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Challenges facing the implementation of Chemistry and Physics as separate and stand-alone subjects in the revised Secondary School curriculum in Malawi: A Case Study of Blantyre District

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ABSTRACT
It is impossible to overestimate the importance of chemistry and physics to society, but in Malawi, secondary schools do not adequately teach these subjects. The purpose of this study is to investigate the obstacles to the efficient teaching of physics and chemistry and to suggest ways to improve their application. Using Cornbleth's framework for curricular implementation as a guide, the study looks into the challenges instructors in these areas confront. The qualitative case study, which took place in two secondary schools in Malawi's Blantyre District, involved 28 participants which were two head teachers, three chemistry teachers, three physics teachers, and twenty students. Data was collected through classroom observations in addition to interviews. The results show that there are a number of issues, such as a lack of certified teachers, inadequate resources and labs, a dearth of textbooks, inadequate teacher orientation, poor teaching and evaluation techniques, and a lack of supervision. To improve Chemistry and Physics education in secondary schools, recommendations include hiring more trained instructors, constructing well-equipped laboratories, and enhancing teacher preparation and oversight.

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INTRODUCTION

All citizens can fulfill their potential, contribute to the growth of their country, and actively engage in a variety of activities connected to that country's development through education. Malawi's education sector envisions itself as a force for industrial progress, socioeconomic development, and the empowerment of the voiceless, weak, and impoverished (Ministry of Education, 2008). Malawians need access to high-quality, timely education, and that is the government of Malawi's mission. Education in Malawi is therefore aimed at equipping students with relevant knowledge, skills, attitudes, and values necessary for self-advancement as well as socio-economic development of the nation (Ministry of Education, 2008).

Most people agree that the Malawian government's objective and goal of giving its citizens access to high-quality, pertinent education cannot be fulfilled by elementary education alone. According to the National Education Sector Plan (NESP) of 2008–2017, "basic education can never be taken as a complete transformer of our society when the world at large is becoming more sophisticated and complex in an evolving and changing world of education." To enable Malawians to navigate the intricate and complicated socioeconomic and

political environment of the global village to which Malawi belongs, secondary education is therefore essential since it imparts new knowledge, skills, and attitudes (Ministry of Education, 2008). In light of the significance of secondary education, the Malawian government, together with the Ministry of Education, launched a review of the secondary school curriculum and assessment in 2012. The review was subsequently implemented in junior classes in 2015 and in senior classes in 2017. To better meet the goals of Malawian society's inhabitants, the secondary school curriculum was overhauled. The Malawian government redesigned the secondary school curriculum, among many other reasons, primarily to make it contribute to the advancement of science and technology in the nation. This was achieved by separating standing-alone chemistry and physics from the previous curriculum's Physical Science subject, which combined the two disciplines. The introduction of Chemistry and Physics as separate and stand-alone subjects in the revised secondary school curriculum constitutes a problem to be investigated. The problem is that the preceding curriculum was offering Physical-Science as an integration of Chemistry and Physics. Some of the apparent reasons for an integrated Chemistry and Physics in the previous curriculum in one subject of Physical-Science were the lack of human and material teaching and learning resources for teaching Chemistry and Physics as separate and stand-alone subjects, lack of qualified teachers for Chemistry and Physics as well as lack of Science laboratories and chemicals for teaching Chemistry and Physics practical lessons, especially in the Community Day Secondary schools (Ministry of Education, 2008). Although the Ministry of Education is fully aware of these challenges that faced the implementation of Physical Science in the previous curriculum, it has nevertheless introduced Chemistry and Physics as separate and stand-alone subjects in the revised secondary school curriculum, despite the apparent challenges of lack of human and material teaching and learning resources for teaching Physical Science in the previous curriculum. This study was therefore conceived to explore the challenges facing the implementation of Chemistry and Physics as separate and stand-alone subjects based on the knowledge that the integrated Physical Science subject faced enormous challenges in its implementation in the previous curriculum.

