

A Critical Analysis on Form Four Leavers' Preparedness in Science Pedagogy in Secondary Schools in Kenya

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Abstract

In Kenyan secondary schools it has become the norm to hire form four leavers who have registered a good academic performance to be part of the teaching faculty due to teacher shortages experienced countrywide. However, most schools continue to register low grades or insignificant improvement in academic performance in sciences. It is possible that to some extent the incorporation of form four leavers in teaching sciences is ineffective. Hence it is necessary to look into form four leavers' preparedness in science pedagogy with respect to mastery of content, lesson planning, lesson delivery, assessment and evaluation. Through a qualitative research methodology and critical analysis design, the study investigated form four leavers' preparedness in science pedagogy. The study found out that most form four leavers are inadequately prepared or not prepared at all for their roles and responsibilities as science teachers hence the study outlines some recommendations.

Key words: *Form four leavers' preparedness,*

science pedagogy, critical analysis

1.0 Introduction

In 2009, an education task force attributed the drop in KCSE science performance to shortages of science teachers such that teachers in the field of humanities were compelled to teach these subjects. Up to now, secondary schools continue to experience teacher shortages and as a result most head teachers find it convenient to involve form four leavers as science teachers. Furthermore, these form four leavers act as role models and to some extent peer counsellors; which means they influence students' perceptions and attitudes on school activities.

Accordingly, form four leavers who are selected to be science teachers have an impact on students' participation and academic performance in sciences. Most of these form four leavers who lack teaching experience and teacher training

nonetheless take on their roles as science teachers to prepare students for KCSE.

However, in most secondary schools form four leavers are not guided nor monitored as they go about their duties and responsibilities as science teachers. This means that form four leavers are inadequately prepared for conducting lessons and as a result their delivery of science content is ineffectual and sub-standard. In addition, they are unaware of how to carry out assessment and evaluation that would otherwise enlighten them on certain aspects that would require alterations to make them more effective science teachers.

2.0 Statement of the Problem

Schools hire and will continue to hire form four leavers as science teachers on the basis of their good performance in KSCE. These form four leavers are expected to positively influence students' attitudes and perceptions in sciences resulting in improved academic performance in sciences. Nevertheless good grades in sciences attained by form four leavers are not translated into good grades for students. Therefore the transition from form four leavers to science teacher needs to be explored to understand why the expected academic outcomes are not forthcoming in sciences. This study involved an analysis into form four leavers' preparedness in science pedagogy with respect to mastery of science content, lesson planning, lesson delivery and assessment and evaluation in sciences.

3.0 Purpose of the study

The aim of this study was to critically analyse form four leavers' preparedness in science pedagogy in

secondary schools in Kenya. This required an in depth investigation into form four leavers' mastery of science content, lesson planning in sciences, lesson delivery in sciences and assessment and evaluation in sciences. From the findings of the study, some recommendations are outlined for the purpose of contributing to provision of quality science education for secondary school students.

4.0 Research objectives

1. To critically analyse form four leavers' mastery of science content in science pedagogy in secondary schools in Kenya
2. To critically analyse form four leavers' lesson planning in sciences in science pedagogy in secondary schools in Kenya
3. To critically analyse form four leavers' lesson delivery in sciences in science pedagogy in secondary schools in Kenya
4. To critically analyse how form four leavers carry out assessment and evaluation in science pedagogy in secondary schools in Kenya

5.0 Research questions

1. To what extent is form four leavers' mastery of science content in science pedagogy in secondary schools in Kenya?
2. How do form four leavers carry out lesson planning in science pedagogy in secondary schools in Kenya?
3. How do form four leavers carry out lesson delivery in science pedagogy in secondary schools in Kenya?
4. How do form four leavers carry out assessment and evaluation in science pedagogy in secondary schools in Kenya?

6.0 Significance of the study

This critical analysis will be a significant endeavour in better understanding of challenges that form four leavers face when they are given roles and responsibilities as science teachers. This will be beneficial to secondary school heads and qualified teachers because they will be in a position to adjust their approach in incorporating form four leavers as part of the science teaching faculty because the study will outline some recommendations. These recommendations when effected will in turn improve form four leavers'

science pedagogy leading to better students' attitudes and performance in sciences.

7.0 Literature review

7.1 Form four leavers' mastery of science

content in science pedagogy

Science teachers are expected to have science content knowledge that involves teaching scientific content in form of facts, concepts, principles, theories and laws which students are expected to understand as they form the foundation of scientific knowledge. Teachers' mastery of science content has an impact on the teaching and learning process in sciences (Magnusson et al., 1999, van Driel et al., 1998). Taking into account that form four leavers have registered good academic performance in KCSE science subjects then they have mastery of the science content as per the KCSE science syllabus up to the secondary school level. However, often science teachers refer to advanced science knowledge which they learnt in higher levels of education to enhance students' understanding of science content. Moreover, teachers who have mastery of science content are more likely to effectively prepare and plan their lesson delivery in terms of organising content and using appropriate teaching activities and resources (Synder et al., 1991). Furthermore, these teachers focus on learner centred approaches that play a key role in development of scientific skills and critical thinking among learners. Therefore, form four leavers who have not yet advanced their science knowledge are likely to feel challenged in a science classroom.

