

Teaching Integrated Science to Junior Secondary School Learners with Hearing Impairment: Teachers' Perceptions in Selected Special Schools of Chipata and Lusaka Districts

By

Rabecca Ndhlovu and Beatrice Matafwali

The University of Zambia

Abstract

The study aimed at establishing the perception of teachers on teaching Integrated Science to grade eight and nine learners with Hearing Impairment. A case study design comprising a purposively selected sample of five teachers of Integrated Science from four special schools in Eastern and Lusaka Provinces of Zambia. In-depth interviews were employed to generate data from teachers. Thematic approach was used to analyse data. The study revealed that although the teachers were qualified to teach Integrated Science, they lacked specialized training which negatively affected the teaching of Integrated Science to learners with Hearing Impairment. Additionally, the study revealed a number of barriers to teaching Integrated Science to learners with Hearing Impairment including: inadequate instructional materials, ill-training of teachers, inappropriate syllabus, communication barriers and inappropriate Integrated Science facilities. Based on these findings the study recommended specialized training for teachers in teaching Integrated Science to learners with Hearing Impairment, curriculum review to ensure that delivery of Integrated Science is inclusive, and provision of specialized materials to support Integrated Science education for learners with Hearing Impairment.

Key words: Integrated Science, Hearing Impairment, Special Education, Secondary School.

Introduction

Integrated Science is one of the core subjects in the Zambia school curriculum. The subject is aimed at inculcating scientific literacy to equip learners with survival skills to adequately respond to life

challenges and make informed choices in their personal lives (Akpan, 2015; Ministry of Education, Science, Vocational Training and Early Education-MESVTEE, 2013 a). According to MESVTEE (2013a), the contributing subjects to Integrated Science are Environmental Science, Home Economics and Agricultural Science. Cross cutting issues such as Environment, Reproductive Health, HIV/AIDS, Hygiene, Nutrition, Substance Abuse, Sexuality Education, Water and Sanitation are also included (MESVTEE, 2013a). It is clear from this subject combination that Integrated Science lays the foundation for learning advanced sciences at higher grades in secondary school and beyond. These skills are necessary for all learners including those with Hearing Impairment if they are to be prepared for a meaningful and independent scientific life. The 2013 revised curriculum framework therefore emphasizes that learners with special educational needs require an adapted curriculum and specialized technology for them to maximally benefit from the learning process. Section 23 (8) of the Education Act further provides that learners with special education needs with quality education in appropriately designed and well-resourced educational institutions, staffed by qualified and dedicated teachers. Section 22 (h) of Disability Act emphasizes that education for the learners with Hearing Impairment should be delivered in the most appropriate language. Sign language is particularly an important component for effective teaching and learning of learners with Hearing Impairment (MESVTEE, 2013b). Despite the introduction of Integrated Science in the Zambian School Curriculum in 2013, little is known about how teachers perceive the teaching of Integrated Science to learners with Hearing Impairment in the revised curriculum.

Study Objectives

The objectives of the study were twofold:

- i. To establish perceptions of teachers on teaching Integrated Science to learners with Hearing Impairment.
- ii. To establish barriers, if any, teachers face when teaching Integrated Science to learners with Hearing Impairment.

Theoretical Framework

The study was guided by Herbert Blumer's (1969) Theory of symbolic interactionism. Symbolic interaction is a process of including the interpretation of actions because symbolic meanings might be formed differently for anyone. According to the theory, human beings give meaning to symbols and they express these things by means of language. Consequently, symbols form the basis of communication. In simple form, people act based on symbolic meanings they find within a given situation. In other words, symbols are indispensable elements for the formation of any kind of communication. Individuals learn about themselves through interactions with others based on gestures. This theory claims that individuals use language and significant symbols in their communication with others and that facts are based on and directed by symbols (Carter and Fuller, 2015). Blumer's symbolic interactionism and its premises are built upon communication between individuals. As such language is vital in the interpretation of symbols. Matafwali & Bus (2013) have further emphasized the importance of oral language as a pathway in the development of other curriculum requisite skills.

