American Research Journal of Humanities Social Science (ARJHSS)
E-ISSN: 2378-702X
Volume-4, Issue-03, pp-23-29
www.arjhss.com

Research Paper Open Access

Teaching and Learning of Physical Science in Anamulenge Circuit: Challenges and Prospects

[1]Tomas Mwaliikombo, [2]Elock Emvula Shikalepo
[1]*Directorate of Education, Arts and Culture, Omusati region,Ministry of Education, Arts and Culture, Namibia*
[2]*Centre for Open and Lifelong Learning,Namibia University of Science and Technology, Namibia*

ABSTRACT: The purpose of the study was to analyse the challenges that faced the teaching of Physical Science in rural schools of Anamulenge Circuit. A mixed-methods research approach was used to carry out the research. The study sampled Physical Science teachers from selected rural secondary schools in Anamulenge Circuit. The data was collected with both closed and open-ended questionnaires. The collected data was analysed using descriptive and thematic analysis.

Key findings revealed that rural schools were experiencing similar challenges with regard to the teaching of Physical Science. The challenges related to the lack of science equipment at schools, exacerbated by limited time allocation for teaching science subjects. In addition, Physical Science teachers did not receive requiredinstructional support from school management, as the regional office was also failing to host workshops and assist with science equipment supplies.

The study concluded that the teaching of Physical Science at rural schools of Anamulenge Circuit was characterised by challenges which impacted negatively on the successful teaching and learning of the subject. The study recommended the regional education directorate to increase the resource pool to rural schools specifically resources meant to facilitate the teaching and learning of Physical Science. It is necessary that the regional education directorate arrange for professional development interventions periodically, to enable Physical Scienceteachers to become well-versed with contemporary teaching methodologies and pedagogies related to science subjects.

Keywords:*Physical Science, Teachers, Rural Schools, Science, Teaching, Learning*

I. BACKGROUND OF THE STUDY

Globally, the standard of teaching and learning in rural areas has been recorded as minimal, as most qualified teachers prefers teaching in urban areas (Noble, 2005). The trend of qualified teachers preferring urban posting has compromised the quality of teaching and learning in most rural schools. The situation gets worse with the teaching of subjects with practical components such as Physical Science. Science subjects are more practical-oriented and requires skilled human resources to render effective teaching, use teaching aids to facilitate learning, and capable of improvising instructional materials that are not readily available at schools. Without requisite human resources and instructional materials, the teaching of science subjects cannot be as effective as desired.

The study by Ross (1998) established that the continent of Africa is characterised by challenges of providing meaningful science education to all learners, asmost schools do not have state-of-the-art laboratories and equipment needed to facilitate successful teaching and learning of science subjects. This implies that the teaching of science subjects continues to be characterised by challenges, ultimately compromising the quality of teaching and learning output.

The government of the Republic of Namibia hasmade numerous post-independent reforms, including reforms related to assessment of curriculum content through national examinations (Iipinge &Kasanda, 2013). To ensure that learners were adequately prepared for examinations, especially for science subjects, construction of laboratories at schools all over the country for effective teaching of science subjects was effected. Despite the construction of laboratories, most laboratories were not equipped with appropriate consumables and apparatus essential for effective teaching and learning of Physical Science and related science subjects. The ripple effects of equipment deficiency continues to be manifested bypoor learner performance in science subjects.

In order to cultivate an empirical understanding of the challenges that faced the teaching of Physical Science in schools, it was necessary to carry out an empirical investigation to establish the specific difficulties that faced teachers with the teaching of Physical Science.This study sought to analyse the challenges that were encountered by Physical Science teachersat their respective rural schools, with the aim of advancing best practices essential for an effective teaching model of Physical Science.

The specific problem that necessitated the study is stated next.

II. STATEMENT OF THE PROBLEM

The sufficiency of instructional resources in all subject areasis a prerequisite for successful teaching and learning in all schools.Without enough instructional materials and resources, the ultimate aim of optimum learning can hardly be attained. Despite the significance of the sufficiency of instructional materials in schools for all subject areas being well documented, current research findings reveals that subjects such as Physical Science and other science subjects did not have enough supplies of resources (Ifeanyi&Uba, 2012). The insufficiency of resourcesfor Physical Sciencehas subsequently compromised effective teaching and learning of the subject.

