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Exploring the Lived Experience of Pupil's Success in the Linear Programming with a View to Develop a Framework Dupped HALP

Mwambazi Chrispine Mulenga[1*], Mubanga Lombe[2], Francis Simui[3]
[1]Nkeyema Secondary School, Nkeyema, Zambia
[2]University of Zambia, Lusaka, Zambia
[3]Institute of Distance Education, Zambia

ABSTRACT

This article explores the lived experience of pupil's success in the linear programming with a view to develop a framework dupped HALP at Nkeyema Secondary School in Zambia. An inquiry based on interpretive technique was carried out. In total, 15 pupils—eight females and seven males—participated in the study. These were former grade twelve pupils from Nkeyema secondary schools. All the participants were selected using homogenous purposive sampling. The data was generated through semi-structured interviews and group discussion which was thematically analysed. The study revealed that learning linear programming was fraught with difficulties. Some of them were: the distance pupils were covering; lack of appropriate teaching/learning materials such as textbooks and computers; pupils' poor learning background in linear programming; family support; poor methodology used by some teachers among others. Based on the above highlighted disablers, the study suggests that the Ministry of Education should build schools near to the communities in order to lessen the distance pupils cover and curb absenteeism. It should also allocate adequate funds to schools for the procurement of teaching/learning materials. There should be additional homework assignments for linear programming so that students can do more research. Government should construct more boarding schools, and school administration should create meal arrangements to motivate pupils.

Keywords: Absenteeism, Hermeneutic Analysis Linear Programming Framework, Nkeyema Secondary School, Communities, Linear Programming, Academic Performance, Government, Ministry of Education

INTRODUCTION

One of the mathematical techniques used often in business and the social sciences is linear programming. The term "linear programming" is clearly derived from the terms "linear" and "programming." "Linear" relationships are the straight-line relationships that emerge from the conditions between the independent variable x and the dependent variable y. Since **a** and **b** are constants, the equations have the form y = ax + b (Basriati, 2018). In the context of this piece of work, "linear programming" refers to the methodical decision-making process (UNEB, 2020). Constraints explain the challenges that must be addressed by these decisions, while objective functions describe the decisions that must be taken (Salim & Alfian, 2021).

However, Zambian pupils have performed poorly in linear programming (ECZ, 2016). The disablers such as pupils learning background, pupils' attitude, peer, teachers' competence, distance pupils cover, and school infrastructure, methodologies used by teachers, teaching and learning aids, inadequate infrastructure, class size, and lack of library are the causes of pupil's poor performance. Eliminating these disablers requires identifying the enablers and creating the framework.

* Corresponding Author

Context

Preparing pupils, it is important to employ practical strategies for linear programming. It should be providing the transformation of word problems of everyday life into real problems whose intellectual motivation is further learning resulting into individual development and intellectual improvement (Nakhanu, 2015). Beyond the classroom, there are likely applications for linear programming. It also provides opportunities for an approach in the mathematics classroom that bring about real-life situational. Despite this, research indicates that students rarely demonstrate mastery of linear programming-related tasks in national exams (ECZ, 2018). The examiners' analytical evaluation reveals that the linear programming problems and related questions are not answered correctly.

Statement of the Problem

The students' continued performance in linear programming may not only impact negatively on the academic of the individual pupils but also the nation at large. This is because according to Geraldo (2015) linear programming has remained one of the most useful mathematical techniques in to days' modern societies as it relates well with other topics such as statistics and probability and it is widely applied in business and entrepreneurship, economics, management, and construction, to mention but a few. Whereas, the failure rate is high among the pupils who attempt to answer LP related exam questions, it is not clear what their lived experiences are.

In this respect, the possession of sufficient knowledge has potential of enabling one becoming real problem solver. As enshrined in the Zambia's vision 2030, the country requires citizens who are competent enough to allocate available resources to competing activities in an optimal manner which is the underlying principle of linear programming.

The Aim of the Study

The aim is to assess pupils' academic performance and create a framework.

Research Objectives

1. Describe the pupils' academic success in linear programming.
2. Design a framework for supporting pupils' success academically in linear programming.

LITERATURE REVIEW

This chapter presents the literature reviewed related to the study. The chapter is structured in three layers namely: developed, Sub-Saharan Africa and Zambia. To this effect, the literature reviewed are limited to a few isolated researchers gathered through the google search engine.

Global Perspective

Academic performance is a key concern on a global basis. According to a study by Kusmaryano (2014), pupils in Indonesia perform poorly in linear programming as they are expected to memorise the content without fully comprehending the concept thereby failing to use it in practical situations. This rose from poor classroom management, along with pupils' negative attitude and instructional methods used by teachers which negatively affects the pupils' success in linear programming (Andaya, 2014).

This proclamation agrees with the study by Lasco and Raganas (2016), who asserted that, pupils' interactions, teachers' attitude, teaching strategies and the materials they employed all had an impact on the pupil's performance and ability to learn linear

programming. Findings showed that, encouraging pupils to collaborate on group work improved mathematics skills.

The study by Abdullah (2018) on teachers' instructional techniques and learning materials. This was in a bid to examine the implementation of appropriate instructional techniques and learning materials. Discoveries showed that, teachers were not using appropriate teaching methods and were not using teaching materials making it difficult for pupils to comprehend related ideas and the content in Linear Programming. Furthermore, pupils had negative attitudes towards Linear Programming. This aspect posed a challenge to both teachers and pupils in term of performance. According to Goulet-Lyle, Voyer, and Verschaffel (2020), assigning students to answer mathematical word problems step-by-step is the most effective approach.

Similarly, the study conducted by PISA (2018) examined the teacher and teacher's views on linear programming. It was found that the topic was being taught in a haste without taking into consideration the slow- learners. Furthermore, the topic at secondary school was taught by teachers who were not particular about linear programming. Therefore, it can be concluded that teachers who taught linear programming at secondary school level had limitations in terms of pedagogical content knowledge, consequently poor performance.

Correspondingly, In the United State of America, the report by Michael et al. (2018) revealed that," the American schools were incapable to bring pupils up to the highest level of standard in mathematics performance as, the outcome was poor. As a result, the USA's policy-making agenda has placed a high focus on strengthening mathematics and scientific education, (Anon, 2015). Consistent with this assertion, Control Chief Examiners Meeting Reports, Department of Examinations, (2018), reported that, in two European countries pupils' performance in mathematics at GCE O/L examination has been at 35 percent during final examination. This means that the performance was still below average. This claim was supported by Yvonne and Roger (2017), who posited that schools were frequently called upon to improve pupils' performance by developing high levels of teacher collaboration to learner achievement.

Luque, González-Gallardo, and Ruiz (2019) analysed multi objective linear programming. Students' subpar academic progress in Spain and Finland was caused by teachers' inadequate methodological practices. Four indicators were used to measure well-being according to variables describing the students' context. The purpose was to determine which aspects would allow the best possible well-being to be reached (PISA 2018).

