



Theoretical and conceptual framework of the academic performance of students with visual impairment in mathematics at Mansa and Malcom Moffat colleges of education in Zambia

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ABSTRACT

This manuscript is an extract of a theoretical framework and conceptual framework from a Master's an on-going study on the academic performance of students with visual impairment in mathematics at Mansa and Malcom, Moffat colleges of education in Zambia. The work is an attempt to review the academic performance of students with visual impairment in Mathematics at Mansa and Malcom Moffat colleges of Education. Among the factors that may affect these students are such as instructional materials, instructional approaches in teaching Mathematics, lecturer's attitude and academic performance of learners with visual impairment. It is argued that if these factors are identified and addressed students with visual impairment can benefit a lot from students with visual impairment education under education system.

Keywords: College of education, students with visual impairment, mathematics, academic performance.

1. INTRODUCTION

Students with visual impairment at college level who have been taking Mathematics have not been performing well. This is supported by Lynn, A.F [5] who stated that students with visual impairment who took Mathematics at college level did not perform well because the pass rate indicated only four percent of those who passed the subject and ninety-six percent did not pass.

There has been a lot of support towards learners with visual impairment at international level. For example, the American Foundation for the Blind [2] has supported learners with visual loss by removing barriers and creating possibilities so that learners with visual loss can achieve their full potential. However, the study by the American Foundation for the Blind [2] did not focus their attention on

investigating the academic performance of students with visual impairment in Mathematics.

In Africa learners with visual impairment are also supported in a number of ways. For instance, the South African National Council for the Blind [2] supports students with visual impairment by training them at colleges. Nevertheless, the South African National Council for the Blind [92] in their study did not highlight the issue of failing Mathematics in colleges by students with visual impairment.

In Zambia, learners with visual impairment receive various supports. For example, McCall (2015) states that the Zambian inclusive education programme aims at improving quality education for the blind and low vision students. The study by McCall, C.H [6] highlighted the support of quality education towards learners with visual impairment but did not talk about the failing of Mathematics by students with visual impairment in the college.

There has been support of various ways from international level. Despite the support being given to learners the issue of failing mathematics by students with visual impairment has not been investigated. This study, therefore, aim at investigating the academic performance of the students with visual impairment in colleges of education.

2. STATEMENT OF THE PROBLEM

There has been support of various ways from international level, in Africa and Zambia. Despite the support being given issue of failing Mathematics by students with visual impairment has not been investigated. This study is investigating the academic performance of the students with visual impairment in two colleges of education namely: Mansa and Malcom Moffat Colleges of Education.

2.1 Purpose of Study

The purpose of this study is to review the academic performance of students with visual impairment in Mathematics at Mansa and Malcom Moffat colleges of Education.

2.2 Objectives of the Study

The study will be guided by the following objectives:

- To establish the academic performance of students with visual impairment in Mathematics at colleges of Education.

- To investigate instructional approaches used to teach Mathematics to students with visual impairment.
- To establish best practices for students with visual impairment in terms of their academic performance in Mathematics.

2.3 Research Questions

- How do the students with visual impairment perform in mathematics?
- What instructional approaches do teachers use when teaching Mathematics to students with visual impairment?
- What are the best practices for students with visual impairment in terms of their academic performance in mathematics?

2.4 Significance of the Study

It is hoped that the findings will review the performance of students with visual impairment in Mathematics at college level. It is also hoped that the findings of this study might be added to the board of knowledge on academic performance for students with visual impairment at college level.

2.5 Delimitations

The study population will be comprised of learners with visual impairment, lecturers teaching Mathematics to students with visual impairment and lecturers with special education background. The delimitation will be that, only the students with visual impairments studying at the college and the lecturer teaching the visually impaired students and lecturers with special education background will be involved. The scope of the study will be limited because the study will not involve all the students and all the lecturers lecturing at the college.

2.6 Limitations of the Study

This study will use questionnaires and participants may not respond accurately. However, triangulation of instruments such as the use of interviews and document study will cover up what will be left out in the questionnaire.