Physical Science is a practical subject, requiring experimentation to complement theories. Hence,sufficient teaching aids were needed to improve the teaching and learning of Physical Science. This study sought to analyse the challenges that faced teachers with the teaching of Physical Science, in order to propose a model for the adequacy of human and instructional resources in the science field.

The research sought to address the following key questions:

a) What were the challenges that faced the teaching and learning of Physical Science in Anamulenge Circuit?
b) How has the challenges affectedthe academic performance of learners in Physical Science?
c) Which strategies can be implemented to improve the teaching of Physical Science in Anamulenge Circuit?

The above questions were addressed using the methods and techniques as discussed next.

III. RESEARCH METHODOLOGY

The research was underpinned by a pragmatic research paradigm in order to gather a proper, holisticand practical understanding of the challenges that faced the teaching and learning of Physical Science in Anamulenge Circuit. Pragmatic paradigm provide opportunities for gathering different types of information from different sources as relevant to the study for a richer understanding of the subjects being studied (Tashakkori&Teddlie, 1998).Data related to positivism were used to understand the challenges that faced the teaching and learning of Physical Science from an objective perspective. Similarly, constructivism was used as a framework forsubjective interpretations of positivistic data to generate a richer practical and theoretical understanding of the phenomenon that was studied.

The pragmatic worldview led to the adoption of a mixed-method research approach. A mixed-methods approach is a methodology for conducting research that involves collecting, analysing and integrating both quantitative and qualitative data into a single study. Mixed-methods approach provides a better understanding of the research problem than either of the two approaches can do (Creswell, 2009). With mixed-methods approach, researchers are able to gain in-depth understanding of the research problem and corroborate multiple research findings, while at the same time offsetting the weakness inherent to using anyone of the approach.

The empirical investigation was carried out by using a survey. A survey is a collection and possible examination of responses about a phenomenon, made by asking people questions. Survey investigations provide scientifically gathered information to serve as a basis for the researchers for their interpretations, discussions and conclusions (Kothari, 2004).The survey method was appropriatebecause the investigation was intended to gather teachers' responses on challenges that they were experiencing with the teaching of Physical Science, and regard the responses as a basis for further interpretation and discussion. Physical Science teachers in Anamulenge circuit were purposively sampled for the study as they were the ones best suited to provide rich information on the difficulties related to the teaching and learning of Physical Science in AnamulengeCircuit.

Thestudy used close-ended questionnaires to collect quantitative data, whileopen-ended questionnaires were used to gather qualitative data for a deeper understanding of the phenomenon.The collected data was analysed by means of descriptive and thematic analysis. The analysed data was presented into tables so that they can easily be understood. The tabulated data was then interpreted and discussed qualitatively through the use of themes. This article presents the subsequent consolidated thematic discussions of the findings as drawn from both quantitative and qualitative tools. The findings were validated by methodological triangulation, where the

data collected with different methods were cross-checked with each other to establish similarities and contrasting views (Kahn & Best, 2006).

Informed consent was sought from participants, where they were made to sign an informed consent form, as a manifestation of their own deliberate and conscious decision to participate in the study. Pseudonyms were used to code participants in the presentation of findings in order to protect the identity of the participants and present data in a manner that it was difficult to be related to anyone of the participants (McMillan, 2007). In addition, participants were informed that the data they provided was going to be used exclusively for the purpose of the specific current research and it was not going to be disclosed to any third party without an express permission of the participants.

The established findings are discussed next.

IV. DISCUSSION OF THE FINDINGS

The sampled Physical Science teachers at both schools responded well to the instruments and co-operated with the researcher. As a result, all questionnaires were responded to.
As stated earlier, the findings sought to address the following key questions:

a) What were the challenges that faced the teaching and learning of Physical Science in Anamulenge Circuit?
b) How has the challenges affected the academic performance of learners in Physical Science?
c) Which strategies can be implemented to improve the teaching of Physical Science in Anamulenge Circuit?

