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Original Research Article

Evaluation of the Physics Curriculum Content Suitability for Learners with Hearing Impairment in Selected Secondary Schools for Learners with Hearing Impairment in Kenya and its Effect on Performance

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Abstract: Physics is a science subjects offered in the 8-4-4 system in secondary schools in Kenya. However, previous studies have indicated low performance in the subject by learners with hearing impairment in the Kenya Certificate of Secondary Education (K.C.S.E) examination in comparison to other subjects, thus limiting their ability to pursue Physics related courses after high school. This study sought to evaluate the Physics curriculum content suitability for learners with hearing impairment in Kenya and its effect on performance. Constructivist, social learning theories and descriptive research design guided this study. Data was collected using questionnaires, interview schedules and document analysis and was then analyzed using descriptive statistics such as frequency tables and percentages. Four schools from four counties; Machakos, Nyeri, Migori and Kakamega were selected through purposively. The sample comprised 4 heads of department, 6 teachers of Physics and 78 students taking Physics. The findings revealed language barrier, unadapted Physics curriculum and missing scientific signs to teach Physics to learners with hearing impairment contributed to low grades. As a result, the Physics curriculum could not meet their needs, implying its unsuitability for learners with hearing impairment in Kenyan secondary schools. The study thus recommends, adaptation of Physics curriculum to meet the needs of learners with hearing impairment.

Keywords: Curriculum content, Hearing Impairment, Performance and Physics.

INTRODUCTION

Physics education cultivates scientific patterns and inculcates scientific skill in students that can be extended to other aspects of life. Development of these skills are essential for the attainment of the Sustainable Development Goals of quality education and other goals pegged on technological advancement (United Nations, 2017). However, African countries still lag behind in attainment of these SDGs in comparison to the rest of the world. This is majorly attributed to the low scores in science subjects (Physics included) at secondary school level (United Nations, 2019). Regional studies have indicated poor grades in Physics at secondary school level, which is attributed to various elements of curriculum such as qualified teachers, learning resources, suitable curriculum and evaluation modalities (Kavcar *et al.*, 2017).

In line with the SDGs, two key sectors Kenya's Vision 2030 are Education and the achievement of scientific, technological and industrial development which have been linked to science teaching in schools (Government of Kenya, 2007). Physics as a science is key in the Kenyan secondary school curriculum since it empowers an individual with scientific skills which are key if Vision 2030 and SDGs at large are to be realized. It is for this reason that the Kenyan 8-4-4 curriculum offers it to all learners in early secondary years and later as an optional subject (Kenya Institute of Education, 2005).

Adaptation of instructional materials has been identified as a measure of enhancing acquisition of scientific skills amongst Learners with hearing impairment (Naidoo M, 2008). One of the main areas of focus is adaptation of language (Roald I, 2002). It is however not clear on what direction should be taken when adapting language used in instructional materials for the Deaf. Should the language just be simplified or should they adopt a written form of sign language for a respective country. Also, no study has looked at whether there are sufficient scientific sign to help in the instruction, and how that can influence performance for learners with hearing impairment. This study aims at clarifying whether or not the Kenyan high school Physics curriculum has been adapted to suit Learners with hearing impairment, whether there are enough scientific signs required in teaching Physics, and how curriculum content of Physics factors such as adaptation, learner involvement, curriculum designing and sign availability influence performance of Learners with hearing impairment in Physics.

The need for inclusion of individuals with hearing impairment in all spheres of life including Physics related jobs is salient. This requires a good background knowledge of Physics for inclusion in such careers. However, studies have shown poor performance in the subject in national examinations at high school level in Kenya.

Despite the effort and focus by the government and private stakeholders in promoting acquisition of scientific skills by learners in schools, performance in Physics and sciences in general has been poor over the years and even worse for learners with hearing impairment. Such continued low achievement in Physics is likely to hinder the pursuance of Physics related courses in tertiary institutions by learners with hearing impairment. As a result, achievement of an all-inclusive society, which is one of the governmental objectives, is likely to be slowed down. With these arguments, there is a need for a study to evaluate the suitability of the Physics curriculum for learners with hearing impairment in Kenya and its effect on academic performance.

The purpose of this study was to carry out an evaluation on the Physics curriculum content suitability for learners with hearing impairment in secondary schools for H.I learners in Kenya and its effect on performance. This was done through collection and analysis of qualitative and quantitative data from teachers and learners with hearing impairment.

