International Journal of Humanities and Social Science Invention
ISSN (Online): 2319 – 7722, ISSN (Print): 2319 – 7714
www.ijhssi.org Volume 4 Issue 2 ǁ February. 2015 ǁ PP.29-35

Assessment of The Influence Of School-Based Factors On The Implementation Of Alternative 'B' Mathematics Curriculum In Secondary Schools In Kericho County

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ABSTRACT: *The current reforms in mathematics and science education recognize the crucial role that teachers play and thus target them as curriculum innovators and implementers through in-service education and training. Unfortunately, several pragmatic innovations have partially been implemented or completely shunned. Several factors have been highlighted as impediments to effective implementation. The objective of the study was todetermine the influence of school-based factors on the acceptability of Alternative 'B' Mathematics curriculum in secondary schools in Kericho County. The study utilized a descriptive research design where frequency counts, tables and figures were used to boil down data into manageable units. A population of 157 principals, 401 teachers of Mathematics and 20 heads of secondary Mathematics curriculum at KIDC, MoE and KNEC were targeted. Simple random sampling was employed to select respondents. Data was analyzed using SPSS computer programme version 20.0, a reliability level of .83 was ascertained by using a pilot study and a reliability level of .76 was arrived at using cronbach Alpha. The findings indicated that school- based factors are key in curriculum implementation.*

KEY WORDS: *School-based factors, Implementation, Alternative 'B' Mathematics curriculum*

I. INTRODUCTION

Background Information : Science and Mathematics has for long been used by developed nations as a means of attaining faster economic development. This has been possible through improvement of traditional science and technology. Most Western European countries, USA, Japan and other developed nations have achieved their economic power by pursuing scientific discoveries. In Kenya, achievement in science and mathematics subjects has not shown an improvement despite the great effort done by the government and development partners. Quite often the poor result is blamed on poor school management. Utilization of facilities in science and mathematics is a major contributor to academic success. This is said to have a link with resource management. Every facility that a school acquires is geared towards enhancing achievements of school goals. Management of Physical resource, material and human resource plays an important role in school's academic achievement. Passing examination is a measure of how resources have been used in learning. The major resources utilized in science and mathematics include chalks, models, text books, computers, projectors, Compact Discs (CD), flash drives, periodic tables, charts, laboratory equipments among others. No matter how well educated and professional teachers are, they need teaching aids and a conducive physical environment for themselves and their learners. Bakhda (2004). Kenya like any other country has experienced many challenges in the performance of science and mathematics. When compared to Art based subjects the performance in science and mathematics in Kericho district is more dismal as indicated in Table 1.

Table 1: Performance in Art, Science and Mathematics Subjects in Kericho District

Subject	Total No. of Candidates Enrolled	Grade A	Grade E
English	4640	40	41
Kiswahili	4594	47	28
Mathematics	4625	47	1969
Biology	4017	44	121
Physics	1233	17	223
Chemistry	4149	56	452
History	2613	82	66

(Source: DEO Kericho District, 2010)

The Table 1 containing comparison of performance in Arts, Science and Mathematics subjects in the year 2009. Mathematics has the highest number of grade Es (1969) followed by Chemistry (452) and Physics (223). For this reason, the Government of Kenya (GoK) has made several reforms of both curriculum and policy to enhance teaching and learning of Science and Mathematics. This includes making at least two science subjects at Kenya Certificate of Secondary Education (KCSE) compulsory. There are also regular Strengthening Mathematic and Sciences in Secondary Education (SMASSE) insets for practicing science teachers. Despite the move by the Government of Kenya, there has been setbacks among them school based factors that this study will seek to determine their influence on the implementation of curriculum development in Kericho County.

Statement of the Problem : It is noted that performance in mathematics and science at KCSE has been poor. For the achievement of vision 2030 whereby Kenya becomes fully industrialised, there is a need to improve performance in science and mathematics. The school leaders blame the poor performance in science and mathematics on improper utilization of teaching and learning resources by subject teachers. Despite Mathematics Alternative 'B' curriculum being considered a simplerversion of the Mathematics subject offered in Kenyan secondary schools Miheso-O'Connor (2011), schools in Kericho County have not implemented this curriculum (Kericho County Director of Education, 2012). It is against this background that the study seeks to establish the influence of school factors on the implementation of Alternative 'B' Mathematics curriculum in secondary schools in Kericho County.

