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Implementation of the Revised Biology Curriculum in Selected Junior Secondary Schools in Namibia

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Abstract

This study focused on the implementation of the updated Biology curriculum in Namibia, particularly the junior secondary (grade 8 - 9) Biology curriculum. The revised Biology curriculum places emphasis on learner-centred instruction, problem-solving approach and critical thinking. However, since its implementation in 2015, teachers reported inconsistencies between the planned Biology curriculum and its implementation. Reported inconsistencies were attributed to a shortage of instructional resources and a lack of motivation. A qualitative study was carried out with nine Biology teachers purposively selected from three rural secondary schools to understand how they implemented the learner-centred curriculum. The participants responded to semi-structured interviews. Results indicated that whilst the updated Biology curriculum had some good intentions, its implementation was limited by challenges of mainly pedagogical and content knowledge amongst teachers and inadequate instructional resources. The results validate previous research and suggest that adequate training and instructional resources should be considered when designing a new curriculum.

Keywords

Challenges, Revised Biology Curriculum, Rural Secondary Schools, Pedagogic and Content Knowledge, Effective Implementation

1. Introduction

Namibia experienced three primary and secondary curriculum upgrades since its independence in 1990 (Ministry of Education, Arts and Culture (MoEAC),

2010). These updates expected teachers to possess pedagogical skills and knowledge to implement the updated curricula effectively (Nangula, 2013; Peters, 2016). According to Loflin (2016), the role of the teacher remains instrumental in the success or failure of the curriculum. In order to ensure that the Namibian society is made up of literate, skilled, articulated and innovative citizens, informed proactive education should be central to vision 2030 (Katjavivi, 2016). This implies that teachers must modify their instructional design in order to challenge students' perceptions (Park, Jang, Chen, & Jung, 2011). While the Ministry frequently dictates the skills covered by the curriculum, a teacher can provide insight into the types of material, activities, and specific skills that should be included (Wallace & Fleit, 2005).

It is in this view that teachers must be active participants in the creation of classroom realities and act based on their own beliefs, attitudes, and perceptions of relevant teaching situations (Tudor, 2001).

1.1. Background to the Study

Namibia introduced a major educational reform in 2014 which was premised on the development and mastery of skills and competencies in learners. This was contrary to the 2010 National Curriculum for Basic Education which was too academic (MoEAC, 2014). The Biology and Physical Sciences have been identified as key in the curriculum and these were earmarked to equip learners with scientific skills to change the economic and technological terrain of Namibia. To ensure this, schools were supposed to make effective use of the new guidelines proposed by the National Institute for Education Development (NIED) in 2015. Some of the key guidelines were as follows: 1) recognize that as information in its various forms becomes more accessible, learners will need to develop higher cognitive skills for analysis, interpretation, and evaluation in order to effectively use information; 2) seek to challenge and motivate learners to reach their full potential and contribute positively to the environment, economy, and society; and 3) recognize that learning includes developing values and attitudes as well as knowledge and skills.

The key guidelines were intended to provide a student-centered learning environment that meets the needs of individual learners through the use of differentiated instructional strategies, as well as to deliver an outcomes-based curriculum of high pedagogical quality. Unlike the traditional didactic teacher-centred teaching approach used in schools prior to the reform, an active and child-centered approach was required to deliver the new curriculum, which focused on developing critical thinking rather than rote learning (MoEAC, 2015).

Since the launch of the new curricula in Namibia in 2015, the implementation of the Biology curriculum, in particular, seems to have been marked by a lot of challenges and controversies. The new curriculum demanded instructional and human resources to ensure that there is a total shift from teacher centred approach characterised by memorization to an inquiry-based teaching approach to

develop the student's scientific knowledge and skills. It seems the Biology teacher has to face an uphill struggle to equip learners with science skills to meet the 21st century. What it means is, that for the ideal teacher to effectively teach, he/she has to be equipped with both pedagogic and content skills. More so, the new competence-based curriculum requires relevant instructional materials to ensure that the learners master the skills. The new curriculum thus seems to have exerted a lot of pressure and demands on both the teacher and schools. The successful implementation of the curriculum could only be realized once these have been established and hence the thrust of this study.

