IDENTIFICATION OF FACTORS AFFECTING THE EFFECTIVE TEACHING OF PHYSICS PRACTICAL IN SENIOR SECONDARY SCHOOL II IN EDO STATE

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BENIN CITY

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A PROJECT WORK SUBMITTED TO THE DEPARTMENT OF CURRICULUM AND INSTRUCTURAL TECHNOLOGY, FACULTY OF EDUCATION, UNIVERSITY OF BENIN IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF BACHELOR OF SCIENCE (ED.) DEGREE IN PHYSICS EDUCATION

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CERTIFICATION

We the undersigned, certify that this project was carried out by **ISIDAHOMHEN EMMANUEL** in the department of Curriculum and Instructional Technology (CIT), Faculty of Education, University of Benin, Benin City Nigeria.

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DEDICATION

I dedicate this work to almighty God for His grace and love towards me.

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ABSTRACT

Physics practicals play a crucial role in enhancing students' understanding of theoretical concepts and developing essential scientific skills. However, several factors hinder the effective teaching of Physics practicals in Senior Secondary School II in Edo State. This study aims to identify and analyze these factors to provide insights for improving practical Physics education. Four research questions were raised to guide the study. They are: What are the Major factors affecting the effective teaching of Physics practical in secondary schools in Ovia North East Local Government Area?, Does the availability of laboratory facilities impact the effective teaching of Physics practical in Senior Secondary School II in Ovia North LGA of Edo State?, Do Years of Experience impact the effective teaching of Physics practical in Senior Secondary School II in Ovia North LGA of Edo State?, Does low motivation level among Students impact the effective teaching of Physics practical in Senior Secondary School II in Ovia North LGA of Edo State?

The analysis of the data was done using descriptive survey research design. The population comprises of Eighty public and private Senior Secondary students in Ovia North East Local Government Area of Edo State. The sample size was 250 students randomly selected from eight Public and Private Senior Secondary Schools. To ensure the content and face validity of the instrument, the draft copy of the questionnaire was given to the project supervisor for proper modification. The data was administered and collected by the researcher and the mean rating inferential Statistics & Standard Deviation were used to interpret the data collected.

Based on the findings of the study, it reveals that inadequate laboratory facilities, insufficient instructional materials, lack of qualified Physics teachers, significantly affect the delivery of effective Physics practical lessons. The study highlights the need for improved funding, provision of modern laboratory equipment, teacher training programs, and curriculum adjustments to ensure a more effective and engaging practical learning experience. Addressing these factors will enhance students' comprehension and interest in physics, ultimately leading to better academic performance in the subject.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The teaching of Physics practicals in secondary schools has evolved over the years, influenced by global, national, and local developments in science education (Omoifo, 2020). The emphasis on practical Physics has been recognized as a crucial component of science education since the early 20th century when the importance of experimental learning in scientific disciplines was acknowledged (Eze &Aduwa, 2020). In Nigeria, the evolution of Physics practical teaching has been shaped by educational reforms, government policies, and infrastructural development.

Edo State, particularly Ovia North East LGA, has experienced both progress and setbacks in the teaching of Physics practicals over the decades (Edo State Ministry of Education, 2021). Before the 1980s, most secondary schools in the region had limited access to laboratory facilities(Edo State Ministry of Education, 2021). Schools relied on demonstrations by teachers rather than full student participation in experiments. However, with the establishment of government-owned schools and increased investment in science education, some improvements were made, including providing laboratories and training for Physics teachers (Eze & Aduwa, 2020).

Obayan (2006), recognized the pivotal role of science and technology in national development. This realization led to several key initiatives aimed at strengthening science education. These key initiatives included the National Curriculum Conference (1969), This conference emphasized the need for a science curriculum that balances theoretical knowledge with practical application, laying the groundwork for future educational policies.

Additionally, the 6-3-3-4 Education System (1982) was introduced to promote technological advancement. This system allocated significant attention to science subjects, advocating for well-equipped laboratories to facilitate effective practical teaching. National Policy on Education (2004) reinforced the importance of practical components in science education, mandating the provision of adequate laboratory facilities and trained personnel to enhance the teaching and learning of science subjects.

Physics being one of the core subjects in science and despite its importance to both man and the society, still remains one of the most difficult and challenging subjects in the school curriculum (Okpe V. O. 2008). This could be because it requires mastering the many features, concepts and skills that makes training in physics so valuable in such a wide range of careers which demands immensely on science students (Aba et all, 2016). Findings on the performance of students in the WAEC examination (2015-2019) show a low performance of 59.32% in Physics practical which is not a good grade for WAEC Folade et all, (2024). Students considering Physics as a difficult subject can be attributed to the cause of this low performance Folade et all, (2024).

In Edo State, and specifically within Ovia North East LGA, the path of Physics practical education shows national efforts, with localized strategies addressing unique challenges (Edo State Ministry of Education, 2021). While some schools have benefited from government interventions aimed at improving laboratory facilities, many still struggle with outdated or insufficient equipment, limiting the scope of practical experiments (Ali, 2021). Also, Ongoing professional development programs have been implemented to enhance teachers' competencies in delivering practical Physics education. However, disparities in access to these programs have resulted in varying levels of effectiveness across different schools (Fafunwa, 1974). Furthermore,

efforts have been made to align the Physics curriculum with contemporary scientific advancements, ensuring that practical lessons are relevant and engaging. Nonetheless, inconsistencies in curriculum delivery and adherence have been observed, impacting the overall quality of Physics education (Ali, 2023).

Recent studies have highlighted ongoing issues affecting the effective teaching of Physics practicals. Ali (2023), in his research, indicates that many schools lack the necessary equipment and resources to conduct comprehensive Physics experiments, leading to a reliance on theoretical instruction. Lucy (2024), reveals that a significant number of Physics teachers possess insufficient conceptual understanding of fundamental topics, such as force and motion, which adversely affects their ability to effectively teach practical components. Furthermore, Ilomuanya & Eguavon's (2024) studies suggest that the lack of practical exposure contributes to diminished student interest and engagement in Physics, further exacerbating challenges in teaching the subject effectively.

According to Searl (1972) as far as science is concerned, experimentation is always exploratory, or perhaps it would be more accurate to say information seeking. Experiments are undertaken to obtain new knowledge, confirm predictions, and test the validity of the assertions of others. Physics is the basis of technological development and as one of the highlights of the Senior Secondary School curriculum which determines the enrolment of students into professional courses in tertiary educational institutions, cannot be studied without practical work (Manso, 2020). Practical activities are bedrocks of all pure sciences of which Physics is not an exemption and learning physics without practical work will only promote rote learning which enables ideas and concepts to be retained for a very short time (Kabia, 2020). This simply means that effective practical activities in Physics enhance learners to build a bridge between what they

can see, hear and handle. Virtually, no amounts of meaningful principles and concepts in physics can be taught without adequate support of practical. Practical activities help learners to retain knowledge for a very long time (Smauel et al 2018). Since course materials, equipment, laboratory facilities and suitable experiments are essential for effectively teaching Physics practicals and learning the subject as a whole, it is not surprising that students in the Ovia North-East Local Government Area achieve lower pass rates in the Senior Secondary School Certificate Examination in Physics compared to their peers elsewhere. Judging from these facts, it could be stated that science laboratories and experiments are success determinants in school Physics practicals, and therefore the importance of laboratory equipment cannot be over-emphasized. This study therefore aims to investigate the factors affecting the effective teaching of Physics practicals in Secondary Schools in Ovia North. By identifying the key challenges, this research seeks to inform policymakers, educators, and stakeholders on strategies to improve the quality of physics education.

