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Teachers' perceptions regarding the role of practical work in teaching integrated science at junior secondary school level in Zambia

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Abstract
This paper reports the findings of a study that explored teachers' perceptions regarding the role of practical work in teaching integrated science at junior secondary school level. The sample consisted of 32 teachers of integrated science. There were 26 males and 6 females teachers. A descriptive survey design was employed under a mixed method approach that placed greater focus on the qualitative strand. Purposeful sampling procedure was used to select teachers. Data collected from survey questionnaires were analysed using Microsoft Excel 2007 while the interview data were analysed using thematic analysis. The study found that teachers had positive perceptions regarding the role of practical work in teaching integrated science although their perceptions did not translate into actually conducting practical work during teaching. Teachers had indifferent attitudes towards conducting practical work. Teachers of integrated science experienced challenges such as overcrowding in classes, language barrier, inadequate professional development, insufficient instructional time to cover the syllabus content, and poor administrative support. The study recommended that standards officers and head teachers should monitor teachers and help improve teacher support by making necessary materials available for use during teaching as well as organising professional development meetings.

Keywords: Challenges. Integrated science. Supervision and monitoring. Teaching. Teachers‟ perceptions. Practical work.

Introduction
Education is one of a nation‟s important tools for achieving more progress and development in the changeable world. Owing to the rapid technological changes and the emerging issues related to learners‟ poor performance in core subjects such as science, education systems are currently undergoing transformation throughout the globe. They are shifting from a philosophy that focuses on theoretical transmission of information to a more constructivist paradigm of teaching and learning which believes in learning by doing. As a result, there have been a number of education reform projects throughout the world which aim at preparing learners to meet the current needs of producing a scientific community that is beneficial to society (Dagher & BouJaoude, 2011). Therefore, to promote a deep conceptual understanding and development of positive attitudes towards science, there have been great emphases on science education methodologies which promote hands-on learning and teaching. In line with this new thinking, education authorities in Zambia have made integrated science as one of the core subjects to be taught in Zambian

schools from Grades 1 to 9 as a standalone subject. Its prime goal is to help to develop processes of scientific thinking in learners (Ministry of Education, 1996).

Challenges of teaching practical work in integrated science

The teaching and learning of integrated science has faced a lot of challenges both at primary and secondary school levels in Zambian schools. These challenges hinder successful learning of practical work in integrated science in schools. Teachers indicated that teaching of integrated science was fraught with various challenges. Most schools do not have enough learning and teaching materials. A study by Haambokoma *et al.* (2002) established that materials and resources were insufficient and sometimes lacking in schools. This impacted heavily on the teaching and learning of practical work in Integrated Science in schools. In addition, the language of instruction has been a huge barrier. Teachers have had difficulties with the use of English language during lessons. Most learners in schools are not able to understand, read or write in English. A study conducted by Matafwali (2005) on reading ability in Grade Six concluded that 49.1 percent of the pupils could not read words at all and 57.5 percent children could not read any single sentence in English language. Other challenges included insufficient administrative support for teachers of science, few teachers of science resulting into high pupil-teacher ratio and lack of on-going professional development (Kelly, 1999; MoE, 1996). These challenges posed a barrier to learners who transitioned from junior secondary to senior secondary in understanding basic concepts of science at that level.

On a global scale other challenges in the teaching of science abound. Alexander (2000) noted that time allocated to teaching science is limited; hence, teachers are under pressure to cover learning outcomes. The content for teaching outlined in the syllabus is usually too much against too little time for lessons. This makes teachers spend much of their time preparing learners theoretically in order to pass final examinations and move to the next grade or level rather than preparing them to master skills. Furthermore, teachers do not have enough time for proper planning of practical work (Backus, 2005). This is because teachers have many other classes to attend to owing to a smaller number of teachers of science in schools. Lastly, some teachers of integrated science have low-level attitudes towards laboratory applications, negative perceptions and beliefs of practical work (Cheung, 2007; Roehrig & Luft, 2004). Beliefs impact their actions and play a critical role in paving restructuring of science education. These beliefs have a strong influence on what they do (Bryan, 2003).

To address some of these challenges, the Zambian government introduced a lot of programmes such as Action to improve English, Mathematics and Science (AIEMS); and distance and full time programmes in science education at Kwame Nkrumah Teachers‟ College, the Copperbelt Secondary Teachers‟ Training College, the National In-Service Teachers‟ College and at the University of Zambia for professional development in the late 1990s. These programmes aimed at equipping teachers with relevant scientific knowledge in both primary and secondary schools. The government also built laboratories in some schools and distributed science kits for most primary and some secondary schools.

Although such interventions were put in place, a study by Mudenda (2008) and an examination report by Examinations Council of Zambia (ECZ) (2014) showed that learners still had a lot of challenges during their practical examinations. It was indicated that most candidates, at both Grades 9 and 12 level did not have in-depth

understanding of the science concepts to the extent that they were failing to make interpretation of practical observations.

