Experiences of Mathematics teachers teaching the Advanced Subsidiary (AS) curriculum at secondary schools in Oshivelo circuit, Namibia

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Abstract
This study sought to explore experiences of Mathematics teachers teaching the Advanced Subsidiary (AS) curriculum at secondary schools in Oshivelo circuit, Namibia. The study explores teachers' experiences through the challenges they have experienced and the coping mechanisms they have adopted in resilience. A qualitative approach was used for this study whereby a total sampling method was used to collect data from mathematics AS level teachers from the two schools which offer AS level in the Oshivelo circuit. Data was collected via unstructured questionnaires. A Thematic and Phenomenological Analysis was used to analyse the collected data which was guided by Regan and Grayson's (2003) curriculum theory. Lack of resources, relatively low minimum entry requirement for AS, inadequate teacher-training, an overcrowded AS level syllabus overcrowded classrooms were some of the challenges encountered by the participants, whereas, offering extra lessons (i.e. afternoon, weekend or holiday classes), teachers learning through online sources (i.e. YouTube videos), creating online teaching-learning platforms (such as WhatsApp groups) and peer learning (teachers rendering assistance to each other) were some of the mechanisms used to help mitigate the challenges faced during the implementation of the mathematics AS curriculum. This study therefore, recommends that the minimum entry requirement symbol (currently a C) should be reviewed to a better symbol (B or A), for the schools offering mathematics AS level should be provided with sufficient resources for the learners to use, for teachers should receive adequate trainings that cover all different aspects of the implementation of the curriculum (i.e., teaching strategies, assessment styles) as well as reviewing the curriculum further in order to reduce the curriculum content to be covered and reviewing the time it needs to be covered.

Keywords: *advanced subsidiary, curriculum implementation, mathematics teachers' experiences, challenges, coping mechanisms*

Background of the study

The Namibian education system has undergone several reforms since independence. The recent curriculum amendments involved the phasing out of the Namibia Senior Secondary Certificate Higher (NSSCH) level and the introduction of the Namibian Senior Secondary Certificate Advanced Subsidiary (AS) level course (Ministry of Education, Arts and Culture, 2020). The implementation of the new AS level curriculum began in 2021. The Namibian Senior Secondary Advanced Subsidiary level (AS level) is a one-year course offered in Grade 12 and benchmarked on the British Cambridge International AS level. The mathematics AS level curriculum is envisioned to accord learners opportunities to enrol for university courses in mathematics and other related courses in Science, Engineering, Medicine, Statistics, etc. (Ministry of Education, Arts and Culture, 2020). For learners to enrol for the AS level programmes, they should have passed the Namibia Senior Secondary Certificate Ordinary (NSSCO) level. Although the introduction of the AS curriculum may be of utmost advantage to the learners in general (Ministry of Education, Arts and Culture, 2020), it could pose varieties of challenges to teachers with regards to underlying norms and objectives, the content, the teaching methodology and means of assessments. In light of the possible challenges, Mandukwini (2016) recommends that teachers should be engaged to document their experiences and enhance effective curriculum implementation. Since the AS level was only implemented in 2021, there exists limited literature on AS curriculum experiences in the Namibian context.

On the one hand, change may be required for improved quality education (Mandukwini, 2016), while on the other hand, these changes may cause challenges that teachers may experience in schools (Nampira, 2016). If these challenges go unaddressed, they might affect the quality of education given. The AS level was recently implemented and as

a result the challenges experienced by the mathematics teachers are yet to be documented. It is therefore against this background that this study focused on the challenges experienced by the AS level mathematics teachers in the implementation of the new curriculum and their coping mechanisms during these experiences.

This study was guided by the following research questions:

1. What challenges do school mathematics teachers face regarding the implementation of the Advanced Subsidiary (AS) curriculum in Oshivelo circuit, Namibia?
2. What mechanisms do school mathematics teachers have, that help them cope with the challenges that are experienced during the implementation of Advanced Subsidiary (AS) curriculum in Oshivelo circuit, Namibia?