Objective of the Study

- To establish the influence of school-based factors on the implementation of Alternative 'B' Mathematics curriculum in secondary schools in Kericho County

II. LITERATURE REVIEW

Review of theory

The study was based on Leithwood (1982) model of evaluating curriculum implementation. This model states that new curriculum implementation is a process of change and therefore, the educator, the learner and the educational institution has to change to accommodate reforms. According to Leithwood (1982), there are nine dimensions of curriculum innovation where change occurs. These include: platform, objectives, student entry behaviours, assessment tools and procedures, instructional materials, learners' attitude, teaching strategies, content and time. Leithwood's (ibid.) model of evaluation has four features. These are procedures for: identifying descriptive dimensions of the innovation; specifying practices implied by the innovation; describing actual practices; and comparing actual with intended practices (Leithwood, 1980).In the practical sense, the inadequate teaching and learning resources for the implementation of the new Mathematics curriculum, means there is a gap in actual classroom practice. This would be an indication that educators are experiencing difficulties or have concerns which have adverse effects on the implementation of the innovation.

School -Based Factors influencing Curriculum Implementation : In the United Kingdom particularly in London, studies done by Bell and Rhodes (2003) whose objective was to explore school based factors that contributed to effective implementation of curriculum innovations, revealed that they are the administrative offices, classrooms, staffrooms, laboratories, equipment, libraries, hostels or dormitories, staff houses and even school grounds. In order for a school to advance the learning opportunities offered to a student particularly in mathematics, it has to adequately avail these facilities and resources.

Similarly research done in America by Orloskey (2007) whose purpose was to look at management of school based assets that could enhance achievement in Mathematics, came up with tangible conclusions. For instance, he asserted that text books, classrooms and teachers were crucial in institutionalization of a curriculum innovation. However, due to over-enrolment most schools are overstretching the few facilities they have leading to poor curriculum implementation. The research done by Serem (2009) revealed that availability of resources and facilities was necessary for effective implementation of any educational innovation. A UNESCO (2002) report, asserted that teachers' ability to implement curriculum innovation was a function of the availability of "tools for the job". For curriculum innovations to succeed, teachers must have the required materials and facilities which must be continuously supplied. In support, Fullan (2002) reminded that implementation of innovation required the establishment of an adequate logistic network to ensure timely delivery of essential materials and equipment to all schools. Further, Serem (2009) indicated that irregularities in the delivery of necessary supplies to schools could threaten proper implementation of the programme. In many curriculum innovations inadequate supply of teachers' guides and other materials caused serious problems of implementation of mathematics curriculum. Additionally, Fullan (2003) pointed out that availability of necessary resources, tools, facilities, equipment, personnel, finance and time were crucial towards successful

implementation of an innovation in schools. Lack of these resources and facilities were a barrier to successful implementation of curriculum.

According to Fullan (2002) who complimented studies of Ornstein and Hunkins (2004) prescribed that inadequate quantity or even simple unavailability of materials resulted in object resistance, shelving or rejection of curriculum innovation by implementers. Research by UNESCO (2006) found out that, there was total reluctance on the part of educational planners and managers on the provision of appropriate facilities and resources for implementing curriculum innovations in sub-Saharan countries. This was supported by Serem (2009) when discussing the importance of resources and facilities in teaching, posits that, no excuse should be given for lack of these resources which are crucial. According to Otunga, (2007), another critical factor that directly affected effective implementation of curriculum innovation at school level was teacher preparation. This involved orientation and retraining of teachers so that they could have necessary knowledge, skills and positive attitude towards the new curriculum innovation, which they were expected to adopt and use in their schools.

Consequently, Serem (2009) posited that educators agreed that the quality of education provided in any institution, by and large, depended on the quality of teachers which in turn depended on the quality of the training they received. Findings by UNESCO (2004) observed that unless the teacher could be able to interpret the curriculum properly, they could be ineffective in implementing it. Other studies done by Cohen and Hills (2001) pointed out that expecting teachers to embrace new approaches without sufficient involvement, training and information on why changes are necessary or warranted was a tall order which often resulted in inadequate adoption of the curriculum mandate. This sometimes resulted into shelving a curriculum innovation. Carl (2002) argued that teachers are critical in determining the quality of implementation of any curriculum innovation introduced in their schools. They should be in a position to justify their beliefs and decision not just to themselves but also to the public that they serve.Report contained in a document, SMASSE (2005) strongly recommended in-servicing of teachers prior to implementation of a new curriculum innovation. Effective implementation of curriculum innovation was not possible without adequate preparation programmes for teachers who would be involved. According to UNESCO (2006), various formats for training staff in curriculum innovation in various subjects are spelt out. Such as written directions, periodicals, teachers guide books, live or videotaped lectures, demonstrations, in-service workshops and site supervisions. Unlike in Kenya where teacher preparation and implementation were separate, implementation stage in the models of countries like America and Britain where teacher preparation activities are detailed (England Department for Education, 2011). Though no extra-skills were needed by mathematics towards implementation of alternative 'B' mathematics, formal interactive sessions to discuss the benefits of the new curriculum innovation according to the researcher were necessary. Such sessions would address concerns and would capture some inputs from experienced classroom teachers.