1.2 Statement of the Problem

Physics practicals play a crucial role in helping students understand abstract scientific concepts, develop problem- solving skills, and gain hands-on experience. However, it has been observed that many public and private secondary schools in Edo-state face significant challenges in effectively teaching Physics practicals. These challenges include inadequate laboratory facilities, lack of essential instructional materials, Teacher's years of experience and poor student attitudes towards practical sessions. Reports from (WAEC Chief Examiners, 2019). indicates that many students struggle with physics practical examinations due to weak conceptual understanding, poor experimental skills, and difficulty in analyzing experimental data. For instance, in the 2019 WAEC Physics Examination, a large number of students had difficulties in setting up and

conducting experiments, interpreting results, drawing accurate conclusions, which affected their overall performance (WAEC, 2019). Additionally, topics requiring experimental demonstrations such as optics, electricity, and mechanics, pose major difficulties due to a lack of functional laboratory equipment.

Effective teaching of Physics practicals requires well-equipped laboratories, competent teachers, and engaging instructional methods. However, taking Ovia North-East Local government as a case study, many schools may face challenges in providing these basic resources.

This study seeks to investigate the factors affecting the effective teaching of Physics practicals in senior secondary schools in Edo state. It will explore the impact of adequate laboratory equipment, Teacher's years of experience, and student engagement to determine why students continue to struggle with Physics practicals despite its importance in the curriculum.

Research Question

1. What are the Major factors affecting the effective teaching of Physics practical in secondary schools in Ovia North East Local Government Area?
2. Does the availability of laboratory facilities impact the effective teaching of Physics practical in Senior Secondary School II in Ovia North LGA of Edo State?
3. Do Years of Experience impact the effective teaching of Physics practical in Senior Secondary School II in Ovia North LGA of Edo State?
4. Does low motivation level among Students impact the effective teaching of Physics practical in Senior Secondary School II in Ovia North LGA of Edo State?
5. Do Teachers Competency impact the effective teaching of Physics practical in Senior Secondary School II in Ovia North LGA of Edo State?

1.3 Purpose of the Study

The primary purpose of this study is to identify and analyze the key factors affecting the effective teaching of Physics practicals in Senior Secondary School II in Ovia North-East Local Government Area, Edo State. The study seeks to examine how challenges such as Inadequate Laboratory Facilities, lack of instructional materials, teacher competence, students interest impacts the teaching and learning of Physics practical. By identifying these challenges, the study intends to propose practical solutions and recommendations that can help improve the quality of Physics practical lessons, ensuring that students gain necessary skills and experiences to excel in the subject.

1.4 Significance of the Study

This study holds significant importance in several ways:

Improving Physics Education: Understanding the challenges hindering effective practical teaching will help in devising strategies to enhance student learning and performance in Physics.

Teacher Development and Training: The study will highlight areas where teachers need additional training, resources, or support to improve their delivery of Physics practicals.

Enhancing Student Performance**:** Identifying and addressing factors affecting Physics practicals can lead to better comprehension of scientific concepts, ultimately improving students' academic performance.

Resource Allocation and Policy Implementation: Findings from the study will provide policymakers and school administrators with data to make informed decisions regarding laboratory facilities, teaching aids, and curriculum improvements.

Guidance for Future Research: The study will serve as a foundation for further research on science education, particularly in rural and semi-urban areas where resource constraints may be prevalent.

1.5 Scope and Delimitation of Study

The Scope of the study focuses on identifying the factors affecting the effective teaching of Physics Practical in Senior Secondary School II in Edo State. It Examines Key Challenges such as inadequate laboratory facilities, lack of instructional materials, Teacher competency, student interest. This study is delimited to Senior Secondary School II in Ovia North-East Local Government area of Edo State.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

The related literature for the study shall be reviewed under the following subheadings:

- Theoretical framework
- Physics Practical as Part of the Curriculum
- Knowledge of Teachers and Students on Physics Practical
- The Attitudes of Students and Teachers Towards Physics Practical
- Factors Affecting the Effective Teaching of Physics practical
- Review of Related Empirical Study
- Summary of Reviewed Literature

Theoretical framework

2.1 Social Constructivist theory

Vygotsky's (1896-1934) social constructivist theory has influenced many areas of inquiry: Education, health sciences, social policy & psychotherapy among others. This theory is based on the idea that learners construct new knowledge. Working with new knowledge involves construction, storage or putting new information into memory, and retrieval.

Social constructivism, a social learning theory developed by Russian psychologist Lev Vygotsky posits that individuals are active participants in the creation of their knowledge (Schreiber & Valle, 2013). Social constructivism suggests that successful teaching is heavily dependent on interpersonal interaction and discussion, with the primary focus on the student's understanding of the discussion (Prawat, 1992). The constructivists assume that teaching is not transferring knowledge from the teacher to the learner's brain. Teaching is more of an activity

that helps learners build knowledge. Then the role of Physics teachers is not only to transfer the knowledge he has to students but more as a mediator and facilitator who helps learners construct their knowledge quickly and effectively. For that, Physics teachers must: (1) create a constructivist learning environment 2. Help students build their understanding of the world around them. Within the domain of physics, this means moving beyond memorizing formulas and laws to developing a deeper, more intuitive grasp of how physical principles manifest in the world. By incorporating constructivist principles into physics practical teaching, Teachers can create an engaging and effective learning environment that promotes deep understanding, problem-solving skills, and motivation. According to Fosnot (2005), constructivist teaching requires teachers to understand not only the subject matter but also how students learn and interact with content. A teacher with a Physics certification is more likel.y to understand the importance of hands-on experiments an inquiry-based learning in helping students construct their understanding of abstract Physics ideas (Schunk, 2012)

2.2 Physics practical as part of the Curriculum

According to Science Community Representing Education (SCORE), practical work means a “hands-on” learning experience that prompts thinking about the world in which we live (Score, 2008). Besides, practical work can also be defined as a “learning experience in which students interact with materials or with secondary sources of data to observe and understand the natural world” (Lunetta, Hofstein, & Clough, 2007). Experimental work and scientific investigations are other ways to be called practical work (Ramnarain, 2011). Students will learn the science concept by doing experiments in the Laboratory which is a different approach from the “Chalk and Talk” method (Bruner, 1990). Therefore, the laboratory experiment is one of the examples of practical work at the secondary school level (Musasia et al.,2012).

