

Impact of Practical Work on Agricultural Science Learners' Academic Performance: Perspectives from a School in Ompundja Circuit, Oshana Region

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ABSTRACT

This mixed-methods study examined the impact of practical work on student performance in agricultural science at a specific school within the Ompundja Circuit of the Oshana Directorate of Education in Namibia. The study applied purposive sampling to select two agricultural science instructors and used a simple random sampling procedure to identify 18 students. The data-gathering instruments comprised a closed-ended questionnaire for students and structured interviews for educators. Thematic and descriptive analyses were performed to interpret the results. The findings demonstrated that hands-on activities advantage learners who thrive in physical engagement, resulting in enhanced performance. Moreover, those who were reluctant to actively participate in practical activities did not attain comparable advantages. Moreover, the study indicated that inadequate preparation and insufficient explanations before practical work led to subpar performance among learners. The study advocates for agricultural science educators to create instructional videos illustrating practical activities, organise seminars for all students to cater to varied learning styles, and conduct comprehensive demonstrations to improve comprehension. It is recommended to enlarge the accessible gardens to encompass all learners' initiatives. The study also recommends that teachers cooperate within their circuits prior to practical work dates to exchange ideas, formulate standardised practical activities, and impart new skills that improve learner success.

Keywords: Practical works, Agricultural Science, Learners' academic performance, Learner engagement, Educational strategies, Namibia education system

1. INTRODUCTION

There is no doubt that practical work in science at schools is widely accepted as a vital component of teaching and learning (Fischer & Connor, 2018). The West African Examination Council [WAEC] (2016) stressed that it is also a well-known fact that learners prefer practical work to any other learning activities. However, learners mostly learn theory compared to practical works. Agricultural science can be a pillar for human survival, and hence the importance of agricultural science is being taught at all levels of education (Fischer & Connor, 2018). Mashebe (2018) said that the process of teaching agricultural science effectively involves hiring highly qualified teachers to guide learners through the theoretical and practical resources accessible in the classroom. Teaching agricultural science is defined as a process of training learners in the process of agricultural science productivity as well as the techniques for the teaching of agricultural science (Mashebe, 2018). Therefore, agricultural science is intended to impart to both male and female teachers the abilities required for the practice of agricultural science, for good citizenship, and to support food security as a component of the sustainability of the country (Madu & Lyiola, 2013).

Agricultural science, which is taught as a pre-vocational subject in Namibia, seems not to be given the attention it requires to promote food security. On the other side, one of the principles of agricultural science is learning by doing. Onanuga (2015) stated that teaching agricultural science in schools aims at ensuring that the learner is exposed to and taught the basic principles that are important to agricultural production in the country and exposing and involving learners in various practical projects that will help them develop the necessary skills and abilities required in agricultural production. Hase (2013) said that academic achievement, which is typically measured in terms of scores and grades received, usually determines a learner's success. Academic performance, which measures a learner's capacity for action, is the primary indicator of that learner's potential, success, and abilities. As a result, the grades and scores that learners receive indicate the level of their academic achievement (Hase, 2013). Insufficient resources, low teacher morale, a lack of parental involvement, learners' and teachers' lack of readiness for change, a lack of incentives for teachers, learners' lack of seriousness about their work, improper assessment, and a lack of support for homework were all identified by Mphale and Khlauli (2014) as contributing factors affecting learner's performance in agricultural science.

Baliyan et al. (2021) outlined that a nation must make significant investments in its human capital to achieve sustainable economic development. Achieving high academic standing is essential for developing qualified graduates and human capital that will accelerate the growth of human resources. Masole (2011) asserted that what makes up a quality education is not what teachers tell their learners to do, but rather what they do on their own to gain information. While learners are actively participating in the activities that lead to their acquisition of knowledge and skills, the teacher is necessary for mentoring, coaching, and assessment.