The key factor in the resolution to this problem is the classroom teacher. This is because even amid the best educational policies, frequent curriculum re-designing, and investing huge sums of money on education, the ultimate realisation of any set of aims for education depends on the teacher. The teacher is responsible for translating policy into action and principle into practice during interactions with learners.

Teachers' perceptions

Perceptions are one of the most important factors that need consideration when developing teachers‟ favourable attitudes towards teaching practical work in integrated science. Maharaj, Brijlall and Molebale (2007) argue that perceptions determine teachers‟ actions in classrooms. These actions may include the way teachers plan the work to teach and select the methods to use to teach the work planned. In a study conducted by Diene (1993) to understand teacher change, it was concluded that teachers‟ perceptions, beliefs and practices were embedded within and tied to broader contexts with personal, social and previous ideas about a particular aspect. Klazky (1984) defines a perception as a process by which individuals select, organise and interpret stimuli into meaningful and coherent pictures of the world around them. An individual's perceptions determine the way s/he behaves, reacts to stimuli, interprets and disseminates information.

Perceptions that individuals possess are as a result of sociological forces including the influence of ideologies, religion, human interests and group dynamics (Phillips, 2000). Beliefs involve "those general understandings related to learning that a teacher holds to be true" (Opfer, Pedder & Lavicza, 2010: 444). These sociological forces determine teachers‟ beliefs about teaching and therefore, teachers will attach a high priority to practice knowledge and skills that conform to their own belief (Opfer *et al.,* 2010).

Further, Ajzen (1985) argues that the connections among clusters of beliefs create an individual's values which guide one's life and ultimately determine one‟s behaviour. This means teachers also possess beliefs (values) regarding professional practice which impact and guide their actions as they teach in schools. Therefore, the way teachers modify and adapt teaching methodologies depends on their perceptions of practical work. In this regard, Ughamadu (2005) argues that success in science will always depend on the quality of teachers and their perceptions. It is therefore, essential to understand teachers‟ perceptions and beliefs about the role of practical work in teaching and learning of Integrated Science at junior secondary school level. A school might have good classrooms and all the necessary teaching materials, but if teachers‟ perceptions are not in tune with official policy, the teaching and learning process is negatively affected. Therefore, it is important to evaluate how teachers in schools interpret and organise Integrated Science practical work. It is against this background that this research sought to explore teachers‟ perceptions regarding the role of practical work in the teaching of Integrated Science at junior secondary school level in Pemba District of Southern Province of Zambia.

Importance of practical work in teaching integrated science

Stoffels (2005) defines practical work as all those teaching and learning situations which provide learners with opportunities to practice the process of investigation and involve hands-on or mind-on practical learning opportunities where learners practice and develop various process skills. During practical work, learners have to interact with materials in order to make their own sound judgement about what they are learning. Practical work makes learners get excited and yearn to learn more (Braud & Driver, 2002). As learners do practical work, much of their senses are involved, hence reducing boredom and making the learner eager to learn more and more. Practical work helps to illustrate concepts so that learners can "see" science concepts (Gott & Mashiter, 1991). When more than two senses are involved, retention of concepts lasts longer because new horizons of understanding or visualising things, ideas and concepts are opened. Learning by doing makes learners use more than one sense and because of that, learners do not easily forget concepts. This makes it easier for learners to link theoretical ideas with real phenomenon.

Millar (2008) adds that practical work helps learners with skills of how to find solutions to problems through investigations and analysis of situations. Therefore, practical work encourages step by step scientific investigations through which learners practice to create hypothesis, collect data, perform experiments, analyse results and make conclusions. In addition, practical work improves the analytical ability of learners and encourages practice of cooperative work (Dillon, 2008). Woodley (2009) further acknowledges that practical work in science supports skills development, experimental learning, independent learning, learning in different ways and the development of personal learning and thinking skills.

Problem statement

Integrated science education in Zambia aims at improving scientific and technological skills of learners through learning practical work. It is expected that at the end of junior secondary school, learners should be able to understand basic science concepts as they transition to senior secondary level. In this vein, the government embarked on training teachers of science and also distributed science kits to most schools throughout the country. However, the results indicate that most candidates still fail to exhibit the expected in-depth knowledge and practical skills required at the Junior Secondary School Leaving Examinations (ECZ, 2014). Research abounds that identifies this problem. However, there is no known research that has been done to determine teachers‟ perception regarding the role of practical work in teaching integrated science at junior secondary. This study sought to address this knowledge gap by answering the following research questions.

Research questions

Specifically this study sought to answer the following questions:

- What is the understanding of practical work in integrated science by teachers of integrated science at junior secondary school?

- What are teachers‟ perceptions regarding the role/importance of practical work in teaching integrated science at junior secondary school?
- What are the challenges of teaching practical work in integrated science at junior secondary school?