2.7 Theoretical Framework and Conceptual Framework

The following theoretical framework and conceptual framework would be used while assessing the academic performance of students with visual impairment in mathematics at two colleges of education, in Zambia.

3. LITERATURE SURVEY

3.1 Theoretical Framework

The research will be guided by Path-smoothing model designed by Alan,W [1]. The model stresses the essential methodology of making a smooth path for the learner to learn Mathematics. In this model the teacher should state the kind of problem of a learner in a classroom. In addition to this, when teaching the teacher should attempt to classify the subject matter being taught into a limited number of categories and to present them one at a time. In this model there is an implicit assumption that, from the exposition, pupils will recognize and identify with their nature of the problem being posed with. The key principle of this model is to establish secure pathways for the students with visual impairment. Thus it is important because model present ways of solving problems in a series of steps which is as short as possible, and often only one approach is considered seriously. The model also stresses that pupils need to work on exercises to practice the methods given which aim at involving learners more actively. These approaches are usually classified by the teacher and are graded for difficulty. The model states that longer term failure is dealt with by returning to the same or similar subject matter throughout the course.

The model has the following components namely: students with visual impairment, instructional materials, and instructional approaches in teaching Mathematics, the lecturer's attitudes and academic performance of learners with visual impairment.

3.2 Instructional materials

According to the model by Alan,W [1]the instructional materials to be used in a classroom where there are learners with visual impairment should be adaptive in nature. The model reveals that if learners with visual impairment are to perform well in Mathematics, there is need for the lecturer to highlight the most effective materials for delivering mathematics instruction to students with visual impairment. The key accommodations that are absolutely essential are access to embossed textbooks as instructional materials as well as in the appropriate media such as recorded media.

The appropriate or adaptive instructional materials require a combination of the abacus, braille codes, tactile materials, and concrete materials to teach mathematics skills to students with visual impairment. for instance, the use of the braille Nemeth code and abacus has long been established as a beneficial practice to teach mathematical concepts to students with visual impairment. The braille Nemeth code gives students who are blind the opportunity to read and write braille mathematical computations, helping to build a thorough understanding of concepts presented. The abacus is a useful calculation tool whether used alone or in conjunction with other devices because of its speed, accuracy, portability, and flexibility.

Students with visual impairment may take longer to learn mathematical concepts without the use of adaptive materials. Therefore it is essential for lecturers of students with visual impairment to learn how to utilize a variety of tools to complete computations in order to help these students.

3.3 Instructional approaches in teaching mathematics

According to Alan,W [1] the model acknowledges that pupils are led through a method for tackling the problems. This is where instructional approaches serve as a concrete frame in terms of learning opportunities, classroom interaction and academic performance. The approaches have the main impact on pupils learning and performance. In this case the learners with visual impairment will learn mathematics better if learning approaches or strategies are used to involve other senses other than sight. This means that the approaches to be used must include touch, hearing, taste and smell. For example, a learner can use the sense of hearing to get the instructions from the teacher or lecturer. The learner can also use the sense of touch to feel the embossed or raised numbers or she can use the sense of touch on embossed aids and explore them those that might be used during the learning process. It is not acceptable for the lecturer to rely heavily on exposition method which mainly benefits learners with sight but he or she need to include the issues of touch, hearing, and smell and taste when teaching mathematics to learners with visual impairment Alan, W [1] further states that the approaches to be used in teaching mathematics to learners with visual impairment should engage with children's thinking, give them sufficient time for dialogue and discussion and space to think about their ideas. For example, children with visual impairment should be given ample time to explore the task given and as they explore it they will be able to think critically and find solutions to the task given.

The model encourages that, approaches being used when teaching mathematics to learners with visual impairment should also provide mathematical representations of the real world, it should also focus on underlying concepts and processes with prompting and probing questions. The approaches should as well demonstrate and promote the correct use of mathematical vocabulary and the interpretation and use of symbols, images, diagrams and models as tools to support thinking, problem solving, reasoning and communication within and outside the classroom.