This study investigated challenges of implementing the Namibian Advanced Subsidiary (AS) curriculum as encountered by mathematics teachers and their coping mechanisms in a secondary school in Oshivelo circuit. The findings might be used in developing better ways to cope with challenges posed to mathematics AS teachers and improve on the implementation of the curriculum.

Theoretical perspectives

This study was guided by Rogan and Grayson's (2003) curriculum theory. The theory states that there are three major theoretical constructs namely, support from outside agencies, capacity to support innovation and profile of implementation. According to the theory, the support from outside agencies describes various actions carried out by outside organizations while, for theoretical construct it is the capacity to support innovation. Theoretical construct is also concerned with factors that are likely to support or hinder curriculum implementation of new ideas and practices in the new or revised curriculum. The last theoretical construct, which is the profile of implementation, assists in understanding, analysing and expressing the extent to which the objectives of the reform programmes are put into practice. Contextualizing the curriculum theory to challenges of teaching mathematics AS level as part of the revised mathematics curriculum, a number of factors should be measured both within and outside the school environment such as necessary conditions which include time allocated to the subject, teachers' knowledge of the subject, in-service trainings, attitudes and competence of teachers among others for effective teaching of mathematics AS level as part of the revised curriculum.

Literature

Curriculum implementation requires assisting learners in acquiring knowledge or experience as it comprises putting into practice the officially prescribed courses of study (Angula, 2015; Amadiola & Owhonda, 2018). The implementation of a new curriculum poses a range of challenges to teachers with regards to the underlying assumptions, goals, the subject demarcations, the content, the teaching approaches and the methods of assessment (Amadioha & Awhonda, 2018). Although curriculum changes are helping modern education become more advanced and appropriate (Nilay & Arjun, 2021), curriculum implementation cannot take place without challenges involved (Bediako, 2019).

Teachers' involvement in curriculum planning

One of the challenges to the implementation of curriculum change is the poor involvement of teachers in matters relating to curriculum planning or reform (Atomatofa et al., 2013; Bediako, 2019; Josua et al., 2022). Lack of teachers' involvement in curriculum planning leads to limited knowledge on the understanding of application of curriculum implementation strategies (preparation, submission, adoption, execution and evaluation) (Atomatofa et al., 2013; Hakutumbulwa, 2021; Mandukwini, 2016; Amadiola & Owhonda, 2018; Josua et al., 2022). Since teachers are at the forefront of ensuring that effective teaching and learning take place in a classroom, Josua et al. (2022) recommended that it is necessary to involve teachers as much as possible in curriculum planning and designs. Josua et al. (2022) recommend a need for research about establishing the level of implementers' participation in the planning and designing of the revised curriculum for basic education and assessing the structural, cultural, and agential.

Teachers' training

Teachers' training begins with staff qualifications and challenges thereof, in-

service training of staff as well as their skills and knowledge (Josua et al., 2022). Literature reports that many schoolteachers lack training on new subject content, objectives, teaching and learning materials are inadequate in most public schools; and the allocated time to complete the intended curriculum content is inadequate (Mashekwa, 2019; Josua et al., 2022). Hence, Josua et al. (2022) recommended that schools should enhance in-service training on revised curriculum implementations, expertise-sharing, and integration of the curriculum content in teacher training programmes.

Resources

Mashekwa (2019) argues that learners' textbooks were inadequate, and learners were made to share textbooks as a result. Correspondingly, in a general review of curriculum change conducted in India, (Arjun & Nilay, 2021) identified the lack of adequate infrastructure, lack of in-service training of teachers, attitudinal issues and lack of funds as some of the challenges in implementing curriculum change. Furthermore, concerning the severity of challenges regarding curriculum implementation, several studies revealed that lack of resources and human resources in schools were part of the biggest challenges faced by schools when it comes to curriculum change and implementation (Mandukwini, 2016; Matati et al., 2022). A similar case was recorded in Nigeria, where Nyamida (2020) also reports that the challenges of curriculum change are inappropriate curriculum structures, inequalities, and disparities in allocation of resources and capacity.