Given the role that Agricultural Science plays in the economy, Botswana's education system included Agricultural Science as a topic to meet the demands of the nation's expanding economy (Baliyan et al., 2021). In Namibia for example, Utete and Ilukena (2019) stated that, high-quality practical works fosters learners' enthusiasm and involvement while also helping them to build a variety of skills, scientific knowledge, and conceptual understanding. Therefore, this study aimed at addressing the following questions;

1. What are the impacts of carrying out practical work on learners' performance in agricultural science?
2. How are the learners' interests in doing agricultural science practical works towards their performance?
3. What are the possible strategies for improving learners' performance when doing practical work in agricultural science?

This study provides data aimed at investigating the impacts of carrying out practical works on learners' performance in Agricultural Science at a school in Ompundja Circuit, Oshana Region.

2. LITERATURE REVIEW

According to Shivolo (2018), learners conduct their experiments using hands-on and mind-on activities, with the teacher functioning as a facilitator. Practical works, in general, can include any type of investigation or experimentation by learners on their own or in groups, as well as teacher demonstration. Because there are so many different types of practical works, some may include teacher-led demonstrations and/or experiments conducted by learners in groups or alone (Shivolo, 2018). Apart from that, Nghipandulwa (2011) said that teaching practical works with real objects and materials assists both teachers and learners in communicating ideas and information about the natural world. It also provides opportunities for learners to develop practical skills of the scientific approach to inquiry, which can improve their performance in science subjects (Nghipandulwa, 2011).

According to Kasiyo et al. (2017), teaching practical work in schools is vital for training learners to become scientists, as it aids in idea learning, attitude development, and enthusiasm in science. Practical work provides learners with knowledge about the scientific process, encourages problem-solving, and helps them grasp the nature of science. Practical work experience does not always imply that learners' scientific understanding improves (Kahn, 2000). Furthermore, the teaching of practical works in science courses is widely supported, with the recognition that it fosters learner engagement and interest while also building a variety of skills, subject knowledge, and conceptual understanding (Kasanda et al., 2001).

According to Liswaniso (2019), teachers should use instructional strategies that allow learners to learn while also sharing knowledge and providing adequate exposure to what they expect in examinations. Liswaniso (2019) further stated that this may be accomplished by providing learners with additional challenges to solve and opportunities to study the topic knowledge in real-world scenarios through laboratory work.

3. RESEARCH METHODOLOGY

This study employed a mixed methods approach which involves collecting both quantitative and qualitative data, integrating the two forms of data, and using distinct designs that may involve philosophical assumptions and theoretical frameworks (George, 2021). Mixed-method approaches were used to gather the necessary data that answered the research questions. Mixed methods research seeks to enrich the depth of qualitative insights with the breadth of quantitative data, offering a well-rounded and nuanced understanding of the researched topic (George, 2021). In continuation, this study employed the exploratory sequential design, whereby qualitative data gathering and analysis come before quantitative data collection and analysis (Lohman, 2021). It also provided answers to research questions and validity, objectively, accurately and economically, as well as served as a control platform to maximise system variances and minimise errors. The purpose of this research design was also to provide a plan of study that permits accurate assessment of cause-and-effect relationships between independent and dependent variables. The qualitative approach was used to elicit the views, beliefs, and experiences of teachers on the effects of carrying out practical works on learners' performance in agricultural science. A quantitative approach was used to show similarities and differences between the responses from different learners. In this study, qualitative data was collected by means of structured interviews with the teachers, and quantitative data was collected by means of a closed-ended questionnaire with the learners. A close-ended questionnaire was used because learners were in large numbers, and by using this instrument, it was easier to gather the data. Structured interviews were used because they give interviewers the freedom to express their views in their own terms and can provide reliable, comparable qualitative data (Bhandari, 2022). Learners were selected using simple random sampling, while teachers were selected using the purposive sampling method. The ethics were considered in a way that pseudonyms were used in this study to ensure confidentiality of participants' names, participants were given the right to withdraw anytime, and none of the harm to the participants occurred in this study.