3.4 The lecturer's attitudes.

According to the model by Alan,W [1] teachers question pupils, but usually in order to lead them in a particular direction and to check that they are following. It is believed that the lecturer or teacher plays a vital role in academic performance of the learners

with visual impairment and even those without impairment. However, if teachers have negative attitudes towards learners with visual impairment and consider them as people who cannot perform well in mathematics it affects their performance. For instance, if students with visual impairment receive little or no attention in classrooms as compared to their sighted counterparts who are actively involved in learning, they may encounter reduced academic performance in mathematics. If for example lecturers rate learners with visual impairment low in cooperation, academic competences and having greater problems of behaviour than their sighted counterparts, these attitudes deprive the learners' right to education and hinder the self-esteem of the students with visual impairment. In this regard, it is believed that these attitudes may negatively affect the academic performance of learners with visual impairment.

3.5 Academic performance of learners with visual impairment

According to the model by Alan, W [1] confirms that like all students receiving special education services, the academic performance of students who are visually impaired in the general education classroom is monitored annually and the performance is very good as compared to learners with other impairment. This can only be done if the individual needs of the learners in a classroom are taken care of. Learners with visual impairment can perform extremely well if the instructional materials, teaching approaches are modified or adapted to meet the needs of the individual learner. For example, if the student's educational needs can be met using touch, he or she can perform well if raised or embossed prints are used as a medium of instruction. The lecturers have an important role to play in order to improve the academic performance of learners with visual impairment. If lecturers can remove all the negative prejudices about the learner as required by education for all, then learners with visual impairment are likely to excel in their academic circles. However, if the lecturers feel that such a learner cannot learn well with his or her condition, then the academic performance for such a learner will be below the expected standards.

This path smoothing model suits well with the current research to be carried out which is focused on the academic performance of students with visual impairment in mathematics at Malcom and Mansa colleges of education because it will help the researcher in identifying and understanding the academic performance of students with visual impairment at college level. This is because the path smoothing model focuses on instructional materials, instructional approaches in teaching mathematics, the lecturer's attitudes and academic performance of learners with visual impairment which will act as a frame work for this study

4. PROPOSED WORK

4.1 Conceptual Framework

This conceptual framework is on the academic performance of students with visual impairment in mathematics at two selected Colleges of education in Zambia. The arrows show a reflective path that the researcher will adopt throughout the research process. The framework begins by looking at the visually impaired students, followed by the best practices in handling students with visual impairment thereafter, instructional approaches, adapted teaching materials and lecturer's attitude towards students with visual impairment. Then it will end with academic performance of students with visual impairment.