Traditional teaching is a teacher-centered approach where the teacher teaches the content and students just sit, read, do assignments, and take notes (Ates & Eryilmaz, 2011). Traditional teaching classes look like a one-person show usually controlled by direct and one-party instruction (Abida & Muhammad, 2012). At the same time, students are just unresponsively receiving information from the teachers (Liu, 2014) and without questioning the teacher (Stofflett, 1999). According to a report, teachers in Nigeria mostly was knowledgeable, and familiar with the teaching contents and used various kinds of techniques in teaching, yet, the teaching method was still teacher-centered. This method of teaching is still going on after 15 years of the report was published and the teaching practices are still one-way, teacher-centered which makes students behave passively in the classroom (Salmiza & Afik, 2012). 'Hands-on' methods are suggested in constructivist-based learning (Ng & Nguyen, 2006). Another alternative constructivist learning approach is the use of practical work in science teaching and learning. By having real-life phenomena, students are allowed to evaluate and measure their views and to improve their understanding before the learning process (Ng & Nguyen, 2006). Practical work creates exceptional learning surroundings that help the student construct their knowledge and enhance logical, inquiry, and psychomotor skills (Mashita, Norita, & Zurida, 2009).

Besides, practical work offers an interactive experience to the students where they can broaden the scope of constructivist learning (Umar, Ubramaniam, & Mukherjee, 2005).

The education system in Nigeria is still very exam-oriented which focuses on examination results and marks (Sharifah Fauziah, Farah, & Ismin Izwani, 2012). Nigerian teachers are also unfamiliar with applying the constructivism approach in teaching. Therefore, teachers will be more teacher-centered rather than student-centered and the constructivism

approach is unachievable (Arlina & Melor, 2014). It is believed that by having practical work, students' knowledge can be expanded to understand the real world (Millar, 2004).

According to Ozdener's study (as cited in Tüysüz, 2010), we know that students can gain knowledge through personal observation and involvement in practical work. Teaching objectives can be achieved easily by doing practical work, especially in teaching physics (El-rabadi, 2013). Furthermore, first-hand knowledge of the physics concept will be generated where students can understand the abstract ideas that are difficult to explain during the class (Osborne, 2002). Students' understanding of theories and models can also be developed (Millar & Abrahams, 2009). According to Inal's study (as cited in Musasia et al., 2012), students are faster to understand the physics concepts when they test the experiment by themselves as they can touch the materials and apparatus which makes them believe in the experiment.

According to Abraham and Millar (2008), preferred to use the term practical work rather than laboratory work this is because they claimed that science activities are not characterized by the location but by the activities of students when doing school science. Millar further reaffirmed that science teaching naturally involves more than asserting facts. It includes showing learners how things happen and putting them into situations where they can observe for themselves. Practical work can be regarded as any learning activity in science that encompasses learning by experience (Hodson, 1991). This is most understood when students have first-hand experience in seeing, feeling, and handling objects and organisms for themselves.

Physics is an experimental science and the history of science reveals the fact that most of the notable discoveries in science have been made in laboratories. Seeing experiments being performed i.e., demonstrating experiments is important for understanding the principles of science. In 2009, the UK-based Science Community Representing Education (SCORE), defined

practical work as any science teaching and learning activities that involve students working individually or in small groups, manipulating or observing real objects and materials as opposed to the virtual world.

Woodley (2009) defined practical work as a hands-on learning experience that stimulates thinking about the natural world. He further identified possible practical work as being of two kinds.

1. Core activities, investigations, laboratory procedures and techniques, and fieldwork, ball of which support the development of practical skills and help to shape students' understanding of scientific concepts and phenomena.
2. Directly related activities which include: teachers' demonstration, the experiencing of phenomena, designing and planning investigations, and are either a key component of an investigation or provide valuable first-hand experiences for students.

2.3 Knowledge of Teachers and Students on Physics Practicals

Practical knowledge according to James (1940) refers to knowledge that is connected with reality rather than ideas and theories. In his book "Pragmatism: A New Name for Some Old Ways of Thinking" (1907), James argued that practical knowledge is a type of knowledge that is derived from practical experience and is focused on achieving specific goals or solving real-world problems. James contrasted practical knowledge with theoretical knowledge, which he saw as more abstract and focused on understanding general principles and concepts. According to Mankilik (2011), that practical approach is any teaching and learning activity that involves at some point the students in observing or manipulating real objects and materials. The term practical is preferred to laboratory work because location is not a salient feature in describing this kind of activity since observation and manipulation of objects can also take place in an out-

of-school setting such as learners' homes. For instance, boiling and freezing water, switching off lights, AC, TV, and Radio, looking at mirrors, and many more.

According to Gotta and Duggan view practical work as an activity that allows learners to learn with understanding. With practical work, learners understand better what they have seen rather than what they were taught theoretically. During practical work, learners hold and touch the equipment themselves and as such learn by doing. The value of practical work has long been recognized at the secondary school level. Many teachers acknowledged the value of learning by doing rather than just being shown or told Driver and Braund, (2002). If students can be allowed to do practical work in physics, then this could help them understand the content, because students learn something better by doing. They will remember something better that has been done with their own hands. This was further emphasized by Hodson (2002) who said that practical work is an essential component of science teaching. It is therefore advisable that students should be prepared to master the skills required for practical work so that they will be ready for assessment. Hodson (2002) further added that in practical work the candidate performs certain activities to discover something as yet unknown, to test a hypothesis, or to check an already known fact.

A large proportion of both primary and secondary pupils thought that practical work would contribute positively to general learning in science. They believe that practical work provides a carefully independent experience that supports learning. By doing practical work in science at school, students can find things out themselves rather than the teacher telling them (Krathwohl, 1998). This statement by Krathwohl (1998) is true. From the researcher's experience, usually, when it is time for practical work, most students are happy and then usually pay more attention than the normal lecture lesson. In other words, students find it fun when doing practical

work because they discover things for themselves. Leach and Paulseen (1998) stated that practical work with real objects and materials helps teachers and learners to communicate information and ideas about the natural world and also provides opportunities to develop students' understanding of scientific inquiry. Practical skills in science education are important in their own right.

Practical work is useful and essential for the teaching of science in schools to become scientists or technicians and helps assist concept learning and the development of attitudes and interests of learners in science. Students can construct knowledge and skills through their own experience (Windschitl, 2002) and they can construct an accurate representation of the real world (Doolittle & Camp, 1999). The science laboratory environment or setting is a major path for the students to be involved actively and to perform activities, construct new knowledge-sometimes modify the previous knowledge- onto their existing mental framework for meaningful learning to take place (Huitt, 2003; Sherman, 1995). However, the concept of practical work may be extended to include the need for experience and even a student exercise involving a pencil, paper, and calculations based on real examples. Practical work may be performed in the laboratory, but practical activities are confined to the laboratory alone. In that light, physics practical should be treated under

- Laboratory activities, experiments, and demonstrations. In a review of the literature on the place of practical work, Schulman and Tamir (1373, p.343) proposed a classification of goals for laboratory instruction in science education.
- Arouse and maintain interest, attitudes, satisfaction, open-mindedness, and curiosity in science.
- Develop creative thinking and problem-solving ability.