Learners with Hearing Impairment learn through sign language which is all about symbolic interaction. The use of sign language when teaching and learning Integrated Science helps teachers to keep learners actively engaged, assist learners in language development, and promote positive peer to peer communication and interactions. For instance, during Integrated Science practical in the laboratory, the teacher and learners interact through the use of sign language or through the use of symbols. Similarly, teachers teaching Integrated Science to learners with Hearing Impairment can use symbolic interactions to enhance the learning process by bringing visual feedback to help reach to all learners. In this study the importance of learning Integrated Science through interaction with symbols for learners with Hearing Impairment cannot be overemphasized. What remains a matter of concern for this study is the existence of adequate symbols to enable effective communication of scientific concepts to learners with Hearing Impairment.

Literature Review

The literature reviewed on this study covers the experiences of teachers in teaching Integrated Science to learners with Hearing Impairment and the barriers to teaching learners with Hearing Impairment when teaching Integrated Science. Some local and international studies on the two themes of this study have been reviewed as follows:

Teachers' Experiences in Teaching Integrated Science to Learners with Hearing Impairment

Literature shows that the experience of teachers in teaching of Integrated Science to learners with Hearing Impairment is mostly accompanied with several challenging experiences. Teachers' experiences range from inadequate and inappropriate teaching and learning materials, lack of administrative support, lack of proper infrastructure or conducive environment for learners with Hearing Impairment, negative perceptions towards learners with Hearing Impairment, inadequate knowledge of Deaf education as well as teaching learners whose performance is not so motivating to mention but a few.

According to Sagree (2008), teachers of Learners with Hearing Impairments are enthusiastic about teaching Learners with Hearing Impairments but they lack effective guidance, training and teaching resources to handle learners with Hearing Impairment. This means that most teachers of Integrated Science have no proper training to handle learners with Hearing Impairment. Due to inadequate training in special education, teachers usually fail to make modifications for Learners with Hearing Impairments as such this contributes to low performance levels among Learners with Hearing Impairments. In addition, the lack of appropriate teaching materials coupled with overcrowded classrooms makes teaching Integrated Science to Learners with Hearing Impairments a very difficult experience for teachers.

Most literature shows that teachers have a responsibility of modifying their classes, instructional materials and evaluation procedures so that Learners with Hearing Impairments can benefit from the learning process. This implies that teachers teaching

Integrated Science to learners with Hearing Impairment experience difficulties in teaching in that they are overloaded with work as they mostly take up the role of interpreters, teachers and translators of teaching materials. As such, some studies have shown that in certain Deaf schools, classes and instructional materials are not modified for learners who may have specific learning preferences and needs because others believe that learning is solely the responsibility of learners, hence most teachers do not perform their role of modifying their classes and instructional materials (Sagree, 2008).

Some studies have shown that teachers' experiences in teaching Learners with Hearing Impairments are also coupled with teaching learners that are not motivated and lack interest in learning Integrated Science (Poisson 2001; Adu- Gyamfi, 2013). One reason is that few learners with Hearing Impairment are not motivated to learning Integrated Science because they usually have fewer opportunities to get employed in science related professions. Thus, other teachers perceive teaching science subjects to Learners with Hearing Impairments a share waste of time (Ting and Gilmore, 2012). Some teachers feel discouraged teaching Learners with Hearing Impairments whose performance is constantly poor in Integrated Science. Teachers feel it is easier to teach hearing learners than those with Hearing Impairment because they academically perform poor. Adu-Gyamfi (2013) observes that reasons to poor performance among Learners with Hearing Impairments is linked to lack of preparedness, lack of motivation, poor English skills, and overreliance or dependence on support services. These teachers' perspectives are a reflection that there is need for further research to establish teachers' experiences in teaching Integrated Science to learners with Hearing Impairment.

