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Teaching Methods and their Influence on Poor Performance in Ordinary Level Mathematics in Glenview-Mufakose District of Harare, Zimbabwe

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ABSTRACT

The main purpose of the study was to examine the influence of teaching methodologies on performance in Ordinary Level Mathematics in Glenview-Mufakose district of Harare in Zimbabwe. It was underpinned by two theories, the Constructivist theory by Jean Piaget 1896–1980 and the Systems Theory of von Bertalanffy 1930. The conceptual framework guiding this study was Mathematics Curriculum Implementation. This study was pragmatic in nature, hence considered both the positivist and post-positivist ontologies. The mixed methods approach was chosen because no one approach is better than the other. The researchers saw it ideal to mix the qualitative and quantitative paradigms in the present study. The concurrent triangulation design was used where both data which was qualitative and quantitative were collected concurrently in one phase, analysed separately and then compared and combined. The study sample consisted of twelve school heads, twenty-four parents, forty-eight teachers and ninety Ordinary Level Mathematics learners who were purposively sampled from twelve secondary schools in the district. The total sample was one hundred and seventy-four respondents. Data collection instruments consisted of questionnaires, interviews, observation guides and mathematics teachers' documents. The major finding of the study was that many teachers in the district were less qualified hence they used teacher centred methodologies in teaching Mathematics at Ordinary Level. The study recommended that Ordinary Level Mathematics teachers should make their lessons interactive and actively involve learners in the teaching and learning process (use of learner centred methodologies encouraged).

Introduction

In the quest to improve the pass rate of different subjects in Zimbabwean secondary schools, the Ministry of Primary and Secondary Education (MoPSE) developed a policy on Learning Area Platforms (Secretary's circular minute number 5 of 2018). The policy was operational in all secondary schools in Zimbabwe on the 1st of July 2018. It was instituted in all the learning areas across the curriculum of which Mathematics was one of them. The major purpose of this policy document was to give guidelines for the formation, functioning and operations of learning areas (subjects) platforms for enhancing the implementation of the New Curriculum in Zimbabwe. It is in tandem with Biama's (2014) sentiment that the successful implementation of the Curriculum Framework requires a strategic and holistic approach that includes the creation and strengthening of structures including peer support configuration; resources mobilization; training of personnel; effective monitoring and supervision. This policy document has been put in place following the low pass rates recorded in different

subjects across the country especially in Ordinary Level Mathematics. This policy compels all practicing Mathematics teachers, from Early Childhood Development (ECD) to Advanced Level ("A" Level) to belong to it. In this platform, Ordinary Level Mathematics teachers discuss how to improve pass rate of the subject, appropriate methodology in the teaching of Ordinary Level Mathematics, Ordinary Level Mathematics professional ethics and how to motivate learners during teaching and learning.

The argument of this paper was informed by von Glasersfeld's (1995) view that Mathematical claims are not absolutely true or valid but viable if they prove adequate in the contexts in which they are created. Like the Canadian teachers in the study undertaken by Goldblatt and Smith (2004), Ordinary Level Mathematics teachers in Zimbabwe were guided by their memory of past experiences as learners and were sometimes reluctant to consider proof of Ordinary Level Mathematical results in their teaching. Technology change with time and so are concepts. These teachers do not want to change their teaching styles. They want to teach the same way through and through. They want to continue doing things the same way they were taught more than five years ago.

Many nations are facing the same predicament of high failure rate in Mathematics Education at secondary school level (Nyikahadzoyi, 2008). Zimbabwe is one of the nations which has the same predicament of high failure rate especially in Ordinary Level Mathematics. Teachers and their learners are facing challenges in applying what they always talk about in the classroom to life situations. In Malaysia, studies showed that learners felt mathematics to be difficult because they had difficulty understanding and retrieving mathematical concepts, formulas, facts and procedure (Zahrah et al, 2003) and lacked the ability to conceptualise and recontextualise mathematics problems and concepts (Tarzimah, 2005). If learners were failing to understand Mathematical concepts, then this was attributed to different variables which came into play. This might be due to poor teaching strategies employed by the teachers. This showed that there was a missing link between the way teachers were trained to teach and how they are implementing the curriculum. There is a gap between training and implementation modalities. Teachers, the world over, need to understand learners' possibility, challenges and learning difficulties in order to implement effective teaching strategies and to produce meaningful learning among the learners. The teachers should make sure they educate all and the way they teach (methodology) caters for every learner in the class. This is the gap which this current research tried to address.