Methodology

The study employed a mixed methods approach with greater focus on the qualitative strand. Brynard and Henekom (1997) contend that qualitative methodologies allow the researcher to know people personally and to see them as they are, as well as to experience their daily struggles when confronted with real-life phenomena. In this case, it focused on an in-depth analysis of the teachers‟ perceptions of the role of practical work in teaching Integrated Science and used the descriptive survey as a research design.

The study sample comprised of 32 teachers of integrated science at junior secondary school from 18 different schools within Pemba district. There were 26 males and 6 female teachers involved in this study. This sampled shows a bias towards more males than females because there were only 8 females who taught integrated science in the district at that time. Two out of the eight were used in the pilot study. The schools sampled for study included basic and secondary schools. This study used purposive and convenient sampling procedures to select teachers and schools. Purposeful sampling procedures were used to select teachers because of two reasons. Firstly, these were the only ones who could provide the required information in line with research objectives. Secondly, it was necessary to purposively sample teachers of Integrated Science because of their scarcity in schools. This explains why there were only 6 females in the sample. There are few females teaching integrated Science in Zambian schools. In this case the 6 females represented all the females teaching integrated science in the sampled schools. Any other form of sampling would have seriously affected the sample size. In terms of schools, the sampled schools had received Science kits from the government through the Ministry of Education.

Data were collected using semi-structured questionnaires with both closed and open-ended questions that endeared themselves to quantitative and qualitative analysis, interview guides and checklists/observation sheets. The questionnaire was used to obtain teachers‟ perceptions of the role of practical work while the checklist was used to determine teachers‟ physical application of practical work from their portfolios (schemes of work, lesson plans and records of work). Interviews were conducted after teachers filled in questionnaires to triangulate information provided and allow teachers provide more information which could not be availed in the questionnaire. The data collected were analysed by coding and grouping the emerging themes which corresponded with research questions. To facilitate further analysis, some of the data were analysed using Microsoft Excel 2007 to obtain descriptive statistics which included frequencies and percentages.

Findings

Table 1 shows the demographic information of teachers who took part in the study.

Table 1: Demographic information of teachers

General Information		Frequency (N=32)	Percentage (%)
Gender	Male	26	81.2
	Female	6	18.8
Age	21–25	2	6.3
	26–30	4	12.5
	31–35	12	37.5
	36–40	5	15.6
	41 and above	9	28.1
Highest level of academic qualification	Secondary Diploma	27	84.4
	Bachelor"s Degree	5	15.6
Experience of teaching Integrated Science at junior secondary school level	2 – 5	3	9.4
	6–10	18	56.2
	11–15	5	15.6
	16–20	4	12.5
	21 and above	2	6.3
School type and numbers of teachers involved	Basic schools (14)	25	78.1
	Secondary schools (4)	7	21.9

(Source: Fieldwork data, 2016)

Teachers' understanding of practical work in integrated science

This section presents findings on teachers" understanding of practical work in Integrated Science at junior secondary schools in Pemba district. All the teachers who were interviewed were able to explain the meaning of practical work correctly. One of the teachers stated that „p*ractical work is an activity in which pupils handle apparatus on their own to find solutions to a given problems*". Another teacher had the following to say „p*ractical work is an activity in which pupils are involved in doing activities of testing and making conclusion of their own in a classroom*". Generally, the results indicated that teachers were knowledgeable in their understanding of practical work in integrated science.

Importance of conducting practical work in integrated science

In addition to their understanding of practical work in integrated science, respondents were asked for their perceptions about the importance of conducting practical work in the teaching of integrated science. All teachers agreed that it was necessary to conduct practical work in integrated science at junior secondary level. Teachers indicated that practical work helped learners to translate theory into practice and also to retain what had been learnt. In supporting this view, one of the teachers indicated

that „p*ractical work arouses interest in learning and makes learners to feel ownership of the learning processes".*

The study further investigated the techniques of teaching practical work in integrated science. These are presented in table 2.