The purpose of this research was to determine how the Biology curriculum was implemented in Namibian rural secondary schools. The findings would greatly assist in the effective implementation of current curricula in Namibia and elsewhere. The findings will also assist curriculum developers and policymakers in the educational system in proposing solutions to challenges affecting curriculum implementation, as well as advising future education curriculum research.

1.2. Statement of the Problem

The current Namibian school curriculum reforms were intended to bring about a learner centred and outcome-based curriculum which is sensitive to the needs and challenges of the country. Science subjects were placed on the centre stage of these reforms. A strategic plan by the MoEAC (2014) emphasized that all learners should develop a lively, questioning, and creative intellect in order to discuss issues rationally, make careful observations and analyses, think scientifically, and solve problems. In a study by Neshila (2018) on Academic Resilience in science subjects amongst junior secondary school learners in Namibia, it is revealed that on average about 45% of learners pass Biology with A-E symbols to proceed to senior secondary and the rest 55% do not qualify to proceed to senior secondary school. According to Ornstein and Hunkins (2012), teachers, as frontline users of the new Biology curriculum, are critical to its successful implementation because teaching is a critical part of curriculum implementation. Against this backdrop, the current study tried to explore how Biology is taught in Onathinge circuit of Namibia and the challenges envisaged as teachers implement the curriculum.

1.3. Research Questions

1) What are the determinant factors that impact the extent to which teachers implement the Biology curriculum?

2) How do Biology teachers' perceptions of resources and materials influence their strategies in teaching the updated curriculum?

3) What support do Biology teachers receive during the implementation of the updated curriculum?

1.4. Literature Review

Education programs and the school curricula are guided and shaped by the as-

pirations of a country which should be expressed through policies. These policies should shape the goals, content and implementation of the curriculum. Ogar and Awhen (2015) view curriculum as planned experiences offered to learners by the school. Similarly, Bruns and Schneider (2016) conceive it as the "sum total of all learning experiences and opportunities that are provided to learners in the context of formal and informal education". Raselimo and Mahao (2015) contend that the clarity of policy expectations influences educators' translation of such arrangements. Namibia developed a competency-based curriculum in order to develop the much-needed human capital base that would ensure Namibia's long-term development (MoEAC, 2015). The Namibia Junior secondary curriculum for Biology set objectives such as:

- Obtaining the necessary Biology skills and attitudes for ensuring personal and social security and overcoming adversity in life through science practice (Liswaniso, 2019).
- To become scientifically tempered, rational, and superstitious-free (Aloovi, 2016).

These objectives imply that the curriculum is aimed at developing scientifically literate citizens who are expected to understand and explain scientific phenomena by grasping the broad integrating ideas of science. The product from such a system is expected to transform the community scientifically. However, the success of these objectives depends on how teachers implement the Biology curriculum through the use of specified resources provided in the curriculum and those found within their immediate environments.

1.5. Implementing the Curriculum

The main guiding research question for this study was: how do the Namibian Biology secondary school teachers implement the revised Biology curriculum? Esu, Enukoha and Umoren (2004) conceptualized the term implementation as a process of putting an agreed plan, decision, proposal or policy into effect. The authors further observed that curriculum implementation includes the provision of organized assistance to teachers in order to ensure that the newly developed curriculum and the most powerful instructional strategies are actually delivered at classroom level. Similarly, Mampuru (2001) believed that curriculum implementation could not take place without the learner. The author sees the learner as the central figure in the curriculum implementation process. As a result, implementation occurs as the learner acquires the desired experiences, knowledge, skills, ideas, and attitudes that will allow the learner to function effectively in society (Aneke et al., 2016; Eya, 2012). In this case, putting the curriculum into action necessitates the involvement of an implementation agent. The teacher, according to Obilo and Saugoleye (2015), is the agent in curriculum implementation. According to the authors, implementation is the process by which a teacher selects and blends the various aspects of knowledge contained in a curriculum document or syllabus into practice. In short, the teacher converts the planned or

officially designed course of study into syllabuses, schemes of work, and lesson plans that are delivered to students. Implementation of the curriculum calls for the teacher's grasp of the curriculum's goals, intentions, content, methodology and evaluation approaches, without which the results of the implemented curriculum will be futile. Fullan (2001) argues that the implementation stage is the most vital stage in curriculum change as it translates what is on paper (official curriculum) into practice. Similarly, curriculum implementation is the most difficult phase of curriculum development (Mampuru, 2001). As a result, curriculum implementation is an important, difficult, and unavoidable stage in curriculum development.

