

Human resource factors affecting the performance of Mathematics in secondary schools in Kenya: a case of Mbitini division, Makueni County, Kenya.

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Abstract

There has been a perennial problem of poor performance of mathematics in secondary schools, in Mbitini Division, Makueni County, despite efforts by the Government and local leaders to reverse the situation. The indicators of this poor performance have been poor grades and low mean scores that schools in the Division have continued to get over the years. This study sought to address this problem by investigating the impact of the two human resource factors; Staffing and Motivation on the performance of mathematics by students in the secondary schools in the Division. A descriptive survey design was used to collect data. The study was carried out in Mbitini Division of Makueni County in an area covering three geographical areas; highland, midland and lowland regions. The targeted population included 24 secondary schools with an enrolment of 5505 students out of whom 552 students, 9 head teachers and 9 mathematics teachers were sampled for the study. Stratified sampling was used to divide the 24 schools into heterogeneous categories namely; highland, midland and lowland schools. Random sampling was then applied to each category of schools to identify three schools for purposes of the study. The study administered two types of research instruments namely; Questionnaires and Interview Schedules. There was one questionnaire each for students, teachers and head teachers. In addition, two interview schedules were administered to head teachers and mathematics teachers to help clarify and enrich responses from the questionnaires. A pilot study was conducted in one of the schools to determine the validity and reliability of the research instruments. The researcher, assisted by mathematics teachers of the sampled schools administered the instruments to students, teachers and head teachers and collected data on the staffing situation of the schools and the types of motivation given to both teachers and students. Data collected were analyzed both qualitatively and quantitatively. In qualitative analysis data were analyzed by identifying the major themes relevant to the research questions and objectives and developing a summary of these themes and the associations between them. Interpretations and conclusions based on the major themes were identified and their associations made. Quantitative data was subjected to the SPSS (Statistical Package for Social Sciences) to analyze responses from the questionnaires administered. The major findings of the study were that

most schools in the Division were adequately staffed with teachers with teaching experiences of between 10-15 years and had also the necessary academic and professional qualifications in mathematics. It was also found that on-the-job professional development of teachers was lacking. Teachers were found to have hardly enhanced their profession through post-graduation trainings, workshops and seminars related to their areas of specialization. Results from this study were expected to contribute greatly in enhancing performance management and may be used by policy makers and educational managers to develop policies and programs to improve the performance of mathematics in the Country. The study contributes significantly to the discipline of HRM by laying emphasis on two key areas in performance management namely; continuous capacity building and guidance and counselling of the human resource.

Key Words: Human resource, Mathematics, Performance, Motivation, Staffing

Introduction

The importance of mathematics in almost all aspects of human endeavour cannot be over-emphasized. The history of human civilization is dotted with numerous examples of mathematics including counting, measuring, weighing and drawing (Babu, 2008). In supporting this view Rani (2009) remarked that mathematics was indeed a mirror of civilization and the emperor of the whole academic world.

The 17th and the 18th centuries are often referred to as the “the age of enlightenment” or the “age of reason” (Sifuna & Otiende, 2006). This period is characterized by great scientific and mathematical advances during which several inventions were made (Sifuna & Otiende, 2006). It was during this period when Isaac Newton, one of the greatest mathematicians of all time wrote his famous book, “Mathematical Principles of Natural Philosophy” in which he discussed the law of gravity. As a result of his mathematical genius, Newton was able to formulate his famous laws of motion. The mathematical equation $F = ma$, relating force (F) and acceleration (a), called Newton’s Second Law of Motion is one of the most important laws of dynamics (Rezende, 2006).

But perhaps the greatest invention of the 20th century was Albert Einstein’s law of special relativity (Haven, 2007). In this invention, Einstein, considered as the greatest scientist and mathematician of the 20th century, formulated his famous energy-mass equation, $E = mc^2$, where E = Energy, M = Mass of an object and C = the speed of light. Physicists today consider the equation, $E = mc^2$ as the most famous equation in the history of humankind (Haven, 2007). Einstein’s realization that matter (mass) and energy are really different forms of the same thing and that the two are interchangeable (Haven, 2007) has ever since “revolutionalised” human thinking and changed the course of history. The fulfilment of this great scientific feat was made possible by the mathematical genius possessed by Einstein.