- Promote aspects of scientific thinking and the scientific method e.g., formulating hypotheses and making assumptions.
- Develop conceptual understanding and intellectual ability.
- Develop practical abilities, for e.g., designing an executing investigation, observations, recording data and analyzing and interpreting data.

In teaching Physics, experimental work is an integral component in giving the starting point of knowledge formation and conceptualization. Koponen & Mantyla (2006) propose an educationally oriented reconstruction, which is based on the idea that in the epistemology of experiments, the inductive-like generative justification of knowledge is central. A generative view makes it possible to retain those aspects of experiments that make them purposeful for learning and can give a starting point for students' construction of knowledge, that is, the generative view makes it possible to retain those aspects of experiments, which make them purposeful to learning by giving a starting point for students' construction of knowledge during the learning process. The reconstruction also helps to conceive the experiments with their correct historical role and helps to bring back the generative use of experiments in teaching, which after all, has never vanished from the practice of physics

2.4 The Attitudes of Students and Teachers Towards Physics Practical

Attitudes are related to coping with and management of the emotions occurring during the learning process, and they play an important role in directing human behavior. Whether attitudes occurring as part of a system of values and beliefs are positive or negative directly affects the learning process and influences the future lives of individuals (Seferoglu, 2004; Sunbul et al., 2004).

According to Hendrickson, attitudes are the best predictor for estimation of students' success (Hendrickson, 1997). Activities must be planned, organized, and implemented so that students may develop more positive attitudes (Pintrich, 1996). Many attitude scales have been developed for the determination of students' attitudes towards Natural Sciences. Regarding these scales, Hewitt (1990), Oliver and Simpson (1988), House and Prison (1998), Geban et all. (1994), Kind et al. (2007) Pell and Jarvis (2001), Reid and Skrybina (2002), Selvi (1996), Bilgin et al. (2006), Nuhoglu (2004,2008), Bozdogan and Yalcin (2005) have developed attitude scales toward physics lessons, physics laboratories, and science lessons Budak (2001) has developed an attitude scale toward chemistry laboratory; Ekici (2002) has developed an attitude scale toward biology laboratory; and Simsek (2002), Kan and Akbas (2005) have developed an attitude scale toward chemistry lessons. Researchers mostly examined the attitudes of primary and high school students or candidate teachers or investigated the relationship between students' attitude and their success. Many attitude scales have been developed to determine students' attitudes toward Natural Sciences. Some of these have been developed by El-Gendy, (1984), Misiti et al. (1991), Geban et al. (1994), Selvi (1996), Boone (1997), Morrell and Lederman (1998), Francis ve Greer (1999), Pell and Jarvis (2001), Kan (2005)Bilgin et al. (2006), Budak (2001), Reid and Skryabina (2002), Yesilyurt (2004), Nuhoglu and Yalcin (2004), Sengoren et al. (2006), Unal and Ergin (2006), Kind, et al. (2007), Nuhoglu (2008), Azizoglu and Cetin (2009) and Kurnaz and Yigit (2010) for attitudes towards science lessons and science laboratories.

According to Mbajiorgu and Reid (2006), attitudes have four issues that are important in physics. These are attitudes toward physics, attitudes towards physics subjects, attitudes toward learning physics, and scientific (the methods) attitudes. Physics lessons being held in the classroom on the sole theoretical basis is one of the factors that influence the attitude of the

students toward these lessons in a negative manner. Thus, physical topics consist of abstract concepts that should be discussed in the student's daily life, together with simulations, animations, and other videos to keep the attention of the students alive. Learning by discovery is better than passive listening, so it should be shown how to associate physical concepts with the daily lives of the students. Hasan Kaya el Ugur Boyuk (2011) Instead of increasing physics laboratory lessons' hours, hands-on experiments that may be executed effectively, and attract attention with simple materials should be developed. Studio physics which is a method of teaching that provides an integrated learning environment with hands-on lab measurements coupled with active student problems- should be applied in the physics lessons. To make physics lessons more interesting, physics instructors should convince students that physics serves them. Physics instructors should spend more effort to associate physics–technology–and daily life. Physics instructors should like their profession and reflect this to others. Such manners of instructors will improve the attitude of students toward physics lessons and physical experiments. Hasan Kaya el Ugur Boyuk (2011) Poor academic performance in Physics has been a concern in many high-learning institutions in the last years around the world. Different authors attribute this poor performance to different causes, namely poor learning environment, poor teaching, inexperienced teachers, learning approaches, cognitive style of students, career interest, the influence of parents and friends, low ability of the student, socio-economic level and so on (Erdemir, 2009; e.g. Ibeh et al., 2013; Olusola & Rotimini, 2012). But most of them agree that the attitude of students toward Physics plays a big role in this poor performance.

George (2006) defines the attitude toward science as the positive or negative feelings about science, specifically in science classes. The attitude of a student toward a learning subject has therefore been an object of intensive research in the last years to determine its responsibility

for poor performance in science in general and in physics in particular. Once this responsibility is determined, researchers seek to find a way to improve the attitude to improve students'" performance. Akinbobola (2009) introduced cooperative learning to boost student's attitudes toward Physics. She found that students taught using cooperative strategies show more positive attitudes toward Physics compared to those taught with competitive and individualistic strategies. Marusic and Slisko (2012) opted for active learning to increase the students" attitude toward Physics. A positive shift of attitudes was observed in both groups of the experiment. In physics learning, attitude toward physics falls into four categories, namely feeling fond towards physics, pleasuring in the process of learning physics, understanding of physics compared to other problems, and understanding practice in learning physics. The other research found the attitude toward physics into six categories, namely interest, career, the importance of physics, teachers, difficulties in learning, and equipment used in learning physics. Furthermore, Kamba et al. developed parameters of attitude toward physics into four categories, namely student self-concept, anxiety in learning physics, fear of physics learning, and aspiration.

Teacher-Related Factors

Teachers' knowledge, skills, and attitudes are fundamental to the effective teaching of physics practicals. According to Shulman's (1986) theory of pedagogical content knowledge, teachers need a strong grasp of both subject matter and methods of teaching to convey concepts effectively. Studies by Jegede and Okebukola (1991) highlight that teachers with inadequate training in laboratory techniques often struggle to facilitate meaningful experiments. Furthermore, Oduro (2015) found that teachers' motivation and interest directly affect their ability to engage students in practical sessions.

2.5 Student-Related Factors

Student attitudes, prior knowledge, and engagement levels also significantly impact the teaching of physics practicals. Research by Hofstein and Lunetta (2004) reveals that students with a positive attitude toward science are more likely to participate actively and learn effectively during practical sessions. Conversely, limited foundational knowledge and fear of failure, as highlighted by Abrahams and Millar (2008), can hinder student participation and performance.