Barriers to Teaching Learners with Hearing Impairment when Teaching Integrated Science

Researchers such as Omiko (2014) and Akpan (2015) found that most Integrated Science teachers are not academically qualified to teach the subject to learners with disabilities specifically to learners with Hearing Impairment. Normally, teachers who teach Integrated

Science to learners with Hearing Impairment just teach what they know (Davis, Petish, & Smithey, 2007). The implementation of the revised curriculum effectively depends on the quality of the teachers. For example, a look at the Junior Secondary School Certificate Examination (JSSCE) results of schools in Ebonyi State in Nigeria revealed that learners' performance in Integrated Science is not encouraging (Omebe and Omiko, 2015).

Literature further shows that performance of learners with Hearing Impairment in Integrated Science as a subject is low (Adetayo, 2008). A study done in Nigeria by the Delta State Ministry of Education revealed that there was abysmal learner's performance in Integrated Science at the JSSCE. In another development, Childs and McNicholl, (2007) also argued that the falling educational standards can be attributed to the use of teachers who are unqualified for instructional purposes. It must therefore be noted that without a professional teaching qualification, no meaningful progress can be achieved in the teaching profession.

Lawal (2003) posits that skilled and effective teaching and learning of Integrated Science requires professionally trained teachers. Teachers teaching learners with Hearing Impairment outside their area of specialism face considerable barriers in lesson preparation and Integrated Science teaching. Inadequate background in the subject knowledge is one of the main factors that contributes to such barriers and can have an impact on the development of the teachers' pedagogical content knowledge as well as on self-confidence and attitudes when teaching. The teachers' knowledge base strongly influences all aspects of teaching like preparation, planning and decision making regarding the choice of content to be taught (De Jong, Veal, & Van Driel, 2002).

They Support materials by teachers during the teaching process include text and reference books, wall maps, charts and science kits are crucial in facilitating the effectiveness of the learning of Learners with Hearing Impairments (Possi, 2006). A study carried out by Yosia (2005) in Tanzania showed that, in most schools where learners with Hearing Impairment were found, the required teaching and learning materials were inadequate. Davis et al., (2007)

echoes this view by noting that learners with Hearing Impairment in various junior secondary schools equally lack the appropriate basic textbooks and other important materials that will support them in learning Integrated Science at that level. As such, teaching of Integrated Science to learners with Hearing Impairment without relevant instructional materials leads to poor performance (Osborne and Collins, 2001).

A study done in Tanzania by Migehe (2014) noted that at both school and council level, no consideration was made for Special Educational Needs in the planning process, particularly in terms of the necessary requirements for learners with Special Educational Needs. Special education teachers' involvement in curriculum adaptation in Zambia has also been a matter of concern (Muzata, Mahlo and Mabunda, 2019). The neglect of learners with disabilities particularly those with Hearing Impairment in the planning process caused a shortage of teaching and learning materials, equipment and assistive devices resulting in difficulties in the teaching and learning process.

The use of inappropriate methods could make learners dread Integrated Science in later life. This means that the use of inappropriate methods may perhaps also affect hearing impaired learners' performance in Integrated Science. Many of the Integrated Science teachers do not have a clear insight about the appropriate pedagogies to enhance Integrated Science teaching and learning for learners with Hearing Impairment (Abell, 2008). Most of the teachers teaching learners with Hearing Impairment resort to teaching with only one major teaching method which is the speech or "chalk and talk" method in the Integrated Science classroom. This greatly affects Integrated Science teaching ranging from methodology and techniques of teaching (Abell, 2007).

Olarewaju (2001) acknowledges that there is a difference between the common language and the scientific one and teachers are not prepared enough to link the ways of expression. Mostly, teachers use the common language when teaching Integrated Science while on the other hand Integrated Science has got its own language in that it has its own scientific terms. In addition, learners with Hearing Impairment use their own language which is sign language, this means that if the teacher is not familiar with sign language and the

content of Integrated Science there is a distortion in both delivery and acquisition of the content in the subject (Thomberg, 2009).

Learners' poor attitude and interest towards school Integrated Science is an issue identified across the world (Adu-Gyamfi, 2014; UNESCO, 2010). In some instances, learners' lack of interest in Integrated Science is associated with the use of science to select a small fraction of elite learners at the early ages to become science specialists. In Malaysia, learners' lack of interest in Integrated Science is associated with scarcity of well-paid jobs for science professionals especially those with disabilities (Hallack and Poisson, 2001).