African Perspective

According to research by Ogan and George (2015), pupils' perceptions show that mathematical ideas are challenging in Nigeria, with varying degrees of difficulty for each area. Pongsakdi (2020) conducted research in Nigeria to examine the role of beliefs and motivational factors in improving word problem solving. The heuristic problem-solving strategy had a considerable impact on linear programming solutions. Early conventional procedures by the comparison group revealed that it was difficult for the students to understand some mathematical theoretical concepts as they learnt. When teachers from the experimental group used the heuristic problem-solving learning approach, some students who had grown weary of Linear Programming regained their enthusiasm and significantly increased their post-test scores. The researcher agrees with Pongsakdi teachers need experience in the learning and teaching of linear programming.

As a result, the heuristic problem-solving approach improved students' cognitive and affective domains in basic algebraic content, which subsequently facilitated and enhanced their mathematical conceptual understanding, procedural fluency, and competency to Linear Programming tasks (Qian et al., 2020).

Reinforces this revelation by positing that pupils' who lack conceptual understanding and apprehension of tackling simple algebraic problems are obstacles to their success in solving mathematics word problems (Julius, 2018).

According to UNEB's (2016) reports on applicants' performance, there are consistently significant failure rates in mathematics, notably in linear programming, which most pupils find difficult. The popular pupils have consistently struggled with this topic, failing to use the proper scale, represent the formulated inequalities on the graph, label the axes correctly, and optimise the feasible region. It is thought that in this situation, the use of efficient learning strategies that support pupils' conceptual and procedural understanding may improve pupils' skills in mathematics, and Linear Programming in particular. The researcher agrees with this finding. It evident from different views that learners usually have a difficult perception of linear as topic and this affects their performance

Opolot-Okurut (2010) looked into the relationships between pupils' attitudes and their performance when tackling computational word problems. This supports earlier empirical findings and has important ramifications for teaching mathematics in Uganda. As a result, changing a pupil's attitude may affect how well they perform mathematically. The attitudes of the pupils help them acquire the basics of linear programming. This implies that having a good attitude helps students perform better. The constructivism theoretical framework, support the idea that pupils should continually examine the knowledge they already possess and use it to create new knowledge. As indicators of students' confidence, motivation, usefulness, and enjoyment in learning Linear programming word problems and mathematics in general, this will also serve as a lens for improving pupils' achievement.

Smith (2018) asserted that, "for example, teacher shortages are often eliminated artificially by a process of inferior substitution: That is, surplus teacher (in other subjects) and temporary teachers are assigned to teach mathematics, even though they are not qualified to teach mathematics". This situation usually occurs due to most African governments insufficient funds to train and employ more specific and qualified mathematics teachers.

Lack of identifying and tracking gifted children. The purpose of identifying exceptionally gifted mathematics students is to ensure that gifted children mathematically reach their maximum potential to benefit their countries as well as themselves. In the Sub-Saharan Africa (SSA), for instance, there are few systems if not none for identifying children and no system for tracking them once identified. Such systems, were they available, might make a small but concrete contribution to mathematical development of African countries. Lack of effort to popularize mathematics is also another factor of poor performance (MOE, 2018).

In Malawi, mathematics remains a challenging subject especially in secondary schools. Based on student performance in national examination, the pass rates in mathematics have been lower than in many other subjects. The Malawi Institutes of Education (MioE) is currently reviewing the secondary school curriculum. This aim is to narrow the gap that exist between Secondary school and first-year mathematics courses, as evidenced by poor performance of first-year University students in mathematics. Lack of Research funds to advance mathematics as a subject. Students hoping for advanced studying in mathematics must search for funding from foundations or from foreign governments, which is scarce and difficult to secure. Without research, there can be no new ideas to improve the underperformance of students in mathematics. Lack of mathematical facilities, equipment, and literature also contributes to poor performance in mathematics (MOE, 2018).

Pupils' performance is also affected by ineffective teaching methods. Powell, Berry and Benz (2020) observed that, "teaching is effective and efficient when students are taught the right content, having enough learning materials and activities. This requires a teacher to have passion in sharing knowledge with students while motivated with school management

system". Teaching aids are materials that teacher use to communicate the content the learner in a simpler manner. Effectiveness transforms the intangible into tangible and theory into reality. Gender stereotype is another glaring problem. Widespread acceptance of stereotyping of mathematicians and engineers as predominantly male domain from elementary to university level is still the norm in the most African countries.

Lack of parental support for teacher efforts also has an impact on pupils' achievement. The success of a pupil depends on the relationship that exists between teachers and the parents (MOE, 2018). When there is no such a strong bond between the school and a home, the outcome is low performance in mathematics.

Due to the underperformance found, student math performance is a hot topic being explored at the national level. One of the reasons for poor arithmetic performance is that some teachers have poor mathematical skills and have limited viewpoints on mathematics education. Some teachers are not competent enough in tackling all the topics in mathematics (MOE, 2018). They do skip certain topics that appear to be so challenging to them to teach the learners.

For instance, some teachers may find it challenging to teach linear programming, and their only option is to omit it from the curriculum while deceiving the students into believing that the subject is not covered or that it won't be on the test. However, some teachers pay little to no attention to having clear instructional objectives. They usually not evaluate whether they have met their objectives or not.

Zambian Perspective

According to ECZ (2017) report, Zambian pupils have struggled in linear programming. Kaabo (2019) observed that pupils' performance was greatly impacted by their comprehension of the concepts and symbols used in linear programming due to the methods utilized by teachers to teach it. Pay particular attention to the instructional tactics that are built from the beginning of the lesson to its finish to ensure that the concepts and symbols receive the essential contact to improve their use in an interactive learning environment.

The study further established the constraining factors in the effective teaching of LP and the intervening measures that were suggested to overcome the constraints. The constraining factors were; the region to be shaded for linear in equation and linear programming were not consistent, less learner interaction with variety of linear programming questions/situational statements and getting in equations to form linear programming questions to enhance use of the terms and associated inequality symbols was inadequate.

According to a study conducted in the Mufulira District by Koji et al. (2016), children should first be taught the fundamentals that are more complicated before being taught about linear equations. The prior knowledge should cover algebraic laws, the idea of variables, algebraic words and expressions (the symbolic language of mathematics).

They asserted that when we are able to connect two or more ideas—old and new—together, learning becomes meaningful. One criterion is that the knowledge imparted to the learner be related in some sort of logical way. New knowledge also needs to be integrated into a bigger scheme or whole. It is necessary for the learner to possess past knowledge to which the new concept can be linked or anchored. Thirdly, the appropriate subsuming conceptions must be present in the learner's cognitive framework. Lastly, the student must make a real effort to connect, in some rational way, the new ideas to those that are already known. If any of these conditions is missing, the end result will be rote learning and challenges such as the ones exhibited will continue to be part and parcel of the mathematics education in Zambia and elsewhere. Lack of comprehension of any of the aforementioned concepts could make it extremely difficult for a pupil to understand linear equations.