PROBLEM STATEMENT

The implementation phase of a curriculum is thought to be the most crucial step in the curriculum development cycle because, regardless of how carefully a curriculum for any subject is planned and designed, all the time and money invested in the process could be lost if the implementation phase of the curriculum receives insufficient attention (Onyeachu, 2008). To ensure an effective implementation of the curriculum, Cheplogoi (2014) states that there are a number of elements that need to be considered that affect curriculum implementation at the school level. Having enough teachers with the necessary qualifications to deliver the curriculum and having adequate teaching and learning resources are two of these key components. According to Muchangi (2010), updating an old curriculum also necessitates buying new textbooks and other teaching resources for schools and parents. According to Cheplogoi (2014), a deficiency of professionally trained and competent individuals, particularly instructors, can hinder the successful execution of a program. According to Murava (2017), since they take on and carry out the concepts and goals of the curriculum designers, teachers are the most crucial human resource in the implementation of the curriculum. For the new curriculum to be implemented successfully, there must be an adequate number of qualified teachers. According to Cheplogoi (2014), one other significant aspect influencing the implementation of a curriculum is the absence of ongoing moral and financial support for the process.

However, when curriculum changes are made, the Ministry of Education does not make sure that the elements that affect the curriculum's effective implementation are minimised before the curriculum is implemented at the classroom level (Muchangi, 2010) and (Sabola, 2018). For instance, Muchangi (2010) claims that the Ministry of Education fails to guarantee that instructors receive sufficient training on curriculum modifications before they are put into effect and that schools receive sufficient assistance to purchase the necessary textbooks. Muchangi (2010) states that parents are in charge of buying textbooks for their children

to comply with the new curriculum. According to Muchangi (2010), the practice of abdicating responsibility for the purchase of textbooks for students following the new curriculum has an impact on the curriculum's implementation because, in most cases, parents find the cost of the required textbooks for the new curriculum to be too high and prioritise their children's basic needs before considering buying textbooks for them.

The above-mentioned challenges associated with the implementation of every new curriculum as identified by educationists internationally require that schools adopt effective coping strategies to manage curriculum changes in a way that will not compromise the effective implementation of a new curriculum to improve the quality of education. Research on the investigation of the challenges facing the implementation of Chemistry and Physics as separate and stand-alone subjects in the revised secondary school curriculum is anecdotal. It is against this knowledge gap that this study was conceived to unearth the challenges facing the implementation of these subjects in the new secondary school curriculum in Malawi.

Research Questions

This study was guided by the following primary research question:

What are the challenges facing the implementation of Chemistry and Physics in the new secondary school curriculum in Malawi?

Sub-Questions

The following research sub-questions were asked to help answer the main research question:

1. *What are the reasons for the challenges faced by the schools in the implementation of Chemistry and Physics as separate and stand-alone subjects in the new curriculum?*
2. *How can the challenges faced by the schools be overcome to improve the implementation of Chemistry and Physics in the new secondary school curriculum?*

THEORETICAL FRAMEWORK

The study embraced Cornbleth's (1990) theory of curriculum implementation and the variables that either facilitate or hinder curriculum implementation. An effective curriculum implementation, according to Cornbleth (1990), necessitates that students gain the intended or planned experiences, information, skills, concepts, values, and attitudes. But the application of curricula does not happen in a vacuum. A curriculum can only be successfully applied in supportive environments. When problematic elements of the educational context are found and fixed, curriculum implementation will improve. Cornbleth (1990) distinguished between two categories of settings that will affect how a curriculum is implemented. These environments are "structural and social." The arrangement of the school and each classroom is referred to as the structural context. According to Cornbleth (1990), school leaders, or head teachers and principals, play a crucial role in the structural context of the school's organisation and can either help or impede the curriculum's successful implementation.

The instructor has a crucial role in the structural setting of the classroom, helping or impeding the curriculum's proper implementation. On the other hand, the social context primarily relates to the educational setting in which a curriculum is put into practice. The social context of the curriculum's implementation includes the social, political, economic, and demographic circumstances. Furthermore, the social context will include the priorities and desires of various groups of individuals who are involved in the educational activities of a particular school (Cornbleth, 1990). Cornbleth (1990) defined the students as the important role actors who will either help or hinder the implementation of a curriculum within this social framework of the educational environment. Because they are from the community, students take on roles in the social context of the school setting as a whole (Cornbleth, 1990). From their homes or communities, they contribute strengths and limitations to their learning environment. Thus, one of the main determinants of a learner's success in school is their home background, specifically the social conditions of the communities from which they originate.