In Ghana the study of Adu-Gyamfi (2013) added that learners' lack of interest in science related subjects is anchored on the time consuming and less practical nature of teaching and learning of scientific concepts and principles in Integrated Science as well as the learning of science which is basically knowledge transfer from Integrated Science teachers and textbooks. Thus science is presented in more or less an abstract manner to learners by science teachers. Integrated Science teachers' decisions about instructional practices for learners with disabilities such as procedures for assessment, grouping of learners, and the types of rewards and punishments are crucial to influence learners' interest and attitude in pursuing any science related subject or course in the future (Anderman et al., 2012).

The barriers to teaching and learning, not only in science subjects but other subjects generally, in Zambian schools appear to be many, mainly affecting teachers of for learners with Hearing Impairment. For instance, Muzata and Mahlo, (2019) noted that:

While the curriculum has been appreciated as broadening employment opportunities in the formal and informal sectors by the introduction of the vocational career path way, the implementation is beset with challenges of lack of adapted materials in sign language, inadequate sign language vocabulary and teachers' incompetence in sign language. The familiar language of instruction compounds the already existing challenges related to sign language vocabulary further complicating effective delivery of the curriculum to learners with deafness at lower primary school level.

From the excerpt above, it is undoubted that the teaching of science subject specifically exerts many challenges to teachers. The lack of adapted materials is likely to frustrate the efforts teachers would like to put in teaching learners with Hearing Impairment.

Lack of time within the classroom periods is another challenge that is faced when teaching and learning Integrated Science. Time allocated to instruction is being more and more restricted. Teacher's time tables also lack time to do experimental work presentation (Omiko, 2016). Despite these problems, the subject is still being taught in schools (Adekola, 2006). In Zambia, Integrated Science is taught as a compulsory subject at junior secondary school level. Moreover, all learners including those with Hearing Impairment are subjected to the same junior secondary school examinations (JSSE) in Integrated Science (MESVTEE, 2013a). However, the impact of subjecting learners with Hearing Impairment and those with hearing to the same syllabus and subsequently to the same examination, without specific modifications may be disadvantageous to the performance of learners with Hearing Impairment. The experiences of teachers in teaching science to learners with Hearing Impairment as a focus of this study could unveil the barriers to teaching science to these learners.

Methods

The study adopted a qualitative approach. A case study design was used to establish the perceptions of teachers on teaching Integrated Science to learners with Hearing Impairment. Through a qualitative paradigm, in-depth interviews with teachers on teaching Integrated Science to learners with Hearing Impairment were conducted. The qualitative research design allowed for the exploring and gathering of data regarding the views of teachers on teaching Integrated Science to learners with Hearing Impairment. Interview guides were used to collect data. Questions used to collect data were unstructured as it allowed the researchers to collect more data including that which may not have been planned for by the researchers but related to the experiences and barriers to teaching Integrated Science to learners with Hearing Impairments.

Five teachers for Integrated Science from four schools participated in the study that is one male and four females. All participants were purposively selected from four special schools in Eastern and Lusaka provinces. Data were analysed in themes basically following the two main research questions that guided the study.

Findings and Discussion

The findings of this study have been presented according to the two research questions. Verbatim excerpts have been provided to back the themes in each research question.

Research Question 1: *What are the perceptions of teachers on teaching Integrated Science to learners with Hearing Impairment?*

Teachers highlighted various perception on their ability to teach learners with Hearing Impairments. The study particularly revealed that teachers who teach Integrated Science to learners with Hearing Impairment were not trained to teach learners with Hearing Impairment but were deployed to schools of Learners with Hearing Impairments because of lack of teachers in the special education field. This is evidenced from the following excerpts by teachers that participated in this study:

I have been teaching Integrated Science in the mainstream for the past 23 years. But to teach at a special school it's my first experience (TR, 3-Male, SSRS3. 29.06.2018).