III. METHODOLOGY

Research Design : Expost-facto designwas employed in the study. Expost-facto design according to Mathooko, Mathooko and Mathooko (2007), explores and clarifies relationship between two or more variables. This design was found to be most appropriate for this study because both independent and dependent variable could not be manipulated since they had occurred. In this study the design helped the researcher to establish the relationship between school factors and implementation of Alternative B curriculum.

Target Population : The target population was Head teachers and teachers in Kericho Districts.According to TSC (2010), there were about 157 secondary schools with 157 principals and 401 mathematics teachers which formed the study population with 20 heads of mathematics from KICD, MOE and KNEC.

Sampling Size and Techniques : The sample size constituted 157 Head teachers and 401 science teachers. The figure was arrived at by using the formula provided by Krejcie and Morgan (1970) as cited by Kathuri and Pals (1993). In this formula:

$$S= \frac{X^2NP(1-P)}{d^2 (N-l) + X^2P (1-P)}$$

Where

S= Required Sample Size.

N=. Number of secondary school teachers in the District (401),

P= Population proportion of individual that yield maximum possible sample size (Assumed to be 0.5).

d= Degree of accuracy as reflected by amount of error that can be tolerated (taken as 0.5).

X^2=Table value of chi-square for one degree of freedom taken as 3.841 for 0.95.

District schools were the only used to ensure that only schools with comparable academic resources formed the framework of the study. The total number of secondary schools in the district was 157. From this, 47 schools were randomly sampled. A list of all schools was used as initial sampling frame. The schools were sub-divided into sub-groups or strata based on their locality and gender of students. A proportionate number of respondents was selected from each stratum in order to obtain a sample which could typically reflect the schools' characteristics. Teachers' sample was obtained using simple random sampling method as recommended by Muthooko, Muthooko, and Muthooko, (2007). Head teachers purposively sampled.

This study employed the *expost-facto* design in a causal comparativeresearch. According to Mathooko, Mathooko and Mathooko (2007), an *expost-facto* design explores and clarifies relationship between two or more variables. This design was found to be most appropriate for this study because both independent and dependent variables could not be manipulated since they had occurred. A correlation describes how, as one variable changes (the independent variable) another variable also changes (the dependent variable) in a somehow predictable way. In this study the design helped the researcher to establish the relationship between dynamics of curriculum development and acceptability of Alternative B curriculum . The characteristics which constitute the independent variables could not be directly controlled by the researcher. Their influence had already occurred and therefore not manipulatable . The design ensures that little or no control is exercised over any of the variables. This design was considered as suitable for this study because many of the phenomena in dynamics of development and acceptability can only be studied after the facts.

Table 2: Sample units of principals and teachers of Mathematics

No.	Participants	Sub-County	School Type	Target Population	Sample size	%
1	Principals	Kericho East	Boys	8	3	1.9
			Girls	9	3	1.9
			Mixed	9	3	1.9
		Kericho West	Boys	8	3	1.9
			Girls	10	3	1.9
			Mixed	12	4	2.5
		Londiani	Boys	6	2	1.3
			Girls	7	2	1.3
			Mixed	10	3	1.9
		Kipkelion	Boys	7	2	1.3
			Girls	6	2	1.3
			Mixed	11	4	2.5
		Bureti	Boys	13	4	2.5
			Girls	17	5	3.2
			Mixed	24	7	4.5
		Sub total		**157**	47	**30.0**
2	Teachers of Mathematics	Kericho East	Boys	24	7	1.7
			Girls	20	6	1.5
			Mixed	27	8	1.9
		Kericho West	Boys	18	5	1.2
			Girls	25	7	1.7
			Mixed	26	8	1.9
		Londiani	Boys	14	4	0.9
			Girls	19	6	1.5
			Mixed	24	8	1.9
		Kipkelion	Boys	18	5	1.2
			Girls	14	4	0.9
			Mixed	27	8	1.9
		Bureti	Boys	33	11	2.7
			Girls	44	13	3.2
	Sub-Total		Mixed	68	20	4.9
				401	120	**30.0**