Table 2: Techniques of teaching practical work in integrated science

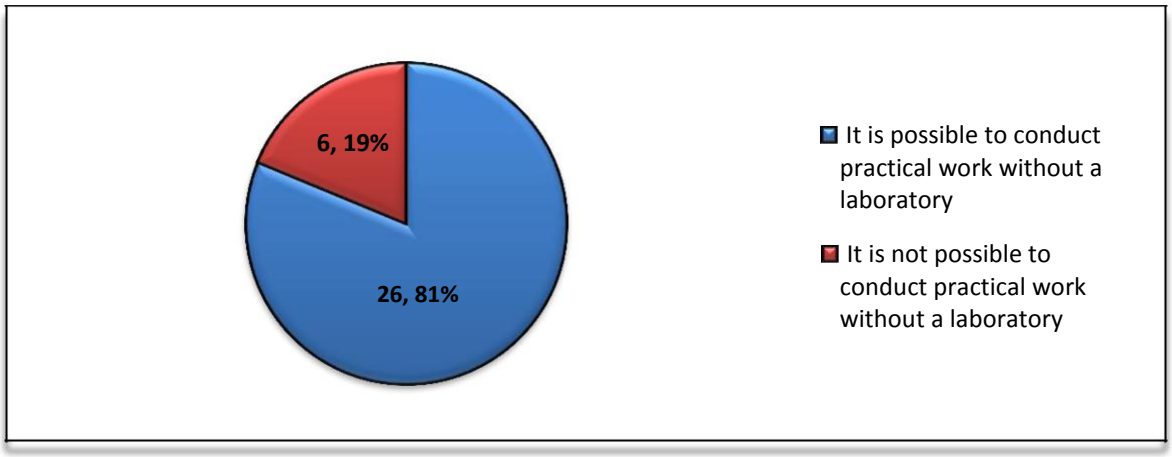
Techniques of teaching practical work	Frequency (N = 32)	Percentage (%)	Reasons for the choice of technique
Demonstration	23	71.9	It saves time, less involving, easy to control class, easy to prepare, cheap
Investigation	4	12.5	Learners develop investigative skills, learners learn by doing
Structured	2	6.2	Easy to prepare, easy to mark and to control learners, learners practice physically
Rotating or circus	3	9.4	Inadequate apparatus, each learner does the experiment, involves more senses.
Problem solving	0	0	-

(Source: Fieldwork data, 2016)

Table 2 shows that the majority of teachers (71.9%) preferred using demonstration to any other technique in the teaching of practical work because they found it to be less involving, cheaper and time-saving. Significantly, none of the teachers preferred to use problem solving. Problem solving needs a lot of time and sometimes more materials than the other techniques. From table 2, it is clear that the majority of teachers were aware of the different techniques of teaching practical work in Integrated Science.

Possibility of conducting practical work without a laboratory

Regarding the possibility of teaching integrated science in the absence of a laboratory, twenty-six (81.2percent) teachers agreed that it was possible to teach practical work in their schools without a laboratory, while six (18.8percent) indicated that it was not possible to conduct practical work without a laboratory. Figure 1 below shows the details.



(Source: Fieldwork data, 2016)

Figure 1: Possibility of conducting practical work without a laboratory

Respondents were further asked about the importance of keeping records of practical work conducted in Integrated Science. Teachers acknowledged that it was important to keep records of practical work for learners. They understood that practical work helped teachers avoiding repetition of work previously taught in case of another teacher‟s absence. Hence, one of the teachers said „k*eeping records of practical work helps to know where the other teacher ended in case of transfer or change of class‟.* Another teacher supported the above viewpoint thus „k*eeping records of practical work helps teachers to take note of challenges and help to make modifications of practical lesson in future‟.* The general picture from responses indicated that the majority of teachers were aware of the importance of record keeping.

Challenges towards conducting practical work in integrated science in schools

Although teachers agreed that they conducted practical work in Integrated Science in their schools, most of the teachers indicated that did not have enough teaching materials such as science text books and apparatus in their schools. Most teachers indicated their schools were not able to purchase extra materials to cater for every pupil as reported by one of the teachers noted that „*our school is unable to purchase science apparatus and we have no capacity to store chemicals‟.* Some teachers further indicated that were not receiving enough funds from the government and even when they did, the little they received was disbursed late. Besides that, most teachers also indicated that practical work in Integrated Science was paid least attention by their school administration compared to other activities in school, as indicted by one of the teachers said that „o*ur school would rather send pupils for sports than purchasing science equipment‟.*

Teachers also complained of too much workload as there were few teachers of science. In line with that, one teacher stated that:

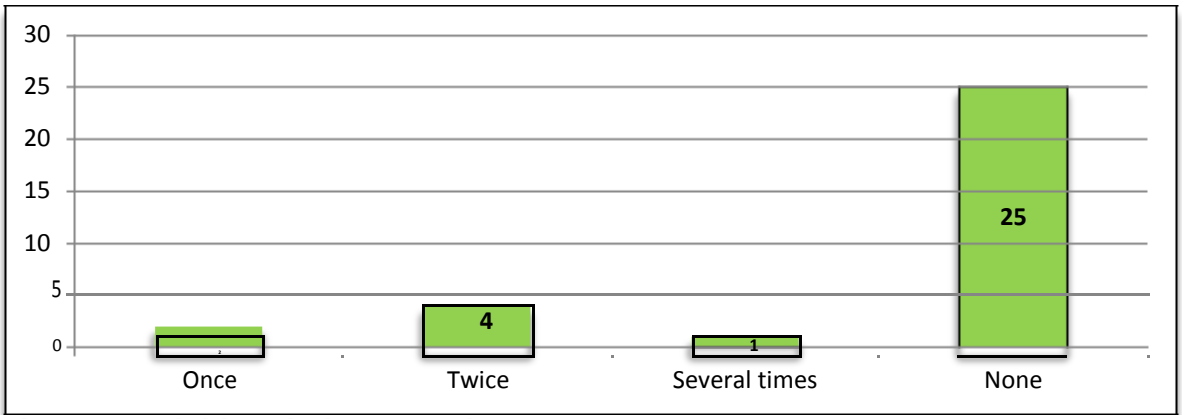
There is little time to prepare for practical work because of many classes to teach. As a result when we knock off we are too tired to start preparing adequately for the next lesson.