Another teacher added that:

I am a Diploma holder trained from Chalimbana. I was just trained as an ordinary teacher, I just found myself here due to lack of teachers in Special Education (TR 5-Female, SSRS4, 09.07. 2018).

The other teacher who had some experience of teaching learners with Hearing Impairments at primary school level said,

I have been a teacher for 17 years but I have only taught Integrated Science to learners with Hearing

Impairment for 2 terms, all along I have been teaching in the mainstream. I have a brief background about special education because I remember at Primary Education there was a component on Special Education in our programme. (TR 4-Female, SSRS4, 06.07.2018).

It is clear from the foregoing that although teachers were trained to teach Integrated Science, non of them had specialized training to effectively teach learners with Hearing Impairments. This finding is similar to what Silondwa and Muzata, (2019) found in their study that teachers lacked skills of teaching science to learners with visual impairments. The Ministry of General Education is also aware that some of the teachers that are being employed to teach Integrated Science to learners with Hearing Impairment are not actually qualified to do so (Ministry of Education- MoE, 2014). This finding is contrary to what is stipulated in the Zambia New Curriculum Framework (MESVTEE2013a) which clearly indicates that teachers should be equipped with necessary knowledge and skills to teach learners with Hearing Impairment.

In this study, it was further established that some topics in science may not be appropriate to teach learners with Hearing Impairments especially those with pre-lingual deafness. Teachers reported their experiences that topics like starch, molecules and minerals among others were difficult to teach because learners could not understand the concepts, findings that were similar to Muzata, (2017) and Muzata, Mahlo and Mabunda (2019).

Research Question 2: Views of Teachers on Barriers they faced in Teaching Integrated Science to Learners with Hearing Impairment

Various barriers were highlighted including: lack of teaching and learning materials adapted in sign language; lack of teaching and learning materials; and teachers' negative perceptions towards learners with Hearing Impairment that they are too slow at learning. On lack of materials as a barrier, one of the teachers said;

It is a challenge when teaching them, we use all the materials starting from the syllabus, the books and the like, and they just suit the ordinary learners. Because

with them, there are no books, no syllabus with sign language. Everything is just word, diagram in line with the ordinary pupil, there is no consideration, so it's really a challenge. When you are teaching the content, it is really a challenge for you to just marry the content to their basic language which is just signed English because they would want everything to be in sign language. (TR 1-Female, SSRS1, 06.06.2018).

From the findings of this study, the challenges on lack of teaching and learning materials adapted in sign language are clearly acknowledged by (MoE, 2014; Muzata, 2017 and Muzata, Mahlo and Mabunda, 2019). The Ministry of General Education has observed that children with special educational needs are not usually favored by the education curriculum and syllabi content in order for them to participate fully in the learning process so that they can choose their career pathways early. It is further acknowledged that the local book publishers and suppliers of specialized education materials have no capacity to develop and produce sign language related teaching materials.

Another teacher explains barriers to teaching science being more as a result of lack of terms in sign language:

Certain concepts and terms in Integrated Science you cannot convert and you cannot modify, like molecules or elements you cannot modify or change it. How do you sign elements or molecules and how can you differentiate so that learners keep it at a test of time. That's where the challenge is. (TR 3-Male, SSRS3, 29.06.2018).

This study established that some teachers teaching Integrated Science to learners with Hearing Impairment were not trained in sign language. In such a situation, it is wondered how teachers who were not trained in sign language manage to translate the general syllabus into sign language so that learners with Hearing Impairment can appreciate the learning of Integrated Science.

Teachers further indicated that because they did not know sign language, they struggled to find ways to explain terms in science.