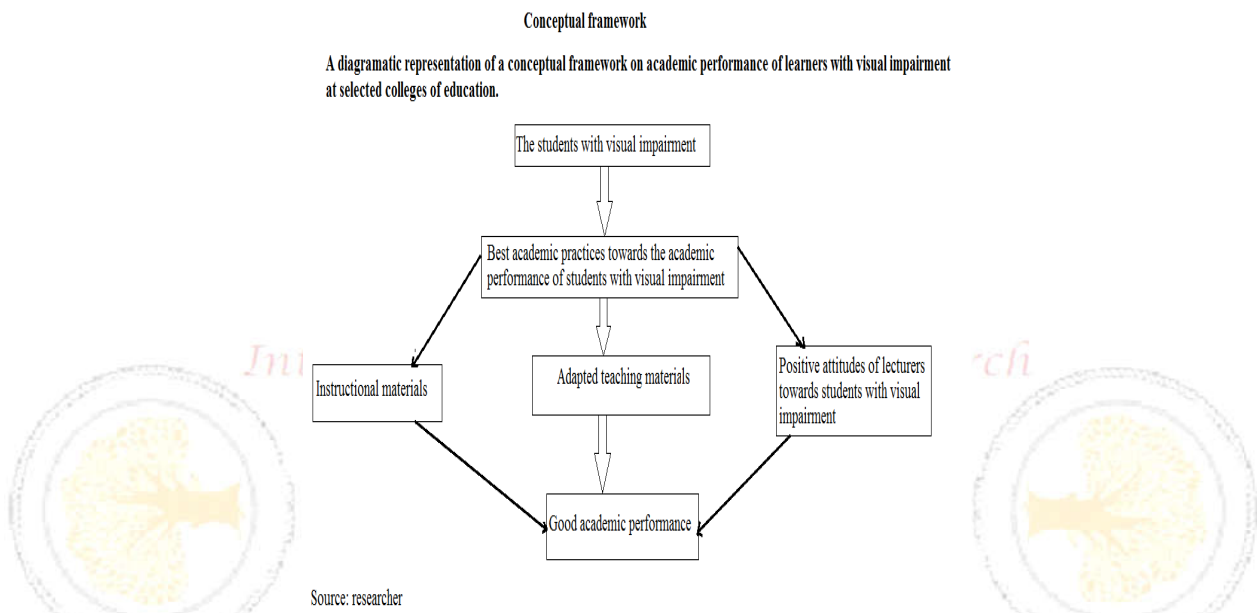


Figure 4.1: A diagrammatic representation of conceptual framework on academic performance of students with visual impairment at selected colleges of education.

4.2 Visually impaired students

Students, who are blind or visually impaired, require adaptations to the environment, materials and instruction in order to have the access to the subject curriculum. Visual impairment, also known as vision impairment or vision loss is inability to perceive any light at all or a decreased ability to see to a degree that causes problems not flexible by usual means but with the use of such as contact glasses. Visual impairment is a term experts use to describe any kind of vision loss Kid's Health, [4]. Students with visual impairment require to be handled in a best way.

4.3 The best practice in handling students with visual impairment

The best practice in handling students with visual impairment requires the use of standards for high quality instructions with use of ongoing professional development in order to remain relevant in order to meet the current development concerning the best practice. This was supported by Carmen, W. [3] who stated that, lecturers of students with visual impairment should follow profession standards to address issues. The issues that lecturers should address in this study are such as those falling under mathematics as a course.

4.4 Mathematics as a course

Mathematics is the science of structure, order and relation that has evolved from elemental practices of counting, measuring and describing the shapes of objects. It deals with logical reason and quantitative calculation, and its development has involved an increasing degree of idealization and abstraction of its subject matter. Mathematics provides a single integrated, continually expanding system that covers the breadth and depth of technical computing. The standards in mathematics requires the lecturer to use appropriate instructional approaches, adapted teaching materials and should have positive attitude towards students with visual impairment for them to perform well academically.

4.5 Instructional approaches

Instruction approaches are techniques teachers use to help students become independent. These approaches become learning strategies when students independently select the appropriate ones and use them effectively. Proficiency in mathematics is necessary because it is critical to functioning adequately in the context of daily life situations. In order to realize proficiency lecturers teaching students with visual impairment should focus on using different instruction approaches such as tactile method and other methods in which other senses are used such as hearing, taste and smell, in order to reduce some challenges the visually impaired students encounter in mathematics. The approaches should include the correct use of vocabulary and interpretation and use of symbols, images and diagrams as tools to support thinking.

The approaches should also include mathematical representations of the real world for example the use of tactile graphics. These are graphics intended to be read principally by touch rather than vision, students may use the sense of touch instead of hearing. The use of both student and teacher centered methods should be applied. Cooperative learning, group work and discovery methods should be used. Lecturers teaching the students with visual impairment should engage their students by providing visual and auditory information. They convey their mood through touch

expressions, tone of voice, giving directions and touching or holding their hands Zebehazy, K. and Wilton A [9].

4.6 Adapted teaching materials

Material adaptation refers to the application of some strategies of modifying teaching and learning materials in order to make them more effective and flexible in meeting needs of learners with visual impairment. It can also mean the use of education technology which meets the needs of learners with visual impairment because of being adaptive to their learning for example the use computer software synthesizer such as JAWS a Screen Reader for People Who are Blind or Visually Impaired. This software is needed because students with visual impairment would also typically need adaptations to access printed information that will allow the students to access all areas of the curriculum. The lecturer can rely on it as teaching aid because it is a powerful software program designed to work with a speech synthesizer to improve the productivity level of learners with visual impairment.