4. ANALYSIS AND RESULTS

During this process, the researcher gathered dynamic information and drew conclusions for the study. Best and Khan (2016) stated that thematic analysis is a qualitative data analysis method that involves identifying, analysing, and interpreting patterns or themes within qualitative data. In this study, thematic analysis was used to analyse the qualitative data collected from the teachers using structured interviews because it provides a structured approach to analysing qualitative data, facilitating the identification of key findings and generating rich, context-specific insights (Webster, 2023). Themes were composed from the questions asked to make it easier for the readers in terms of identifying the answers contributed by the participants. The quantitative data collected from the learners using close-ended questionnaires were analysed using descriptive analysis whereby diagrams, such as graphs and tables, were used. Descriptive analysis involves summarising and interpreting data to uncover patterns, trends, and relationships (Webster, 2023). It was used to provide an overview of the data's main features using the mentioned diagrams.

4.1 Findings from structured interviews for teachers

Agricultural Science teachers were asked different questions that were composed from the main research questions/objectives. The main focus was to investigate the impacts of carrying out practical works on learners' performance in Agricultural Science, to determine the teachers' views on learners' interests in doing practical works in Agricultural Science, to find out resources used in Agricultural Science practical works and identify learners' weaknesses in previous years' performance. Additionally, teachers were also asked to provide strategies to be followed in integrating practical works teaching materials in the subject and also their views on learners' performance in Agricultural Science. As a result, below are the findings that were gathered via interviews from the teachers.

Theme 1: The impacts of carrying out practical works on learners' performance in agricultural science

Teacher A emphasised that doing practical work improves learners' understanding by offering hands-on experience, reinforcing theoretical information, and increasing retention through active learning. Teacher B stressed the importance of practical work in developing critical thinking, problem-solving abilities, and concept application, which leads to greater engagement and achievement in agricultural sciences.

This indicates that practical activity in agricultural science plays an important role in education. They improve comprehension, reinforce theory through hands-on experience, and develop critical thinking and problem-solving skills. This combination results in deeper engagement and improved overall performance among learners, increasing their subject knowledge.

Theme 2: Teachers' views on learners' interests in doing practical work in agricultural science

Both teachers (A and B) appeared to be interested in doing practical work in agricultural science. Teacher A believes that it helps learners to relate them to the theory that enhances their understandings, and Teacher B added that it also helps learners to get to tasks and increase their knowledge content.

This implies that teachers get excited and develop interesting phenomena whenever they are teaching practical works because learners participate better compared to when they are engaged theoretically. Learners only become interested when they are doing a practical that they have a clue on; they better understand. Nevertheless, this can be in a way that the teachers need to state the importance of a specific practical before learners have started.

Theme 3: Resources used in agricultural science practical works

Based on both teachers (A and B) answers, they answered this question relying on the *school practical works that are more on the crops; hence, they mentioned the tools for land cultivation and a garden*. However, Teacher A added *the laboratory resources as well*.

It can be implied that many tools that are used in agricultural science are hand tools, and they are mostly used in the gardens. Resources need to be enough at all the schools, gardens need to be expanded and a few laboratories can be built where possible by means of non-governmental organisations.

Theme 4: Learners' weaknesses in previous years' performance

Teacher A expressed herself that she *noticed some weaknesses, and they are caused by lack of tools*; however, *she, the teacher, has ordered some tools to accommodate every learner*. While Teacher B suggested that, *to mitigate the weaknesses, learners need to be motivated*.

This says that teachers lack motivation towards doing the practicals in agricultural science; they do not have enough tools; thus, teachers needed to order extra ones. Therefore, providing tools and increasing motivation can successfully improve the learning environment and learner outcomes.

Theme 5: Strategies to be followed in integrating practical works teaching materials in the subject

Teacher A stated that *some of the strategies to be put into task are to buy enough tools for every learner and make enough space for a school garden to accommodate all learners*. Teacher B added that *teachers should ensure practical teaching aids are locally available and excursions need to be done to expose learners to the real world*.