Source: Field Data,2012

IV. DATA COLLECTION METHODS

A research permit was sought from the National Council for Science and Technology (NCST) through the school of education, Kisii University. On obtaining the research permit, the researcher sought permission from the DEO's office to visit schools. Selected schools were thereafter visited by the researcher after an appointment had been made with the school administration. Questionnaires and the interview schedules were

administered personally by the researcher to the teachers and interviews conducted with head teachers. Adequate instruction and assurance of confidentiality was provided to all participants. Thereafter, the questionnaires were collected by the researcher after being filled.

Validity and Reliability of the Instruments : Kothari, (2006) defines content validity as the extent to which a measuring instrument provides adequate coverage of the topic under study. According to Mugenda and Mugenda, (2003:99), "content validity of the measuring instrument refers to the accuracy and meaningfulness of inferences which are based on the research results". It is the degree to which results obtained from the analysis of the data actually represent the phenomenon under study. In order to determine the content validity of the instruments, the researcher discussed the items with colleagues and experts in the department of curriculum and instructional media who helped to determine the relevance and content validity of the questionnaires developed. Besides, the tools were piloted and the weaknesses therein found to exist were rectified. Reliability is a measure of the degree to which a research instrument yields consistent results or data after repeated trials, (Mugenda and Mugenda 2003). Reliability is concerned with precision and accuracy. For research to be reliable, it must demonstrate that if it is carried out on a similar group of respondents in a similar contact, then similar results would be found (Cohen et al, 2000). There has been debate whether the canons of reliability of quantitative research apply to qualitative research. Cohen et al, (2000) says that in qualitative research replicability can be achieved by the researchers' choice of informants, social situations and conditions under investigation and the methods of data collection. One way to ensure reliability in qualitative data is by use of measures that have proven themselves in previous research, (Babbie, 1992). Test-retest technique was used during piloting to establish the reliability of the questionnaires and interview schedules. The responses from the pilot study were compared and found to be reliable.

Data Analysis : Data analysis entails the separation of data, to distinguish its component parts, or elements separately or in relation to the whole (Oso and Onen, 2008). In this study data was analyzed using quantitative techniques. Quantitative data collected was tabulated and pie charts, bar graphs and frequency tables developed. The frequencies were converted to percentages to illustrate relative levels of opinions. Qualitative data from the HODs and head teachers' interview schedules were coded and analyzed to establish thematic patterns from which useful conclusions were drawn. The statistical Package for Social Sciences (SPSS) assisted to analyze the data collected.

V. RESULTS AND DISCUSSION

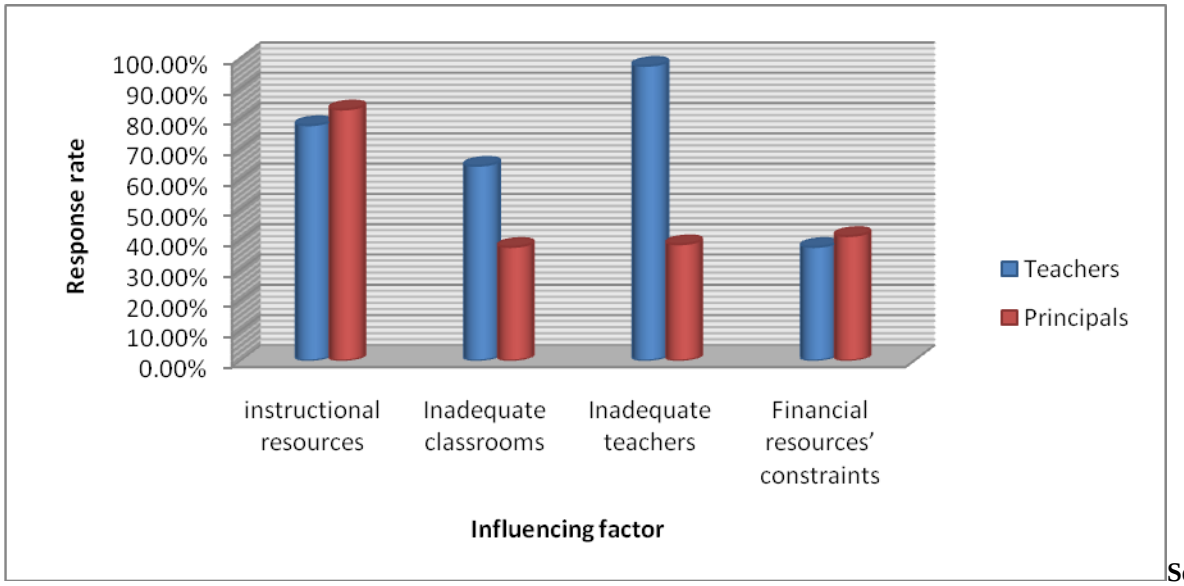
Influence of School-Based Factors on the Implementation of Alternative 'B' Mathematics Curriculum