Statement of the Problem

Performance in Ordinary Level Mathematics in Zimbabwe is very pathetic especially in Glenview-Mufakose district. Owing to the low Ordinary Level pass rate in Zimbabwe generally and Mathematics in particular, there is need for an educational analysis. In light of this, the study intends to analyse the teaching methods and their influence on poor performance in Ordinary Level Mathematics in Glenview-Mufakose district of Harare in Zimbabwe.

Objectives of the Study

The study sought to:

a. establish the teaching methods used by the O" Level Mathematics teachers in Glenview-Mufakose district
b. analyse methodologies contributing to learners` poor performance in Ordinary Level Mathematics.

Research Questions

The study seeks to find answers to the following questions:

a. What teaching methods are used by the teachers in Glenview-Mufakose district of Harare Metropolitan province in teaching Mathematics?
b. Which teaching methods contribute to poor performance in Glenview-Mufakose district?
c. To what extend do they contribute to the teaching and learning of Ordinary Level Mathematics?

Literature Review

The conceptual framework guiding this study is Mathematics Curriculum Implementation. This was discussed as a lens for the researchers to visualise the direction of the research. Futes and Huberman (1994) defined a conceptual framework as the researchers` map of the territory being investigated that explains, either graphically or in narrative form the main things to be studied and the presumed relationship between them. The conceptual framework of this study drew from the ideas of Barnard and Saunders (1994, p. 231) who argue that "effective Mathematics curriculum implementation entails an application

of Philosophy of Education to Mathematics Education and teaching". This entails that the teacher should have the knowledge of Philosophy, the knowledge of Education (Theory of Education) and the knowledge of Mathematics Curriculum (Mathematics Content).

This study was guided and underpinned by two theories, the theory of constructivist learning and The Systems Theory. Constructivism is basically a theory based on observation and scientific study about how people learn. It is concerned about the learner as the one to get the knowledge and it stresses that learning should be hands on. System theory, on the other hand, is the transdisciplinary study of the abstract association of occurrences, autonomous of their substance, type, or spatial or temporal scale of existence, (Barnard and Saunders, 1994). It investigates both the principles common to all complex entities, and the usually mathematical models which can be used to describe them. It was developed by Von Bertalanffy (1930). This paper showcased how the two theories were applied simultaneously in the Mathematics education system of Zimbabwe specifically looking at poor performance in Glenview-Mufakose district of Harare Province.

The initial starting point of the Mathematics Curriculum implementation for the stage of compulsory education is to promote all-round, constant and pleasant development in school learners. In short, this is the production of a learner who is a whole and who can fit in any situation. The production of a learner who is a being who feels for others and one who considers not him/herself first but the community at large. Murray and Mazur (2009) pointed out that the Mathematics curriculum implementation not only considers the characteristics of Mathematics itself, but also follows learners` psychological rules and patterns of Mathematics learning and all these should assist in the production of a well-rounded being who has life skills and who can survive even under harsh conditions. This means the attitudes of the learners are also taken cognisance of. It emphasises that learning starts from children's past experiences, affording them the chance to experience individually the processes within which authentic problems are abstracted to form mathematical models that may be used for clarification and presentation in their daily life.

Effective learning can take place well when these learners are exposed to what they know first before they are shown the abstract things. Learning always should be from the known to the unknown (Mhlolo, 2011). This is a pragmatic approach to learning which gives the learner the chance to explore and discover on his/her own. Apart from understanding Mathematical knowledge, learners also progress and develop in areas like cognitive, attitudinal and emotional development. This entails the production of a learner who is a whole being. This is one dimension that needed unpacking. These gaps were closed in order to reduce the extent to which the factors contributing to poor performance in Mathematics were pitched.

Learning Mathematics also entails acquiring the means of gaining access to technology. Mathematics Education should thus enable learners to understand that it is not a static quantity of knowledge but, on the contrary, a living and expanding science, whose development is nourished by that of other scientific fields and nourishes them in turn, (Mtetwa et al, 2010). It should enable learners to understand the power of Mathematics as a tool for building understanding and influencing the world in all fields of study. Learners should know that without Mathematics it is very difficult to operate in life. All fields are influenced by Mathematics in one way or the other. Everyone should be exposed to Mathematics so that the world becomes operational. It is therefore imperative that every learner should do Mathematics in school.

Methodology

The main purpose of the study was to analyse the impact of teaching methodologies on poor performance in Ordinary Level Mathematics in Glenview-Mufakose district of Harare in Zimbabwe. The researchers considered a mixed methods approach in this study.