2.6 Institutional Resources

The availability of resources, including laboratory equipment, materials, and space, is a critical determinant of the effectiveness of physics practical teaching. According to Oladejo et al. (2011), schools with well-equipped laboratories produce students with better practical skills and understanding. However, many schools, particularly in developing regions, face significant resource constraints. A report by UNESCO (2018) indicates that the lack of modern and functioning equipment poses a major barrier to effective practical teaching.

2.7 Factors Affecting the Effective Teaching of Physics Practicals

Some of the factors affecting the effective teaching of Physics Practicals include teachers' training and conceptualization of the subject, students' understanding of the subject, and physical resources such as laboratories, teaching aids, and textbooks. Research findings suggest that traditional lecture instruction is ineffective in dealing with students' misconceptions. Traditional lecture instruction does not consider the views of students. This technique is limited in helping a learner develop skills (Tarekegn, 2009). The practical approach on the other hand engages the student productively and leads to relational understanding. The proposed study contends that if a practical work instructional approach is used perhaps improved students' achievements in the subject may occur. In addition, the enrolment is likely to increase. It is on this basis that the

proposed study is designed to investigate the effects of Physics practical work on students' achievements in Physics.

According to Chiu (2000), it has been observed that students taking physics at all levels find it difficult to internalize physics concepts that do not agree with what they have already internalized (Refik & Bahattin, 2008). Furthermore, to capture and retain an interest in the subject is one of the many difficulties faced by the teachers. Several research conducted have shown that the teaching of physics faces the same problems in the whole world. This is credence by Mac Dermott (1998), who showed that students from different cultural backgrounds and social classes have different understandings of physics concepts. However, many young people have a similar understanding of physics concepts.

A study conducted by Juan (2009) on the totalizing of the didactic teaching-learning process in Physics. The study found that teaching and learning physics faces some challenges since its teaching has been largely confined to the classroom. He also found out that the teaching appealed more to the cognitive domain and little to the affective-emotional domain. Teaching and learning Physics was individualized. Another finding was that learning was not focused on changing the individual to change the environment but learning was focused on making the individual fit in the environment. Thus, due to the foregoing, it is important to change the approaches to teaching to improve it and be meaningful. Also, it is worth noting that there is a breakdown between the practicals and theory taught. The practicals are taught as a different entity from the theory and this does not reinforce concept acquisition. Practicals should be an integral part of teaching and theory should be derived from the practical (Juan, 2009). This informed the design of the current study. Another challenge facing Physics as a subject is inadequate content knowledge by the teachers of Physics.

Fadaei (2012) researched to find out the teacher's level of knowledge acquisition. It was based on Force and Motion Conceptual Evaluation (FMCE) for teachers understanding of mechanics concepts. It was administered to a large group of teachers in teacher training courses. The study found that most of the Physics teachers did not completely understand kinematics and dynamics concepts. In addition, Assessments using the FMCE indicate that teacher understanding of dynamics concepts will be improved when some learning strategies are planned. Therefore, 1) Self-evaluating for teachers to know their abilities and motivating them to be more active in teaching. 2) Recognizing the necessity and planning for teacher training projects have to be emphasized.

María et al., (2012) proposed a new approach to teaching Physics having considered a problem within the teaching of Physics, in two aspects: The first, is the didactic part, which concerns the professor, since Physics courses, generally, are imparted without giving the student an active role and with knowledge and concepts unlinked of his/her environment, making the teaching and learning of this subject lose its essence and significance. The second, the discipline part, has to do with the student; since it is observed recurrently that even with education, the student does not use precisely the concepts of a studied theme when explaining or arguing a Physical problem or situation. Particularly within the Heat topic, although there is a daily generalized interaction of people with thermal phenomena. Evaluation is a key stage in all teaching-learning processes, but it usually demands significant efforts of preparation from students and teachers, not to mention that it is very time-consuming. The traditional model of evaluation prescribes that students must sit periodically to demonstrate that they can recite blocks of knowledge, and solve exercises and problems which usually resemble or refer to the same set of study cases presented in lectures, in the laboratory, or in the textbooks. Thus

conceived, evaluation is indeed lacking, particularly in Physics practical teaching. Therefore, there is a need to develop effective physics teaching evaluation methods which puts into consideration the following factors. This includes exploiting the examinations as opportunities for further learning and as a way of acquiring new knowledge or learning new analytical techniques. It also means seeing examinations as an opportunity for the application of standard powerful tools that students learned in their previous mathematics and Physics courses (Celso, 2009).

Klainin, (2009) identified some problems of practical work schools as experienced by teachers and students in both developed and developing countries. These problems are associated with curriculum implementation, change of emphasis in school curriculum, problems of incentives, and problems associated with goals that could be attained by practical work. Problems associated with curriculum implementation include the lack of equipment, and enough time for practical work. Safety precautions in the laboratory and student participation. Those associated with incentives include the value of practical work held by students, teachers, and Curriculum developers, and the lack of reward for students. Practical work for school science classes might be very expensive in money, time, and human resources. Third world countries have not been reluctant in designing their science curricula to accept the challenge of using practical-based approaches to school learning. As a result, many problems then arise. How can equipment be obtained? How can it be stored? How can large classes experience activities when only one set of equipment is available? Given the importance of practical work in enhancing understanding, ample time and resources should be made available to schools. This will enable science teachers to ensure the attainment of science content and processes. There was a significant difference between teachers who have science laboratories and those who have not.

The teachers who found their laboratories well-equipped wanted to do more practical are compared to those whose laboratories were inadequate. Having no science laboratory or inadequate equipment in science laboratories in schools affects teachers' attitudes towards the arms of science experiments.

The teachers' opinions related to the non-existence of laboratories and inadequate equipment in laboratories may prevent them from the idea of doing simple experiments under the current skimpy circumstances. Thus, an idea that only when there is a well-equipped laboratory, they can perform science experiments and reach their goals (Gary Ford,2008). Halai (2008) states that there is a significant shortage of science teachers in schools and that the situation is much worse in rural areas. She also mentions that some teachers never studied science in school yet teach science subjects because of the shortage of science teachers. Kasanda (2008) notes that there is a lack of science teachers, Such teachers, even in countries, such as Canada, the USA, the UK, and Sweden. Halai (2008) states that the shortage of science teachers creates an extra workload for the teachers which compels them to teach which compels them to teach a large number of classes with a large number of students, and that is why they ton Students, and that is why they tend to focus on covering the syllabi for the examinations. Ranade (2008) mentions that large class size is a hindrance for teachers trying to use activity methods and it leads them to the teaching of science through the overuse of lecture met. According to Ng'ethe (2012) Students exposed to practical work in Physics performed better than those taught through conventional method. The value of practical work has long been recognized at the secondary school level. Many teachers acknowledge the value of learning by doing rather than theory only. (Driver and Braund, 2002). According to Hodson (1990) students should be prepared with mastery of the skills required for practical work so that they will be ready for assessment. Hodson (1996)

further added that in practical work the candidate performs certain activities to discover something as yet unknown, to test a hypothesis, or to check an already known fact. To perform these activities, the candidate has to learn the skills required for practical work, which includes preparing and performing experiments and processing the results obtained.