With Namibia not exceptional to the challenges, in their study on challenges associated with curriculum alignment, change and assessment reforms in Namibia, Iipinge and Kasanda (2013) revealed that:

> "Namibia has faced several challenges in reforming and aligning its school curriculum and assessment systems. These included poor correlation between continuous assessment and examination marks, weak links between assessment activities and learner-centred education, and adequate training of Namibian examiners and markers and the development of additional learning materials that reflected the new curriculum and assessment systems" (p. 438).

Some of these findings submit that challenges relating to curriculum implementation existed prior to the curriculum change.

Coping mechanisms

An understanding of change and a clear formation of the curriculum are essential conditions for the improved implementation of reformed curriculum into practice (Arjun & Nilay, 2021). Lumbre (2020) conducted a study on novice teachers' level of stress and revealed that paperwork involving lesson preparations, class size, and lack of resources and behavioural problems of students were said to have a bearing on teachers' level of stress. Studies have been conducted on improving learning-outcomes which are mainly based on improving learners' performances in Namibia through better distribution of resources, cooperative learning, curriculum reforms, different assessment methods and tools etc. (United Nations Educational Scientific and Cultural Organisation, 2021; Shikalepo, 2020). However, there exists a gap on curriculum reform and its effective implementation. The limited focus on challenges faced by curriculum implementers may be the reason for limited learners' performance. Mashekwa (2019) found that ways to implement a curriculum in its fullness is central to systematic attempts to improve performance. Furthermore, research studies revealed coping mechanisms for teachers in dealing with stress and burnout at schools, the review of literature seems not to specifically reveal the coping mechanisms applied by the curriculum implementers to help them cope with the curriculum changes or reforms. Hence, the need to investigate the challenges posed onto mathematics AS teachers in implementing the revised curriculum and their coping mechanisms during the implementation of the revised curriculum.

Methodology

This study used a qualitative approach. The qualitative approach allowed participants to describe their experiences, challenges, and coping mechanisms in implementing the AS level curriculum. The population of this study comprised all AS level mathematics teachers in Oshivelo circuit, Namibia. There are two schools offering AS level programmes in Oshivelo circuit and the researchers used a total sampling method, since the population is relatively small. All five AS Mathematics

teachers at the two schools participated in the study. Data was collected through unstructured questionnaires, which comprised open-ended questions to allow participants to describe their experiences.

A thematic analysis and Interpretive Phenomenological Analysis (IPA) was used to analyse the collected data. The collected data from the questionnaires were organized in categories, as well as themes. Research questions served as guidance for conducting data analysis. Participants received full information about the purpose and objectives of the study prior to completing the questionnaire. This enabled them to make informed decisions whether to participate in the research or not. The information provided by the respondents was treated with the utmost confidentiality and anonymity. Issues of confidentiality and maleficence were taken care of; therefore, teachers' names were not revealed anywhere in this report.

Results

Data obtained through questionnaires were presented under the following themes: teachers' experience of implementing the mathematics AS curriculum, challenges that mathematics AS teachers experienced in teaching mathematics AS and the support rendered by officials from the National Institute for Educational Development (NIED) to teachers in implementing the mathematics AS curriculum teachers to mitigate the challenges in implementing the mathematics AS curriculum. Each theme presents data that emanated from the questionnaires.

Table 1: Themes generated from data

Generated themes	Questions emanated from the themes
Theme 1: Teachers' experiences in implementing the mathematics AS level.	What are teachers' experiences of the implementation of the mathematics AS level curriculum?
Theme 2: Challenges encountered by teachers during the implementation of the mathematics AS curriculum.	What challenges do school mathematics teachers face regarding the implementation of the Advanced Subsidiary (AS) curriculum?
Theme 3: Support rendered to the teachers implementing the AS mathematics curriculum.	What support do mathematics teachers receive in implementing the mathematics AS curriculum effectively?
Theme 4: Coping mechanisms of the AS level mathematics teachers	What mechanisms do school mathematics teachers have, that help them cope with the challenges that are experienced during the implementation of Advanced Subsidiary (AS) curriculum?