A study by ECZ (2016) asserts that, regardless of their preferred learning method, students had trouble applying the principles of linear programming to problems involving the construction of mathematical models answer over time. Undoubtedly, this necessitates new, creative pedagogical approaches, team teaching being one of them. As a profession that necessitates both study and experience, team teaching offers a formal structure for teacher collaboration to enhance each teacher's individual relevant pedagogical and subject competency. The researcher argues with the study findings of ECZ this is because the attributes are not based on learner's struggles but teacher's incompetence and lack of proper trainings from different colleges and universities

There have been many concerns for many years about learner's poor performance. According to the highlights of the 2014 Grade 12 Examination Results Statistics, and a report prepared by the Research and Test Development Department (2015), the poor performance on the overall was recorded in Mathematics, which was below 60 percent. Mathematics seem to be problematic to many learners either because the subject is difficult or teachers do not teach adequately by using the most effective teaching approaches. LP is one such subject in mathematics where students struggle, and this undoubtedly has an impact on their performance.

Changwe and Mulenga (2018) did a study where they analysed the mathematics teacher education curriculum in which they sought to find out student teacher's competences. One of the study's key findings was that the mathematics teacher education program did not adequately equip teachers of mathematics for successful classroom mathematics instruction.

Theoretical Underpinnings of the Study: Phenomenology Model

Phenomenology focuses on human experiences (Husserl, 1927). It explores the lived experiences of individuals in pursuit for a meaning (Carel, 2013). As the concept implies, lived experiences comprises of the daily activities, thoughts and impressions of an individual's domain a specific content (Creswell, 2007). According to Carel (2011, 2013), lived experiences are exactly how they look to us. Since we cannot leave our bodies in our perception of the world, things as they appear to us are subjective (Merleau-Ponty, 1963). The way things appear to us is there not necessarily the way things are objectively (Simui, 2018). Phenomenological offers more than a simple account of daily activities and perceptions. It digs deeper into the meaningful combination of emotions, thoughts, culture and bodily experiences of an individual (Carel, 2011). The difficulties, as well as fear, hardships, and weaknesses, would be projected in a phenomenological account of grade twelve students' lived experiences.

METHODOLOGY

Research Design

The study will use the qualitative approach to explore pupils' academic performance with the view of designing a framework (McMillan & Schumacher, 2014). Qualitative research is an inquiry in which researchers' collects data by interacting with selected persons in their own environment (Creswell & Poth (2018). It describes and analyses people's individual and collective social actions, beliefs and the meaning that people assign to them.

McMillan and Schumacher (2014) further stated that it is a constructionism, which is more concerned with understanding the social phenomenon from the participant's perspective. The data collection strategies that were used included interviews, and group discussion.

This study therefore, was guided by Hermeneutic phenomenology which is concerned with human experience as it is lived (Heidegger, 1996). In order to comprehend the reality of

life, we must investigate the narratives that people tell about their experiences, frequently with the aid of a particular hermeneutic (interpretation) (Heidegger, 1996).

This study employed only qualitative methods. According to Shava and Nkengbeza (2020), postulate that it is an investigation that takes a naturalistic stance to comprehend events in particular contexts. The study employed hermeneutic phenomenological design. This approach situated subjectivity at the heart of knowledge production (Guimond-Plourden, 2009).

There are seven (7) different approaches to phenomenology but only two (2) approaches namely: transcendental (descriptive) and interpretive (hermeneutic) phenomenologies are used to get the insightful information and in-depth understanding (Dangal, 2020). Out of Dangal's two suggested phenomenology methodologies, the hermeneutic phenomenological technique was selected for the current investigation. This is because hermeneutic phenomenologists take the freedom to interpret the unspoken, unconscious, and hidden meaning they perceive to exist in the phenomenon under study, rather than simply to provide a full description of the data (Cohen and Omery, 1994 in Simui 2018).

In other words, a hermeneutic phenomenological technique enables the researcher to explain phenomena rather than merely recording informants' firsthand accounts. The design is most effective when evaluating actual experiences (Donalek, 2004) as cited by Mathatha and Ndhlovu (2019).

Therefore, hermeneutic phenomenological approach focusses beyond the eye of the participants so as to have a deeper understanding of the phenomenon.

The four existential aspects introduced by Van Manen served as the foundation for the elucidation (1990–1997 in Guimond-Plourden, 2009) namely lived body (corporeality), lived space (spatiality), lived time (temporality) and lived relation (relationality). The researcher integrated these existential dimensions because they are all embedded in the life of a participant or any human being.

Similarly, Van Manen (1990/1997) as cited by Guimond-Plourden (2009) posits that the life worlds or lived world of all human beings regardless of their cultural, historical or social situatedness is pervaded by temporality, corporeality, spatiality and relationality. Further, he points out that these dimensions can be differentiated but cannot be separated because they form an intricate unity known as our lived world.

A hermeneutic phenomenology design was used to examine students' real-world experiences. Heidegger’s thesis is on ‘Being and Time’, which was further expanded by Van Manen’s four reflective thematic areas on lived experiences. The four are:

i) lived space – Spatiality;
ii) lived body – Corporeality;
iii) lived time – Temporality;
iv) lived human relation – Relationality (Van Manen, 1997).

In other words, lived experience takes place in ‘Space’, ‘Body’, ‘Time’ and ‘Relations.’ Owing to limited time available to conduct a longitudinal study, a cross-sectional approach was preferred to longitudinal approach. Participants were divided into groups based on their grade-level of experience through a purposeful selection process. According to Van Manen (1997), the researcher was able to learn more about how students of various ages and academic years (Time), learning with other students (Relations), in a setting similar to a school environment (Space), experience their personal experiences (Body).

The hermeneutic phenomenological technique was chosen for this study because it was both consistent with the researcher's reflective stance on knowledge formation and it took into account the distinctive lived experiences of pupils learning mathematics (Donalek, 2004) as cited by Mathatha and Ndhlovu (2019).

However, the lived experiences of previous grade twelve pupils were explored using Heideggerian Hermeneutics Phenomenology lenses. The four reflective themes listed by Van Manen are as follows: The lived qualities of (i) lived space—Spatiality; (ii) lived body—Corporeality; (iii) lived time—Temporality; and (iv) lived relation—Relationality—all contribute to Martin Heidegger's "Being and Time" thesis (Van Manen, 2007).

Sample Size and Criterion for Selection

Neuman (2003) asserts that non-probability or a non-random sample is the centre of qualitative research, which means that sample size is rarely predetermined. A sample size of 15 previous grade twelve students who were familiar with the exam was used. Van Manen's (2007) recommendations were used to develop an inclusion/exclusion criterion for carefully choosing research participants. The case study of choice complied with the predetermined limits (Neuman, 2003).