As a result of the overwhelming importance associated with mathematics in human life and indeed the world’s entire business and commercial system (Babu, 2008), it’s necessary to investigate some human resource factors affecting the performance of the subject in secondary schools in Kenya, namely; staffing and motivation.

Medina (2004) defines human resource management as the management function concerned with ensuring that the human component (people) achieves organizational goals assigned to it. He identifies four functions of human resource management as staffing, training, motivation and maintenance. Armstrong (2007) seems to agree with Medina (2004) when he defines HRM as a

strategic and coherent approach to the management of an organization's most valued assets – the people working there who individually and collectively contribute to the achievement of its objectives. One can therefore concur with both Medina (2004) and Armstrong (2007) in contending that HRM is indeed a management function within an organization which focuses on people-related issues such as compensation, hiring, performance management, employee motivation, training and administration.

Ployhart, Schneider and Schmidt (2006) define staffing as the process involved in finding, assessing, placing and evaluating individuals at work. According to Amos, Ristow, Ristow and Pearse (2008) staffing constitutes one of the most important decisions that managers make because it impacts on how effectively work is performed. The importance of staffing in an organization is further reinforced by Storey (2007) when he emphasizes the significance of staffing on the MNCs, especially on the expanding markets in China and India. In the secondary schools where this study is focused staffing involves the process of recruitment, selection, placement, monitoring, development and retention of suitable teachers (Knox, 2002). While considerations about the pupil/teacher ratios are important in determining the physical numbers of teachers to attract to a school Wash, Dunne, Stewart and Stoten (2006) hold the view that schools ought to be staffed on the basis of their curriculum needs. Thus, the number of subject areas that the school offers rather than the number of pupils in the classes should determine the number of teachers to engage in the school.

Motivation may be defined as the process of stimulating people to action to accomplish desired goals. It involves arousing needs and desires in people in a propulsive manner (Sagar, 1998). Aydin and Coskun (2011) define motivation as 'the driving force activating behaviour'. Armstrong (2007) concurs with this view when he describes motivation as 'the factors that influence people to behave in certain ways'. Armstrong (2007) views the management function of motivation as being 'about getting people to move in the direction you want them to go in order to achieve a result'. He suggests that in order to achieve high levels of motivation in an organization management needs to give incentives, provide satisfying work and promote opportunities for the learning and growth of the human resource.

The study identified several issues related to staffing and motivation, influencing the performance of mathematics in secondary schools around the World and in Kenya. Issues to do with the adequacy of teachers in schools, the qualifications of the teachers, compensation, on-the-job training, heavy workloads and lack of teachers' exposure to professional forums featured prominently as causes of poor performance of mathematics. At the same time issues relating to the inability of the school to provide the necessary environment and impetus for performance as in intrinsic and extrinsic motivation also featured.

However, the researcher did not come across a study that addressed either or both of the two human resource factors, namely; staffing and motivation affecting the performance of mathematics in secondary schools in Kenya with specific reference to Mbitini Division. This study therefore sought to fill this knowledge gap.

Statement of the Problem

The performance of mathematics in secondary schools in Mbitini Division (A case out of many others in the country) has continued to be poor despite interventions by the Kenya Government and

local leaders to address the problem. This continued poor performance calls for an alternative approach of trying to solve the problem based on a human resource perspective rather than on the traditional education perspective that emphasizes pedagogy and teaching/learning materials. The current study was aimed at providing this alternative approach by investigating the influence of staffing and motivation in the performance of mathematics in the 24 secondary schools in the Division.

Research Questions

- (i) What is the status of mathematics performance in secondary schools Mbitini Division?
- (ii) How does staffing affect the performance of mathematics in secondary schools in Kenya?
- (iii) In what ways does motivation affect performance of mathematics in secondary schools in Kenya?

Purpose of the Study

The purpose of this study was to investigate the impact of the two Human Resource factors; Staffing and Motivation in the performance of mathematics in secondary schools in Mbitini Division, Makueni County. Findings from this study may be used to develop policies and programs which would be used to improve the performance of mathematics in secondary schools in the Division. The same findings may be generalized in all the schools in the Country.