Teachers' experiences in implementing the mathematics AS curriculum

All the participants seem to have same or similar experiences, as all of them pointed out a shortage in teaching and learning materials, curriculum overload and learners struggling to understand the mathematics AS content due to a relatively low minimum requirement for the mathematics AS entry level which is a "C" symbol. Furthermore, participants pointed out that they had a high number of learners in their classes. Some of the participants' responses were:

- "*Learners are too many, this gives less attention given to individual learners. Too many learners to give more activities to mark and to give feedback and marking too many papers delay quality preparation which is a must for this level. Most of these learners only qualified with the minimum symbol (C) which makes it difficult for them to grasp the AS content easily".*
- *"The number of Textbooks also has an effect on teaching because they are not sufficient".*
- *"Learners are many. This makes it difficult because, small groups usually provide better quality and richer environment for learners, while making teaching also more enjoyable. Small groups also result in learners with lower academic ability doing better. A small group would also make it easier for me to devote more time to individuals, engage more on time-on-task instructions and would help me identify precisely and earlier, learners with*

learning problems that may be remediated before the learners falls too far behind".

The participants felt that the admission requirements for mathematics should be at least a B symbol. The next sub-section presents the challenges faced by teachers implementing the AS level mathematics curriculum.

Challenges encountered by teachers during the implementation of the mathematics AS curriculum

Participants listed the challenges they encountered during the implementation of mathematics AS level curriculum.

- *"As a teacher, sometimes I do not have knowledge on how to deliver some topic to the learners.*
- *"Not having enough textbooks for each learner".*
- *"Lack of textbooks, completing of syllabus, lack of individual attention for the learners and learners' negative mindset about mathematics".*
- *"I struggle to finish all topics on time. Some learners do not attend extra (afternoon) classes and most learners not even do their work on time".*
- *"I struggle sometimes with content knowledge and learners do not have enough textbooks".*

The participants indicated that classrooms were overcrowded resulting in minimal attention accorded to individual learners. Participants also indicated that textbooks were not enough for all learners. Some participants indicated that they struggled to understand how to approach specific topics and how to teach such to learners. Participants further indicated that the content is too much and they found it hardly possible to complete teaching the syllabus within the allocated times. The next section presents the support rendered by NIED officials and available for AS level teachers.

Support rendered to the teachers implementing the AS mathematics curriculum

All participants indicated that they have attended workshops, although they noted that the workshops did not cover all the crucial topics of the syllabus as the workshops were ran for a short time (four days). They, therefore, could not cover most topics of the mathematics AS content. The participants indicated that:

- *"Training was not that much of help since it was just for few days, four days to be specific. However, that is not a problem, with little help I got from the training, as a teacher you need to prepare and research just like when teaching other levels".*
- *"Most assistance and teaching strategies I get from my colleagues and the internet".*

Participants indicated that they received assistance from their colleagues, supervisors and by viewing online videos. The next section presents the coping mechanisms of AS level teachers.

Coping mechanisms of AS level mathematics teachers

On the challenges experienced by AS level mathematics teachers, the participants had their own ways of mitigating the effects. Some participants encouraged parents to buy textbooks for their children, and those who could not manage had to share the available textbooks giving each other equal turns. Some participants involved parents to assist in making sure that learners did their work on time and that all learners always attended afternoon classes when requested to. Participants pointed out that extra classes (i.e., afternoon classes, weekend lessons and holiday classes) helped in completing the syllabus as the time allocated for the syllabus is too short. Some used social media platforms (e.g., WhatsApp groups) to communicate, and shared questions on the platform after school hours. On the challenge of topics presenting difficult for the teacher to understand well and teach it, one participant said *"Most assistance and teaching strategies I get from my colleagues. I mostly watch video clips on YouTube".* On the lack of prescribed textbooks, one participant said *"I encourage learners to buy textbooks and those that cannot afford are sharing few copies that are available at school. I also send question papers and notes on WhatsApp groups and learners watch video clips on some topic using overhead projectors".* It appears teachers have developed coping mechanisms amidst the challenges they were experiencing with implementing the AS level mathematics curriculum. The next section presents a discussion of the findings of this study.