1.6. Teachers' Concerns

Hall and Hard (2016) observed the importance of thoroughly understanding teachers' roles and concerns during curriculum implementation. Similarly, Usman (2011) reported that in most instructional restructurings, the educator's contribution is not only essential, but also required for course implementation to be successful. This implies that teachers should be consulted during the curriculum change planning stage. Gecer and Ozel (2012) identified teachers' lack of knowledge about the change. Teachers appear to have been unaware of the changes they are expected to implement from the start of the implementation stage (Gecer & Ozel, 2012). Budak (2015) advised that if teachers' concerns are taken into account, they will be able to implement the new curriculum with fidelity, and researchers will be able to gain accurate insight into whether the curriculum met its intended objectives, providing a better measure of student performance. As a result, there is a need to comprehend teacher concerns that either support or hinder teachers' faithful implementation of the Namibian Biology curriculum.

1.7. Resources and Facilities

This researcher discovered that meaningful teaching and learning can only occur when adequate resources and facilities are available. This implies that if the MEC provides schools with resources such as laboratory material, textbooks, classrooms, and laboratories, the updated Namibian Biology curriculum can be implemented as planned. Lyons and Cassebohm (2012) define learning as a complex activity that involves the interaction of students' motivation, physical facilities, teaching resources, teaching skills, and curriculum demands. Material resources, human resources such as teachers and support staff, and physical facilities such as laboratories, libraries, and classrooms should all be available for teaching and learning (Lyons & Cassebohm, 2012). According to Momoh (2010), in order for effective teaching and learning to take place, these resources should be provided in sufficient quantity and quality in schools. As a result, poor performance could be attributed to a lack of resources and facilities, which is why this researcher decided to conduct this study.

1.8. Teacher Support

Ngara, Ngwarai, and Ngara (2013) found that when a new program is implemented, educators require assistance and guidance. The availability of resources, funds, training, and a positive school climate are all critical for successful curriculum implementation. Park and Sung (2013) added that if teachers are asked to change the core of their practice, they should be provided with ongoing in-service training to deal with the problems and difficulties encountered during the implementation process. Similarly, Jess, Carse, and Keay (2016) found that the purpose of training and professional development necessitates a focus on teaching students how to best interpret the curriculum so that their needs are aligned with appropriate instructional practices. Bakir, Devers, and Hugs (2016) hold the same opinion, observing that administrative support and professional development opportunities influence whether or not teachers feel supported and comfortable with new curricular implementations. This study will investigate how Biology teachers are supported in implementing the updated 2015-2022 curriculum with fidelity.

1.9. Theoretical Framework

The study was guided by Rogan and Grayson's (2003) Theory of Curriculum Implementation. The theory is premised on three constructs: the implementation profile, the capacity to innovate, and Outside Support Agencies. The profile of implementation aids in comprehending, analysing, and expressing the extent to which the reform program's objectives are realized (Rogan & Aldous, 2005). This means that it provides a map of the learning area, allowing curriculum planners to conceptualize different levels of curriculum implementation and identify strengths and weaknesses in the implementation process. It allows for the emergence of good practices during implementation. In terms of school factors that are likely to support or obstruct the implementation of innovative curricular proposals, Rogan and Grayson (2003) state that they are a major concern. Physical resources, management, teachers, and students are all examples of school factors. Rogan and Grayson (2003) identify Outside Support Agencies as departments of education, aid agencies and teacher unions. During the implementation process, these can provide material or non-material assistance.

The framework was selected due to its relevance to curriculum implementation, particularly science education in developing countries (Rogan & Aldous, 2005; Rogan, 2007). The most important aspect of Rogan and Grayson's (2003) framework is their concept of Zone of Feasible Innovation (ZFI), which provides teachers and administrators with a new way to determine what to focus on as next steps in Biology implementation in their schools.