Another important component of the social backdrop of the school environment that either helps or hinders the successful implementation of a curriculum is the national ideology and philosophy of the governing body.

The national ideology and governing philosophy of the time have a significant impact on the educational system. To properly teach science courses, schools need to have access to materials such textbooks, chalk, charts, and, for Chemistry and Physics, laboratories, lab equipment, and other science-related supplies. The classroom experience is threatened when these resources aren't available for teaching and learning. The availability of these resources in schools would depend on the government's financial situation (Cornbleth, 1990). For instance, the lack of resources, such as textbooks, severely impacted and tarnished Malawi's previous senior secondary school curriculum and its new curriculum (Ministry of Education, 2008). Therefore, the purpose of this study was to explore the structural and social contextual elements that impact the introduction of chemistry and physics as independent, stand-alone topics in Malawi's new secondary school curriculum (Cornbleth, 1990). The knowledge of these factors may help curriculum implementers to utilize the enhancing aspects in implementing the curriculum subjects.

LITERATURE REVIEW

A literature review is an extensive and critical assessment of earlier studies. It is an overview and synopsis of a specific field of study that enables readers to understand the motivation for your pursuit of that particular field of study (Arshed, 2015). This study concentrated on the difficulties in implementing Chemistry and Physics in the new secondary school curriculum in Malawi's community day secondary schools. As a result, the majority of the literature examined national and international research on the definition of curriculum implementation and the variables influencing the adoption of a new curriculum, particularly in the area of science topics.

According to Fullan (1992), curriculum implementation is the act of putting the curriculum into practice in the classroom so that students can learn it. Curriculum implementation normally happens in two stages, namely macro and micro implementation. Macro implementation is when the official curriculum is introduced to teachers by orientating them to the curriculum. On the other hand, micro implementation is when the teachers use the curriculum at the lesson delivery level in the classroom where the official curriculum becomes the non-official curriculum as the teachers use it in the classroom as they make some adaptations to it to suit their students' characteristics (Fullan, 1992). A curriculum's ability to be implemented effectively depends on many different elements. Some of the key factors are, firstly, teachers' lack of clarity of the curriculum. According to Pratt (2005), the greatest difficulty in the implementation of a curriculum arises when the implementers cannot even identify the main goals for implementing the new curriculum. According to Pratt (2005), because of the choices they make on the subjects they teach and how best to deliver them to the students, teachers act as gatekeepers for the curriculum. In this regard, Pratt (2005) contends that government policymakers ought to ensure that teachers and other important participants in curriculum implementation are fully informed about the curriculum review procedures, including the reasoning behind the reviews, to ensure that they are ready to put these innovations into practice. On the other hand, according to Pratt (2005), learners must be informed of the relevance of the subject matter in the curriculum so that they are also motivated to learn the subjects of the new curriculum.

The absence of facilities and resources for teaching and learning is the second element influencing the introduction of subjects in a new curriculum. Ziganyu (2010) asserts that inadequate infrastructure, facilities, and instructional resources have an impact on how well curricula are implemented. Ziganyu (2010) states that although physics and chemistry practicals can be completed in the classroom, laboratories are still the best places to conduct scientific investigations. This is due to the facility's unique layout and availability of the necessary equipment for teaching physics and chemistry. Zigaru (2010) claims that the majority of schools have made an effort to establish a laboratory because they understand how important it is to the teaching and learning of science topics. However, Zigaru (2010) states that for the scientific lab to effectively fulfill its

intended function, it must have the necessary amenities and be built with the suggested layout. For example, the lab needs a steady power source, adequate furniture, adequate air, and a water supply.

According to Zigaru (2010), the laboratory needs to include enough chemicals and other teaching supplies, including safety equipment, in addition to the basic facilities needed for the successful application of chemistry and physics. In agreement with Zigaru (2010), Pratt (2005) contends that instructional materials serve as the center of learning and that a dearth of these resources has an impact on how well subjects are taught across a curriculum. In a similar vein, Gatana (2011) concurs with Pratt (2005) and Zigaru (2010) regarding the significance of having access to instructional resources for the efficient execution of curriculum themes. Gatana (2011) asserts that inadequate chemical supplies and equipment for Physics and Chemistry contribute to students' poor performance in these courses. In a similar vein, Oyelana (2015) blames the inadequate availability of pertinent textbooks, chemicals, safety kits, and equipment for the poor execution of scientific curricula in schools. Oyelana (2015) asserts that science instructors hold a special place in the classroom. They typically have their own labs and specific chambers, and in some nations, they might have technical support. Occasionally, they might also wear protective gear and wear specialised clothes.