The other technological materials that can be utilized are such as computer algorithms, thermoform machine, braille embossers and other adapted materials. It is the role of lecturers of students with visual impairment to determine the material adaptations that the student needs. Lecturers may use the adapted materials to encourage students in order to facilitate their learning and mostly utilizing all the remaining senses such as hearing, taste, smell and feeling by making use of their tactile receptors in their fingertips while using the materials. Large print materials such as books can also be used by lecturers teaching students who have low vision. Lecturers should use braille code to teach students with visual impairment as well as namath code, Perkins braille, computers, tape recorders and television sets, Carmen,W [3].

4.7 Lecturers attitudes towards students with visual impairment

Attitude means manner, disposition, feeling, with regard to a person or thing or it can be defined as a settled way of thinking or feeling about something. The teaching of students with visual impairment requires lecturers to have positive attitudes towards them and students with visual impairment should be provided with counseling in the process of solving their problems. Mushome, A.M and Monobe R [7].

4.8 Academic performance

Academic performance in this study is the evidence of a student with visual impairments concrete or abstract thinking skills, literacy skills such as reading and writing skills, attention focus, academic success, language development, proficiency with sequencing. This is supported by Penda, A., Ndhlovu, Dand Kasonde-Ng'andu, S[8] who stated that, academic performance is noticed in a learner with visual

impairment as accuracy or correct manifestation of performance in oral and written work in terms of brail literacy of reading and writing skills, critical thinking, remembering, understanding, applying, analyzing, evaluation and creativity.

5. CONCLUSION

Based on the discussion, the paper concludes that the Path-smoothing model designed by Alan,W [1] and conceptual framework on academic performance of students with visual impairment at selected colleges of education can be used the models in identifying factors affecting students with visual impairment in the selected colleges of education in Zambia. It involves instructional materials, instructional approaches in teaching Mathematics, the lecturer's attitudes and academic performance of learners with visual impairment. Thus the aspect of instructional materials will be a guide in identifying if adaptive materials are used while teaching mathematics to students with visual impairment. The aspect of instructional approaches in teaching mathematics will be a guide in identifying the approaches lecturers use when teaching mathematics to students with visual impairment. Furthermore, the aspect lecturers' attitude towards learners with visual impairment will be a guide in identifying if their attitude is positive or negative. Finally, the aspect of academic performance of students with visual impairment will be a guide ascertaining the academic performance of students with visual impairment.

REFERENCES

- [1] Alan, W (2008) Models for Teaching Mathematics. Hull: Sage Publishers.
- [2] American foundation for the blind (2008). Performance of students with visual impairment on high stakes tests: A Pennsylvania report card. Pittsburg: University of Pittsburg.
- [3] Carmen, W (2018) Role of the Classroom Teacher in Provision of Special Education. London: University of Roehampton
- [4] Kids health (2018) The Society. Newsland: Starship Foundation.
- [5] Lynn A.F (2012) Performance of Students with Visual Impairment on High Stakes Tests: A Pennsylvania Report card. Pittsburgh; University of Pittsburgh.
- [6] McCall. C.(2015). Zambia inclusive education programme: Lusaka; Gvt printer
- [7] Mushome, A.M and Monobe R (2015) The Attitude of Lecturers Towards Visually Impaired students: A Case Study of one of the Universities in the Limpopo Province in South Africa.Limpompo: University Press.
- [8] Penda, A., Ndhlovu, Dand Kasonde-Ng'andu, S.(2015) "How art education teaching method is used in teaching learners with visual impairment". International Journal of Multidisciplinary Research and Development, Volume 2, Issue (4) P: 157-166.

- [9] Zebehazy, K. and Wilton A. (2014) Quality importance and instruction, the perspective of teachers for blind students. *Journal of visual impairment and blindness*, 108(1) 5-16.