Research Paradigm

In the context of this study, research paradigms are perspectives of looking at reality and how it is organized. This study followed a mixed methods approach to research because of its pragmatic nature. This was done to better understand the contribution of teaching methodology on poor performance in Ordinary Level Mathematics in Glenview-Mufakose district of Harare. The use of the qualitative and the quantitative methods provided a better understanding of research than either approach as a single unit. Ellis (2002) also argues that the mixed methods approach complements the strengths of a single design, to overcome the weaknesses of that single design and address a question at different levels. This is the reason why the present study was designed to use the two methods that produce qualitative and quantitative data.

The Research Design

The researchers used the concurrent triangulation design to seek an understanding of the extent to which teaching methods impacts on poor performance in Ordinary Level Mathematics in Glenview-Mufakose district of Harare in Zimbabwe. This was done through triangulating data from multiple methods. THE MULTIPLE METHODS WERE USED BASING FROM A PRAGMATIC PERSPECTIVE WHICH INCORPORATES ALL THE TWO PARADIGMS. The triangulation design, also called convergent design, is described as a design that involves the collection of different but complementary data on the same phenomena (Edmonds & Kennedy, 2013). In this study, both data which were qualitative and quantitative were collected simultaneously in one phase. The data were analysed separately and later on compared and combined. This method was used in this study to confirm, cross-validate or corroborate findings.

Population and Sampling

Glenview-Mufakose district has thirteen secondary schools. One of these secondary schools is a privately owned school. The researchers purposively sampled the other twelve secondary schools. The twelve secondary schools in the district formed part of the sample. One privately owned secondary school in the district had some reservations and the researchers left it out after consultation with the authorities and concentrated on the remaining twelve secondary schools.

The eligibility criteria in this study were that the participants had to be:

- an Ordinary Level Mathematics teacher, in possession of a minimum qualification of a diploma in Education Secondary and teaching in Glenview-Mufakose district in Harare in 2019.
- a secondary school head in Glenview-Mufakose district in Harare in 2019.
- Ordinary Level Mathematics learners in Glenview-Mufakose district in Harare in 2019.
- a parent of an Ordinary Level learner in Glenview-Mufakose district in Harare in 2019.

Data Collection Instruments

Data collection instruments are measurement devices such as survey, test, questionnaire, intervie (Koskei, Tomui & Simiyu, 2015) that are used to measure phenomenon in a research. Researchers choose which type of instruments to use based on the research questions (Koskei, Tomui & Simiyu, 2015). In this study, the researchers were guided by the research`s pragmatic approach and chose two data collection instruments to assist in gathering the data required for data analysis. Interviews and questionnaires are the two research instruments used for collecting quantitative data to answer research question one which talks about the availability and ratio of resources to the learners. This was done in order to see how teaching methods used in secondary schools in Glenview-Mufakose district contribute to poor performance seen in the district.

Data generation procedures

Data generation instruments which were used to collect qualitative data are observation guide and observation protocol. These were taken on board as a lens to see the impact of the chosen methods used in the district on poor performance in Mathematics.

Results and Discussion

The objectives were to find out which teaching methods the teachers were using, to find out those ones which were contributing to poor performance and to what extent, as evidenced by the pass rates or by interviewees' sentiments teaching methods contribute to poor performance. This was done in Glenview-Mufakose district of Harare.

Heads' perceptions on contribution of teaching methodologies to learners' performance

Most of the secondary school heads interviewed indicated the need for variation of teaching methods when teaching Mathematics at Ordinary Level. Mawarire (2013) pointed out that what Ordinary Level Mathematics curriculum potential has depends on how an Ordinary Level Mathematics teacher uses the material, which in turn, depends on how he or she interprets what is contained in the materials in a classroom context. The teacher has to understand the content first which he or she would interpret during teaching and learning.

Head of school three postulates that:

> *Teachers` attitudes are bad because of the low salaries they are earning. My school' enrolment is unbearable to the extent that we end up having up to seventy learners in one classroom. How then do you expect teachers to perform miracles and wonders if the situation is like that? Textbooks for the New Curriculum are very limited. We looked for them in the market but could find them. The curriculum was rather hurried. Teachers require orientation to teach the competency-based way. Most of my teachers are diploma holders and it is imperative that they upgrade themselves. They cannot do the self-upgrading because they are incapacitated monetary wise.*

Most of the heads indicated that their teachers always stick to teacher centred methods which calls for a further training of teachers so that they are kept in track with the new trends and developments as required by the competency-based curriculum. They also indicated that secondary schools in the district should establish Ordinary Level Mathematics Associations so that their teachers share expertise as they also learn from others.