According to Oyelana (2015), teaching science involves teaching students difficult practical skills, frequently involving health and safety concerns that are very different from what other subject matter teachers do. In a similar vein, Oyelana (2015) blames the inadequate availability of pertinent textbooks, chemicals, safety kits, and equipment for the poor execution of scientific curricula in schools. Oyelana (2015) asserts that science instructors hold a special place in the classroom. They typically have their own labs and specific chambers, and in some nations, they might have technical support. Occasionally, they might also wear protective gear and wear specialised clothes. According to Oyelana (2015), teaching science involves teaching students difficult practical skills, frequently involving health and safety concerns that are very different from what other subject matter teachers do. Oyelana (2015) goes on to say that although students use powerful acids and other chemicals in science class, which are hazardous to their health, they typically do so without enough first aid supplies, which has an impact on how well chemistry and physics are taught.

To guarantee that Chemistry and Physics are implemented effectively, in addition to teaching and learning materials, there must be a sufficient and qualified human resource pool that includes instructors and teachers as well as laboratory technicians who can offer their expertise during hands-on lessons. Cheporir (2014) states that to administer the science curriculum, teachers must possess the requisite knowledge, abilities, and competencies. According to Cheporir (2014), science instructors should consequently possess a strong command of the subject matter. This will allow them to help students understand the abstract nature of the subject by assisting them in making connections between what they learn in the classroom and real-world scenarios. This aids students in appreciating the material and realising its significance. Many countries are experiencing a scarcity of science teachers, especially those with a background in science, according to literature on the teaching of science topics. For instance, Moor et al. (2006) discovered that just 25% of science teachers in England have a degree in chemistry, and only 19% hold a degree in physics, in their extensive assessment of science instruction in the country. This indicates that lecturers of Science courses were not up to par. This had an impact on how science courses were taught in England. According to the study, Moor et al. (2006) suggested giving unqualified Science instructors in-service trainings to help them develop the content knowledge and teaching techniques they need to effectively teach their subjects. Moor et al. (2006) and Robbins, Francis, and Elliot (2003) concur that in-service trainings are crucial for providing teachers with the knowledge and abilities they need to teach effectively.

The employment of non-science-promoting teaching strategies by teachers is another obstacle impeding the adoption of science subjects, in addition to the shortage of trained teachers. According to Millar and Osborne (1998), science education employs particular methodologies, such as projects and experiments. Students start to attain levels of work that they were previously unable to achieve when they are encouraged

to conduct experiments in the sciences in a more exploratory manner (Millar and Osborne, 1998). Additionally, Millar and Osborne (1998) contend that science projects and experiments enable students to see the practical aspects of science and develop their ability to apply it in real-world contexts. However, most schools find it difficult to secure the funding necessary to support projects and experiments. The use of continuous assessment is another significant factor that influences the effective teaching and learning of science subjects, in addition to the use of appropriate approaches like projects and experiments. Gipps (2010) asserts that continuous assessment, also known as assessment for learning, enhances science instruction by assisting teachers in identifying areas in which students struggle. This allows teachers to design lessons that will significantly enhance science instruction.

According to Gipp's (2010) study on the caliber of science instruction, the majority of schools assessed students in science using a summative approach that favoured written exams over projects and practical work. This approach was found to have no positive effects on students' acquisition of science knowledge. School-based supervision is another element that contributes to the successful implementation of a curriculum, in addition to the use of appropriate teaching and learning strategies and continuous assessment techniques, which are some of the factors that contribute to the effective implementation of the Science subject. Daramola (2016) asserts that school managers, who oversee the operations of a school, must make impromptu inspections of teachers' lesson plans and notes in addition to seeing them teach in the classroom to guarantee the successful implementation of a curriculum. According to Daramora (2004), a curriculum's implementation process needs to be carefully examined to guarantee that it is being implemented effectively. This increases the curriculum's implementation effectiveness.