Another teacher reported that:

Most of the learners in our school do not understand English language and therefore, it is difficult to explain in local language as most of scientific terms are not in our local languages.

Teacher supervision in schools

Regarding supervision of teachers teaching integrated science, the results are presented in figure 2.



(Source: Fieldwork data, 2016)

Figure 2: Teacher supervision in schools

Figure 2 shows that 25 (78.1percent) of the teachers were not observed conducting practical work by their supervisors in the last three terms while 1 (3.1percent) was frequently observed conducting practical work to learners and yet supervision is one of the key factors that remind teachers of what they are supposed to do in their routine work at school.

Findings from teachers' portfolios

Teachers" portfolios (schemes of work, lesson plans and records of work) were collected and thoroughly checked for evidence of practical work. Table 3 presents this data.

Table 3: Evidence of practical work in teachers' portfolios

Teachers with evidence of practical work		
Teacher portfolio	Frequency (N= 32)	Percentage (%)
Schemes of work	4	12.5
Lesson plan	6	18.8
Records of work	6	18.8
Average percentage		16.7
Teachers without evidence of practical work		

Schemes	28	87.5
Lesson plan	26	81.2
Records of work	26	81.2
Average percentage		83.3

(Source: Fieldwork data, 2016)

Table 3 shows that on average, 16.7 percent of the teachers prepared and taught practical work in their schools, while 83.3 percent did not. Most of the teachers, (5 out of 6) who had prepared practical work in their portfolios, were from secondary schools as opposed basic schools. This indicates that more practical work was done in secondary schools than in basic schools.

Discussions

Teachers" perceptions on the role of practical work in teaching integrated science
The findings indicated that all teachers showed a satisfactory understanding of practical work in integrated science. Their explanations and descriptions of practical work were in line with Lunetta *et al.* (2007) who describe practical work as learning experiences in which learners interact with materials or with secondary source of data to observe and understand the natural world. A good understanding of the nature of practical work might help teachers to plan sound practical activities. Knowledge is very important in teaching because when it is applied correctly, it yields desired results. Positive perception of practical work can impact directly on the way the teacher conducts practical work. Therefore, teachers should have a clear understanding of what practical work entails and the purposes it serves.

The findings further show that teachers understood why practical work was taught in Integrated Science. Their responses are in agreement with explanations by Gott and Mashiter (1991); Braud and Driver (2002) and Inomiesa (2010) on the importance of practical work. These state that practical work makes learners get excited and yearn to learn more; helps to illustrate concepts so that learners can "see" science concepts; and that practical work helps learners with skills of how to find solutions to problems through investigations and analysis of situations. It must be realised that the more the learners carry out practical work, the more efficient they become in performing the practical work and the greater the retention of practical skills the learner gains. For this reason, it is very important that learners are involved in practical work frequently.

The findings also indicate that teachers were aware of and used different techniques of teaching practical work during Integrated Science lessons. These techniques of teaching practical work are in agreement with Kapenda *et al*. (2002) and Wellington (1998) who considered demonstration, investigation, structured, rotating or circus and problem solving as some of the common styles of teaching practical work in science. It is very important that during teaching and learning, a variety of styles of teaching practical work are employed so that learners are kept motivated. If the same style of practical work is used all the time, learners get bored and lose interest in doing practical work. However, it was observed that most teachers (71.9%) performed more of demonstration than any other style of teaching practical work. This also agrees with Pekmez, Johnson and Gott, (2005) who reported that demonstration was the most frequently used type of teaching practical

work by teachers. Demonstration does not involve learners physically manipulating materials. It is usually the teacher who conducts that activity. Teachers already have the knowledge and skill, but it is the learner who needs it most. Learners who manipulate tools by themselves understand concepts better and gain adequate skills than those who just observe others (Dirkes, 1991). Therefore, the majority of teachers denied learners chance to understand concepts and practical skills by not allowing them to manipulate apparatus by themselves.