Significance of the Study

Mathematics plays an important role in all aspects of human life (Babu, 2008). Mathematics also constitutes an integral part of most professional courses in universities and middle level colleges and it's a major requirement in admissions to those institutions (Eshwani,1993).The division therefore risked failing to produce personnel of professional qualifications like engineers, doctors, architects and scientists in future if the prevailing trend in poor performance of mathematics was not arrested.

Methodology

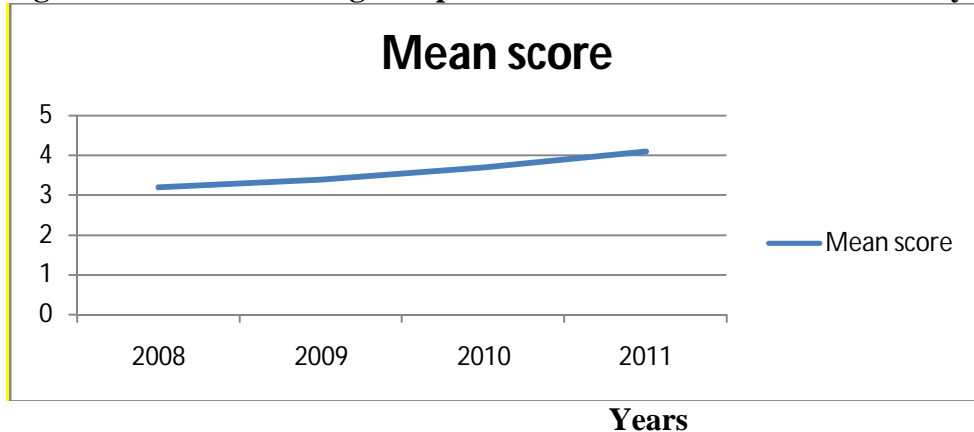
The study was concerned with finding out the influence of the two HR factors, Staffing and Motivation in the performance of mathematics in secondary schools in Mbitini Division. Areas investigated included; the staffing situation in the sampled schools, quality and experiences of such teachers and the motivation of both teachers and students. Being an applied social science research project this study used the descriptive survey design to collect information from the head teachers, teachers and students through questionnaires and interview schedules.

This Study targeted 5505 students, from 24 secondary schools in Mbitini Division (D.E.O. Nzau, 2012). Out of these about 25% were form 3 students. Three distinct geographical features were identifiable in the Research Site; highland and lowland areas separated by a midland area. To facilitate the study the division was divided into three heterogeneous regions namely; lowland, midland and highland regions. The schools to be studied were randomly selected from each region. Three schools were selected from each region exhibiting internal homogeneity and they constituted a good representative sample of the schools in the region.

Performance of mathematics in secondary schools in Mbitini Division

The performance of mathematics in secondary schools within Mbitini Division was examined through an analysis of trends of mean performances of schools that provided consistent results for four years. The results were presented on figure 1 below.

Figure 1: Trend of mean grade performance in mathematics in last 4 years



Source: Researcher, 2013

The performance of mathematics of secondary schools within Mbitini Division reflects an increasing trend steadily over the last four years. The year 2011 recorded the highest mean score of 4.1 compared to 3.7, 3.6, and 3.2 in the years 2010, 2009 and 2008 respectively. The overall performance in the division is however below 6.0 median score, indicating that the performance of mathematics in the division still remains a major issue of concern.

The impact of staffing on performance of mathematics in secondary schools

Staffing was one of the human resource factors examined in relation to its contribution towards performance of mathematics in Mbitini Division. Under staffing ; the researcher investigated the C.B.E of different schools, number of mathematics teachers in form 3 class, and teachers duties in terms of general number of lessons in a week, lessons allocated in form 3 mathematics class, time spent by teachers in other duties apart from teaching. The results were discussed and presented below.

i). CBE of different schools.

The curriculum based establishment, which is the number of teachers expected to support a given curriculum, was analyzed for the 24 schools in the Division.

