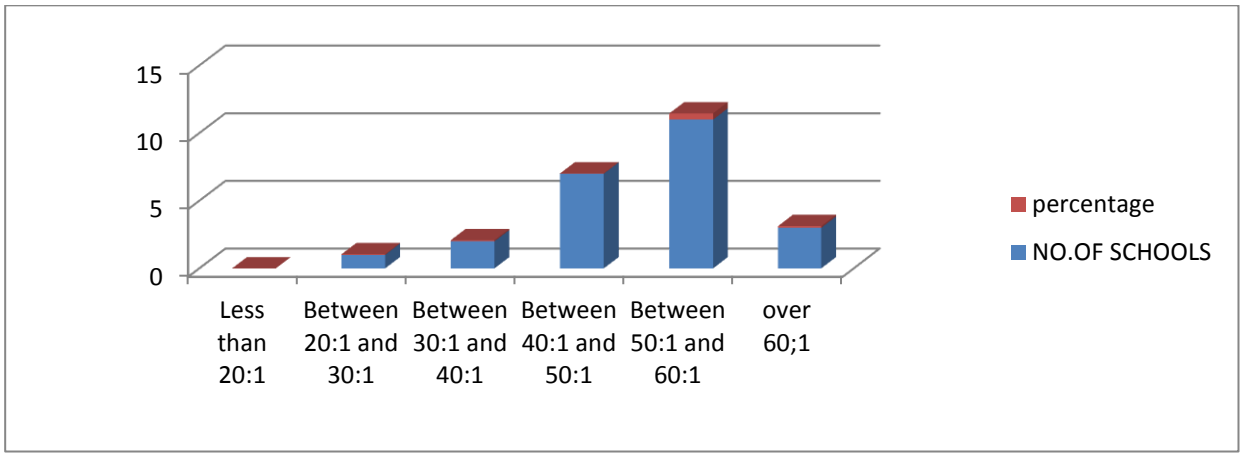
	Lessons per week		
	Less than 30	**Between 30 and 35**	**Over 35**
No. of schools	0	17	7
Percentage	0	70.8	29.2

Source: Field data

Most respondents agreed that teacher-pupil classroom interaction potentials in the lower classes were not exploited to the full. Generally it was revealed that, teachers rushed over lessons interacting only with bright pupils and ignoring weaker and slow learners. These were some of the factors that were found to impact negatively on the performance of pupils in the national exams. This finding supports the conclusions drawn in the study conducted in schools in Nairobi slums by Ngware, Oketch and Ezeh

(2008), which revealed that teachers in public schools had huge workload which affected effective pupil-teacher interaction.

Figure 3.1: PTR in the sampled schools



The study revealed that the largest percentage (45.83%) of schools have PTR of between 50:1and 60:1, which is far above the set standards of 40:1. Most respondents of this study agreed that attaining ideal PTR is one of the major challenges schools face and which affects performance. This supported the findings of Hanushek (1999) which concluded that low pupil-teacher ratio had a positive effect in secondary schools and elementary schools. This study found out that lack of recruitment of teachers is the major factor that obstructs schools from attaining the required set standard of 40:1. Most schools were therefore found to have high teacher exit than entry.

In analysing the data related to PTR and its impact on academic performance, the study revealed that PTR is a significant predictor of pupils' performance. Analysis revealed that there was -0.323 correlations (R) between PTR and test scores. This negative index indicates that there is an inverse relationship between PTR and performance.

Table 3.3: Pearson's Correlation Coefficient R

		PTR	Scores
PTR	Pearson correlation sig.(2-tailed)	1	-0.323
SCORES	**Pearson correlation sig.(2-tailed)**	**-0.323**	**1**

The findings of this study concur with the conclusions drawn in earlier studies conducted in various parts of the World on the impact of class-size and students achievement. The Tennessee STAR experiment and the SAGE programme in Wisconsin

revealed an inverse relationship between student-teacher ratio and student academic achievement. This earlier studies indicated that small class-size matters in determining students achievement.

The study carried by Michael lowa (2001) concluded that there was an inverse relationship between class size and learning outcome. He noted that academic achievement was increasingly high in smaller class size in regular classes. This finding coincides with the results of this study that low PTR has positive effect on pupils' performance.

Table 3.4: Coefficient of Determination R^2

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.323	.104	-.008	5.63720	.104	.930	1	8	.363

From the Table 3.4 above the R statistic computed is -0.323, therefore R^2 is equal to 0.104. This is the coefficient of determination and expresses the proportion of variance in performance that is explained or accounted by PTR. From this data if $R^2 = 0.104$, this means that 10.4% of variance in performance is accounted by PTR.

Therefore from this analysis it can be deduced that PTR only accounts for 10.4% of the pupils' performance while the remaining 89.6% is accounted for by other factors or error in the independent variable. The respondents of the study indicated that other than high PTR and acute teacher shortage, there are other intervening factors such as lack of facilities and overloaded curriculum.