Woolnough and Allsop (2001) noted that many science teachers recognized the importance of practical work. They believed that students should have first-hand practical experience in laboratories to acquire skills in handling apparatus, to measure, and to illustrate concepts and principles. Having firsthand information will allow students to apply the skills acquired during practical work when they become scientists in the future. Physics, like religion, is a search for truth. Hence to a student physics should be as sacred and as pious as the place of worship to a devotee. In fact, physics study enables young minds to equip themselves for something higher and noble as search for truth and unrevealing the mysteries of nature. Demonstration of experiments is important for understanding the principles of physics. However, performing experiments with one's hand is far more important because it involves learning by doing. It is necessary to emphasize that for systematic and scientific training of young minds, a genuine laboratory practice is a must. According to educational psychologists, the attitude of the student plays an important role in his systematic and scientific training. Science is a great human expertise. Open-mindedness, curiosity, collection of data, demand for verification and proofs of statistical reasoning, suspended judgments, acceptance of warranted conclusion, and willingness to change over opinion in the light of new evidence are the ferments that characterize the scientific enterprise.

Appropriate practical work can be effective in helping teachers construct their knowledge, develop logical and inquiry skills, and problem-solving abilities, and can also assist in the

development of manipulative and observational skills. Physics practical has great potential in promoting positive attitudes and in providing students with opportunities to develop skills. In this respect, the science laboratory is a unique learning environment as it would provide science teachers with opportunities to vary their instructional techniques. Ahiakwo (2002) suggested that practical work as a unique social setting has great potential to enhance social interactions that can contribute positively to developing attitudes and cognition in students. Nzewi (2008) asserted that practical activities can be regarded as a strategy that could be adopted to make the task of a teacher more real to the student as oppressed to abstract on theoretical presentation of facts, principles, and concepts of subject matters. The use of a practical approach to the teaching of physics must be implemented in schools if we hope to produce students who will be able to acquire the necessary knowledge, skills, and competence needed to meet the scientific and technological demands of the nation. A study by Owolabi (2004) revealed that the performance of Nigerian students in ordinary-level physics was generally poor. Jegede, Okota & Eniayeju (1992) reported factors responsible for the poor implementation of practical work in physics as; poor laboratory facilities, and an inadequate number of learning facilities among others. Physics as a science subject requires trained technicians and laboratory attendants (instructors). In many schools due to the lack of these technicians and attendants, the teaching of Physics has been based largely on the expository strategy of teaching which encourages rote (memorization) of factual details with minimum emphasis on practical. Today the students perform experiments for the sake of marks and teachers have failed to realize that ‘’practical work’’ can aid them to effectively carry out their lessons. As a result of this, students at the senior secondary are not able to observe and draw inferences from their observations, tackle problems scientifically, and

even handle simple apparatus to verify principles to aid comprehension. This has led to students' poor performance in Physics practicals leading to their failure in Physics examinations.

2.9 Review of Related Empirical Study

There are many studies available that have been contributing on the factors affecting the effective teaching of Physics practical.

Rukayya, Nura, Mujittafa, Buhari, & Rukayya (2015) researched on the problems that are facing students in the conduct of Physics practical. The research adopted a descriptive survey research design, the population of the study constitutes of about (1413) student, and (20) teachers, out of which only (306) students, and (15) teachers were randomly selected as the sample. During the course of the study, a lot of problems have been discovered, which were: problem in identifying physics apparatuses, setting the apparatuses, making observations, taking readings, plotting of graph, lack of standard physics laboratory, inadequate laboratory apparatuses, lack of supervision, Teaching attitude, lack of appropriate time allocation to physics practical among others. The recommendations made after this study include provision of a standard physics laboratory, and provision of adequate laboratory equipment's among others.

Also, research by Solomon & Kedir (2015). On the Problems in the Teaching and Learning of Physics at the Secondary and Preparatory Schools, the study explored problems in the teaching and learning of Physics practicals from the following perspectives: problems related to school facilities, teachers, students, plasma instruction and the extent to which the school is conducive for practical activities. The research methodology employed in the study was a descriptive survey. Purposive, stratified and simple random sampling techniques were used to select the data sources of the study. Educational administrators (Principals and V. Principals), physics teachers, students, and supervisors at zonal and woreda levels were the subject of the

study. Questionnaire and interview were the major data gathering instruments used for this study. Besides, some document analysis and personal observation were made to get additional evidences to the study. Numbers, percentage, mean values, grand mean and mean rank were the statistical tools used to analyze the data obtained from the subjects. As the data collected showed, besides students' background to learn physics, the main problems that encountered in the teaching and learning of Physics Practicals are, Inadequate space for laboratory or laboratory facilities outmode, Insufficient found for equipment and supply, Insufficient administration or recognition, Insufficient referee books in the library.

Another finding by Ezellora (2000). He researched on the effect of teacher's qualification on the academic performance of students in Physics in Senior Secondary Schools. His result States that "good and qualified physics teachers help in students learning of physics practical". He pointed out in his research on the influence of the location on teaching practical and also reveals that the location of the laboratory has greatly influences student's utilization. Because a laboratory sited in a noisy environment will not be conducive for learning due to the distraction from the environment. Teachers, proprietors, and the government must be prepared and encouraged to create awareness of the importance of laboratory practices to learning of theoretical physics. The survey type of descriptive research design was adopted. The sample for the study consisted of 100 Senior Secondary Schools Physics students and the teachers that prepared and presented the students in each school for West African School Certificate Examination. The year's result summary for each school was collated with the bio-data of their respective Physics teachers. Four hypotheses were postulated and tested at 0.05 significance level.

Also, another finding by Atsuwe, Adeniran & Echono (2016) whom reveals in their study on the factors affecting the effective use of laboratory in teaching and learning of physics in selected

secondary schools. The study is a survey which used questionnaire to collect information on the factors affecting the effective use of laboratory in the teaching and learning of physics in secondary schools. The sample consisted of 100 Physics students randomly selected from the 10 schools of the study. Questionnaires were used to collect data from the students. Data collected were analyzed using mean and T-test statistics. The study revealed that qualification of teachers, standard and well equipped laboratories and the location of laboratories are the factors that influence students' effective use of the physics laboratory in Senior Secondary Schools. Recommendations were made to individuals and organizations involved in the management of school science laboratories on how to proffer lasting solutions to the problems identified.

2.11 Summary of Reviewed Literature

The Factors affecting the effective teaching of Physics practical has been a topic of interest for researchers and policymakers. Numerous studies have examined some of this Factors affecting the effective teaching of Physics practicals. Including, Qualification of teachers, inadequate laboratory apparatuses, lack of appropriate time allocation to physics practical e.t.c

The reviewed Literature underscores the importance of laboratory resources, teacher competency, teacher years of experience, student engagement in the effective teaching of Physics practicals. While well-equipped laboratories and trained teachers enhance learning outcomes, challenges such as lack of professional development, student disengagement hinder practical instruction. Addressing these issues requires School-level reforms and innovative teaching strategies.