1. Lived with experience for a term learning linear programming (Temporality).
2. Lived with experience for a term learning (Spatiality)
3. Lived with experience for a term being taught learning linear programming by a teacher (Relationality)
4. Lived with experience solving linear programming (Corporeality).

Sampling Techniques

In selecting participants, for the purpose of choosing individuals who could provide thorough details about the occurrence, a homogenous purposive sampling was adopted. Denzin and Lincoln (2017) noted that it suggested purposive sampling participants were chosen based on their familiarity with the sought-after information. To put it another way, purposive sampling permits the researcher's judgment to choose the best participants to respond to the study's questions and goals. Purposive sampling's objective is to choose individuals who will enable the researcher to fully grasp the phenomena rather than to generalize findings to a larger population (Makondo & Makondo, 2020).

Data Collection Instrument

Interview guide and group discussion guide were used to collect data. The use of numerous techniques increased the validity and reliability of the findings (Bertram & Christiansen 2016). Mkandawire (2019:145) stated that "qualitative data collection methods are those strategies used to collect information based on subjective assessment of opinions, behaviour, attitudes, and social interactions." Common qualitative data collection methods include interviews, group discussion, observation, and document analysis (Cohen, Manion, & Morrison, 2018).

Data Collection Procedures

The current study employed the qualitative data collection techniques as explained below:

Interviews

In interview, the investigator gathers data directly from the respondents in face-to-face contact and by recording the responses using some mode of recording. Sidhu (2006:158) asserts that "the interview reveals what people think and do by what they express in conversation with the interviewer".

During the face-to-face interviews, pre-planned qualitative unstructured interview questions were used to collect information from the fifteen respondents (Newby, 2010:343). In order to suit the respondents, sometimes questions were altered. This was done so that the

respondents could be helped to answer according to the way they understood the question. Direct questions were asked to fill in any gaps.

The voice recorder to record the proceedings were recorded so as to avoid misinterpretation of collected data (Hinfelaar's, 2001:18). Additionally, a note book was used to take down notes of any responses not clearly explained by the respondents, and any other useful information found useful to record.

Focus Group Discussions

Focus Group Discussion (FGD) was also used to collect information from eight participants. Focus group discussion provides an opportunity to collect a larger amount of information regarding everyday experiences (Maguire, 1987). The feelings, beliefs and ideas were revealed in the group's social setting. The discussion was recorded and notes were taken which later were compared with the voice recording (Newby, 2010).

Research Instruments

Interview guide was applied in order to gather information from different respondents. The interview guide was useful because it personally helped to administered to a respondent or groups of respondents. The guide consisted of pre-planned questions or guidelines which guided me to conduct the interview.

The guide also provided me with an opportunity to establish rapport to set the stage for the interview, and to explain the meaning of items which might not be clear. Additionally, a focus group discussion guide saved my time and expense since I did not have to make more than one trip to meet different participants for the interview. I conducted the interview smoothly and effectively using the pre-planned unstructured questions whose responses I received immediately.

Basically, the research tools used to gather data from students were a detailed interview guide and focus group discussions. In order to successfully overcome the difficulties encountered during the focus group discussion, I asked the main respondents to share some of their ideas. I also used a recorder, a note book, and pencils as additional research tools to capture the data provided by all of the respondents.

Data Analysis Procedure

Data for this study were simultaneously collected and processed (Bertram & Christiansen, 2016). In order to spot any recurring themes or patterns, notes were regularly checked. The information was coded, subjected to a thematic analysis, and then themes were checked for to ensure their validity.

Trustworthiness

The following four criteria from Guba (1981) were used to the study: (i) credibility, (ii) transferability, (iii) dependability, and (iv) confirmability. To extract significance from the collected data, the researchers employed a reflexivity technique. The study conclusions could be applied in many contexts, the data generation process and boundaries were also described. The study also satisfies the requirements for reliability and confirmability because it is presented verbatim.

Ethical Considerations

The ethical guidelines provided the basis for this investigation, which included obtaining verbal and/or written agreement from each participant (Cohen et al., 2000). To ensure anonymity and privacy, pseudonyms were allocated to replace real names. The respondents who participated had their identities concealed by the pseudonym.

Constructed Framework to Document and Interpret Lived Experiences

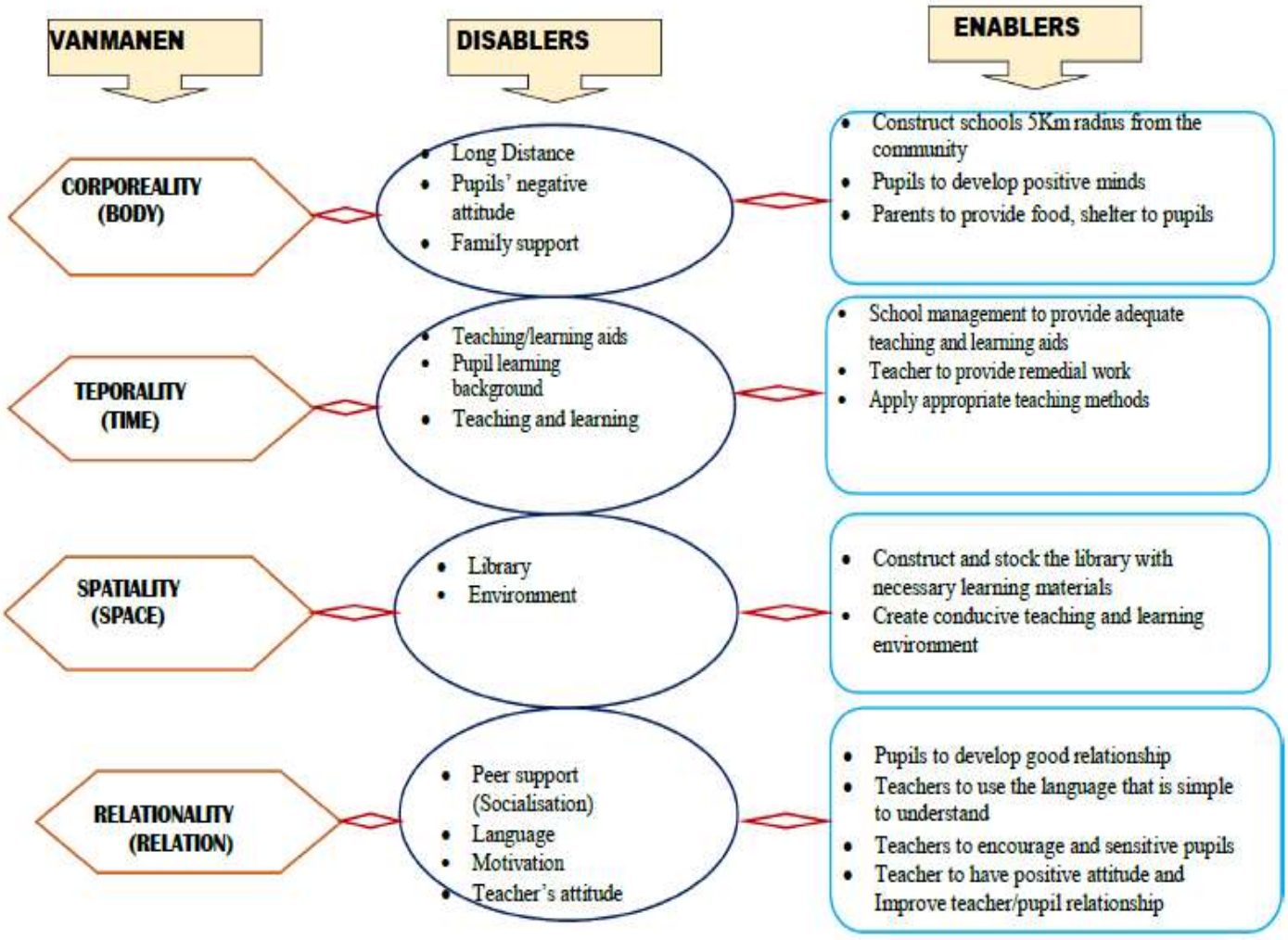
This section is an extension of discussion chapters and responds to the last research objective focused on developing a framework for documenting and interpreting lived experiences of pupils at school. The emergent framework is dubbed Hermeneutics Analysis linear programming framework [HALP], a result of four months of deep reflection on the pupils' personal experiences. The multi-dimensional framework consists of three segments namely: (i) Van Manen, (ii) disablers and (iii) enablers. In addition, the framework is situated within existential philosophy and *Words* and *Language* in uncovering the hidden essence in the advanced version of "Being and Time" by Heidegger and other proponents such as Ricoeur, Gadamer and Merleau-Ponty in (Simui, 2018).