The results of the curriculum based establishment of schools within Mbitini Division indicate that 71.4%, representing a majority of schools have C.B.E of 16-20 teachers. This could be an indicator that almost all schools have equal levels of staffing and therefore the differences in mathematics performance may not be as a result of disparities in the number of teachers in these schools. This confirms the researcher's premise in this study's concept that staffing not only entails identification of teacher vacancies based on the curriculum (CBE) and attracting physical teachers through TSC and BOG but it also includes the quality of teachers.

ii). Number of teachers teaching mathematics in different schools

It has been noted that most of the schools are adequately staffed with qualified teachers capable of delivering on the secondary school curriculum.

An analysis of the number of teachers teaching mathematics in form 3 indicated that just like the C.B.E analysis, most schools had at least 2 mathematics teachers in form 3. This, further add credence to the researcher's study premise that performance in mathematics was not only based on teacher numbers but also on the quality of the teachers in question.

An analysis of duty allocation for mathematics teachers indicated that in the majority of schools (66.7%), mathematics teachers had 7 lessons in a week except in a few cases that showed that they had 1 (11.1%) and 2(22.2%) lessons in a week respectively. From these findings, it can be adduced that the majority of schools in Mbitini Division have adequate numbers of teachers necessary to handle the workloads in mathematics and that most of these teachers are academically and professionally trained to handle mathematics in secondary schools.

Information from head teachers' interviews revealed that teachers did not complain of heavy workloads. Most schools had the same sources of recruitment for their teachers; the pool of unemployed graduate teachers. There were thus no wide disparities in the quality of teachers emanating from recruitment.

iii). Time spent in outside class activities by mathematics teachers

An analysis of mathematics teacher's time expenditure outside the classroom revealed that; 44.4% (5-8 hours) was spent doing administrative / supervisory duties, 22.2% (over 8 hours) was spent doing student counselling and between 1-8 hours in meeting teachers and parents. Similarly 22.2% of the teachers spent 1-4 hours and 5-8 hours respectively attending seminars / conferences for professional development. 11.1%, 22.2% spent between 1-4 hours, 5-8 hours and over 8 hours preparing/ grading students' tests or exams. Equal percentages of teachers (44.4%) spent between 5-8 hours and over 8 hours attending students meetings outside classrooms.

From the aforementioned analysis of teachers' time spent outside the classroom, it can be noted that majority of mathematics teachers hardly spent their time meeting parents, attending conferences for professional development or doing student counselling. This could imply that mathematics teachers had indeed adequate time which could be used to address mathematics in class rooms. However, the fact that teachers had all the time to address issues affecting pedagogy of mathematics at the classroom and yet the performance of the subject continued to be poor would imply that other issues came into play to complicate performance issues. It was not the teacher numbers but rather the quality of the teacher that may be the issue after all.

iv). Recruitment of teachers

Recruitment is a critical aspect in staffing that can never be overlooked as it determines the right calibre of staff to be placed in an organization. An analysis of mathematics teachers' qualifications revealed that 77.8% of mathematics teachers in schools within Mbitini Division had majored in mathematics in their university education. It is therefore unlikely that poor performance was as result of teacher qualifications attributed to the recruitment process.

v) Head teachers rating on mathematics teachers' performance

Teachers' appraisal as a function of staffing entails continuous assessment of teachers'

performance in order to ensure that performance was in line with schools' objectives. In the present study this is illustrated by the head teachers' judgment on mathematics teachers' capability in terms of initiative to create time for G & C, general performance in the subject and team playing with other stakeholders in the school. The study noted that 71.4% of the teachers were rated very well in their initiative to create time for guidance and counselling and also in their general performance respectively, while 57.1% gave a very good rating as being team players. It may therefore be concluded that most mathematics teachers undertook the necessary measures to enhance mathematics performance in schools.

Staff motivation as a factor in influencing the performance of mathematics in secondary schools in Kenya

Findings in this study indicate that, the impact of staff motivation in enhancing performance in secondary schools was examined through establishing teacher and student motivation as well as by examining the students' attitude towards mathematics subject as a source of teacher motivation.