It was noted that, hence, learners learn through different learning styles, and those who learn virtually can learn in a way that teachers host school trips that will open up learners who do not have hope in doing practical work. In addition, videos need to be created by the agricultural science experts and shared with the learners.

Theme 6: Teachers' views on learners' performance in agricultural science

Teacher A stressed that practical work has positive effects because most learners obtain more marks through practical work that helps them to perform well in the subject. While teacher B believes that practical works have both positive and negative impacts. Learners that are good at physical (practical) work tend to benefit positively, thus improving their performance. Those that are less motivated tend to have low participation, and their performance is affected negatively.

It can be implied that some learners do not have a proper understanding of the practical works since they perform poorly compared to the theory content. However, those who understand both theory and practical works, their performance is improved.

4.3 Findings from learners' close-ended questionnaires

A close-ended questionnaire was used to collect data from the learners. It focused on the learners' interest in doing practical work in agricultural science, better ways of doing practical work in agricultural science, and the availability of tools used in practical work. Besides that, learners were also asked whether they encounter some shortcomings that hinder their performance in agricultural science. Apart from that, learners were also asked whether they would like to specialise in agricultural science in the near future as well as their suggestions towards the topic under discussion. The learners were presented as shown below.

4.3.1 Learners' interest in doing practical works in Agricultural Science

This statement aimed at identifying whether learners are interested in doing practical works in Agricultural Science. As a result, the graph below presents their responses.

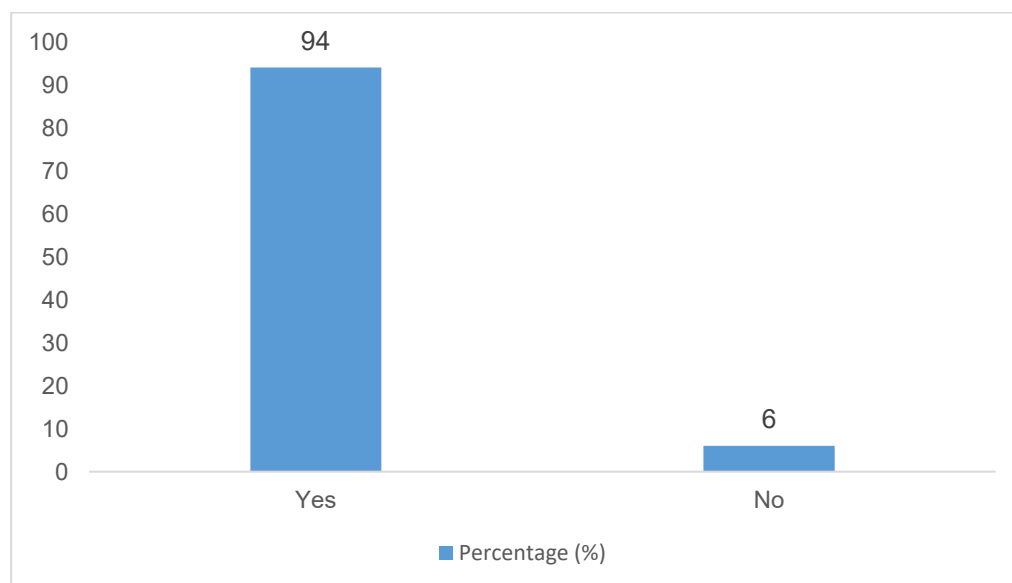


Figure 1: Learners' interests in doing Agricultural Science Practical works

Learners were asked if they were interested in doing practical work in agricultural science, and 94% indicated that they were interested, while 6% were not interested, as indicated in Figure 1. This signifies that many learners are willing to do the practical work, provided that they understand the teachers' explanation and they also ask where it seems unclear.