2. Methodology

According to Creswell (2012), qualitative research is best suited for investigating and developing a thorough understanding of a central phenomenon. This study

used a qualitative approach in order to investigate and gain a thorough understanding of the obstacles to the implementation of the new Biology curriculum in junior secondary schools, which was the study's central phenomenon. It entailed an in-depth study of the phenomenon in its natural setting on a small sample (nine Biology teachers), which was determined by the concept of saturation because the findings were context bound (Simon & Goes, 2013). A case study design was used in the study. Creswell (2012) views a case study as a bounded case. In the current study we used Onathinge Circuit as our case study. The study wanted to explore in detail how the Biology curriculum was being implemented. Semi-structured interviews were conducted with each of the nine teacher participants, purposively selected.

The researcher obtained ethical clearance and approval to conduct the study from the Great Zimbabwe University research committee prior to data collection. The researcher then obtained permission from the Ministry of Education in the Oshikoto region and notified the principals of the chosen schools.

The data collection process was divided into two phases by the researcher. In the first phase of data collection, six Biology teachers from the three selected schools were given questionnaires. The participants were expected to complete the questionnaires within one week, and the researcher collected the completed questionnaires from schools on the second week for analysis.

In the second phase, in-depth interviews were conducted with three principals from the three schools. The interviews lasted about 30 minutes and were conducted in the participants' own setting to avoid disrupting their daily activities. The interviews were audio-recorded and verbatim transcribed.

Teachers' concerns about implementing the updated Biology curriculum, the availability of resources and facilities, and the support received during the implementation process were all addressed. The Biology curriculum was being implemented by all of the teachers. Their responses to questions were observed during the face-to-face interview process. This was based on the fact behaviour and experiences are considered inseparable in qualitative studies (Denzin & Lincoln, 2011). Permission and consent were obtained to participate in the study, and the ethical principles of confidentiality and anonymity were followed (Marshall & Rossman, 2011).

A thematic analysis is one that looks across all of the data to identify common issues that reoccur and the main themes that summarize all of the perspectives you have gathered (Patton, 2002). Four themes were used are:

Theme 1. How changes in curriculum affected teaching and learning.

Theme 2. Factors affect changes in Science curriculum.

Theme 3. Support and monitoring of changes in the Biology curriculum.

Theme 4. Suggestions for future planning of Biology curriculum reform.

The data were analysed manually by making summaries of the accounts of participants. The participants will be pseudo named teacher 1 (T1), teacher 2 (T2), teacher 3 (T3), teacher 4 (T4), teacher 5 (T5), and teacher 6 (T6), and principal 1 (P1), principal 2 (P2) and principal 3 (P3) for anonymity or confidential-

ity. So data analysis was done based on the research questions on themes emerging.

The collected data was analysed by working from specific to generalized perspectives through the use of segmentation, codes, categories, and themes (Creswell, 2014). It was from these descriptions that the way teachers implement the curriculum and the challenges experienced by teachers in implementing the new Biology curriculum in Onathinge circuit in Namibia were unravelled.

3. Findings

Findings from the nine Biology teachers from three rural secondary schools in Onathinge circuit of Namibia were presented in themes for analysis. For anonymity and credibility of results pseudonyms were used where names would be needed and interview excerpts would be provided.

3.1. Major Features of the New Biology Curriculum

Participants were further asked to identify what they could say distinguishes the new from the old Biology curriculum. Most of the participants indicated that the new curriculum calls for problem solving, scientific thinking, related things learned in class to daily life and thinking independently. AT1 said the following:

> One of the key features of the new curriculum is that we should stop teaching and let the children learn. In experiments, we no longer do for them. We only give guidance and they do under our watch.

Similarly, CT1 had this to say:

> The lecture method we were used to is now a thing of the past. Learners now take full responsibility of their learning. We just present them with scientific problems and they present their findings and solutions. However, it invites a lot of research.

The indication from the above excerpts is that the new curriculum is learner centred since its emphasis is on independent thinking and problem solving. Teaching is positively influenced if teachers understand the need to change some of their teaching methods to new ones that suit the new curriculum.