It is in this disposition that the conceptualisation of the proposed framework is based on essential words as given by former pupils of Nkeyema secondary school. The words depict their felt lived world while interacting with their teachers. The Proposed framework provided patterns based on the essences generated through pupils. In addition, the framework aided in developing a story line during the writing phase of findings and discuss discussion chapters.

In this vein, the proposed framework finds its space as an innovation developed through inductive logic. The framework could serve as a snap-short of verifying the emergent themes within a short space of time available. The framework offers a ‘valuable format to communicate knowledge’ as perceived by the participants (Schadewitz & Jachna, 2007:1).

Furthermore, the framework is good in determining saturation of sample, when emergent themes are related and similar and no longer new. Qualitative researchers agree on ‘sample saturation’ as determinant point to end further sampling process. However, little is known on how the saturation point looks like. Therefore, the framework could be useful to novices in qualitative research dealing with the challenges related to determining saturation point.

The process of generating essences was enhanced through a designed framework with ‘rows’ ordered and ‘columns.



PRESENTATIONS AND DISCUSSION

According to the study, there were numerous factors that affected pupils. The themes that surfaced were all linked to various stages, including (i) pupils with poor learning backgrounds, (ii) distance learners, (iii) teaching and learning aids, (iv) learning environments, (v) pedagogy, (vi) students' negative perceptions of mathematics, and (vii) libraries.

Pupils with Poor Learning Backgrounds

Notably, research findings by Meara et al. (2019), reveal that poor pupil learning backgrounds [temporality] have had a substantial impact on the skills, and values in education. Slow learners may find it tough to succeed and catch up because they lack the necessary foundation. The study of mathematics builds on previously understood ideas. This means that learners must have prior knowledge before beginning to learn a new mathematics topic. Harris (2015) makes an analogy by saying you can't run a marathon if you can't complete a 5-km race. Many students struggle with linear Programming because they lack the basic mathematics skills required to perform linear operations. Brijlall and Ndlovu (2013) also demonstrated that pupils were unable to relate what they were learning to what they

previously knew. It was also found that learners experienced some difficulties (Brijlall & Ndlovu, 2013).

However, it is therefore advisable that pupils have strong background if they are to do better in their studies. Having a solid foundation is ideal, if not necessary, before linking to linear programming. To put it another way, it is crucial to cope with linear programming in order to ensure that learning progresses from the familiar to the unfamiliar.

However, *Mawilo* highlighted that pupils who lack a strong foundation would find it challenging to understand topics as he reflected on his challenges in grades eight and nine. His teacher was unable to teach the students because of the over teeming class. *Mawilo* remembered his teacher's ability to simply relate a story. This specifically had a bigger effect on his performance once he entered grade 10. His past mathematical expertise was inadequate because learning is said to occur from the known to the unknown. *Milangi,* who was acquainted with the subject, echoed *Mawilo's* assessment. He had to study because he had to. Whether or not he comprehended the subject matter was irrelevant.

The claims made by Mawilo and Milangi are consistent with Changwe's (2017) contention that if performance at the school certificate level is to improve, a strong foundation should be formed through the effective at the primary school level. When learners are given incorrect instruction in basic mathematical ideas, it becomes exceedingly hard to understand advanced mathematical concepts, which may affect how well they perform in mathematics in later years of higher education.

Distance

Similar to background, distance [Spatiality] was regarded highly as a crucial component in the education of pupils, which was one of the deterrents in the learning process of students. *Kande* attributed the distance he was traveling for his poor academic achievement. He observed that I was fatigued when I got to school and that I was having difficulties concentrating. It was difficult for me to concentrate and learn more when I occasionally arrived at school without eating, which contributed to my lack of motivation. This was especially true for a topic like linear programming.

Kakumba also claims that I arrive home late and exhausted when I knock off. The next morning, I got up at 4:30, and I was so late with my homework and other teacher-given assignments that I even stopped trying.

The claim regarding distance is supported by Dawa, Sherpa's (2021) research on the effects of distance on learning outcomes, which states: that a student's travel distance has an adversely impact their academic performance, preferably in their key subject matter.

Shimano and *Mungomba* also made the following discovery: Some boys and girls who travelled a great distance were compiled to rent homes and turned to doing bad deeds. They usually associate with bad people in bad groups to avoid learning. The claim is consistent with Mufalo's study findings from 2022, which stated that some boys and girls from far locations rented thatched cottages in adjacent villages and spent the most of their time shopping for food. Other children resorted to drinking beer. The circumstance that makes pupils late for class and absenteeism more likely, which is a recipe for low academic achievement in schools.

Therefore, the government should build schools near to the communities to lessen the distance pupils cover and boarding schools.