METHODOLOGY

This study used a case study methodology and a qualitative technique to research. A case study design can facilitate in-depth analysis and explain specific events (Creswell, 2009). Case studies provide a distinctive viewpoint on a specific person or group (Denscombe, 2003). Two secondary schools in the Blantyre district hosted the study's participants. There were two secondary schools: one in an urban area and the other in a rural one. Purposeful sampling was employed in the study for the participating schools. The schools sampled were those which are offering Physics and Chemistry as stand-alone subjects.

There were twenty-eight participants in all—three Chemistry instructors, three Physics teachers, two Headteachers, and twenty students. Students participated in the study because, depending on their social, economic, and intellectual traits, they are both the curriculum's consumers and important role actors in its implementation, which can make a difference in the program's success or failure. Eleven male students and nine female students made up the twenty participants in the study. All of the participants in this study are students who take both chemistry and physics courses, suggesting that they attended both classes. Since head teachers are the primary supervisors of curriculum implementation at the school level, they play a crucial role in guaranteeing the efficacy of the implementation of new curricula. For this reason, head teachers were included as study participants. The two head instructors who participated in the study were both male and had 24 and 36 years of combined teaching experience. Five of the six teachers who participated in the study were men, and one was a woman. They had five to twelve years of experience as teachers.

Three different techniques were employed to gather data for this investigation. They included document reviews, in-person semi-structured interviews, and instructional observations in classrooms (Creswell, 2009). The documents reviewed were the Physics and Chemistry Syllabuses, teachers' lesson plans and Schemes of work. The Syllabuses were reviewed in order to get familiarized with the content or the subject matter which the students were taught. The Lesson Plans and the Schemes of Work were reviewed in order to explore the challenges which the teachers indicated in their teaching records that the students were facing in the learning of the subject. Semi-structured interviews were conducted in order to obtained in-depth information from the

participants of the study about the challenges facing the teaching and learning of the subject and their root causes. The recommendations for resolving the challenges were also gathered through the semi-structured interviews. Classroom Instructional observation was conducted in order to provide methodological triangulation of data so that the data obtained from the in-person semi-structured interviews could be confirmed through the lesson observations. The three approaches worked well together to give the study methodological triangulation (Creswell, 2009). Cross-checking the reliability of the study's data was made easier by the use of methodological triangulation. The main method used to investigate the "intended" implementation of Chemistry and Physics in the revised curriculum in schools was the examination of official documents. This included content, teaching and assessment strategies, and resources that the Ministry of Education recommended be used by Chemistry and Physics teachers in the classroom. The "Syllabi" for physics and chemistry were the primary official documents examined in the research. In addition to official records, "documentary sources" were examined to learn more about the "intended" implementation of the chemistry and physics courses in the updated secondary school curriculum. The "documentary sources" that were examined for this study comprised instructional plans, work plans, and work schemes. Thematic analysis was used to analyse the study's findings. This technique of data analysis is defined by Creswell (2009) as a means of categorizing data based on themes, concepts, or comparable characteristics.

FINDINGS AND DISCUSSION

The purpose of this study was to look into the difficulties in teaching physics and chemistry separately and independently. Data analysis led to the following key themes: the shortage of Chemistry and Physics teachers, ineffective orientation training for the teaching of Chemistry and Physics as separate and stand-alone subjects in the new curriculum, insufficient Science laboratories, insufficient Chemistry and Physics teaching and learning materials, and ineffective school-based supervision of the teaching of Chemistry and Physics of the revised secondary school curriculum. These key findings are presented and discussed in detail below:

Shortage of qualified Chemistry and Physics teachers

The findings of this study indicate that there is a deficiency of competent educators teaching Chemistry and Physics in the two participating schools. For example, the findings show that there were two qualified teachers only for Chemistry and Physics at one of the two schools and four qualified teachers for Chemistry and Physics at the other school. The findings further revealed that there was a shortfall of one Chemistry teacher and one Physics teacher at both the two schools involved in this study according to the schools' official establishment requirement of Chemistry and Physics teachers.