3.2. The Implementation Process

The study was also interested in finding out how the teachers were traversing the new curriculum amidst their rural contexts. The teachers tried to answer the question, how exactly do you then implement the new Biology curriculum? One teacher, BT2 had this to say:

> Unlike in the past where we would start and end in the classroom, this curriculum demands us to go outside the classroom and explore the environment. It requires that we be knowledgeable of the content. You need to be creative and innovative since most of the apparatus needed in teaching Bi-

ology are scarce and to the truth they are not there. For me I really enjoy.

It was however a different story from BT3 who seemed to represent most of the teachers:

> Whilst the new curriculum is good in its intention, the government did not provide the needed resources such as chemicals, so what do you expect us to do. I just dictate notes and let learners read. In terms of how we should teach not much has changed. Learners are expected to use internet which is not always available in rural areas. We have to make do with what is there.

The excerpts above present a sorry state of how teachers implemented the new Biology curriculum. The majority of the teachers engaged in what we can call implementation fallacy as they could not exercise fidelity of implementation. This actually compromised the product from the new curriculum.

3.3. Teachers' Concerns

Almost all teachers indicated they perceived the New Biology curriculum as the most ideal curriculum ever implemented in the country. BT1 intimated that:

> The newly introduced curriculum was long overdue. It is a curriculum that will transform our learners and our country at large if implemented. On paper, it is so good. It is actually opposite to the previous curriculum which was too theoretical and failed to develop scientific skills in our kids! However, I doubt if resources will be availed timely.

Echoing the same sentiments, AT2 said that:

> The new curriculum is actually resulted and outcomes based. This curriculum is after skills acquisition, not just rhetoric cramming of concepts by learners. There was no science at all in the old curriculum. My prayer is that the Ministry avails the requisite teaching and learning resources. This is a toll order.

The excerpts above indicate that teachers perceive the new curriculum highly although they were sceptical about the availability of resources by the Ministry. They applauded the coming in of the new competence-based curriculum which is more child centred and skills oriented.

3.4. Resources and Facilities

All participants revealed that the implementation of the new Biology curriculum was beset with varied challenges. The challenges could be categorised into teacher related. Teachers mainly identified syllabus interpretation, inadequate training, inadequate resources and lack of laboratories as major negative factors influencing the teaching and learning environment and the process of curriculum implementation. AT2 said the following:

> Crowded classroom with students in different levels is a problem. We need

more classrooms and additional teachers. Also, we have not yet received textbooks for the new curriculum and we rely on the internet because most of the topics cannot be taught using textbooks for the old curriculum.

CT1 weighed in with the following:

We badly need a laboratory this time because of the learner centred approach we are using. We cannot continue carrying out experiments in the classroom. I also missed training and there is no hope that I will be trained in future.

Participants most frequently stated challenges they expected the Ministry to have addressed before implementation. Most of them felt that they were given cars without fuel to drive. Even innovative teachers found it hard to address challenges like overcrowding, laboratories and resources and left it to the Ministry to resolve.

3.5. Teacher Support

Participants were also asked about the support they received during the implementation of the updated curriculum. CT1 said the following:

We were not trained to teach the new curriculum at university, so we need a lot of support. Huge class sizes do not allow us to reach every learner. We skip some topics because of resource constraints. I do not blame the management because they also wait to hear from the Ministry.

Asked the same question about support, AT2 said:

I feel this curriculum was just dumped in my hands. There is no money to buy materials needed in Biology. I only received few textbooks, so I make copies to supply all learners, but the textbooks do not add some of the topics. We never had any workshop after training. Things are tough.

Similarly, BT3 was not comfortable with the support received:

My HOD trained to teach Math and does not understand what goes on in Biology. Resource teachers you know do not visit schools to offer help. I mean we have nobody to turn to in times of need. You even understand that workshops were banned because of COVID-19 and budgets to ministries were cut.

The indication here is that Biology teachers get very little support to implement the updated curriculum. This becomes a challenge if the Ministry expects good results from an unsupported system.