The study was conducted in special secondary schools for the learners with hearing impairment and it focused on four major counties across the country, namely Machakos County, Kakamega County, Nyeri County and Migori County in Kenya. A secondary school for the Deaf from each of these counties was selected for this study. These schools were; St. Angela Mumias Secondary School For Deaf Girls in Kakamega county, Machakos Secondary School for the Deaf in Machakos county, Rev. Muhoro Secondary School for the Deaf in Nyeri county and Kuja Special Secondary School for the Deaf in Migori county. These four schools were selected purposefully since they are the oldest secondary schools for H.I learners in the country offering Physics as a subject and have had candidates sitting for the KCSE longer, in comparison to other secondary schools for H.I learners which came up within the last decade. In this regard, teachers of Physics in these schools were likely to have had more experience in teaching of the subject which was an important aspect in the collection of data for this study. The locale of this study was in both urban and rural schools setting.

This research will be of help to curriculum developers in making improvements to the Physics curriculum with an aim of benefitting learners with hearing impairment and improving their performance. The findings of will also be of benefit to examination authorities in developing balanced assessments and evaluations for students with hearing impairment.

EXPERIMENTAL SECTION

Research Design

The research design used in this study was descriptive survey research design. This design was important for the collection of data to test study objectives or to answer questions concerning the prevailing status of the subjects or situation in the study (Mugenda *et al.*, 2003). Descriptive survey research design also helped the researcher in seeking of opinions, analyzing them and interpreting the data. In this regard, the design was suitable since the study aimed at collecting information from heads of science department, Physics teachers and students taking Physics on their opinions regarding the Physics curriculum for Learners with hearing impairment.

Target Population

There are 21 secondary schools for H.I learners in Kenya. However, not all the secondary schools offer Physics as a subject to KCSE level. Of the 21 secondary schools for H.I learners, one is a boys' boarding secondary school for Deaf, one is a girls' boarding secondary school for the Deaf and 19 are mixed secondary schools for H.I learners. Only secondary schools for H.I learners offering Physics to KCSE level were targeted for this study. This study therefore targeted 10 heads of department, 12 teachers of Physics and 137 learners with hearing impairment taking Physics were targeted as respondents.

Sampling Procedures and Techniques

This study applied purposive sampling techniques. The researcher selected four secondary schools for learners with hearing impairment in Kenya purposively. The choice of this sampling technique enabled the researcher to obtain a sample of secondary schools for H.I learners offering Physics at KCSE level that contained sufficient data suiting the study and schools that acted as a representation of all the secondary schools for H.I learners in Kenya.

Sample Population

A sampling frame is a set of cases that may be chosen from a list, directory, or index. It's essential to remember that a study's degree of generalization is determined by the precision of the sampling frame from which the sample was drawn (Mugenda *et al*, 2003).

There are 21 schools for the Deaf countrywide with 10 having taken candidates of Physics to KCSE level. The researcher focused on 4 schools out of the 10. This translated to 40% of the target population. These four schools were selected purposively. Heads of science departments, teachers of Physics and selected students from each of the four schools participated in the study. The sample of the study comprised 4 Heads of Department, 6 teachers of Physics and 78 students taking Physics. Table 1 shows a summary of the sample size.

Table 1: Sampling Grid

	Target population	Sample	Percentage	Method of sampling
H.O. D	10	4	40%	Purposive
Teachers	12	6	50%	Purposive
Students	137	78	57.93%	Purposive
TOTAL	**159**	**88**	**55.35%**	

Data Analysis Techniques and Procedures

Data was analyzed both qualitatively and quantitatively, and merged for general interpretation. Descriptive statistics was used for analysis of data in this study. Data collected from different sources was coded and entered into a database. Coding was done by use of a Likert scale rated from 1 to 5 with 1 representing strongly disagree and 5 representing strongly agree in ascending order. Computation of the data was the done on computer using the Statistical Package for Social Sciences package (SPSS) version 21.

Quantitative data was analyzed using descriptive statistics by use of frequencies, mean and percentages of mean. This study's qualitative data was analyzed by organizing them into similar themes and tallying the number of similar responses with respect to research questions for use of emphasis in the intended purpose. The results of data analysis were presented using frequency distribution tables.

Conceptual Framework

This study seeks to carry out an Analysis of how Physics curriculum content suitability for learners with hearing impairment in secondary schools for H.I learners in Kenya. The conceptual framework in this study shows the relationship between independent, and dependent variables. The independent variable is curriculum content, while the dependent variable is performance in Physics at the national levels.