Measures undertaken to motivate teachers who perform well in school

➤ Ways of teacher motivation

An analysis of the ways in which teachers were motivated in schools involved tangible rewards like cash as indicated by 14.3% while 85.7% of the schools provided intangible rewards like recommendations to employers for promotion, oral commendations during important schools days and recognition certificates showing positions attained in their subjects, all shown above in figure 4.6. Similarly all head teachers examined indicated that students were motivated through tangible rewards such as educational materials e.g. text books and also through intangible rewards like words of praise for excellent performance and teachers interest in students work.

➤ Students' attitude towards mathematics teacher

An analysis of the trend of students attitude towards the mathematics teacher indicated that 59% against 41% of students had been taught by the same teacher since form 1, 51.8% against 48.2% of students confirmed that their mathematics teachers were happy with their performances, 79.3% against 20.7% students confirmed that they wanted to be as good in mathematics as their teachers, 63.1% against 36.9% of the student respondents indicated that they would like to be mathematics teachers in secondary schools while 78.2% against 21.8% of respondents indicated that they would be happier if all lessons in mathematics started at 8.00am. From the above analysis, it can be noted that many secondary school students would wish to perform well in mathematics and that mathematics teachers are viewed by students as role models who would facilitate learning process.

The literature on motivation does not link the students' poor attitude towards mathematics to reduced teacher motivation and hence low performance in mathematics. On the contrary, the passive role of the student in teacher motivation has been discussed with most of the studies presuming that students should always be motivated by either being given autonomy by parents or, teachers employing strategies such as rewards, appraisals and sanctions to motivate students towards performance (Wentzel and Wigfield 2009). The results however concur with Harris (2010) observation that students would be motivated to learn depending on the functionality of the programs under study with particular to their careers. Thus the fact that many students believe that

mathematics will help them in future means that there is still room for changing their view about the subject.

Discussions

The analysis of the performance of mathematics in secondary schools in Mbitini Division indicated that all but one school performed poorly over the period 2008-2011, attaining mean scores below 6.0 on the KNEC performance scale of 0-12. This trend in poor performance is in concurrence with findings indentified in the literature review. Munyao (2003) highlights poor performance of mathematics in a study carried out in Masinga Division in Machakos. Similarly, Yara (2011) established that there was a dismal performance of mathematics in schools in Nyamira District. Other findings by Eshiwani (1993) and Ng'ang'a (2011) are in agreement with the findings in this study.

The current study has also found out that the teacher factor, in terms of teacher numbers, qualifications and experience was not a major factor in the performance of mathematics in secondary schools in the Division. This finding goes against Yara and Otiende's (2012) observation that the recruitment of less competent teachers was a major cause of poor performance of mathematics in secondary schools in Mbondo District.

Other studies done around the world highlighted below seem to concur with Yara and Otiende (2012) that, teachers needed quality support in enhancing performance of mathematics in secondary schools. According to *Journal of Mathematics Collaborative Volume 7 (2004)* poor performance in mathematics was highly attributed to lack of qualified teachers in mathematics and science. The Journal observed that professional development of the teacher was particularly important in enhancing the mastery of the subject content. Similarly, Mji and Makgato (2006), while supporting the teacher factor as instrumental in mathematics performance observed that lack of adequate knowledge of the subject content was among the key impediments to the good performance of mathematics in South Africa. These views were shared by Eshiwani (1973) when he observed that the major cause of student failures in mathematics had to do with the inability of mathematics teachers to improve on their performance by undergoing continuous on-the-job training. Professional development as a facilitative tool towards enhancing teacher performance in Mbitini Division doesn't seem to have been embraced by teachers and could thus explain the continued poor performance in mathematics among secondary school students in the Division.

While this study has identified efforts by most schools to motivate students and teachers through provision of both tangible and intangible rewards it was nevertheless observed that student/teacher and parent/student interactions to inculcate the virtue of self-efficacy among students were minimal. It was observed that the passive role students played in their learning did not help teachers in enhancing their performance. A study by Wentzel and Wigfield (2009) seemed to support findings in this study when it observed that teachers and parents had a responsibility in motivating their children through rewards, appraisals, sanctions and even autonomy in deciding on matters related to their future. Harris' (2010) observation that students would be motivated to learn depending on whether indeed the programmes they were studying would be useful to them in their future endeavours is in consonant with this view. Thus the fact that many students believe that mathematics would help them in future means that there is still room for changing their view about the subject.