For instance some scientific terms found in Integrated Science like molecules, minerals and elements do not have signs which teachers can use when teaching, as such teachers are unable to deliver the right content to learners with Hearing Impairment. This findings are similar to Thomberg (2009) who states that Integrated Science has got its own language in that it has its own scientific terms and learners with Hearing Impairment use their own language which is sign language. Likewise, Muzata (2017), and Muzata, Mahlo and Mabunda (2019), note the lack of curriculum adaptation and the difficulties teachers were facing teaching scientific terms to learners with Hearing Impairments. This situation implies that if the teacher is not familiar with sign language and the content of Integrated Science then there is usually a distortion in both acquisition and delivery of the content in the subject. This means that learners with Hearing Impairment are at a disadvantage of attaining quality and equal education in relation to their peers. In relation to lack of teaching and learning materials, the findings of this study revealed that there were lack of teaching and learning materials such as texts books for Integrated Science, beakers, white board markers and laboratories. One of the teachers laments:

The problems when there are no aids, it's difficult to explain to these learners. There are certain words of course that are not very easy to explain in Integrated Science, they need apparatus. Like here am using a white board, but the board markers are not writing. So how can I teach like this? (TR 4-Female, SSRS4, 06.07.2018).

These teaching and learning materials are essential in the teaching and learning process of Integrated Science. The need for all the aforementioned teaching and learning materials cannot be ignored because the nature of Integrated Science as a subject requires that learners practice what they learn in the subject before they write class tests or examinations. This finding simply shows that the teaching and learning of Integrated Science for learners with Hearing Impairment is not up to an acceptable standard as the learners learn without teaching and learning materials.

The aforesaid finding of lack of teaching and learning materials is in line with a study which was carried out in Tanzania by Yosia, (2005) which showed that in most schools where learners with Hearing Impairment are found, the required teaching and learning materials is inadequate. These views were also echoed by Davis *et al.*, (2007) who noted that learners with Hearing Impairment in various junior secondary schools lack the appropriate basic textbooks and other important materials that will support them in learning Integrated Science at that level. Teachers further expressed the following sentiments:

We do not have a laboratory to teach practical subjects from so it is difficult to teach the Deaf children. The other problem we have is that we do not have materials to use to teach Integrated Science to the Deaf children. (TR 2-Female, SSRS2, 15.06.2018).

Another teacher added that:

The problems when there are no aids it's difficult to explain. There are certain words of course that are not very easy to explain in Integrated Science, they need apparatus. Like here am using a white board, but the board markers are not writing. So how can I teach like this? (TR 4-Female, SSRS4, 06.07.2018).

The findings of the study show that teaching and learning materials for learners particularly in Integrated Science are inadequate in most junior secondary Deaf schools. This finding is in line with a study done in Tanzania by Migehe (2014) who noted that at both school and council level, no consideration had been made for Special Educational Needs in the planning process, particularly in terms of the necessary requirements for learners with disabilities.

The other barrier appears to relate to negative attitudes that teachers themselves exhibit towards learners with Hearing Impairments. For instance, some barriers that teachers noted that learners with Hearing Impairments were slow to learn reflect simply the negative attitudes resulting from lack of training and understanding of learning differences in learners with different abilities.

Two of the teachers indicated that:

Sometimes the pupils take time to understand so when teaching you have to repeat the same topics for one term so that the pupils can understand, as such we do not finish teaching because the pupils are slow to learn and understand. (TR 2-Female, SSRS2, 15.06.2018).

The other teacher added that:

The other challenge is slowness. The major one is slowness. The learners are slow. So because of the slowness of other learners you find that we do not cover the topics that needs to be covered (TR 5-Female, SSRS4, 09.07.2018).

These views portray negative attitudes rather than the actual prevailing situation about learners with Hearing Impairments. Like any other learners, learners with Hearing Impairment also exhibit differences in their pace of learning. There are those who may be slow and those that are fast at learning. This also depends on the nature of support provided for them to learn effectively and at an acceptable pace. Similarly, Hallack and Poisson (2001) say in Malaysia, hearing impaired learners' lack of interest in Integrated Science is associated with scarcity of well-paid jobs for science professionals especially those with disabilities including those with Hearing Impairment. The findings of this study on hearing impaired learners' poor attitude and lack of interest towards Integrated Science is similar to a study done in Ghana by Adu-Gyamfi (2013) who added that hearing impaired learners lack of interest and poor attitude in Integrated Science is attached on the time consuming and less practical nature of learning Integrated Science which is basically knowledge transfer from Integrated Science teachers and textbooks. Interest in learning for learners with Hearing Impairments needs to be extrinsically motivated mostly by the presentation of visually oriented learning experiences. Interest is a personality attribute that cannot be blamed or generalized on all learners with Hearing Impairments.