Teachers of Mathematics, principals and heads of Mathematics curriculum alike were asked to respond to this study item. The main school-based factors that were cited as those that influenced the implementation of the new curriculum innovation were instructional resources, adequacy of classrooms, adequacy of teachers and financial resources necessary for the implementation of the new curriculum innovation. However, there were varying frequencies in citations of these factors by teachers and principals. Majority (109; 97.3%) of the teachers of Mathematics who were sampled in this study cited teacher inadequacy as a major school-based factor that influenced the implementation of Alternative 'B' Mathematics curriculum. There were 72 (64.3%) teachers who cited inadequate classrooms and 42 (37.5%) who cited constraints in financial resources for the implementation of the mew curriculum innovation.

There were 39 (82.9%) principals who cited inadequate teaching and learning resources as a factor that influenced the implementation of Alternative 'B' curriculum, 42 (37.5%) cited inadequate classrooms while 43 (38.4%) cited inadequacy of teachers of Mathematics. Those who cited constraints in financial resources for the implementation of the new curriculum innovation were the majority (46; 41.1%). This was attributed to the fact that, principals as the overseers of curriculum implementation require sufficient financial resources to facilitate the implementation of a new curriculum innovation.

This finding is illustrated in Figure 1.

Figure 1: Factors influencing Implementation of Alt. 'B' Maths Curriculum



So

urce: Field data, 2012

All heads of Mathematics curriculum at KICD, MoE and KNEC agreed that there were no additional resources that schools were allocated prior to implementation of alternative 'B' Mathematics. These respondents affirmed that this made it very difficult for schools to implement alternative 'B' Mathematics curriculum and consequently schools ended up shelving the implementation. An interview with one of the heads of Mathematics curriculum at KIDC yielded the following observation:

> *...it is true that we (the curriculum developers) did not put adequate measures in place to ensure provision of necessary resources and facilities in the facilitation of Alternative 'B' Mathematics curriculum. The assumption was that the existing scenario in schools would accommodate the new curriculum innovation...that was an oversight....*

These findings were in concordant with studies by Fullan (2002) and Serem (2009), who asserted that availability of adequate resources and facilities as school-based factors is a pre-requisite for effective implementation of any curriculum innovation. A report by UNESCO (2006) also supported that, there is total reluctance on the part of educational planners and managers on the provision of appropriate facilities and resources for implementing curriculum innovations in sub-Saharan African countries. The report indicates that this is one of the main reasons why quality curriculum innovations in sub-Saharan countries have been shelved over the years. Unless adequate measures are put in place in terms of provision of necessary resources and facilities, prior to the implementation of a new curriculum innovation, the process is bound to fail. In the United Kingdom particularly in London, studies done by Bell and Rhodes (2003) whose objective was to explore school based factors that contributed to effective implementation of curriculum innovations, revealed that they are the administrative offices, classrooms, staffrooms, laboratories, equipment, libraries, hostels or dormitories, staff houses and even school grounds. In order for a school to advance the learning opportunities offered to a student particularly in mathematics, it has to adequately avail these facilities and resources. Similarly research done in America by Orloskey (2007) whose purpose was to look at management of school based assets that could enhance achievement in Mathematics, supported the findings of this study by observing that text books, classrooms and teachers were crucial in institutionalization of a curriculum innovation.

V. CONCLUSIONS AND RECOMMENDATION

School-based factors play a significant role in facilitating the implementation of a new curriculum implementation process. School-based factors such as physical facilities, instructional materials, adequacy of teachers and availability of financial resources are key in curriculum implementation process. Failure to consider these factors results in failure of the implementation process as well.

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