3.6. How Challenges Could Be Overcome

Participants came up with several ways and strategies of overcoming challenges affecting the effective implementation of the Biology curriculum. While most participants felt that retraining was needed, BT3 was of the opinion that the

challenge could be addressed at school or cluster levels since most of the teachers could interpret the syllabus well. On the issue of laboratories, participants unanimously agreed that the Ministry should treat the construction of laboratories as an emergency since schools were offering Biology. All participants felt that the teacher-pupil ratio of 1:50 and sometimes beyond needs to be addressed by building more classrooms and employing more teachers. They cited overcrowding and carrying out of experiments as a cause of concern.

4. Discussion

The discussion will be on the different views raised from the findings:

The interview for teachers revealed that there were many challenges that teachers were facing in implementing the revised Biology curriculum. The Biology teachers teaching in the junior secondary phase indicated that they were failing to effectively implement the new Biology curriculum due to shortage of resources like textbooks, teaching materials and support from the advisory staff; hence the poor performance by the learners. The evidence suggests that there was infidelity in the implementation of the new Biology curriculum by Biology teachers, who neglected the teaching of practical work due to a lack of resources. This supports the findings of Liswaniso (2019), who discovered that science education in Namibia is primarily theoretical, with little emphasis on practical work in most secondary schools. Chiromo (2009), on the other hand, encourages teachers to be creative and improvise science teaching and learning materials whenever possible, rather than waiting for supplies that may arrive late.

The findings revealed that teachers were facing a critical shortage of teaching and learning equipment. Participants stated that they were required to use microscopes in their classrooms but that they were out of stock. Teachers also admitted to using old teaching methods because they had not been trained on new teaching methods. The MoEAC (2014) advised that all learners should cultivate a lively, inquisitive, and creative mind in order to discuss issues rationally, make careful observations, think analytically and scientifically, and solve problems. This may be difficult to achieve if teachers continue to use traditional lecture methods and are not provided with the appropriate resources to help students solve problems. This may be difficult to achieve if teachers continue to use traditional lecture methods and are not provided with the resources that students can use to solve problems. A lecture method, according to Aneke et al. (2016), cannot prepare a learner to function effectively in society.

Teachers were also having difficulty teaching some of the new Biology curriculum topics. One such topic mentioned was "magnifying," which teachers said was difficult to teach. Gott and Duggan (2002) recommended that ethno-based teaching and learning skills be used as a starting point for teaching and learning, with topics to be taught linked to students' experiences. Learners appear to understand concepts better when they are taught while relating them to everyday life. As a result, Biology teachers should attempt to connect the concepts taught

to what students encounter in their surroundings. Students should be exposed to problem-solving, analysis, interpretation, and evaluation approaches as recommended by the new Junior Secondary Biology syllabus (2016).

The study's findings also show that teachers, advisory staff, and principals have limited knowledge of curriculum implementation strategies. Teamwork and a shared vision are essential in achieving any goal. Effective curriculum implementation is the goal that must be achieved in schools. Teachers cannot accomplish this without the assistance of advisory staff and principals. Furthermore, principals cannot accomplish this without the assistance of teachers and advisory staff. It is therefore critical that the three collaborate to achieve the goal. What the principal hopes to accomplish should be shared with the teachers, along with maximum support, to avoid pointing fingers at one another if the goal is not met.

5. Conclusions and Recommendations

The findings revealed the following challenges impeding effective implementation of the revised Biology curriculum: a lack of textbooks, a lack of laboratories, a lack of laboratory equipment, insufficient training, large classes, a lack of support, and difficult topics. As evidenced by the difficulties encountered in implementing the new curriculum, any change requires adequate preparation time. It is in this light that a few suggestions can be tendered:

- School authorities can appeal to parents/guardians to support the teaching and learning of science subjects by paying a small levy that goes towards purchasing much-needed equipment and chemicals while waiting for government funding which usually takes longer to reach schools.
- Internet can assist teachers and learners with the most recent materials. Where schools have no internet, arrangements can be made with schools, so that teaching is not put on hold while waiting for supplies from the government.
- Instead of lamenting over challenges in implementing the revised curriculum, Biology teachers can organise themselves at cluster or circuit levels and exchange ideas on how best to implement the revised Biology curriculum.
- The Ministry of Education, Arts, and Culture should decentralize laboratory construction and promptly release funds for effective teaching and learning of science subjects.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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