4.3.2 Various ways of doing practical work in agricultural science

Learners were asked whether they find it easy or difficult to do the practical work in agricultural science. Figure 2 below presents their responses.

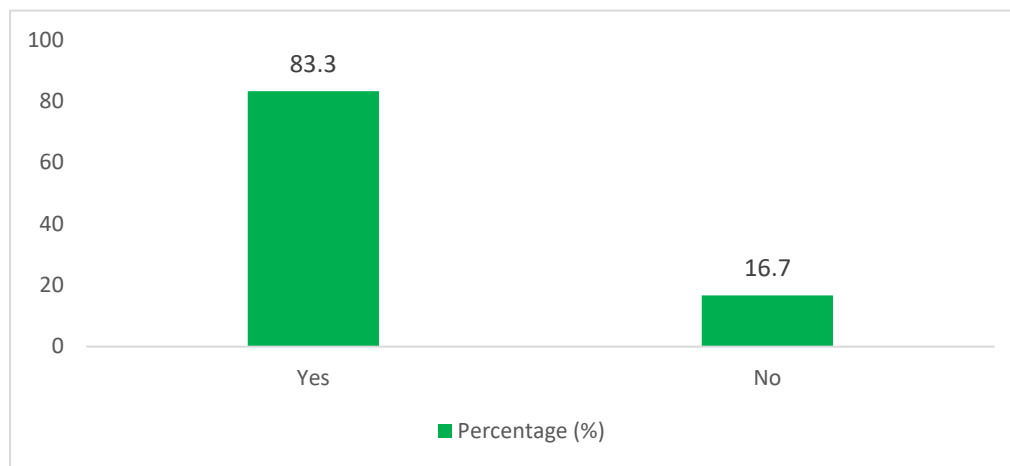


Figure 2: Varies ways of doing practical works in Agricultural Science

Learners were asked if they found it easy to do practical activities in agricultural science, and 83.3% of learners indicated that they found it easier to do practical activities, while 16.7% of learners found it difficult, as indicated in Figure 2. This denotes that the majority of learners require less attention when they are carrying out the practical works in agricultural science. Learners who are struggling with practical work are shown with lower percentages, and teachers need to pay attention to them in a way that they should either group them with those who find it easy to do the practical work.

4.3.3 The availability of tools used in practical activities

Under this statement, learners were asked to indicate whether they have enough tools for doing practical work in agricultural science. They have responded as follows:

Table 1: The availability of tools for practical works

The availability of tools for practical works	Percentage (%)
Yes	67
No	33
Total	100

Learners were asked to state if their school had enough tools or if they borrowed from the neighbouring schools. 67% of learners responded that they had enough tools, while 33% of learners indicated that they do not have enough tools, as appeared in Table 1. As per the data presented in the above table, it infers that the school needs more tools to be used during practical work. It can be that the available tools are shared among learners, and some of them might end up not finishing their works on time, leading to affected crops in the garden.

4.3.4 Challenges hinder learners' performance in agricultural science

Learners were also asked whether they encounter some challenges when they are doing practical work that hinders their performance in agricultural science. On the other hand, the researcher made this a close and open-ended question for easier identification of the challenges experienced by the learners. Learners responded differently, as shown in Figure 3 appearing below.