Teaching and Learning Aids

Another concern that emerged clearly from all the participants was lack of learning resources for linear programming components. According to this assertion, the research by Yara and Atieno (2010) in Bondo district of Kenya showed that lack of needed

teaching/learning materials in schools affects the performance of learners. The same conclusion was reached by Mulenga and Kabombwe (2019) study, which also found a similar lack of resources as well as inadequate and inappropriate learning and teaching materials in schools (spatiality).

This assertion is supported by Mwanza and Silukuni (2020) findings, which showed that large class sizes, a lack of educational resources, subpar classrooms, and desks all had a detrimental effect on the delivery of high-quality instruction and led to pupils performing badly in school. When pupils are not exposed to the most recent books, they tend to overlook important knowledge. Because of this, it's critical to make sure that learning resources are current and useful in the fast-paced academic environment.

Naku and *Njolo* made a point about the value of teaching aids. The school should provide the classroom with appropriate teaching and learning aids.

Learning Environment

The setting for instruction is a critical factor in pupils learning and academic performance.

Kakumba observed the critical factor in pupils learning concept especially in Linear Programming. When the environment is strong, pupils can learn effectively. A study by Akey (2006) ascertained that school environment (teacher support, pupil interaction and pupil expectations) is largely related to pupil attitudes and behaviour. Teachers should ensure that learning environment is conducive so as to motivate learners.

It is adequate to state that students' attitudes toward their teachers have a big impact on how they approach math. As a result, successful students are aware of their surroundings and have motivating teachers (Maat & Zakaria, 2010).

Pedagogy

Comprehensive pedagogy built on constructivism was crucial for students' academic success. The use of instructional materials for the teaching/learning process and teaching strategies to improve learning, comprehensive pedagogy was demonstrated. Both *Kande* and *Kamasisi* described how their "teachers" (Relationality) were having difficulty imparting the programming theory ideas. The views put out by *Kande* and *Kamasisi* above are consistent with Lamichhane's (2017) research on the pedagogical changes needed for pupils from various backgrounds to succeed in the classroom.

Lee et al. (2019) focuses on the teacher's presentational style and strategy for making lessons engaging. Facilitators have high pedagogy content knowledge if they can make their lessons engaging for the learner. Teachers need to have a solid grasp of the things they are teaching. They also know how to organise concepts into logical sequences, build the factual knowledge required for each subject, and help their students explore various modes of knowing (Delaney, 2012). Learning is benefited by the teaching methodologies and subject matter. It is challenging to measure the value of mathematics for the students due to ineffective teaching strategies and a lack of conceptual understanding (Olusegun, 2015; Ültanır, 2012).

Poor subject knowledge throughout teaching jeopardizes students' test scores. Thus, a high degree of subject matter is advantageous to the student and can improve performance, particularly in linear programming. In line with these claims, Mufalo (2021) effectively stated that teachers must have a deeper understanding of the subject-matter expertise to avoid delivery issues that may prevent students from learning the skills and knowledge they need to transform. Similar findings were reached by American research that demonstrated the link between subpar arithmetic ability and classroom factors, such as inefficient teaching methods

(Elliot et al., 2013). Research shows that the commonly used teaching methods are question and answer, exposition, guided discovery and group work.

Pupils Negative Perceptions towards Mathematics

Pupils Negative Perceptions towards Mathematics was among the themes that pupils brought out. If noy properly checked can affect performance. Negative attitudes result in a major learning obstacle and low academic achievement (Poku, 2019). Negative attitudes manifest through social discrimination, lack of awareness and traditional prejudices.

UNESCO (2017) observes there are still some areas where people think mathematics is difficult. As a result, in order for a pupil to thrive academically, they must possess a positive outlook through secondary obstacles caused by stakeholders who have a bad attitude. Because of this, according to *Kabi,* it is never simple for a non-gifted student or learner [corporeality] to reach grade twelve [temporality]. This argument asserts that the teacher alone is responsible for guiding a slow learner [relationality].

The majority of respondents seem to ascribe failure [attribute model] they had towards linear programming to pupils' negative attitude, in contrast to certain students who displayed a positive attitude mind-set as their main attribute. Claims made by *Kabi* and *Njolo* are constant with those made by Poku (2019), who examined junior high school students' attitudes about mathematics achievement in Ghana.

Poku assertion agrees with Mutanga and Walker (2017), who argued that pupils who display negative attitudes and a lack of preparedness for school have challenges in their studies. Consequently, this affects their full inclusion in school.

In Ghana Arthur, Asiedu-Addo and Assuah (2017), who studied on Empirical Review of Students Attitude and Achievement, assessed students' perspectives and their impact on the interest of Ghanaian students in mathematics using a multivariate statistical analysis alluded that teachers attitude affects pupils' attitude towards the performance in Linear Programming. *Kabi* reached the same conclusion after hearing male teachers say that only real boys should study mathematics [*Relationality*]. Such sentiments from teachers prevented pupils from developing good views regarding mathematics.

Additionally, students were encouraging one another by making fun of their classmates when they responded to questions incorrectly. By deduction, one's attitude is significant on others and as such can greatly affect one's achievement and abilities in mathematics. This finding agrees with Asempapa (2022), Ngussa (2017), who did their studies in Tanzania, and Mutegi, Gitonga, and Rugano (2021), who studied mathematics anxiety, attitude and performance among school going pupils in Kenya.

Teachers inculcate positive attitude, and assign different tasks to pupils based on their academic level so that they apply previously acquired knowledge, understanding, and experiences in subsequent learning (Yurt, 2015). This claim is in line with the hypothesis made by Berger, Mackenzie, and Holmes (2020) that positive attitudes toward mathematics and science are advantageous to student progress. Additionally, Menon (2018) concur with Berger that a good attitude toward math supports early academic progress.

Library

Lack of Library [*Spatiality*] is an obstacle to successful learning effort of pupils. For convenient information storage and retrieval, schools should build and equip their libraries with devices, including tablets, wi-fi, and internet connectivity. Majinge and Stilwell (2014) noted that study materials are important for improving performance.

In some schools, a textbook is the only resource that is available to teachers and pupils. Therefore, the textbook is another factor that have an influence on learners' performance. This assertion agrees with Siyepu (2013) who pointed out that, there are complaints about the

inappropriateness of textbooks in South Africa. Some textbooks have been blamed for having few learners' activities while others have been criticized for having lower-order skills, such as recall, as opposed to higher order skills, like problem solving.

According to Siyepu (2013), many South African textbooks do not give learners opportunities to make inferences, conjectures and generalization to understand the strategies used to derive the formula. In this case, textbooks have been blamed for what is termed the "cookbook" approach, where formulae are supplied to the learners without their having to derive them (Siyepu, 2013).

In a study carried in high schools in Ghana (Brew, 2011) revealed that textbooks had an effect on learners' performance, especially where the textbook was the only resource available. Pupils believed that using textbooks will help them better performance in mathematics. Government should furnish schools with textbooks that contain activities that will help them to develop the necessary skills in mathematics (Brew, 2011).