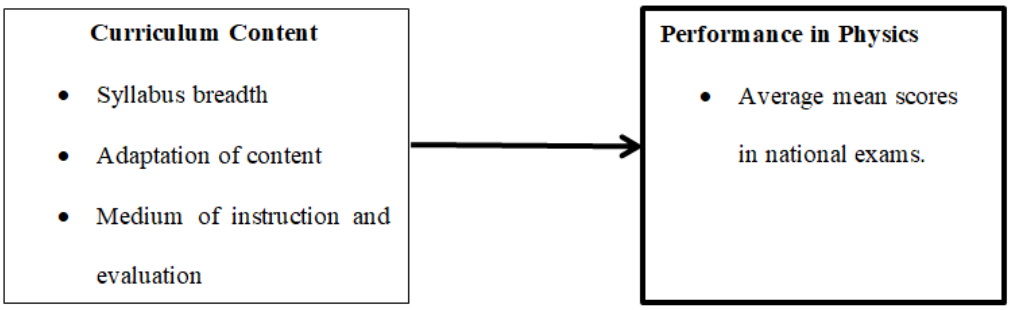

Figure 1: Conceptual Framework

RESULTS AND DISCUSSION

The objective of the study sought to evaluate the Physics curriculum content suitability for learners with hearing impairment in secondary schools for H.I learners in Kenya. Various constructs indicating perspective on curriculum content of Physics were sought from. The Likert scale used is rated on five points with 1 indicating strongly disagree and

5 indicating strongly agree. The findings are presented as shown in Table 2 using frequency counts, percentages, means and standard deviations.

Table 2: Perspective on Curriculum Content of Physics

Perspective on Curriculum Content of Physics	SD f(%)	D f(%)	SHA f(%)	A f(%)	SA f(%)	M
I feel more involved during Physics lessons	5(6.5)	9(11.7)	16(20.8)	20(26.0)	27(35.1)	2.28
The syllabus content has been adapted to suit my Deafness	10(13.0)	22(28.6)	11(14.3)	23(29.9)	11(14.3)	3.03
Physic content is too wide	10(13.0)	15(19.5)	16(20.8)	20(26.0)	16(20.8)	2.77
I am capable of handling all Physics topics	9(11.7)	14(18.2)	21(27.3)	19(24.7)	14(18.2)	2.80
I have enough background knowledge on science to handle Physics	12(15.6)	20(26.0)	15(19.5)	12(15.6)	12(15.6)	2.74
The Physics syllabus has never changed since I joined form one	52(67.5)	6(7.8)	6(7.8)	11(14.3)	2(2.6)	1.63
Physics terminologies are too difficult for me to understand	14(18.2)	5(6.5)	18(23.4)	27(35.1)	13(16.9)	2.74
All terms in Physics have their signs	11(14.3)	10(13.0)	5(6.5)	7(9.1)	44(57.1)	3.89
Topics learnt in Physics are important for my future	7(9.1)	8(10.4)	9(11.7)	16(20.8)	37(48.1)	2.11
Physics formulas are difficult to understand	20(26.0)	7(9.1)	9(11.7)	26(33.8)	15(19.5)	2.88
My teachers uses KSL in teaching Physics	10(13.0)	8(10.4)	14(18.2)	27(35.1)	18(23.4)	2.54
My teachers uses SEE in teaching Physics	9(11.7)	6(7.8)	7(9.1)	42(54.5)	13(16.9)	2.42
Physics exams are set in English	15(19.5)	18(23.4)	9(11.7)	14(18.2)	21(27.3)	2.89
Physics exams are set in KSL	53(68.8)	4(5.2)	3(3.9)	10(13.0)	7(9.1)	1.72
OVERALL MEAN						2.56

Source: Researcher, (2019)

Key: SD – Strongly Disagree, **D** – Disagree, **SHA** – Somehow Agree, **A** – Agree, **SA** – Strongly Agree, **M** – Mean

The findings on Physics curriculum content suitability for learners with hearing impairment are evident as indicated in Table 6 from the learner's perspective on the same. Majority of the students, 27(35.1%) felt more involved during Physics lessons, even though averagely (M=2.28) on their overall rating on involvement, which is a low rating. Averagely (M=3.03), students indicated that the syllabus content has been adapted to suit their deafness, with majority, 23(29.9%) agreeing with the statement. The Physics content was averagely rated (M=2.77) which is slightly above 2.5, with majority, 20(26.0) supporting this finding. It is also clear from the findings that the students were capable of handling Physics topics as revealed by the rating (M=2.80) even though majority of the students, 21(27.3%) slightly agreed with that. The findings indicate that students had enough background knowledge on science to handle Physics (M=2.74) although majority, 20(26.0%) disagreed, although they were in agreement with the fact that Physics syllabus had never changed since they joined form one (M=1.63), as also indicated by majority, 52(67.5%) who strongly disagreed. Majority, 27(35.1%) of the respondents agreed that Physics terminologies are too difficult for them to understand with a moderate rating (2.74, 1.33) on the same, whereas 44(57.1%) reported that all terms in Physics have their signs with a rating (M=3.89) indicating suitability of the Physics curriculum. There was an overall slight (M=2.11) agreement on importance of topics in Physics with majority 37(48.1%) indicating an strong agreement. However, majority, 24(31.2%) of the students indicated that the Physics workload is too much with a rating (M=2.49) implying affirmation. It was however clear that the Physics formulas were difficult to understand as rated highly (M=2.88) with majority 26(33.8%) supporting the finding. Physics content is written using difficult vocabulary as indicated by majority, 27(35.1%) with a rating (M=2.28) which is though low. The findings indicates that most students, 27(35.1%) agreed that their teachers use KSL in teaching Physics with overall rating (M=2.55), teachers use SEE in teaching Physics by majority, 42(54.5%), with a rating (M=2.42) implying uncertainty in suitability. The findings also revealed that Physics exams are set in English as indicated by majority, 21(27.3%) with a rating (M=2.89) but not in KSL as revealed by majority, 53(68.8%) of the respondents with an overall rating (M=1.72) which is low.