Teachers reported that they preferred demonstration to other techniques of teaching practical work. They stated that they had inadequate apparatus and saved time through demonstrations in terms of preparation and class control. On the contrary, Stoffels (2005) argued that many teachers used demonstrations simply because of their failure to be resourceful since some practical work could be done with simple materials from the local environment. Teachers showed mixed perceptions regarding conducting practical without a laboratory. The results indicate that the majority of the teachers, 26 (81.2%), agreed that it was possible to conduct practical work in Integrated Science without a laboratory. Teachers were in line with Maboyi and Dekkers (2003) who suggested that practical work could be conducted anywhere provided there was enough space and materials to use. Teachers of science are supposed to be resourceful and innovative.

On the other hand, 6 teachers disagreed and stated that it was not possible to conduct practical work without the laboratory. These teachers agreed with Tsuma (1997) and Solomon (1994) who argued that a science laboratory is an indispensable facility in science education because it provides the best setting for teachers to assist learners in acquiring scientific knowledge and skills. Solomon (1994) further observes that science teaching must take place in the laboratory since it belongs there naturally as cooking belongs to the kitchen.

Although both arguments are true, the argument by Maboyi and Dekkers (2003) seems to make more sense. It is not all practical work that needs to be confined to laboratory conditions. Some practical work, such as measuring breathe rate can be done even on a football pitch. It must be realised that the presence or absence of a laboratory in the school does not overrule the importance of the role of practical work in teaching Integrated Science. Therefore, teachers should find what suits their condition best and ensure that practical work takes place during learning and teaching of integrated science.

Teachers also showed that they were aware of record keeping and its importance in teaching of practical work. Their responses agree with Macharia and Wario (1994) who outlines the following importance of record keeping: to assess what has been achieved in the past by the pupils; to show the present rate of progress that the pupils are making; to identify the areas of difficulty for individual pupils so that remedial teaching can be planned for them; to provide basis for guidance and counselling of pupils when they are planning their future education and to assist in the smooth transition of education from one school to another. Important records which teachers should have in their files include schemes of work, lesson plans, records of work and pupils progress records. It is important to ensure that exercises, quizzes, or tests that are given to pupils are also reflected in all these records. These may be used as terms of reference when assisting learners who are not performing by pointing out their weaknesses as well as those performing well to determine their future. All well-meaning teachers favour keeping records of work as it is the pillar of teaching and learning.

Data obtained from the questionnaires were matched with data from the teachers‟ portfolios obtained using checklists. This triangulation proved valuable in validating data. The findings revealed that most teachers did not have a record of practical work in their portfolios despite having satisfactory knowledge and understanding of record keeping. These findings agreed with Kibirige, Osodo and Mgiba (2014) in South Africa who concluded that teachers, despite being aware of the importance of practical work, did not often keep records of practical work. The findings further showed that teachers recorded other works which they taught apart from practical work in their portfolios. This was an indication that the majority of the teachers did not conduct practical work in their schools.

It can, therefore, be stated that teachers have unsatisfactory perception regarding application of practical work in schools. Perceptions are very important because they determine how the teacher behaves while conducting practical work. The way a teacher understands things has a strong bearing on how he or she is going to conduct any activity. However, this study has shown that teachers‟ positive perception of the role of practical work did not translate into positive behaviour regarding the same. Having satisfactory perceptions alone is not enough; such perceptions must be translated into practice.

Challenges of conducting practical work in integrated science

Teachers of integrated science indicated numerous challenges. They reported that they did not have enough learning and teaching materials in schools. This is in agreement with Haambokoma, Nkhata, Kostyuk, Chabalengula, Mbewe, Tabakamulamu and Ndhlovu (2002) who established that materials and resources were insufficient and sometimes lacking in schools. This impacted adversely on learners because they were unable to do practical work. The findings also indicated that overcrowding in classrooms was a major obstacle in conducting practical work in classrooms. This coupled with inadequate teaching and learning resources made it difficult for teachers to conduct practical work. These findings correspond with Manda (2012) who acknowledges that over-crowding of classrooms was one of the major obstacles to carry out classroom assessment in schools.

Teachers also indicated that the official language, English language used in schools was a challenge in the learning and teaching of integrated science. Teachers noted that most of their learners could not express themselves fluently, both in written and spoken English. This hindered learners from participating fully during discussions and failing to write findings and reports during practical work. This made it difficult for teachers to teach practical work in local language into which most of the science terms could not be translated easily and directly. In line with that, Chibesakunda (1983) acknowledges that when a learner of science is not a native speaker of English language, his learning through it demands very special additional difficulties of cognition and understanding. Language is key to learning of new concepts more especially if taught in first language.

The findings also indicated that teachers had inadequate professional development in schools. Most schools, especially basic schools, did not have enough financial resources to hold continuous professional development meetings. Such meetings hinge on adequate teaching aids of which many schools cannot manage to purchase. These were in agreement with Al Shammeri (2013) who argued that most teachers had inadequate professional development in schools. The findings further show that teachers did not have enough time to complete the

syllabus when they engaged learners in most of the practical work. This is in line with Haambokoma *et al.* (2002) who argued that overloaded syllabus does not give adequate time for teachers to engage pupils in practical work such as conducting experiments which require more time to give results.