Future research should focus on the interplay of these factors, explore technological advancements in practical teaching, and examine strategies to promote student – centered learning in Physics Education.

CHAPTER THREE

METHODOLOGY

This chapter deals with the research procedure to be taken in carrying out the study. It is organized under the following subheadings.

Research Design

Population of the Study.

Sample and Sampling Techniques.

Research Instruments.

Validity of the Instrument.

Method of Data Collection.

Method of Data Analysis.

3.1 Research Design

The research design used for the study is descriptive survey. Survey according to Akuezuilo & Agu (2012) is a method of obtaining information from various groups or persons mainly through questionnaire or personal interview. With descriptive survey research design, the researcher was able to collect information through a questionnaire from a group of people which was analyzed and consequently generalized to cover the entire population.

3.2 Population of the Study

The Population of this study consists of Eighty (80) Senior Secondary Schools in public and private secondary schools within Ovia North East Local Government Area (LGA) of Edo State, Nigeria.

3.3 Sampling and Sampling Techniques

The sample for this study will be drawn from Senior Secondary School II (SSS II) students, Physics teachers, and school administrators in the selected public and private secondary schools within Ovia North-Easr Local Government Area (LGA) of Edo State, Nigeria.

The study focuses on SSS II students because they are actively engaged in Physics practical sessions as part of their preparation for external examinations like the West African Senior School Certificate Examination (WASSCE) and National Examinations Council (NECO).

The sampling technique adopted for this study was the simple random sampling technique. The researcher randomly picked 8 schools out of the 80 schools. The criteria for this selection is that sample size should be 10% of the population, Therefore, 10% of 80 = 8. The sample was selected by utilizing the random selection process. The schools selected includes; UNIBEN Staff School, Paragon Comprehensive College, UNIBEN Demonstration Secondary School, Emotan Girls College, Idia College, Mayor Group of School, Boiling Point Academy, and Candid Success Academy. The number of respondents is shown in the table below;

Category	**Estimated Sample Size**
SS II Physics students	250
Physics teachers	15

3.4 Research Instrument

The data of this study are obtained through the use of a Likert scale questionnaire. This is made up of two types: one for the Physics teacher and the other for the students. The titles of each

questionnaire are; the Teachers Survey Questionnaire (TSA), and Students Survey Questionnaire (SSQ). The Teachers' Survey Questionnaire was divided into four sections. Section A contained three items covering the background information of the respondent, Section B contained four items covering the educational qualifications and years of teaching experience of the respondents, section C contained twelve (12) items covering the factors affecting the effective teaching of Physics practical in secondary schools while section D contained 4 items covering the impact of the availability of laboratory facilities, and student engagement on the effective teaching of Physics practical in Senior Secondary School II. The students' Survey Questionnaire (SSQ), was divided into two sub-sections. Section A contained the background information of the respondents while section B contained ten (14) items which covered the factors affecting the effective teaching of Physics Practical in Senior Secondary Schools. The questionnaires was structured under a 4-point Likert scale of strongly agreed (SA) 4 points, agree (A) 3 points, disagree (D) 2 points, and strongly disagreed (SD) 1 point. The questionnaires was structured in such aa way that they reflect the framework of the research question.

3.5 Validity of the Instruments

The instrument was subjected to face and content validation by the expert judgement of the project supervisor and a lecturer from the Department of Curriculum and Instructional Technology (C.I.T). The final edition of the instrument was obtained after the researcher effected the necessary corrections required.

3.6 Reliability of the Instrument

The reliability statistics of the Teachers Survey Questionnaire (TSA) indicates that the Cronbach's Alpha coefficient for the scale used in the study is 0.97, with a total of 16 Items included in the analysis. It indicates that the items in the scale are closely related and measure the

same underlying construct consistently. Hence, the data is proven to be reliable. Similarly, the reliability statistics of the Student Survey Questionnaire (SSQ) indicates that the Cronbach's Alpha coefficient for the scale used in the study is 0.99, with a total of 14 Items included in the analysis. It indicates that the items in the scale are closely related and measure the same underlying construct consistently. Hence, the data is proven to be reliable

3.7 Method of Data Collection

The instrument for data collection in this study is the Likert Scale questionnaire. The researcher and two assistants distributed the questionnaire to the respondents. The researcher waited and collected the completed questionnaires from the respondents when they were through with it. However, the researcher also returned to collect those of the respondents who were not disposed to fill out the questionnaire on the spot.

3.8 Method of Data Analysis

In analyzing and interpreting the data generated from the study, the simple descriptive statistics: Mean and Standard Deviation was used to analyze data collected from the study and also used to answer the research questions.

The mean was calculated as follows:

Since the research questionnaire is rated on a 4.0 Likert scale, the decisions have their numerical value as follows

Decision	Ratings
Strongly Agree	4
Agree	3
Disagree	2
Strongly Disagree	1

Let N_1 be number of responses to the decision "Strongly Agreed (SA)"

Let N_2 be number of responses to the decision, "Agreed (A)"

Let N_3 be number of responses to the decision "Disagreed (D)"

Let N_4 be number of responses to the decision "Strongly Disagreed (SD)"

Let N be the total number of responses to all the decisions

Then,

$$Mean(X) = \frac{4N_1 + 3\ N_2 + 2N_3 + N_4}{N}$$

The decision rule for interpretation of the mean scores is based on the Likert scale standard.

1.74 and below is 'strongly disagree', 1.75 to 2.49 is 'disagree', 2.5 to 3.24 represents 'agree', while 3.25 to 4.00 represents 'strongly agree'.

CHAPTER FOUR

PRESENTATION OF RESULTS AND DISCUSSION OF FINDINGS

This chapter presents the analysis and interpretation of data collected through the questionnaire across 8 public and private secondary school in Ovia North-East Local Government Area of Edo State. The analysis is structured according to the research questions outlined in the study. Descriptive statistics provide an overview of the demographic characteristics of the respondents. Mean and Standard deviation are used to interpret the findings in the context of the study's objectives.

Section A: Demographic Characteristics of Respondents (Students)

Table 4.1: Gender Frequency and Percentage distribution table of Respondents

Variable		**Frequency**	**Percentage**
Gender	Male	111	44.4
	Female	139	55.6
Total		250	100

Table 1 above presents the distribution of the gender of respondents. The male gender includes 111 respondents accounts for 44.4% of the study, while the female gender amounting to 139 respondents accounts for 55.6% of the study. This data shows a balanced gender distribution among respondents, with a slightly higher number of females.