The most often utilized resource in schools is a text book. Many teachers, including mathematics teachers, rely heavily on textbooks in their daily classroom activities. Some teachers have developed the tendency of using their textbooks as their lesson plans rather than as supporting resources because of their reliance on them. While others have the tendency of following the textbooks page by page. Such cases make it clear that textbooks have a direct impact on learners' achievement.

A study by Rezat (2009) has revealed that pupils use the mathematics textbooks not only when they are told to by their teacher, but also of their own accord (Rezat, 2009).

The four particular actions listed below characterize learning mathematics through math textbooks: (1) solving tasks and problems, (2) consolidation, (3) acquiring mathematical knowledge, and (4) Completing tasks and concerns is linked to activities where students consult their math textbooks for assistance. These activities are associated with an interest scenario.

Lack of Role Models

Since there aren't enough role models for learners to imitate in their communities, students have negative views toward education. There must be guidance and counselling to pupils so that they develop high self-esteem. In other words, for pupils to receive maximum learning, an atmosphere of comfort, motivation and experimentation in the classroom should reign. However, studies have shown that students generally feel positively about the subject. Teachers with greater self-efficacy and higher goals and objectives for themselves along with their pupils are likely to cope successfully with barriers and problems (Ross and Bruce, 2007).

Family Support

Family support [corporeality] is also very important to the pupils thus providing them with all the physiological needs such that learners can move to the next level in the hierarchy need. If pupils are not provided with the required support, they tend to flaw.

This assertion backs up the claim made by Liouaeddine et al. (2017) that a child's familial environment significantly affects their achievement in school. These studies often evaluate the family environment in terms of social economic status, family's social class, the parents' educational backgrounds, and the wealth of the family. Noted that family and parental characteristics also include factors such as genetic endowments that could be transmitted passively to the child through the hereditary process. The intrinsic qualities of the student, such as mental capacity and personality traits, are shaped by this process.

Similarly, Smith (2014) asserted that, family background tends to influence student performance. Students' cultural backgrounds differed and affected students influences in

mathematics. Furthermore, students from different cultural backgrounds were influenced differently based upon parental experiences, interests in mathematics and cultural views and attitudes of mathematics education.

According to Sirin (2015), the most stable and consistently observed phenomenon in the realm of education was the impact of learners' home background on achievement. Students from families with greater socioeconomic position often do academically better than students whose parents have lower socioeconomic status, regardless of their parents' wealth, level of education, or career. Thus, an impoverished homestead tends to impact negatively on the academic achievements of children in most cases.

Lack of Proper Teaching Methodology

Lack of proper teaching methodology [temporality] is a draw back to the learners. Continuous usage and provision of learning aids from local resources are required. This helps easy and facilitate achieving learning needs of the pupils. Thus, teaching becomes more fascinating as learners learn from concrete materials unlike leaning from abstract

In most cases where learners are not exposed to the updated learning and books, the pupils tend to miss valid information. As a result, be sure to use timely and up-to-date educational materials that can support a dynamic learning environment. This will help cope with modern technology of the day.

The Learning Environment

This is important for both learning and performance. Students can learn well in a supportive setting (Ehiametor, 1990; Farrant, 1982). Pupils' ability to learn effectively is hampered by a poor learning environment (spatiality). In a setting that is encouraging and uplifting, students feel more valued. As a result, students feel inspired and actively involved in the learning process.

According to Tanveer, Rizwan, Ali, Arif, Saleem, and Rizvi n.d. (2019), students learn best and have a positive outlook on a subject when they are actively interested in it. Students typically perform better when there is good teacher-student contact and when teachers use cutting-edge teaching techniques.

Enu et al. (2015) claim that in a classroom or school environment that teachers see as helpful, students tend to feel more confident in their ability to succeed. Students who are more attuned to a positive learning environment tend to be happier and to have a more productive attitude toward mathematics (Maat & Zakaria, 2010). It is sufficient to say that students' views toward mathematics are significantly influenced by how they regard their teachers.

Language barrier

Language [relationality] is the pillars of child development. Students are unable to learn properly moving ahead due to language obstacles. The language used to deliver educational learning objectives must be simple and common sense in order to guarantee that students comprehend the essentials communication. Sakayombo (2018) observed that some learners found it exceedingly challenging to understand the vocabulary employed in mathematics, which made it an abstract topic. As a result, Sakayombo's research demonstrates that learners struggle with learning about linear programming because of the complex vocabulary required to coordinate it. This assertion is consistent with Davison's (1990) hypothesis that a language deficit causes a math disadvantage (Barwell, 2018).

Motivation [motivation] is the crucial elements. Students who lack motivation find it challenging to focus on what is being taught. The learners should meet both intrinsic and extrinsic motivation that should drive them to the desired set objective. Motivation was found

to significantly affect student performance in general and mathematics (Singh, Granville & Dika, 2002). Students are more adept at solving word problems when they are familiar with mathematical jargon (Fuchs et al., 2018). According to Nuerk (2015), word issues are difficult or impossible to solve because the language and math components are not grasped.

Teacher Attitude

Finally, teacher attitude is also very important [relationality], a self-motivated teacher with positive altitude drives the learners according to their interest. Every teacher should remember that every student can study in any conducive environment (spatiality). With an enhanced and positive interaction between the teacher and the students, this is practically possible. As a result, it's important to give students access to some real-world applications and practical learning (Cady & Reardon, 2007).

In support of this position, Moore (1998) argued that teachers should teach passionately because passionate teachers perform quality academic work.

Thus, pupils who score higher marks in mathematics will turn to have stronger affection and attitudes and vice-versa. In support of this, Lopez et al. (1997) maintained that self-efficacy of pupils, attitudes are correlated, and that self-efficiency in mathematics is influenced through previous grades and marks.

Suggestive that pupils with poor previous grades would tend to be negatively influenced which would eventually translate into poor academic attainment in mathematics.

According to Jurdak (1991), math teachers' attitudes and convictions have a big influence on the way they teach. In a 1997 study by Leo (relationship), who looked at the beliefs of 16 Singaporean teachers, revealed that the way math teachers approached the subject had an impact on their own notions and beliefs. Similarly, in a comparative study, Pepin (2011) established a direct relationship between teachers' philosophies and their teaching methods.

It discovered that for classroom mathematics instruction and learning to be effective, the institution must have a strong infrastructure, the right tools for teaching and learning, and highly skilled teachers. This can be resolved by the government providing appropriate funds to the education sector and by coordinating the mathematics teacher education program with the academic program.

To summarize the aforementioned components, the relationships between teachers and their students have substantial effects on how well students perform in the subject.