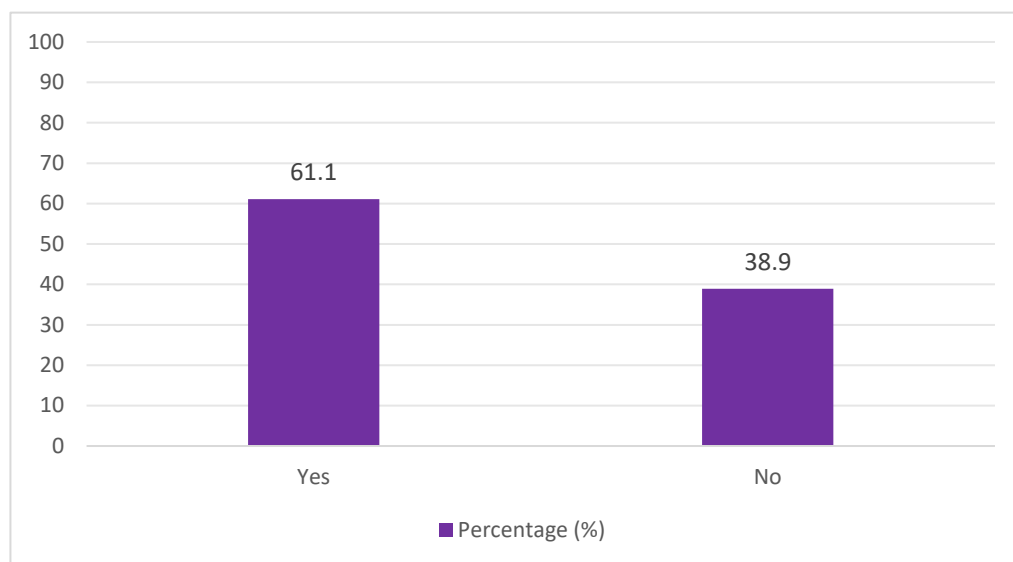


Figure 3: Challenges hinder learners performance in Agricultural Science

Learners were asked if they encounter any challenges that hinder their performance in agricultural science. 61.1% of learners indicated that they experienced challenges, while 38.9% of learners do not experience challenges, as shown in Figure 3. It has been shown that many learners encounter some challenges, and they identified them in the following paragraph.

Apart from yes or no answers, learners also contributed in the way that, *Learner 1 and 13 stated that, lacking of commitment is one of the challenge and the solution can be, learners need to be encouraged. Learner 2, 3, 6 and 7 indicated that, they have few tools and the school need to buy extra tools that are enough to do the practical works. Learner 4 and 10, 11, and 12 answered that some learners are less motivated and they rarely put more efforts in doing practical works, they need to be motivated. Learner 5, 8, 9 indicated that they lack more textbooks and past practical papers and the teacher needs to provide them to improve this. However learner 14, 15, 16, 17 and 18 said that they are satisfied with the service that they get from their schools, hence this made them not to encounter any challenges instead, and they enjoy going the practical works.*

This implies that the challenges in Agricultural Science practical works are varied. While some learners cite issues like lack of commitment, inadequate tools, low motivation, and insufficient learning materials, others are satisfied with their school's support.

4.3.5 Learners possibility to specialize in Agricultural Science in the future

Learners were asked whether they would like to specialize in Agricultural Science in the future. The learners responses based on the mentioned statement appear as follows