Discussions

This study explored challenges experienced by AS level mathematics teachers as well as the teachers' coping mechanisms in Oshivelo circuit. This study adopted a qualitative approach using questionnaires from the two schools that offer AS level in Oshivelo circuit. Participants identified a number of challenges experienced in teaching AS level mathematics in Oshivelo circuit. From the findings, it is clear that a great need exists to make amendments to the mathematics AS level curriculum in order to mitigate most, if not all challenges teachers experience.

Although several studies have been conducted on improving learning-outcomes which are mainly based on improving learners' performances in Namibia through better distribution of resources, cooperative learning, curriculum reforms, different assessment methods and tools etc. (United Nations Educational Scientific and Cultural Organisation, 2021; Shikalepo, 2020), the results from this study showed a huge challenge of not enough resources (especially textbooks) for the mathematics AS learners in the circuit as all participants from the circuit indicated that " *no enough textbooks for the learners*" were available. Learners sharing of textbooks could still be a challenge to the teachers' effective implementation of the mathematics AS level content, as it might delay learners in completing their tasks on time. According to Rogan and Grayson (2003), insufficient resources, such as classrooms and textbooks, may hinder the effective implementation of a curriculum. It is evident from the participants' responses that there is a lack of textbooks for learners, making it difficult for the teachers to implement the mathematics AS level curriculum effectively.

Although all five participants indicated that they had all attended the training for the mathematics AS curriculum, they all highlighted in this study that they had not been adequately trained in the implementation of the mathematics AS curriculum as the training was relatively short and therefore could not cover all curriculum topics. The study also found that the minimum entry requirement (symbol "C") for the mathematics AS level is too low which is one of the factors that made learners struggle in grasping the content. Participants indicated that "*there is a huge gap between the NSSCO curriculum content and the AS level content, symbol "C" is too low for most kids to grasp the AS content*". It was also found, that the number of learners per class was high which, prohibited teachers from providing and rendering individual attention and assistance to all learners. Some participants recommended that the minimum requirement be changed to at least a "B" symbol whilst others suggested that the requirement should be an "A" symbol only as there was a huge gap between the NSSCO mathematics content and the AS level. The "C" symbol requirement might be the reason for the high number of learners per class. It might motivate learners to study hard and, the number of learners to enter mathematics AS level may be slightly reduced if the requirement was set to be higher than the current "C" symbol.

Participants also stated that the mathematics AS level content is overcrowded with too many objectives making it difficult to complete the content within the required period. Therefore, setting up afternoon, weekend and holiday classes enables teachers to complete the content as per the requirement. However, with all the efforts to teach during extra classes set for the afternoon, weekends and holidays, there was still no time to prepare and coach learners thorough for examinations as they still do not get time to do any revisions with their learners at all.

Conclusion

The findings from this study presented the challenges that the AS level mathematics teachers were experiencing at the two schools in the Oshivelo circuit, Oshikoto region. The study further presented the coping mechanisms that teachers have adopted to optimise the effects of AS mathematics curriculum implementation. The results of this study should not be generalised to other circuits or regions in Namibia, but it does recognise the fact that similar challenges are probably being experienced in other sectors of the country.

Recommendations

The study, therefore, recommends the following:

- The minimum requirement for mathematics AS level should be increased from a "C" symbol to a "B" or "A" symbol. This might reduce the number of learners enrolling for mathematics AS so that those who enrol might perform much better compared to those with "C" symbol.

- More training that covers all crucial topics of the AS content be availed to the teachers.
- Since the participants experienced that the content is more and difficult to cover, this study recommends that some of the chapters such as further Trigonometry, further Differentiation and further Derivatives be removed and covered at the tertiary level instead. This may allow teachers to have enough time to cover the content and do revision with the learners. Otherwise, the time frame to cover the AS curriculum should be extended from one year to two years.
- A similar study should be conducted on a larger scale so that prevailing challenges are documented so that solutions could be sought to enhance the desired academic results of the AS level mathematics learners.

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