Additionally, the findings indicate that teachers did not have enough time to prepare for practical work adequately because they had many other classes to which they attended. This was due to shortage of teachers of science in schools. This is in line with Johnson (2009) who contends that lack of sufficient planning and preparation time has long been a contextual mainstay of the teaching profession. Besides the above stated challenges that teachers experienced in conducting practical work in their schools, they also lacked close supervision from their superiors. It is not uncommon for teachers to relax when supervision is inconsistent or lacking so much that they tend to take every situation lightly and even forgetting their core duties. Therefore, teachers also need supervision to work hard no matter their level of experience and devotion. Supervision is necessary to ensure teachers perform to expected standards.

Apart from that, teachers seemed to have had indifferent attitudes. As Cheung (2007) argues, some teachers of science have low-level attitudes toward laboratory applications, negative perceptions and beliefs of practical work. Attitudes determine what each individual will see, hear, think and do. They are rooted in experience and do not become automatic routine conduct. Therefore, teachers may stick to what they think works rather than doing what works.

Conclusion

The research has concluded that there was a mismatch between teachers‟ perceptions towards the teaching of practical work and the extent to which they engaged learners in practical work. Teachers‟ failure to conduct practical work with pupils was largely attributable to their indifferent attitudes towards practical work. This was in spite of that fact that teachers are holding satisfactory perceptions regarding the role of practical work in teaching integrated science. These indifferent attitudes could have been caused by numerous factors including inadequate learning and teaching materials, overcrowding in classes, language barrier, inadequate professional development, insufficient instructional time to cover the syllabus content, and inadequate time for planning practical work; some teachers did not conduct practical work owing to lack of close monitoring and supervision by their supervisors.

Recommendations

Based on the findings of the study, the following recommendations were made:

i. School head teachers, heads of science departments and head of sections should intensify monitoring teachers in conducting practical work in integrated science at junior secondary level to ensure compliance to the practical aspects of the syllabus, thereby ensuring that appropriate teaching standards are maintained.
ii. Teachers should develop initiative to use materials in their environment to supplement materials in the laboratories.

iii. School administration should motivate their teachers by purchasing necessary materials such as modern equipment for conducing practical work in integrated science in their schools.

References

Ajzen, I. (1985). From intentions to actions: A theory of planned behaviour. In J. Kuhl and J. Beckman *(Eds.), Action control: From cognition to behaviour.* New York: Springer.

Alexander, R. (2000). *Culture and pedagogy: International comparisons in primary Education.* Oxford: Blackwell.

Al Shammeri, A. (2013). Curriculum implementation and reform: Teachers‟ views about Kuwait‟s new science curriculum. *US-China Education Review, 3*(3): 181-186.

Backus, L. (2005). A year without procedures. *The Science Teacher,* 72 (7): 54-58.

Braud, M., & Driver, M. (2002). *Moving to the big school. What do pupils think about science practical work pre- and post-transfer*? Retrieved from: http://www.leeds.ac.uk/educol/ [accessed 29/09/2013].

Bryan, L.A. (2003). Nastiness of beliefs: Examining a prospective elementary teacher‟s belief system about science teaching and learning. *Journal of Research in Science Teaching,* 40(9): 835-868.

Brynard, P.A., & Hanekom, S.X. (1997).*Introduction to research in public administration*. Pretoria, South Africa: J. L. Van Schaik.

Cheung, D. (2007). Facilitating chemistry teachers to implement inquiry-based laboratory work. *International Journal of Science and Mathematics Education,* 6(1): 107-130.

Chibesakunda, G.A. (1983). *The problems of teaching science in Zambia with particular reference to language*. Unpublished master‟s dissertation. London: Chelsea College.

Dagher, Z.R., & BouJaoude, S. (2011). Science education in Arab states: Bright future or status quo? *Studies in Science Education,* 47(1): 73-101.

Diene, S. (1993). *Toward understanding teacher change.* Urbana: Centre for the Study of Reading.

Dillon, J. (2008). *A review of the research on practical work in school science.* London: King‟s College.

Dirkes, M. A. (1991). Draw to understand. *Arithmetic Teacher,* 39(4): 27-29.

Examinations Council of Zambia. (2014). *2013 examinations performance report: Natural sciences booklet.* Lusaka, Zambia: Examination Council of Zambia. Gott, R., & Mashiter, J. (1991). *Practical work in Science: A task- based approach?*

Greene, J.C. (2007). *Mixed methods in social inquiry.* New York: Wiley.

Haambokoma C., B. Nkhata, V. S. Kostyuk, V. Chabalengula, S. Mbewe, M. Tabakamulamu and Z.B. Ndhlovu. (2002). *Strengthening of mathematics and science education in Zambian secondary schools*. Lusaka, Zambia: Ministry of Education and Japan International Co-operation Agency.