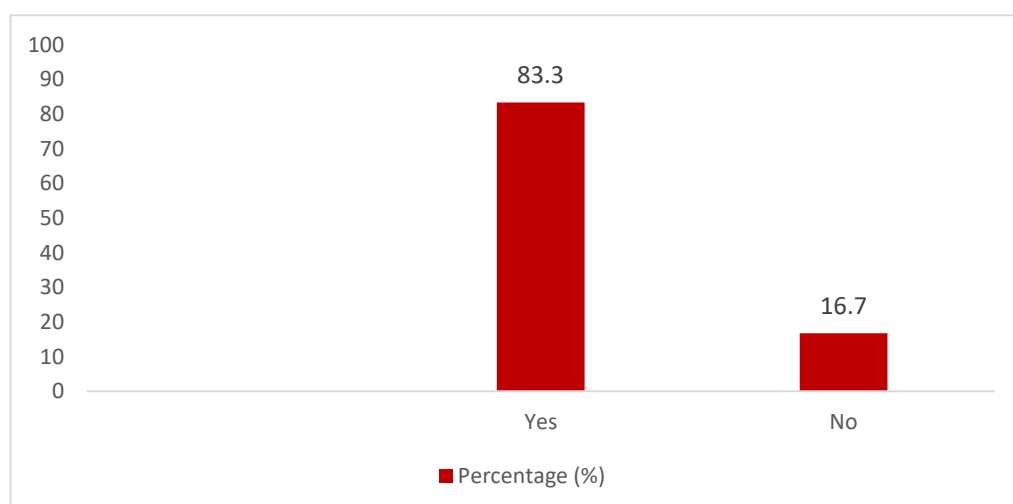


Figure 4: The possibility of learners to specialize in Agricultural Science

Learners were asked if they would like to specialise in agricultural science in the future, and 83.3% of learners responded that they would like to specialise in agricultural science, while 16.7% of learners are not interested,

as shown in Figure 4. The responses show that many learners are willing to specialise in agricultural science as their future career. Therefore, understanding in practical works should be mandatory for them. Those who had answered with a “no” answer may need it also for farming purposes.

4.3.6 Learners expect teachers to pass the practical works with distinctions.

This was the last question of the questionnaire. The researcher made it open for the learners to easily get their insights regarding the ways learners think teachers should do for them to pass the practical works in agricultural science with distinctions.

Learner 1 and 2 answered that *teachers should instruct the learners properly on how to do the practical work*. In continuation, learners 3 and 14 responded to the question that *teachers should make sure all the necessary tools to be used in certain practical works are set and ready to be used*. Furthermore, Learners 4, 5, 6 and 15 responded that *teachers should demonstrate the practical work, give examples and explain precisely first before they give it to the learners*.

Besides that, learners 7, 8 and 17 responded that *teachers should give more samples of practical work before the final practical work*. In addition, Learner 9 and 18 responded that *teachers should motivate learners about the importance of doing agricultural science practical work before they hand it to the learners*, and learners 10, 11, 12, 13 and 16 responded that *teachers should provide enough notes that are related to the practical work and should also give enough time to prepare*.

This implies that learners believe several key strategies can enhance their success in agricultural science practical works. These include thorough instruction on procedures, ensuring availability of necessary tools, clear demonstrations and explanations, ample practice opportunities, motivation regarding the significance of practical works, provision of comprehensive notes, and sufficient preparation time. Implementing these suggestions can effectively support learners in achieving distinctions in their practical assessments.

5. DISCUSSION AND IMPLICATIONS

This part discusses the findings or results of the study according to the three main research questions/objectives. The findings are discussed in order of the objectives, which were to investigate the impacts of carrying out practical works on learners' performance in agricultural science, to find out learners' interest in doing agricultural science practical works towards their performance and to determine the possible strategies for improving learners' performance when doing practical works in agricultural science.

5.1 The impacts of carrying out practical work in agricultural science

The study found out that doing practical work improves learners' understanding by offering hands-on experience, reinforcing theoretical information, and increasing retention through active learning. The importance of practical work in developing critical thinking, problem-solving abilities, and concept application, which leads to greater engagement and achievement in agricultural sciences. This is in line with Adeyemi (2008), who indicated that practical works in agricultural science also add to the learners' practical knowledge; they make the subject expand from just theory into learners' accumulation, where these learners can practise all that they have learnt in the class. Nghipandulwa (2011) said that teaching practical works with real objects and materials assists both teachers and learners in communicating ideas and information about the natural world. It also provides opportunities for learners to develop practical skills of the scientific approach to inquiry, which can improve their performance in science subjects (Nghipandulwa, 2011).

In addition, Science Community Representing Education [SCORE] (2008) elaborates that a practical lesson is any science teaching and learning activity which involves learners working individually or in small groups, manipulating or observing real objects and materials, as opposed to the virtual world. Learners can also use their own hands to manipulate real objects during the teaching and learning process or observe their teacher to manipulate a real object for them to see and practice later. With all these experiences, many learners will be able to perform better since the learning style was involving them (learner-centred approach).