Several modes of motivation used by schools in Mbitini Division agree with (Harris, 2010) observation that there are several ways of motivating students in order to improve on their performance. Harris' (2010) suggestion that the teacher explains clearly what he intends the students to do and why a form of motivation constitutes. Harris (2010) felt that students did poorly in assignments because they did not know what was expected of them. Other suggestions included; enhancing extrinsic motivation through giving rewards, encouraging students to participate in their learning, teaching inductively where students would be given an opportunity to draw conclusions, and appearing human and caring for the students. These views tally with observations made in this study.

Conclusion

From the study findings on human resource factors affecting performance of mathematics in secondary schools in Kenya, the researcher drew the conclusion that; like many other schools in the country, the performance of mathematics in secondary schools in Mbitini Division was below the KNEC average with only one school obtaining a sustainable mean score above the KNEC average of 6.0. In most schools, majority of mathematics teachers seemed to have adequate experience in teaching the subject and were professionally trained on the subject, thus teachers experience and professional qualification were not the contributing factors towards poor mathematics performance in secondary schools in the division.

Schools within the Division seemed to be adequately staffed with majority having 16-20 teachers and each school having at least 2 teachers to teach mathematics in the form 3 classes. It can therefore be concluded that performance in mathematics is not only pegged on the physical number of teachers in school but also on the quality services that they deliver to students. Teachers are not seemingly overloaded and their subject allocations are well within manageable levels. Thus it can also be concluded that since most teachers are not overloaded in their subject allocations it would be expected that efficiency in the delivery of teaching mathematics and equally good performance in the subject could be achieved. That many teachers do not spend time meeting parents, attending conferences for professional development or doing student counselling could imply that mathematics teachers had adequate time to address mathematics in class rooms. It would seem necessary therefore for teachers to enhance their professional development through capacity building and dedicate more time in diagnosing and understanding the factors that lock up students from unleashing their full potential in excelling in mathematics.

The results from the primary findings indicate that teachers had the necessary intrinsic motivation especially from the school management to facilitate performance in secondary schools. However, tangible incentives such as cash rewards were not popularly mentioned as the major ways in which schools motivated their mathematics teachers.

The influence of staff motivation in enhancing performance in secondary schools was examined through establishing teacher and student motivation, as well as examination of students' attitude towards mathematics as a source of teacher motivation. An analysis of the ways in which teachers were motivated in schools include; provision of material rewards like cash, and other tangible prizes as indicated by 14.3% while 85.7% indicated that schools provided; recommendations to employers for promotion, oral commendations during important schools days, recognition certificates showing positions attained in the subjects, paid up trips to places of educational interest, subsidized house rents and free electricity, bonding retreats with teachers and BOG members and empathy during difficult times. Teachers and school heads made efforts to motivate students towards better

performances, however, it was noted that performance in the subject could be attributed to factors within the students and not teachers. While many students acknowledge the importance of mathematics subject in their future career placement and solving daily problems, majority of them seem to have lost the believe that they can still do well in the subject. This could be a source of lost motivation among teachers. Continued poor performance in the subject may render teachers' efforts towards the subject fruitless.

From the aforementioned it would seem that the findings of this study are in agreement with the Expectancy Theory which ties performance with reward. That students are motivated to perform as a result of expected future benefits is clearly in tandem with this theory. Students in secondary schools in Mbitini do not seem to espouse the concept of goal setting as a means of staying focused. The fact that the concept of self-efficacy does not seem to come out clearly, among the students, showing the linkage between performance and self determination may point to the cause of the poor performance. Students do not have the intrinsic drive to succeed. This observation is in congruence with the Goal-Setting Theory.

The findings of this study point to the fact that it's the teacher factor in terms of the quality of services provided and not the teacher numbers that may after all be the major determinants of success. Students lack of self motivation and hence lack of self-efficacy has been observed to be another impediment to performance. These observations are clearly in conformity with the conceptual frame work which identifies staffing and motivation as major areas for investigation.

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