Ineffective orientation training of Chemistry and Physics teachers to the new curriculum

This study revealed that there were insufficient numbers of Chemistry and Physics teachers who were oriented to the new curriculum, rendering the orientation training ineffective for the implementation of Chemistry and Physics as separate and stand-alone subjects in the new curriculum. For instance, the study's data showed that, at one school, all of the physics teachers were not orientated to the new curriculum's teaching, while only one chemistry teacher attended the orientation. In the case of school the other school, out of four science teachers, only two teachers attended the orientation training of which one was a Chemistry teacher and the other one was a Physics teacher. The data of the study also revealed that the teachers were trained at school level by the headteachers who attended the national training and who happen not to have a Science teaching background themselves. The possible challenge of the school-based training that some teachers involved in this study attended was the possibility of the teachers receiving diluted information as the information they received was not first-hand information. Cascade models of training, like the one used to prepare chemistry and physics teachers for the introduction of the new secondary school curriculum, have been criticised in literature. Rembe (2006), for instance, contends that the cascade model of training has been

criticised for diluting material and is inefficient in enabling instructors to effectively teach a new curriculum. Rembe goes on to say that the cascade training approach for teachers is inadequate since most teachers rely on the abilities and qualifications of a small number of people who are selected and trained to train others. These orientations fail to provide teachers with the necessary skills and inadequately transmit material. He goes on to say that it is challenging to assess the efficacy of the cascade model of training and that it dilutes information when it is distributed to teachers. Thus, it is reasonable to assume that one major issue impeding the successful integration of Chemistry and Physics in the new curriculum is instructors' inadequate acclimatization to the curriculum as a result of the training model's cascade effect.

Shortage of Chemistry and Physics laboratories in the schools

The study's conclusions also showed that one of the schools examined didn't have a chemistry or physics lab, so its instructors conducted their experiments in a classroom. The Headteacher of one of the schools indicated that they have been promised by the Ministry of Education that they will construct Chemistry and Physics laboratories at the schools but the construction has not commenced yet. According to the report, there is an old laboratory at the other school that was formerly used for physical science experiments. This laboratory however is not sufficient taking into consideration the large number of learners at the school. Therefore, the ineffective implementation of chemistry and physics in Malawi's new secondary school curriculum is being badly impacted by the lack of science laboratories.

Inadequate apparatus and chemicals for teaching Chemistry and Physics

The study's data showed that the participating schools lacked the necessary equipment and supplies to teach physics and chemistry. For instance, observations made in the classroom revealed that the equipment and materials needed for the experiments were insufficient for the students. In one of the study's participating schools, for instance, the teacher was seen using "teaspoons" rather than spatulas to transfer chemicals from a beaker into test tubes. During a post-lesson observation interview, the Chemistry instructor at one of the study's participating schools mentioned that,

"Spoons were used in place of spatulas because the school had not purchased spatulas because it does not have enough funds to support the buying of laboratory apparatus since they are expensive".

Similarly, a Physics teacher at the other school involved in the study complained that,

"We have learners learning Chemistry and Physics at this school but the number of apparatus available does not match the large number of the learners.

The study's conclusion about chemicals was that there weren't enough of them in the participating schools for practical chemistry and physics classes. For example, a Chemistry teacher at one of the schools reported that since the opening of the term (semester), he had managed to have only one Chemistry experiment on 'endothermic and exothermic reaction'. This complaint concurred with the comment of one of the Chemistry and Physics learners who similarly complained that,

"In most examinations, we do not have a practical test in Chemistry and Physics because the school is not willing to buy chemicals and other needed materials".

These remarks from educators and students demonstrate that one of the main obstacles to the successful implementation of chemistry and physics in Malawi's new secondary school curriculum is the lack of chemicals, apparatus, and equipment in secondary schools.

Shortage of Chemistry and Physical Science textbooks

The study's conclusions showed that there were insufficient textbooks and syllabuses available for teaching chemistry and physics in the schools that took part in the investigation. For example, one of the Chemistry teachers complained that his school was not supplied with enough textbooks for the new curriculum and as such, the school was using old textbooks to teach the new content in the new Physics and Chemistry syllabus. The teacher complained that,

"We are using old books to teach the new Physics and Chemistry syllabus which becomes a challenge to teach effectively."

This comment concurs with a comment from one of the learners who similarly complained that,

"We are not performing well in Physics and Chemistry because there are no enough books in the library".