Inomiesa, E.A. (2010). “*Teaching of science in Nigerian secondary schools: The beginning, the present and the future.* Abraka, Nigeria: Delta State University, Abraka.

Johnson, C. C. (2009). An examination of effective practice: moving toward elimination of achievement gaps in science. *Journal of Science Teacher Education,* 20: 287-306.

Johnson, R.B., & Onwuegbuzie, A.J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher,* 33: 14–26.

Johnson, R.B., & Turner, L.A. (2003). Data collection strategies in mixed methods research. In A. Tashakkori and C. Teddlie (Eds.), *Handbook of mixed methods in social and behavioural research* (pp. 297–319). Thousand Oaks, CA: Sage.

Kapenda, H. M., Kandjeo-Marenga, H. U., & Kasanda, C. D. (2002). Characteristics of Practical work in science classrooms in Namibia. *Research in Science and Technological Education,* 20(1): 53-65.

Kelly, M.J. (1999). *Origins and development of education in Zambia.* Lusaka: Image Publishers Limited.

Kibirige, I., Osodo, J., & Mgiba, A.N. (2014). Exploring grade 7 science teachers‟ perceptions regarding practical work in Limpopo, South Africa. *Mediterranean Journal of Social Sciences, 5(4):* 399-405.

Klazky, R.L. (1984). *Semantic factors in cognition*. Hillsdale, NJ: Lawrence.

Lunetta, V.N., Hofstein, A., & Clough, M.P. (2007). Learning and teaching in the school science laboratory: an analysis of research, theory, and practice. In S.K. Abell and N.G. Lederman (Eds.), *Handbook of research on science education* (393-441). Mahwah, NJ: Lawrence Erlbaum.

Maboyi, T.R., & Dekkers, P. (2003). *Science teachers‟ purpose for doing practical work-Does professional Development makes a Difference? Paper presented at the 11th SAARMSTE Conference in Waterford Kamhlaba UWC, 2003.*

Macharia, S.N., & Wario, L.H. (1994). *Teaching practice in primary schools.* London: MacMillan Education Limited.

Maharaj, A., Brijlall, D., & Molebale, J. (2007). Teachers‟ view of practical work in Teaching of fractions: A case study. *South African Journal of Education, 27(4): 697-612.*

Manda, K. (2012). *Learning difficulties grade 12 pupils experience in biology: The case of selected high schools in Samfya District of Zambia*. Unpublished master‟s dissertation. Lusaka, Zambia: University of Zambia.

Matafwali, B. (2005). Nature and prevalence of reading difficulties in grade three: The case of Lusaka Province. Unpublished master‟s dissertation. Lusaka, Zambia: University of Zambia.

Millar, R. (2008). *Analysing practical science activities to assess and improve their effectiveness: The practical activity analysis inventory (PAAI).* York, UK: Centre for Innovation and Research in Science Education, University of York.

Ministry of Education (1996). *Educating our future: National policy on education*. Lusaka, Zambia: ministry of education.

Mudenda, V. (2008*). Zambian grade twelve pupils‟ experiences of biology practical work during school certificate examinations: The case of Kabwe high school*. Unpublished master‟s dissertation. Lusaka, Zambia: University of Zambia.

Opfer, V.D., Pedder, D.G., & Lavicza, Z. (2010). The role of teachers‟ orientation to learning in professional development and change: A national study of teachers in England. *Teaching and Teacher Education, 27:* 443-453.

Pekmez, E.S., Johnson, P., & Gott, R. (2005). Teachers‟ understanding of the nature and purpose of practical work. *Research in Science & Technological Education,* 23(1): 3-23.

Phillips, D.C. (2000). *Constructivism in education: Option and second options on controversial issues.* Chicago, USA: The National Society for the Study of Education.

Roehrig, G.H., & Luft, J.A. (2004). Constraints experienced by beginning secondary science teachers in implementing scientific inquiry lessons. *International Journal of Science Education,* 26(1): 3-24.

Solomon, J. (1994). *Teaching science, technology and society*. Philadelphia: Oxford University Press.

Stoffels, N.T. (2005). There is a worksheet to be followed: A case study of a science teacher‟s use of learning support texts for practical work. *African Journal of Research in Science, Maths and Technology Education,* 9(2): 147-157.

Tsuma, R. (1997). *Science education in Africa*. Nairobi, Kenya: Jomo Kenyatta Foundation.

Ughamadu, K.A. (2005). *Curriculum: Concept, development and implementation*. Onitsha: Emba Printing and Publishing Company Ltd.

Wellington, J. (1998). *Practical work in school science: Which way now?* London: Routledge.

Woodley, E. (2009). *Practical work in school science-Why is it important?* Retrieved from: www.gettingpractical.org.uk/documents/emmawoodleyarticle.pdf [accessed 12/11/2018].