The themes that were discussed were formulated according to the above questions that the research sought to address.For the purpose of this article, the following discussion focused on the first and second questions, while the third question is addressed by the subsequent recommendations.

The discussion of the finding is presented next.

Challenges facing the teaching and learning of Physical Science

The teaching and learning of Physical Science in Anamulenge Circuit was characterised by the challenges as discussed next.

Lack of science equipment

Important apparatus and materials were totally absent in all sampled schools, including the equipment for measuring mass such as electronic balance and top pan balance. Further observation revealed that apparatus such as connecting wires, cells, cell holders, evaporating dishes and delivery tubes were not available at sampled schools. In spite of their absence, these apparatus are important in teaching Physical Science, and their absence meant that teachers were required to use alternative means for teaching and learning of Physical Science. ThePhysical Science syllabus states that in case the required teaching and learning resources are not available at schools, teachersand their learners should improvise alternative resources available in their environment.

To live up to the syllabus expectation, it was established that during the preparation of hydrogen and oxygen, teachers conducted experiment using improvised wooden made beehives because the glass made equipment were not available. This revelation confirms previous research findings thatmost schools in rural areas in Namibia do not have equipment or apparatus to carry out experiments during lesson delivery, with a negative impact on the teaching and learning of Physical Science(Sinimbo, 2012). Science practical in schools are meant to prepare and capacitate learners to solve different problems in practical ways. This preparation and capacitation fades in the absence of sufficient instructional materials.In addition, most learners enjoy teaching and learning of Physical Science when a variety of teaching methods are used, which methods requires sufficient instructional materials. This study argues that the teaching of Physical Science in Anamulenge Circuit was not effective due to limitations related to instructional resources.

Availability of chemicals

The study discovered that most of the chemicals needed for the teaching and learning of Physical Sciencewere not present in the sampled schools. Some chemicals serves more than one purpose, and not having them implies a great loss of knowledge. For example, sodium chloride is used in qualitative analysis, properties of alkalis, sublimation and electrolysis. Chemicals that were missing at schools include Ammonia solution, Barium Chloride, Copper Sulphate, Copper Nitrate, Copper Chloride, Calcium Hydroxide, Calcium Carbonate, Ammonia Chloride, among other chemical substances. The lack of science resources at the sampled schools concurs with the findings of Jerkins (2015), emphasising that schools should acquire the latest and high quality science laboratory supplies of chemicals to render effective the teaching of Physical Science.

Physical Science is different from any other subject, due to its practical nature. In order to understand

its concepts, learner needs to look beyond the books and conventional classroom teaching and learning practices. Effective teaching and learning of Physical Science involves seeing, handling and manipulating real objects and materials. Earlier scholars such as Iipinge and Likando (2013) has cautioned that the lack of suitable resources compromise the quality of education and its assessment. This caution is upheld by the fact thatmost rural schools in Omusati region lacked chemicals needed for the teaching of Physical Science, which has contributed to poor performance in science subjects in the region as established.As chemicals were not available at schools, it was clear that the teaching and learning of Physical Science was compromised in rural secondary schools of Anamulenge Circuit.

Lack of laboratory teaching models

Teaching models are tools that teachers use in the classroom to impart subject knowledge and skills to learnersin a way that help learners to better understand the subject matter.The findings show that the availability of teaching models, especially for Physical Science subject as recommended in the current subject syllabus, varied from one school to another. Since teaching models are meant to foster student's practical understanding, they were supposed to be used all times according to the topic to stimulate subject interest amonglearners. Teaching models also help learners to recall or make perceptions of how matters look like in real life situation from which they can build their knowledge and make informed conclusions about subject matter. Models such as the Periodic Table, Eye, Waves and Force, were some of the critical science models that were missing at sampled schools. The absence of the models meant that teaching and learning of science subjects, including Physical Science, was not conducted effectively.

The study established that the models that were available at schools, were not stuck on the wall of the classroom or laboratories as required. This implied that learners usually did not have time to revisit the classroom or laboratory to review the models after lesson and relate what was taught in class to the real world situation during their leisure time. Scientific theories and concepts that are difficult to explain directly from the books alone without reviews and revisiting models. Therefore, Tamuti (2011) emphasise that anatomical models makes it easy to understand complex theories of science, and should thus be made readily available at schools.