Conclusions and Recommendations

The study concludes that although Integrated Science is an important subject at both primary and Secondary School level, teachers lack

specialized training to effectively teach learners with Hearing Impairments. Specifically, teachers lack competence and skills in Sign Language. The study has further highlighted various factors that act as a bottlenecks to effective delivery of Integrated Science to learners with Hearing Impairments. These include among others: inadequacy and inappropriate facilities needed for Integrated Science teaching and learning for learners with Hearing Impairment; lack of specialized trained teachers. Although the 2013 Revised Curriculum Framework was launched in January 2014 clearly demonstrates effort by the Ministry of General Education (MoGE) through the Curriculum Development Center (CDC) to employ modified technology, adapted syllabuses along with the alternative curriculum for learners with Hearing Impairment were not readily available for teachers to use. The study therefore recommends the need for specialized training and Continuous Professional Development in Integrated Science with Sign Language as a pedagogical approach. A focus on Continuous Professional Development on Sign Language related symbols in science would enhance knowledge and skills of teachers to effectively deliver lessons and respond to diverse needs of learners with Hearing Impairment. Necessary materials such as modified materials, text books rich with signs and adapted syllabi are provided to teachers for them to effectively teach Integrated Science to learners with Hearing Impairment.

References

- Abell, S. (2007). Research on science teacher knowledge. In Abell, S. and Lederman, N. (eds.) *Handbook of Research on Science Education*, 1105-1149. Mahwah, N.J.: Lawrence Erlbaum Associates.
- Abell, S.K. (2008). Twenty Years Later: Does pedagogical content knowledge remain a useful idea? *International Journal of Science Education*, 30 (10), 1405-1416.
- Adetayo, T.O. (2008). A survey of the teaching effectiveness and attitude for business studies teachers. *International Journal of Labor Education Trade Unionism*, 3 (2).
- Adu-Gyamfi, K. (2013). Lack of interest in school science among non-science students at the senior high school level. *Problems of Education in the 21st Century*, 53(53), 7-21.

- Adu-Gyamfi, K. (2014). Challenges faced by Science Teachers in the Teaching of Integrated Science in Ghanaian Junior High Schools. *Journal of Science and Mathematics Education*, 6(2), 59-80.
- Akpan, B.B. (2015). The place of Science Education in Nigeria for Global Competitiveness. *Journal of Science Teachers Association of Nigeria (JSTAN) 50 (issue 1)* 1-23.
- Anderman, E. M., Sinatra, G. M., & Gray, D. L. (2012). The challenges Barriers of teaching and learning about science in the twenty-first century: Exploring the abilities and constraints of adolescent learners. *Studies in Science Education*, 48(1), 89-117.
- Crabtree, B.F., & Miller, W.L. (1999). *Doing Qualitative Research*. London: SAGE Publications.
- Davis, E.A., Petish, D., & Smithey, J. (2007). Challenges new Science Teachers face. *Review of Educational Research*, 76 (4), 607-651.
- De Jong, O., Veal, W.R., & Van Driel, J.H. (2002). Exploring Chemistry teachers' knowledge base. In Gilbert, J.K., de Jong, O., Justi, R., Treagust, D.F. & Van Driel, J.H. (eds). *Chemical Education: Towards Research-Based Practice*, p. 369- 390. Kluwer Academic Publishers: Netherlands.
- Guetterman, T.C. (2015). Descriptions of Sampling Practices within Five Approaches to Qualitative Research in Education and the Health Sciences. Forum: *Qualitative Social Research*, 16, No. 2.
- Hallack, J., & Poisson, M. (2001). The challenges to be faced in order to progress towards a greater coherence and relevance of science and technology education. In M. Poisson (Ed.), Final report of the international workshop on the reform in the teaching of science and technology at primary and secondary level in Asia: *Comparative references to Europe*, (pp. 127-134). Geneva.
- Lawal, H. S. (2003). Teacher education and the professional growth of the 21st century Nigeria teacher. *The African symposium*, 3 (2).
- Matafwali, B., & Bus, A. G. (2013). Lack of familiarity with the language of instruction: A main cause of Reading failure by grades 1 and 2 pupils in Zambia. *Insights of Learning Disabilities*, 10, 3-44.