Summary

The proposed HALP framework offers a window through which this researcher viewed reality as lived by pupils. In addition, the framework empowered the novice researcher to determine sample saturation based on the similarity of prominent words from the participants and then documented emergent themes accordingly. Further, this framework aided the researcher to develop a story-line based on the emergent themes during the write-up process. If applied it can help to motive and improve pupils' performance

Since the study had an added thread of emancipation of pupils in secondary school, the research was conducted using a Hermeneutic Phenomenology methodology.

After fifteen participants offered to share their own stories, a variety of themes came to light. The concepts of the essence-based Hermeneutic Phenomenological methodology guided the themes.

Their lived experiences led to the emergence of numerous enablers and disablers that represented the felt worlds of former grade twelve students at Nkeyema Secondary School. The quiet voices conveyed how they felt vulnerable and successful, resilient and irritated as they pursued their education in a setting that favoured and was managed by bright learners.

The disabling factors included: (i) pupils' negative attitudes; (ii) poor background; (iii) lack of teaching and learning materials (iv) lack library; (v) pedagogical; (vi) family support; (vii) peer support; (viii); long distance(ix) teachers' attitude and (x)learning environment.

Despite the difficult environment, pupils' academic success was greatly influenced by five factors: a positive mindset, family support, peer support, teacher support, and learning resources. It is apparent that more disablers than enablers were present in students' daily experiences.

The other four enablers, besides having a positive viewpoint, highlighted how dependent students are in a solitary learning environment on their teachers. In this sense, the most crucial enabler for students' achievement at Nkeyema secondary school was singled out among the other enablers. According to the HALP framework described above, the positive attitude manifested itself in many different ways, including resilience, determination, creativity, inventiveness, self-motivation, will power, and enthusiasm. If students had a strong will, perseverance, and inventiveness when a challenge arises, they might still achieve academic success without the aid of a teacher.

Innovations and Contribution to Knowledge

The researcher devised a framework known as the Hermeneutic Analysis Linear Programming Framework. The approach might improve what policymakers should think about implementing at the secondary school level. In a similar spirit, the framework might help officials from the district, province, and headquarters gauge the proficiency levels of teachers.

CONCLUSION AND RECOMMENDATIONS

Overview

This concluding chapter revisits and provides a short recap of the findings. Thereafter, a set of recommendations are presented hierarchically at individual, community, institutional and national levels. Added to the recommendations are three proposed areas for further research

Conclusion

In conclusion, pupils encounter a variety of obstacles every day as they work to advance in their academic careers. Despite the limited resources in schools, administrators leverage the untapped resources that students bring with them to address the problems that students have when studying linear programming. Students will undoubtedly overcome the vast array of problems faced in linear programming if only they can be involved in the teaching and learning process. Due to the numerous disablers raised by students, secondary schools must improve their performance. This draws my attention to suggestions that should be given more thought by many stakeholders.

Recommendations

The researcher provides ten (10) recommendations. Thus, other schools similar to Nkeyema secondary school may do well to engage with and reflect on the recommendations to improve performance. These recommendations are discussed below and have been classified into comprehensive policy, accessibility, active involvement, orientation and mobility, landmark, assistive learning devises, capacity building, guides, peer support and partnerships. Additionally, it is advised to conduct more research in these areas.

1. Teachers, parents, pupils and education policy makers are encouraged to apply the HALP framework to better understand disablers and enablers in the learning and teaching.
2. The school should develop and implement a comprehensive policy on feeding program. Most learners at this school come from distant places, and usually on empty stomach making it difficult for learners to focus on learning. It was not surprising that majority of pupils were unreasonably impeded from accessing and participating. The feeding program will enable the learners concentrate on learning and improve performance However, Nkeyema secondary school did not have such a policy on feeding program this negatively affected pupils' performance.
3. Government should consider developing and comprehensive education policy, which can be domesticated at institutional level as well. The policy could provide a guide and support to pupils within their continuum of experiences from learning and teaching aids, teaching, absenteeism, learning, assessment and final examination. In addition, all the disablers should be addressed within the comprehensive education policy framework.
4. The teachers should involve pupils given that pupils were not involved and were inadequately prepared to face the final examination. The active involvement should include group work, homework, research-based tasks and evaluation. At each of these stages, pupils could provide feedback on the anticipated disablers.
5. The school should ensure that mathematic department have all the required materials to enable teachers facilitate teaching effectively complex topics such as linear programming. For pupils to lessen their dependence on the teacher the school should come up with the physical library. Students can use the library to access books when doing their homework. It is advised that the school establish a school library because every student at Nkeyema Secondary claimed that its absence was one of the factors contributing to their poor academic performance.
6. To help students study properly, the school must encourage regulated prep. All pupils reported poor studying culture. Consequently, this had contributed to pupils being dependent on their teachers. Therefore, the school should take the initiative to redesign and deploy monitors and teachers to ensure that pupils have time to study for their own benefit.
7. The school should procure relevant and appropriate learning and teaching aids. The school should saturate the library with appropriate teaching and learning materials in order to meet the rising demand for such materials in light of the rise in the number of failed students.
8. The school should improve on the learning environment. As was evident, Nkeyema Secondary School lacked enough classroom furniture, particularly in terms of the number of desks per student.
9. The teachers ought to recommend simple methods for presenting content in a responsive setting. Every student laments the absence of content on a certain subject.
10. Qualified teachers to provide support to pupils facing some difficulties in a warmly manner without offending the pupil. In this way a pupil will be motivated and like the lesson. It is not enough for teachers to rush through the topic without considering the less gifted pupils. School as well as Ministry of Education should devote in ensuring that, the less gifted pupils are taken on board by giving them remedial work and on how to effectively manage the learning experiences of pupil's especially linear programming. Government should make it mandatory for all teachers to administer remedial work in linear programming among others topics.

11. The government should ensure that school are near the reach of the pupils. The government should construct school near the communities to help pupils covering long distances as it negatively pupils. Since nearly all the participants acknowledged the long distance affected their performance. When schools are near the reach of the pupil will lessen the stress, they pass through hence being motivated thereby improving academic performance.

Finally, the HALP framework was used as a tool for documenting and understanding the phenomena in order to explore the lived experiences of students' performance in linear programming and the best ways to increase performance.

Future Research Areas

It is advised to use phenomenological techniques in further research. Limited numbers of pupils at secondary level, it can be argued here that a lot more remain hidden to a critical eye. Further research works could be conducted in the following areas:

(i) Teachers should use various teaching techniques if they want their students to understand what is being taught.

(ii) A comparative analysis of the pupils lived experiences of across public/private schools. Since single public school, findings cannot be generalized to the whole country. This then calls for an expanded study on the pupils lived experiences not just in public but also private schools as well.

(iii) Lived experiences of pupil's performance in other topics. A study in this area would help in establishing enablers and disablers faced by pupils/ learners in mathematics. Consequently, such a study could contribute to the realisation of an inclusive society.

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