Learners develop interest in Physical Science when they observe various matters and carry out different experiments in the laboratory. Learners' reasoning skills are sharpened and start thinking deeply theories and concepts of science. In rural areas of Anamulenge Circuit, learners were not exposed to scientific teaching as expected by the syllabus, as laboratories were not displaying charts and models for learners to understand science theories. The lack of concrete scientific exposure led to low performance of learners in Physical Science subject.

Limited time for laboratory use

The study discovered that sufficient time was not spent in laboratories, as teaching and learning time was limited to the length of a normal lesson, regardless of whether the lesson involved experiments or not. No additional time wasscheduledfor learners to return to the laboratory for a prolonged period of time and enhance their subject understanding through experimenting and observations. Experiments are part of the current competence-based curriculum. According to Chipeta (2006), deeper understanding of science and technology processes can be achieved through laboratory activities, which encourage active participation by learners and develop their critical thinking capabilities. Laboratoriesexpose learners to concrete experiences which learners can relate to, and use to substantiate their theoretical knowledge that has been taught and learned.

Teaching science in laboratory settings promotes the development of learner's cognitive abilities such as problem-solving, analysis, generalising, evaluating, decision making and creativity. The necessity of laboratory for conducting experimenting is emphasised by Mark (1998), stating that learners are able to get first-hand experience and retain acquired knowledge for longer when they see the experiments being performed in front of their eyes. Teaching and experimenting deepens subject understanding among learners. Enough time that was not available for the teaching of theoretical content and supplementing it with experiments in the laboratories, impliedthat the learning of Physical Science was inhibited and culminated in low learner performance in the subject area.

Lack of motivation

Even though the necessity for motivation to perform is well documented in literature, the study established that Physical Science teachers were not motivated adequately to perform optimally. There were no incentives given to Physical Science teachers either from school management or education directorate. This implies that teachers were not supported extrinsically as expected for them to do their work effectively. Teachers were also demotivated by the fact that there were no arrangements being made for the procurement of instructional resources for the teaching and learning of Physical Science. Lack of extrinsic motivation coupled with limited teaching aids made it difficult for Physical Science teachers to carry out experiments during lessons. This difficulties has lessened the development of scientific skills among learners.

Teachers were also demotivated by lack of effective communication at schools. Some school administrators did not value good communication ethics with their teachers. As a result of communication gaps

between teachers and school management, the requests by Physical Science teachers for the procurement of science materials were overlooked, not attended to timeously by school managers, and teachers were also not updated of any progress made. Consequently, some of the laboratories at sampled schools were abandoned and ended up not having chemicals and equipment, which further demotivated teachers from conducting experiments with learners in order to supplement their theoretical understanding with practical understanding of the subject matter. Research findings reveals that failure to meet teachers' expectations can frustrate and hinders their ability to successfully complete their task, as only high morale and motivation can result in successful completion of tasks(Riggio, 1978). The teaching and learning of Physical Science was hindered by low morale of Physical Science teachers at schools.

Comprehensively considered, it becomes clear that the teaching of Physical Science at rural schools of Anamulenge Circuit was faced by numerous challenges as discussed above. These challenges has negatively affected effective teaching and learning for Physical Science, warranting interventions for improvement as discussed next.

Improving the quality of teaching and learning of Physical Science

To improve the status quo, various strategies were suggested by participants on how the teaching of Physical Science can be improved. The teaching and learning of Physical Science can be improved by the interventions as described below:

Provision of Physical Science apparatus to rural schools

Rural schools are often the most impoverished schools due to their geographical location, being far from essential services that are common to schools in urban towns. As a result of their locality, rural schools are hardly reached and stays at the margins of delivery for the supplies of teaching and learning resources.Efforts should be made to ensure that rural schools are supplied with science essentials.

Rural electrification

Most of the experiments requires the supply of power, in the absence of which experiments cannot be carried out. It is required that rural schools should be supplied with electricity in order to enable teachers to conduct experiments and enable learners to acquire a better understanding of the subject content.