For instance, due to limited content knowledge form four leavers are likely experience difficulties in planning their teaching and learning process in a manner that would assist students in conceptually organising and constructing knowledge (Ingersoll, 1999). This is likely to lead to form four leavers opting for more direct instruction as opposed to inquiry based approach in learning sciences. Moreover, these form four leavers are likely to express more misconceptions while teaching. In most cases form four leavers unsatisfactorily respond or do not respond to students' questions that require explanations from advanced scientific knowledge. This also means that lack of science

content knowledge contributes to form four leavers' limited knowledge of their students' misconceptions and challenges in their learning process in sciences (Sadler & Sonnert, 2016).

7.2 Form four leavers' lesson planning in science pedagogy

Lesson planning in sciences is necessary as it is a reflection of a teacher's professional performance. The process of lesson planning involves identifying lesson's objectives guided by the curriculum, teaching and learning activities, teaching and learning aids, reference materials and to ensure that the lesson is taught within a specific timeframe. Moreover lesson planning gives teachers an opportunity to review their subject knowledge with respect to the science content that is meant to be taught. Therefore lesson planning brings about confidence, organisation within a lesson as well as making connections between previous and future lessons (Afande, 2015).

The question as to whether form four leavers plan their lessons is greatly influenced by the practice in a particular school. For instance, currently in some Kenyan secondary schools, science teachers tend not to prepare lesson plans as they consider it time consuming and they may be having a large workload in terms of number of lessons taught. Also, some science teachers who have had years of teaching experience may forego lesson planning as they are feel more confident in their skills and subject knowledge (Synder, et al., 1991). When form four leavers are in such a school setting where science teachers do not take part in preparation of lesson plans, they are probably unaware that lesson planning is a requirement prior to attending a lesson, hence will not prepare a lesson plan. Therefore, it seems the only form of lesson preparation that takes place is whereby form four leavers familiarise themselves with the subject content in one or two textbooks then proceed to the classroom. Undoubtedly lack of lesson planning leads to a less confident and less organised teacher as the form four leaver is not sure of what should be done, how it should be done and when it should be done.

On the other hand, there are a significant number of Kenyan secondary schools that insist on

preparation of lesson plans before lesson attendance. Form four leavers in these schools have to comply hence prepare lesson plans like their counterparts. However due to lack of training or inadequate training by their heads of department or colleague teachers, form four leavers are likely to experience various challenges in lesson planning. Consequently form four leavers' lesson plans will be characterised by poorly stated objectives, selection of inadequate or unavailable teaching and learning aids, ineffective teaching and learning activities as well poor or non-existent connections between prerequisite science knowledge and the content being presented in future lessons. Overall, when a lesson plan is poorly prepared, it negatively affects how a lesson is delivered resulting in ineffective teaching and learning in sciences.

Still, some form four leavers are aware of their lack of training and qualification in teaching therefore they may be more thorough in the process of lesson preparation (Synder, et al., 1991). Thus some form four leavers are likely to put more effort in familiarising themselves with the subject content and spend more time in planning a lesson. Moreover they are likely to seek guidance and assistance from other teachers that are qualified and more experienced in lesson planning. Such an avenue makes it possible for trained teachers to share their lesson plans with form four leavers and even improve on them considering that they have taught a lesson in the past and carried out a lesson assessment.

7.3 Form four leavers' lesson delivery in science pedagogy

Effective lesson delivery in a science classroom involves proper classroom management and use of effective teaching and learning activities and aids. Trained teachers are more likely to have better classroom control compared to untrained teachers (Darling Hammond, 2001; Njenga and Kaburu, 2001). Therefore form four leavers are likely to find difficulties in managing their students which may result in indiscipline incidents. A plausible explanation for this is that students may not see the form four leavers as teachers but as their peers taking into account that it was not so long ago that they were students like them. Thus form four leavers not only find it difficult to have students

accord them respect as authority figures but also in their role as instructors and disciplinarians.

Trained science teachers who have more pedagogical content knowledge make learning to be student-centred whereby they act as facilitators for students' development of science ideas and construction of knowledge (Tweed, 2009). This means that students have greater ownership of their learning process as they are required to respond to questions, question their answers and carry out investigations through research and experimentation. Form four leavers may model behaviour of their former teachers whose selection of teaching and learning aids and activities was learner-centred. On the other hand, untrained teachers like form four leavers are more likely to use teacher-centred approach hence they tell students the content instead of following up on students' prior science knowledge, misconceptions and curiosity (Darling-Hammond, 2000). As trained science teachers appreciate and practise the empirical nature of science through identification of a problem, collection and analysis of data and drawing up of conclusions to generate knowledge, form four leavers use a deductive approach that minimises students' opportunity to develop manipulative and process skills.