Poor teaching methods for Chemistry and Physics

The Ministry of Education's Syllabi for Chemistry and Physics (2012) advocates the use of participatory learner-centred methods as the most effective method of teaching Chemistry and Physics in secondary school classrooms. Nonetheless, the research indicated that teacher-centered lecture techniques were primarily employed by physics and chemistry instructors to deliver their lessons. In place of utilising a hands-on exercise where students would utilise simple "Mellor" and other reflecting surfaces to model reflection, a Physics instructor who was witnessed teaching the topic "reflection" utilised the lecture approach in the classroom. The research findings also indicated that project work is not a common teaching strategy for chemistry and physics courses. One of the Chemistry teachers participating in the survey expressed dissatisfaction when asked why the teachers do not employ practical techniques to teach the courses. He said,

"The new syllabus has some projects that are hard to perform, for instance, there is a project on extraction of Sulphur in Chemistry that needs heavy machinery and this is expensive considering the country's economy".

A Physics instructor who was involved in the study also expressed dissatisfaction with the new curriculum, stating that there are more practical lessons required than there is time allotted for teaching the subject on the school schedule. Thus the teacher remarked that,

"It is difficult to teach all practical lessons in the new Physics curriculum because the workload is heavy compared to the amount of teaching time for the subject on the school time table and as a result, we employ the lecture method as a convenient method for teaching the subject to be in line with time".

These comments from the instructors demonstrate that one of the issues impeding the successful implementation of the curricular subjects is the overabundance of Chemistry and Physics courses.

Poor assessment methods for Chemistry and Physics

Formative assessment may be the most useful assessment technique among the several instructional strategies used to enhance science teaching and learning. Timely feedback to both the instructor and the students is essential to good scientific instruction because it allows the teacher to modify the curriculum to better meet the requirements of the students and the students to improve their performance (Okono, 2015). Therefore, the goal of the study was to look into the ways that physics and chemistry teachers use to evaluate their students' performance in these subjects in the secondary schools that took part in the research. The study's data showed that summative assessment techniques are mostly used by all of the participating teachers. For instance, every educator who took part in the study clarified that they evaluate students in their disciplines using midterm and end-of-term exams, which are also semester-long assessments. When asked about why they predominantly use summative assessment, one of the teachers explained that,

"Assessing learners regularly is an expensive task as there is always a need to prepare assessment tasks continuously, buying printing materials and materials for practical examination tasks for Chemistry and as such, we just asses learners using mid-term and end-of-term tests to reduce expenses".

Similarly, another teacher explained that the teachers do not have enough time to conduct regular assessments because of extra work overload which Chemistry and Physics teachers have.

Ineffective supervision of Chemistry and Physics implementation

The purpose of this study was to determine if school-based supervision for the implementation of curriculum subjects is carried out in the schools under investigation. According to Yeager and Wilson (2017), school-based supervision plays a crucial role in curriculum implementation by providing teachers with guidance and information on all aspects of the program. This argument is supported by the literature.

In their schools, head teachers are considered instructional leaders and curriculum developers. They must therefore supervise how a curriculum is being implemented at the school. To get feedback on how to enhance their instruction in Chemistry and Physics, teachers were questioned about whether they were receiving supervision when teaching these courses. The study revealed that Chemistry and Physics teachers are not being supervised by their head teachers in the classroom delivery of their lessons and are being given feedback by the supervisors on the possible corrective measures that they need to put in place to ensure effective implementation of the subjects. The remarks by the teachers that they are not being supervised in the teaching of the subjects were confirmed by the head teachers of the schools involved in this study. For example, one of the head teachers involved in the study remarked that,

"We wait for the Ministry of Education officials to visit the schools for supervision, but the Ministry of Education had only visited the school once for supervision from the time we started teaching the new curriculum and we are still waiting for feedback from the Ministry of Education about our progress on the teaching of this curriculum".

The head teachers' comments demonstrate that there is no school-based oversight of the new curriculum's implementation. A new curriculum's implementation could be badly impacted by a lack of school-based oversight.