Teacher incentives

Given the harsh working conditions in rural areas and the inadequacy of resources, some teachers still manage to achieve satisfactory passing rate in Physical Science though not often. Teachers who are achieving high performance levels in Physical Science should be given incentive in order to motivate them to excel despite the harsh circumstances they are working in.

Political commitment to rural education

A political will could help to avail sufficient resources to the improvement of rural schools. Budgetary allocation should be considerate of the harsh realities at rural schools. This consideration is essential for apportioning sufficient votes for the provisioning of essential services in rural areas, including the provisions of instructional resources.

Professional development opportunities

Physical Science teachers should be afforded opportunities to develop themselves professionally in order to cope with the ever increasing demand of the subject areas. Professional development interventions can help teachers to act competently in improvising materials that are not readily available at their schools, in order to enhance learning.

The interventions described above, once considered, can help to improve quality related to the teaching and learning of Physical Science, especially in rural schools where deficiencies in teaching the subject have been established.

V. LIMITATIONS OF THE STUDY

This was small scale research study confined in a Circuit, and in a rural context. The results of this study are applicable to the sites that took part in the study. This implies that the findings may not qualify for generalisation to other educational settings, unless practitioners in other educational settings finds resemblance in current research, and can establish that their settings share similar characteristics as the settings that participated in the study. In addition, the content is detailed in this article, as the researchers have presented what they considered to be key thematic research findings. The lack of detailed explanations may cause deficiencies in proper understanding of certain content by readers. The researchers employed a mixed-methodsapproach for a better practical understanding of the phenomena that was studied. However, the researchers does not claim expertise in using the said methodology and chances may surface that the methodology may not have been reported appropriately in this article, with a ripple effects on the findings.

VI. CONCLUSION

There is plausible evidence that the teaching of Physical Science in Anamulenge circuit was faced by challenges as discussed in this article. Many times authorities blame teachers for not delivering high pass rate, yet the same authorities kept on a blind eye on the difficulties teachers were going through to bring about good teaching. The challenges that characterised teaching of Physical Science has indeed compromised effective learning of the subject.

The study concluded that the low performance of learners in Physical Science in Anamulenge Circuit was mainly due to the insufficiency of instructional resources in the subject area, and not necessarily due to human resources capabilities that were always to blame. Therefore, this study was necessary to engage with teachers who were directly involved with the teaching of Physical Science to describe the difficulties they were faced at their respective rural schools. The study was essentialto ensure that proposedinterventions were realistic to the existing challenges as established during the empirical investigation.

In view of the challenges discovered and conclusions made, the study made the following recommendations:

VII. RECOMMENDATIONS

The study has advanced the recommendations as outlined below.

a) The Senior Education Officer for Physical Science in Omusati region should embark upon professional development sessions and long term in-service training programs to capacitate Physical Science teachers. This will enable teachers to facilitate the teaching of Physical Scienceusing contemporary teaching pedagogies.
b) The Regional Education Directorate should develop leadership development programs for school leaders so that they are capacitated toeffectively attend to the requests made by teachers, and help teachers succeed in their teaching in spite of the challenges they are experiencing.
c) The Executive Director as the accounting officer of the Ministry of education should consider the ministry tomotivate Physical Science teachers in form of both monetary and non-monetary rewards and recognition. Monetary rewards such as giving monetary incentives, and non-monetary rewards such as regular workshops, career development and promotional opportunities could motivate Physical Science teachers to excel.
d) The Minister of Education should be instrumental in convincing Central government to allocate sufficient vote to the education ministry to specifically cater for the procurement of science materials, apparatus and other instructional resources needed for successful teaching and learning of Physical Science. Sufficient allocation of fund is essential not only for the basic supplies and materials for Physical Science, but also for the maintenance of science equipment and replacement of old equipment at schools. Sufficient fund is also vital for the provision of enough laboratories at schools, to support the successful teaching of Physical Science.
e) Schools should allocate additional time for Physical Science experiments, since the normal lesson duration is usually not enough for conducting science experiments. Additional time can be made available during study time for learners to catch up with their Physical Science experiments.
f) Scholars in the science field are encouraged to periodically carry out research to establish emerging trends and challenges facing the teaching and learning of Physical Science and devisingcontemporary measures to mitigate their impacts on teaching and learning of the subject.