Heads of department felt that the physics curriculum as it was, did not meet their learners needs. This was due to the wide breadth of the syllabus, abstract content and language barrier in the evaluation. They cited use of KSL during instruction and English during evaluation as a challenge to the learners.

"It is difficult to maintain SEE when in class since most of our learners get lost in the structure of English. So we find ourselves switching to KSL to enhance understanding of the concept taught. However, the challenge comes during examinations which have to be set in English.."

They expressed the need to adapt the syllabus to address the needs of the learners with hearing impairment with a focus on its content, breadth and a consensus between the language used in instruction and during examination. Documents analyzed supported their sentiments since they indicated that the termly and yearly targets as planned in the schemes of work were not all met. The syllabus had also not changed for over a decade according to the available documents.

From these findings, it can be noted that most of the rating on suitability of curriculum of Physics content was averagely rated, with factors such as involvement of students during Physics lessons, difficult vocabulary, language used in books and examinations and syllabus adaptation among those scoring low means. As pointed out by the heads of department, there is need for adaptation of the physics curriculum with the needs of the learners at heart (Ergin I, 2012). The findings also indicate that language is a main hindrance in curriculum delivery since the respondents indicated difficulty in understanding the vocabulary used in textbooks and the language used in setting Physics exams. This is in line with (Nyokabi E, 2011) who found out that the language used in books is difficult and content abstract for the Learners with hearing impairment. These results point out the need for teacher involvement including teachers for learners with special needs in designing of curriculum as pointed out by (Kobia L, 2016).

The above findings implied that the Physics curriculum content is not completely suitable for the learners with hearing impairment as indicated by an overall mean of 2.56. A wide syllabus, abstract content, language barrier in accessing written material and influence of KSL poses a challenge to the learner during the evaluation process. Understanding physics content during classwork and questions during examinations becomes difficult to the learner with hearing impairment and as a result low scores are posted by these learners in both internal and national examinations. There is thus the need for adaptation of the physics curriculum for learners with hearing impairment.

Summary of the Findings

The study evaluated the Physics curriculum content suitability using students and teachers perception. Various indications of suitability were gauged using means and standard deviations. The main indicators of curriculum suitability were adoption of the syllabus to suit deafness as revealed by a mean of 3.03, provision of enough background knowledge on science to handle Physics (M=2.74), the scope of Physics content (wide) (M=2.77) and availability of Physics terms signs (M=3.89). However, the least indicators of suitability, dragging the curriculum and making it unsuitable entailed low involvement in Physics lessons (M=2.28), very small change in Physics lessons (M=1.63), little importance of the topics taught in Physics to their future (M=2.11), difficult vocabulary in writing Physics content and setting Physics exams in English (M=2.89) instead of KSL (M=1.72). More extensively, the negative indicators of Physics curriculum suitability outweigh the positive indicators indicated by an overall mean score of 2.56, thus less suitable for the learners with hearing impairment and these indicators are likely to impact negatively students' performance during examinations.

CONCLUSION

A wide syllabus for learners with hearing impairment to cope with and a challenge in the medium of instruction and evaluation showed that the curriculum provided for learners with hearing impairment is not tailored to meet their needs. It also emerged that there is a lack of inclusion of all stakeholders in the designing process of the physics curriculum as indicated by the difficulty level of vocabulary used in written material meant for these learners. This study therefore found that the physics curriculum used was not suitable for learners with hearing impairment in Kenyan secondary schools. As a result, comprehension of the content in the physics curriculum was a challenge for these learners thus posting low scores in Physics exams.

RECOMMENDATIONS

To help in improving the performance in Physics by learners with hearing impairment, this study recommends that the current Physics curriculum be adapted in consideration of the needs of learners with hearing impairment. The adaptation process should involve all stakeholders in the education of these learners. These include curriculum developers (KICD), examination body (KNEC) and teachers of physics in secondary schools for learners with hearing impairment.

Recommendations for further research

The researchers recommended the following for further research;

- There are no studies that have been carried out on influence of curriculum dynamics on performance of H.I learners in other subjects in secondary schools. In this regard, further studies should be carried out on other subjects in secondary schools for H.I learners.

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