DISCUSSION AND CONCLUSION

The results of this study indicate that there is a dearth of trained chemistry and physics teachers in the schools examined. The efficient teaching of physics and chemistry is being significantly impacted by the lack of skilled teachers in these fields. Orado (2009) asserts that competent instructors of physics and chemistry have a thorough comprehension of the ideas about their subjects. On the other hand, poorly qualified chemistry and physics professors may have a detrimental impact on how well the courses are taught. This is a result of insufficient material and pedagogical knowledge held by teachers who lack the necessary qualifications to teach the courses efficiently. In a similar vein, Okono (2015) contends that a teacher's efficiency in getting ready for each class and transitioning between them each day is influenced by the number of lessons they deliver. This is because teachers have a variety of other responsibilities in addition to teaching that must be completed on time to effectively support high-quality instruction and learning. These include managing, lesson planning, assessment of student learning, assignment marking, and resource improvisation, among many other duties. According to Okono (2015), teachers with a high lesson load may choose to do fewer experiments than their counterparts with fewer lessons, which could have a detrimental effect on the successful implementation of a curriculum. As a result, these have a negative impact on how the chemistry and physics curricula are implemented in secondary schools.

The results of this study also demonstrate that instructors at the participating secondary schools were not adequately trained in the new chemistry and physics curriculum to ensure its successful implementation. Additionally, this is having a negative impact on how physics and chemistry are implemented. Muse (2014) argues that in-service orientation trainings play a critical role in the successful implementation of curricula because they provide instructors with the necessary information and abilities to carry out curriculum implementation successfully. The results of this study showed that because of the difficulties associated with the cascade model of training—which propagates erroneous and diluted information—teachers who received their training at the school level appeared to have acquired diluted knowledge from their peers (Rembe, 2006). This investigation also showed that there were no chemistry or physics labs available for conducting experiments in these subjects at the schools that were part of the study. This is making it more difficult to apply physics and chemistry effectively. Nejd et al. (2014) state that because laboratories are necessary for conducting experiments, which support the effective teaching and learning of Chemistry and Physics as practical disciplines, they aid in the effective teaching and learning of science topics. The study found that the schools

involved in the study lacked adequate chemicals and equipment, which prevented the students from receiving enough practical lessons—the most effective method for teaching and learning Chemistry and Physics—and also lacked laboratories for conducting experiments in these subjects.

The study's conclusions also showed that a lack of textbooks is having a detrimental effect on physics and chemistry instruction. Gatana (2011) asserts that inadequate textbooks are a factor in students' poor performance in curriculum topics. In a similar vein, Oyelana (2015) blames the inadequate availability of pertinent textbooks and other teaching and learning tools for the inefficient application of science curricula. This implies that a significant obstacle to the successful adoption of Chemistry and Physics in the new curriculum in the secondary schools participating in this study is the lack of textbooks.

This study also discovered that inadequate chemistry and physics instruction by instructors is having a detrimental effect on the courses being taught. According to this survey, most lectures are delivered by professors utilising teacher-centered strategies. Okono (2015) asserts that the use of experimentation pedagogical approaches is necessary for good Chemistry instruction. This strategy helps the instructor deliver instruction more effectively and enhances the student's understanding of scientific topics. The method also helps students develop their scientific process abilities and ascertain scientific facts, concepts, and principles. This data suggests that the teaching methods employed by physics and chemistry instructors have a detrimental impact on the efficient execution of these curricular courses in the study's participating secondary schools. The study also discovered that the teaching of the curriculum disciplines is being adversely affected by inefficient school-based supervision of the teaching of physics and chemistry. Daramola (2016) states that to provide teachers with feedback, including corrective measures for their teaching practices to improve the teaching of the subjects, government agencies in charge of overseeing the implementation of curricula should conduct impromptu checks on teachers' lesson plans and observe them while they teach in the classroom. Based on these results, the study suggests that to guarantee that a satisfactory teacher-to-student ratio is attained, the Ministry of Education should, first and foremost, hire additional chemistry and physics teachers for secondary schools. Second, for teachers to conduct experiments and practicals for successful Chemistry and Physics teaching and learning, the Ministry of Education must build sufficient Chemistry and Physics laboratories in all secondary schools.

CONFLICTS OF INTEREST

The authors are declaring no conflicts of interest concerning the work. All the data are protected and no further use of anywhere for any study. The authors declare no additional conflicts with this article.

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