- McMillan, J. H. & Schumacher, S. (2006). *Research in Education. Evidence Based- Enquiry* (6th ed.) Pearson Education, Inc.
- Migeha, G.J. (2014). *An Analysis of Academic Performance of Students with Hearing Impairment in Tanzania Secondary Schools*. Unpublished Dissertation. University of Tanzania.
- Ministry of Education, Science, Vocational Training and Early Education. (2013a). *Integrated Science Syllabus Grade 1-7*. Lusaka: CDC.
- Ministry of Education, Science, Vocational Training and Early Education. (2013b). *Zambia Education Curriculum Framework 2013*. Lusaka: The Curriculum Development Centre (CDC).
- Ministry of Education. (2014). *Principles and Practice: Teaching the Deaf in Schools, Teacher's Guide*. Lusaka: Missionary Oblates Printing Press.
- Muzata, K.K. (2017). 'Curriculum Implementation for learners with special education needs: the case of selected inclusive and special schools in Zambia'. University of South Africa, Pretoria, <http://hdl.handle.net/10500/24571>.
- Muzata, K.K. (2018). Teaching skills of special education students during teaching practice: the case of the university of Zambia preservice special education students. *Multi-disciplinary Journal of Language and Social Sciences Education*, 1, (1), 103-137.
- Muzata, K.K., Mahlo, D., & Mabunda, PL. (2019). Special Education Teachers' Involvement in the 2013 Curriculum Development Process in Zambia: A Case of Selected Inclusive and Special Schools. *Multidisciplinary Journal of Language and Social Sciences Education*, 2, (1). 216-250.
- Muzata, K.K. & Mahlo, D. (2019). Deaf education in Zambia: Lessons from the 2013 revised curriculum. *UNESWA Journal of Education (UJOE)*, 2 (1), 289-305.
- Olarewaju, S. (2001). Some Problem Identified in implementing the core-curriculum for Integrated Science. *Journal of science Teacher in Nigeria*, 25 (2), 61- 67.
- Omiko, A. (2014). Identification of the factors that influence teachers use of strategies in effective teaching of chemistry in secondary schools in Ebonyi State of Nigeria. Unpublished Project. Abakaliki, Ebonyi State University.

- Osborne, J., & Collins, S. (2001). Pupils' views of the role and value of the science curriculum: A focus-group study. *International Journal of Science Education*, 23(5), 441-467.
- Possi, M. K. (2006). From Special to Inclusive Education to Children in Special Needs in Tanzania: Old Wine in New Bottle? *Journal of Issues and Papers in Education*, 1 (2), 47 -63.
- Sagree, S. N. (2008). *Science Education for Learners with Hearing Impairments: Educator Perspectives and Perceptions* University of the Witwatersrand.
- Silondwa, O. & Muzata, K.K. (2019). Teaching and Learning Integrated Science: An Analysis of the challenges Teachers, and Learners with Visual Impairments Face in Chinsali District-Zambia. *International Journal of Education and Research*, 7 (10), 113-124.
- Thomberg, D. D. (2009). *Five Challenges in Science Education*. Sage: Thousand Oaks, CA.
- Ting, C & Gilmore, L. (2012). Attitudes of preservice teachers toward teaching Learners with Hearing Impairments. *Australian Journal of Teacher Education*, 37, 12, 46-56.
- UNESCO. (2010). *Current Challenges in basic science education*. Retrieved June 20, 2018, from unesdoc. unesco. org/images/0019/001914/191425e.pdf.