The consideration and subsequent implementations of the above recommendations can result in the improvement of quality related to the teaching and learning of Physical Science, especially in rural areas where the teaching and learning effectiveness has been established as not satisfactory.

References

[1]. Chipeta, L. (2006) .*Curriculum Theory and Teaching.*Mzuzu: Olive Publishing Housing.
[2]. Creswell, J.W. (2009). *Research design: Qualitative, quantitative and mixed approaches.* Thousand Oaks: Sage Publication.
[3]. Ifeanyi, M. S. &Uba, I.I. (2012).The effect of laboratory works in teaching and learning of physics in Onitsha north, Anambra state.*Journal of Science and Arts No.* 1(18):75-84.
[4]. Iipinge, S. M. &Kasanda, C.D. (2013). Challenges associated with curriculum alignment, change and assessment reforms in Namibia.*Assessment in Education: Principles, Policy & Practice,*20(4):424-441.
[5]. Iipinge, S.M. &Likando, G. (2013).Implementing universal primary education in Namibia –Trends and challenges. *American International Journal of Social Science,*2(8):135-142.
[6]. Jerkins, W. (2015).*The Role of Leadership: Transforming Learning*. New Jersey:Longman.
[7]. Kahn, V.J. & Best, J.W. (2006). *Research in education (10th Ed.).* Boston: Pearson Education.

[8]. Kothari, C.R. (2004). *Research Methodology: Methods and Techniques (2nd Ed.).* New Delhi: New age International Publisher.
[9]. Mark, K. (1998).*Science formative Assessment 5th Edition.* London: SAGE Publications.
[10]. McMillan, J.H. (2007). *Formative classroom assessment: Research, theory and practice*. New York: Teachers' College Press.
[11]. Noble. B. (2005).*Extending Educational Reform.* New York: Routledge.
[12]. Riggio, R. (1978).*Introduction to Industrial/Organisational Psychology (7thEd.).* Bradford: University Press.
[13]. Ross, W. (1998).*Educational Management: Redefining Theory, Policy and Practice (2nd Ed.).* New Delhi: A SAGE Publications Company.
[14]. Sinimbo, V. V. M. (2012). A Review on Value Education in Africa. *Ignited Minds Journals,*13:1130 - 1137.
[15]. Tamuti, W. (2011).*Educational Administration and Management.* Kigali: Fountain Press
[16]. Tashakkori, A. &Teddlie, C.(1998). *Mixed Methodology: Combining Qualitative and Quantitative Approaches. Applied Social Research Methods Series.* Thousand Oaks: Sage Publications.

AUTHORS' PROFILES

Tomas Mwaliikombo is a Physical Science educator, working for the Ministry of Education, Arts and Culture, in the Directorate of education, arts and culture, Omusati region. He holds graduate and post-graduate qualifications, including a Master of Education in Educational Management from Midlands State University, Zimbabwe.He has taught science subjects for eons, and is engaged in periodic research related to the improvement of quality in the teaching and learning of science subjects. His research interestslies in science education, applied research, management and leadership. He can be reached at ndunge83@gmail.com

Elock Emvula Shikalepo is a Namibian philosopher, academic and researcher, based at the Namibia University of Science and Technology. He holds both graduate and post-graduate qualifications in teaching, education law, systems and management. He obtained his Doctor of Philosophy from the University of South Africa, focusing on staff motivation and performance in the education sector. His thesis analysed the influence of financial incentive on teacher motivation and learner performance in Namibian rural schools. He has researched widely and published extensively in the areas of education legislations, technical, vocational education and training, teaching and learning, management and leadership, open and lifelong learning, research and supervision. He can be reached at drshikalepo@gmail.com

Corresponding author: Elock Emvula Shikalepo (PhD)
Centre for Open and Lifelong Learning, Namibia University of Science and Technology, Namibia