Table 3.5: Regression Model Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
	Constant	260.840	41.124		6.343	.000	166.008	355.673
	PTR	-.760	.789	-.323	-.964	.363	-2.579	1.058

From the Table above, the regression model can be deduced in the form **Y = 260.8 - 0.760(X).** In this data therefore, the regression model for the study can be used to predict performance of pupils (scores) in the schools when given the PTR. In this case :

Scores = 260.8 – 0.760(PTR)

Therefore given the PTR in a school to be 35:1, the scores will be worked out as :**Scores** = 260.8-0.760 ×35

=234.2

Again if PTR in a school is 55:1, then the performance of the pupils in terms of the average scores becomes;

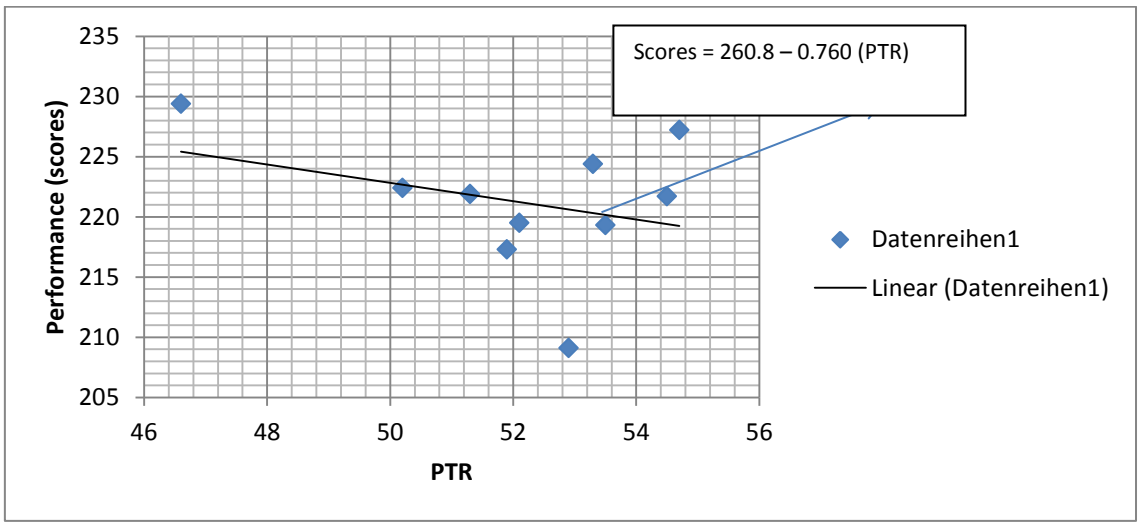
Scores = 260.8 – 0.760 × 55

= **219**

It can be shown from the above worked examples that when the PTR is high, performance in terms of average scores are low. The conclusion drawn from the above is that the higher the PTR the lower the performance (scores). From this evidence it is therefore vital for the policy makers to pay more attention on how to lower the PTR in public schools. Based on this statistical evidence, the performance of pupils in examinations can be predicted and this can be used as a baseline in findings solutions to improving mean scores.

The findings and the analysis of the data related to PTR and performance reveals that PTR is a determinant of pupils' performance in primary schools. This finding supports the study undertaken by Cahen (1989) who revealed that smaller classes allow teachers to engage their students in a differentiated fashion in which teachers can cater their instruction in ways that engage individual students. The statistical analysis can be used to support the view that attaining ideal PTR could be one of the major steps in improving performance of pupils in primary schools.

Figure 3.2: Scatter Plot of Test Scores vs. PTR



The slope of the regression line - 0.760 indicates that an increase in the PTR by one pupil is bound to cause an increase in performance of pupils by 0.760. The regression line in the scatter plot was also found to be downward sloping. This indicates that as PTR

increases performance decreases. Based on the regression model the performance of schools can be predicted within certain margins of accuracy.

CONCLUSIONS AND RECOMMENDATIONS

The results of the findings from the analysis show that PTR is significant factor and can be used to predict pupils' performance in primary schools. Based on the relationships between the two variables, the correlation coefficient using Pearson's product moment indicates that there is -0.323 (negative) relationships between PTR and performance.

This correlation indicates that as PTR increases this affects performance of the pupils negatively. The study therefore revealed that PTR affects performance of pupils since it determines the magnitude of interaction between the teacher and the pupil. In schools where the PTR is high above the set standards, teachers find it difficult to give personalised attention to all pupils and take full control of their classes. Based on the study findings and the statistical analysis there is strong evidence to show that PTR has impact on the performance of pupils in schools. The result from the regression analysis indicates that a reduction of one student caused an increase of 0.760 in scores. The regression model can be used as a predictor of performance in any school given the value of PTR in that school.

Conclusions

The study found out that PTR have statistically significant effect on pupil's performance in primary schools. Results derived from the analysis indicates that there exists enough evidence to conclude that the slope of the population regression line is not zero and that PTR is a significant predictor of pupil's performance. This research study demonstrated that a decline in PTR increases overall performance of pupils in public schools. The analysis therefore partially supported by the findings regarding PTR and performance indicate that there is a relationship between the two variables of the study. It is therefore important that the number of pupils per teacher should be taken into consideration by the government and other education sector stakeholders in formulating policies in the schools. For better academic performance, great attention should be placed on PTR. The impact of PTR also goes beyond its effects on performance but also pupils discipline and teacher motivations. Much of the case for low PTR rests on common sense arguments, but this research has now documented the benefit of attaining ideal PTR. With low PTR, teachers can devote more attention to pupil's needs.

Recommendations for Policy and Practice

i. There is need for government to employ more primary school teachers. This will enable attainment of recommended PTR in schools which currently is far above the required standards. It will also help to offset the problem of teacher shortage as a result of over-enrolments caused by introduction of Free Primary Education.

ii. There is need for the government through the MOE and the TSC to undertake balancing of employed teachers throughout the country to ensure equity in teacher distribution thus bring down PTR in those schools that it high and reduce teachers in those schools that may be overstaffed.

iii. There is need for government-private partnership in employment of teachers. This will lessen the government burden of meeting huge non-development expenditures on salaries.

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