Teachers` perceptions on contribution of teaching methodologies to learners` performance

The teachers know the methods they use in the teaching and learning of Ordinary Level Mathematics. It is common understanding that the achievement of a learner relates to the subject matter knowledge a teacher possesses. That wisdom is contained in adages like "You cannot teach what you do not know". According to Feilzer (2010) research has attempted to establish the correlation between what the teacher knows (teacher content knowledge) and the achievement levels of the learners being taught. In most cases, the results have been embarrassing in that it was very difficult to find out the relationship between the two. Researchers are still struggling to find the relationship between the teacher knowledge and performance, (Feilzer, 2010).

Research on Ordinary Level Mathematics teaching in Zimbabwean secondary schools suggests that many teachers do not possess the requisite content knowledge to implement high-quality Ordinary Level Mathematics instruction as required by the Competency Based Curriculum in Zimbabwe. For example, Mtetwa et al (2010) pointed out that many teachers in Zimbabwe do not possess the appropriate subject matter content that is needed for effective implementation of the Ordinary Level Mathematics instruction of quality. One teacher indicated that Mathematics Olympiads should be done yearly to give room for teachers to share ideas related to the subject. The logic herein is that Ordinary Level Mathematics teachers who possess strong Mathematical knowledge at a greater depth and span are more likely to foster learners` understanding, reasoning, conjecture and problem-solving skills. The survey made indicated that there were no such teachers in the district since most of the teachers were holders of a lower qualification such as a Diploma in Education secondary majoring in Mathematics. This, according to the researchers were the reasons why the teachers were using the wrong teaching methods.

Learners` perceptions on contribution of teaching methodologies to learners` performance

Most learners claimed that the poor performance was as a result that some teachers had deserted classes to look for other things because they could not make ends meet. Learners were also questioning the pedagogical strategies employed by the Ordinary Level Mathematics teachers in the district. The teachers, according to the questionnaire survey given to the learners, were put out of form by the New Curriculum Framework of Zimbabwe (2015-2022) which was introduced recently. The learners who answered the questionnaires indicated that although the teachers had many years of teaching experience, this did not tally with the results they were producing. Although these teachers were experienced, the students felt that their so-called experience had no positive impact on their learning since it was not aiding the improvement of results.

Parents` perceptions on contribution of teaching methodologies to learners` performance

Most parents indicated that some of the Ordinary Level Mathematics teachers seemed to be ignorant or negligent in their teaching process. The way they were trained and what they were expected to do was not tallying. UNESCO (2000) laments that teachers should have access to training and continuing professional development to keep them abreast to the changes of the 21st century.

Extra lessons are lessons done after hours where the teachers will be teaching for a fee. This is where the teacher would teach thoroughly and cover up many concepts. However, even those who were being taught extra lessons were failing the subject in question. This was a clear indication that the way these teachers delivered the lessons was cause for concern. Their

opinions align with Ellis' (2002) idea that teachers confuse the learners because they lack knowledge and skills necessary for quality instruction in delivery.

Conclusion

The Systems Theory and Constructivism guided and underpinned this study. The Systems Theory, which is the input – output model, sees the school as dependent on the environment in which it is established (Hayajneh, 2007; Nickols, 2007). The inputs such as teaching methodologies employed in teaching and learning influenced the poor performance of Ordinary Level Mathematics learners. Teachers are supposed to use learner centred methodologies during teaching. Despite the teachers` qualifications, it was also clear that the teachers in the district were not properly motivated to teach the subject. Eight percent of the teachers claimed their economy was down and they would spend most of their time outside the classroom doing some things to earn a living. It was very clear from the observations made that the Ordinary Level Mathematics teachers in Glenview-Mufakose district used teacher centred methods such as teacher talking and chalking, teacher enforcing rote memorisation, teacher reading from textbook in their delivery.

Recommendations

Recommendations based on the Findings of the Study

Based on the findings of this study, the researchers recommend the following:

a. Ordinary Level Mathematics teachers should make their lessons interactive and actively involve learners in the teaching and learning process.
b. The secondary schools in the district should establish Ordinary Level Mathematics Associations so that their teachers share expertise as they also learn from other Ordinary Level Mathematics teachers in the other eleven provinces.
c. Ordinary Level Mathematics Teachers to create an environment which is friendly to learners so that they develop a love of the subject.

Recommendations for Future Research

a. The present research used a mixed method approach. Thus, in future a research which is either purely qualitative or purely quantitative may be necessary so that the in-depth knowledge of the factors contributing to poor performance in Ordinary Level Mathematics in Glenview-Mufakose district can be gained.
b. The present study only focused on one factor (poor teaching methodology). This is not the only factor and variable which contribute to poor performance in Ordinary Level Mathematics. In future a research which looks at more factors may be necessary for a wider coverage of findings.
c. Mathematics Olympiads, frequent supervision of classes and enlightening of parents on the importance of learners` acquisition of Mathematics be adopted.

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