5.2 Learners' interest in doing agricultural science practical works towards their performance

The study found out that many learners are interested in doing practical work; thus, it needs more serious concepts that may lead to a betterment of performance in the Agricultural Science subject. The primary role of practical agricultural teaching and learning is to equip learners with the requisite knowledge, attitude, practice and skills in undertaking agricultural and farming tasks. Practical skills training in agricultural science is also expected to motivate and generate entrepreneurial skills among learners (Onuekwusi and Okorie, 2008). Uche (2005) emphasised that, for learners to develop keen interest towards practical works in agricultural science,

they (learners) must be carried along, but he also noted that excessive strenuous exercise must be avoided as much as possible since they are not really set for a career in agricultural science yet. Learners' involvement in agricultural science practical works is of great importance in carrying them along. Hindrances to attaining sustainable agricultural science practical work in schools. Furthermore, the teaching of practical works in science courses is widely supported, with the recognition that it fosters learner engagement and interest while also building a variety of skills, subject knowledge, and conceptual understanding (Kasanda et al. 2001).

5.3 Strategies for improving learners' performance when doing practical work in agricultural science

The study suggested that teachers should demonstrate the practicals first before they put them into practice. This goes hand in hand with Osuala (2004), who asserted that any method that is adopted by the agricultural science teachers in the actual teaching exercise must lead to the development of ideas, concept understanding and attitudes by the learners. Agricultural science, being a practical-orientated subject, requires practices with diverse teaching methods like demonstration, projects, field trips/excursions, laboratory work, and discussion. Apart from that, teachers should explain the importance of practical work at large; they should be motivated before they start carrying it out. Instructional materials refer to those materials like textbooks, laboratory chemicals or garden tools, which bring about efficiency and effectiveness in the teaching/learning process and invariably promote and enhance the achievement of instructional objectives; therefore, they are needed – plenty of them – for successful practical works in agricultural science (Osuala, 2004). Liswaniso (2019) asserted that teachers should use instructional strategies that allow learners to learn while also sharing knowledge and providing adequate exposure to what they expect in exams.

Furthermore, Okoh et al. (2006) stressed that at the secondary school level, the professional and qualified teachers should stimulate both the learners and them to enhance efficiencies in performance. Meanwhile, the subject teacher concern in one way or the other must have qualities of farm experience, general technical education character and personality. Okoh et al. (2006) added that skilful teachers are vital to every dynamic successful training programme. Besides that, when studying a particular topic, they should begin with a practical exercise in the laboratory with an open-ended exercise where learners should be encouraged to make their own hypotheses and then to test and draw conclusions (Joan, 2018). The learners learn the effective agricultural methods, chemicals, and technologies through discovery. Policy-makers need to start viewing investment in agricultural education as an investment rather than as a strain on resources (Brett, 2017).

5.4 Conclusion

The researcher found out the impacts of carrying out practical work on learners' performance in agricultural science. The practical works benefit learners that are good at physical participation; hence, they tend to perform high, thus improving their performance, and those that are not willing – it is like they are being forced – and they will end up performing poorly in the subject. The researcher determined that some learners are not interested in doing practical work, while the highest percentages of learners and teachers are interested in doing practical work. Both learners and teachers have contributed the strategies and how they can improve practical work performance by saying that the school should buy enough garden tools for every learner and make enough space in the school garden to cater to all learners doing agricultural science in schools. Teachers should ensure that the practical teachings that are related to the practical under action should be available, and excursions need to be done to expose learners to the real world. In terms of building laboratories, the government should build a component of laboratories in each circuit so that all learners that might be doing practical work in that circuit will travel to that place. This will accommodate all the schools, either in urban or rural areas. This will save costs instead of building at each school. Schools will have a planned calendar on which date they will visit the place. The researcher also recommends teachers team up and meet up at circuits prior to the practical work dates so they share ideas, draft similar practical work per circuit and are able to deliver new skills to their learners.

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