For instance, form four leavers may opt to teach theory without using teaching and learning aids such as experiments where necessary. This denies students the opportunity to acquire manipulative skills and process skills: observation, recording, discussion, classification, application, prediction, interpretation that are key in learning science as well as solving problems in everyday life. Nevertheless, when it comes to abstract content trained science teachers are likely to employ a rigid lesson development strategy with the aim of reducing the complexity of the content (Synder, 1990). For example, trained science teachers may use minimal teaching aids or avoid open questions and investigative activities. This controlled approach does lessen the teachers' involvement in lesson preparation and to some extent the quality of lesson delivery which is at the expense of enhancing the students' learning process.

7.4 How form four leavers carry out assessment and evaluation in science pedagogy

According to Boston (2002) assessment and evaluation are key components in the learning process because they create awareness of students' progress and provide an opportunity for identification of challenges that students face in specific areas. As a result the teacher can respond to these aspects by revisiting the content, undertaking a different technique in teaching or focusing on more practice. The author also points out that timely and positive feedback provided to students gives them an avenue to identify their weaknesses and motivates students to learn as they are assured of their teachers' support and guidance. In Kenyan secondary schools, majority of experienced teachers carry out assessment and evaluation for the purpose of improving their teaching after diagnosing students' problems while less experienced teachers carry out assessment and evaluation for the purpose of grading students (Kagete, 2013). Therefore most form four leavers are likely to carry out assessment to grade their students which means that they overlook questioning the quality of their teaching that has a direct influence on students' participation and performance in sciences.

In Kenyan secondary schools, one common form of assessment is written test in form of quizzes, continuous assessment tests and end of term examinations. According to Kagete (2013) majority of science teachers in Kenya have inadequate training in assessment. Undoubtedly most form four leavers lack training in assessment and evaluation which results in the following demerits. When it comes to test constructions form four leavers are likely to produce substandard tests as they have limited knowledge of the table of specification and they may experience challenges in a balanced test for all student abilities. Furthermore, when grading, form four leavers may experience challenges in awarding of marks as per the requirements of a question. Due to the fact that form four leavers are new to the teaching profession, they are likely to be lenient or strict in their allocation of grades ("Grading and testing", 2016). This can lead to students being overconfident or demoralised which affects their learning process. Moreover lack of harmonised grading among teachers is likely to be a barrier in achievement of the learning goals for students in a school.

8.0 Research methodology

The study took on a critical method design that involved analysing of both qualitative and quantitative research. Through this approach the study sought to establish form four leavers' preparedness in science pedagogy in the following areas: mastery of content, lesson planning, lesson delivery and assessment and evaluation in sciences. This study presented a balanced critique of these aspects and went on to propose recommendations for stakeholders to ensure quality performance from form four leavers in their roles and responsibilities as science teachers.

9.0 Recommendations

Form four leavers will continue to be part of schools' faculty acting as science teachers throughout the country therefore the study recommends the following.

- I It is advisable for form four leavers' to read widely and intensively research on topics that they are not confident in or topics that require more advanced knowledge for better understanding of content. Form four leavers can also approach more experienced teachers to assist in their better understanding of content so that they are more sufficiently prepared to convey the content to students.
- II Form four leavers should undergo training as soon as they are appointed to be science teachers. This training should involve imparting skills in lesson planning, lesson delivery and assessment and evaluation in sciences. On lesson delivery, experienced teachers may opt to invite form four leavers to observe them while they teach. This lesson observation gives the form four leavers an opportunity to not only observe classroom management techniques but also, they are equipped on how to effectively deliver science content to students.
- III Form four leavers should be monitored by the subject heads sciences or by the head of science department. Through monitoring the form four leavers are constantly supervised

and guided so as to evaluate and improve their skills in their role as science teachers.

- IV Teachers who work alongside form four leavers should be good role models to them in their work so that form four leavers can emulate their professionalism in science pedagogy.

10.0 Conclusion

It is paramount that Kenyan students are provided with quality science education which involves the selection and application of effective teaching and learning resources. This responsibility greatly depends on the science teacher in the learning process of students in sciences. With Kenya experiencing teacher shortages, form four leavers will continue to be part of the teaching staff. However form four leavers lack teacher training which has negative impact on students' participation and performance in sciences. The study found that most form four leavers have limited mastery of content as they have studied science up to the secondary level which exerts a negative influence on their classroom practice. Moreover form four students face challenges in lesson planning, lesson delivery and assessment and evaluation in sciences. Nevertheless with assistance, training and guidance from qualified and experienced teachers, form four leavers can be more effective in students' learning process in sciences which is likely going to result to better performance in sciences.

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