Table 4.2: Age Frequency and Percentage distribution table of Respondents

Variable		**Frequency**	**Percentage**
Age	13-15	143	57.2
	16-18	107	42.8
Total		250	100

Table 2 above presents the distribution of the age of the respondents grouped into two categories. The first is 13-15 years, which are 143 respondents amounting to total of 57.2%. The second is 16-18 years, which are 107 respondents amounting to 42.8%.

Section B: Analysis of the Research Question

Research Question One:

What are the major factors affecting the effective teaching of physics practical in senior secondary school II in Ovia North-East Local Government Area of Edo State?

Table 4.3: Presentation of Data on teachers' responses to items 1 to 12, section C of the teachers' questionnaire

S/N	Items	X	S.D
1.	There are sufficient practical manuals in my school.	2.5	0.971
2.	We have a lab technician in my school.	2.4	0.966
3.	We have lab attendance in my school.	2.4	0.843
4.	Professional development programs have significantly improved my teaching strategies for Physics practical	3.1	0.876
5.	My students have a Comprehensive Physics practical textbook.	2.5	1.178
6.	My students have mastered alternatives to practical Physics textbooks.	2.4	1.135
7.	My years of teaching experience have enabled me to effectively engage students in Physics practical activities	3.3	0.919
8.	My years of teaching experience have equipped me to effectively utilize available resources to support my teaching of Physics practical.	2.7	1.059
9.	My years of teaching experience have enabled me to effectively manage the	2.9	0.876

	classroom during Physics practical activities		
10.	I struggle to monitor and assess individual students due to large class sizes.	2.4	1.265
11.	My school does not have alternative power sources (e.g., generators, solar panels) which makes me unable to conduct experiments that involve electrical circuits, electromagnetism, and optics.	2.9	0.568
12.	Poor monitoring and evaluation of teaching standards in Physics practical lead to inconsistent practical learning experiences.	1.8	0.919

The mean scores of teacher's responses to items 1, 2, 3, to 12 are 2.5, 2.4, 2.4, 3.1, 2.5, 2.4, 3.3, 2.7, 2.9, 2.4, 2.9, and 1.8 respectively while the standard deviations are 0.971, 0.966, 0.843, 0.876, 1.178, 1.135, 0.919, 1.059, 0.876, 1.265, 0.568, 0.919. Based on the Likert scale standard, 1.74 and below is 'strongly disagree', 1.75 to 2.49 is 'disagree', 2.5 to 3.24 represents 'agree', while 3.25 to 4.00 represents 'strongly agree' This shows that the respondents Agrees that there are sufficient practical manual in the school, there is an absence of lab technician and lab attendance in senior secondary schools in Ovia North East LGA of Edo State, professional development programs have significantly improved the teaching strategies for Physics practical in Ovia North East LGA of Edo State, students have Comprehensive Physics practical textbook, students don't have master alternative to practical physics textbook, years of teaching experience have enabled Physics teachers to effectively engage students in physics practical activities, years of teaching experience have equipped Physics teachers to effectively utilize available resources to support teaching of Physics practical, years of teaching experience have enabled Physics teachers to effectively manage the classroom during Physics practicals activities, Physics teachers do not struggle to monitor and assess individual students despite large class sizes, schools in Ovia North-East LGA of Edo State do not have alternative power sources (e.g., generators, solar panels) which makes Physics teachers unable to conduct experiments that

involve electrical circuits, electromagnetism, and optics and finally, poor monitoring and evaluation of teaching standards in Physics practical does not lead to inconsistent practical learning experiences. It Therefore shows that respondents generally agree moderately that the factors affecting the effective teaching of Physics practical are;

i. Absence of Lab technician and Lab Attendance

ii. Lack of master alternative to Physics practical textbook.

iii. No alternative power sources such as generators, or solar panels which makes it impossible to conduct experiments that involve electrical circuits, electromagnetism, and optics.

Table 4.4: Presentation of Data on Students' responses to items 1 to 12, section B of the students' questionnaire

S/N	ITEMS	X	S.D
1	We use an empty classroom building as a laboratory in my school.	1.60	0.861
2	We frequently visit the Physics laboratory	2.29	0.827
3	We have physics practical textbooks in my school	2.40	1.232
4	There is no accumulator for conducting Physics practical on electricity	2.96	0.849
5	There is no rectangular glass Prism for conducting physics practical on Waves	2.55	1.093
6	I have problems with calculations related to practical work	2.55	1.098
7	I have a problem with the setting of the apparatus.	2.85	1.052
8	We never visit the Physics laboratory in my school.	2.37	0.962
9	My Physics teacher's years of experience make	2.92	1.081

	their teaching of practical more effective		
10	My Physics teacher's participation in professional development programs improves the quality of their teaching in practical	2.85	0.717
11	My Physics teacher's years of experience helped me understand complex concepts in Physics Practical	3.11	0.859
12	My Physics teacher's years of experience helped them manage the classroom effectively during practicals.	3.16	0.779
13	I have a problem in writing a Physics practical report	3.08	0.803
14	There is no space in the Physics laboratory for easy movement	2.15	0.780

The mean scores of students' responses to items 1, 2, 3, to 14 are 1.66, 2.29, 2.40, 2.96, 2.55, 2.55, 2.85, 2.37, 2.92, 2.85, 3.11, 3.16, 3.08 and 2.15. All mean scores except items 1, 2, 3, 8, and 14 are above the decision rule of 2.5 for an item to be acceptable. This shows that student do not use empty classroom as laboratory, students rarely visit the physics laboratory, students have practical textbook in school, there is no accumulator for conducting Physics practical on electricity, there is no rectangular glass Prism for conducting Physics practical on Waves, students' have problem in calculation related to practical work, students have problem with setting of apparatus, students visit Physics laboratory in school but not often, Physics teachers' years of experience make their teaching of practical more effective, Physics teachers participation in professional development programs improves the quality of their teaching in practical, Physics teacher's years of experience help students understand complex concepts in Physics practical, Physics teachers years of experience help them manage the classroom effectively during practicals, students have problem in writing Physics practical report, there is

enough space in the Physics laboratory for easy movement. Therefore, the factors affecting the effective teaching of Physics practicals concerning the student's responses are;

i. Insufficient Physics practical textbook

ii. Insufficient laboratory Equipment such as accumulator, glass prism, etc for conducting practicals on electricity and waves.

iii. The student has not been able to set up apparatus.

iv. Student has not been able to write a Physics practical report.

Research Question Two:

Does the availability of laboratory facilities impact the effective teaching of Physics practicals in Senior Secondary School II in Ovia North LGA of Edo State?

Table 4.5: Presentation of Data on Teachers Responses to items 13 to 16, section D of the teachers' questionnaire

S/N	Items	X	S.D
13.	Inadequate laboratory equipment like accumulators, cell batteries, convex mirrors, and concave mirrors leads to limited student participation	3.2	0.421
14.	Lack of maintenance and insufficient funding for Physics apparatus like resistance boxes, stopwatches, ammeter, and voltmeter makes it difficult to conduct experiments regularly	3.1	0.738
15.	Poor laboratory conditions discourage active participation, making it challenging for	2.9	0.994

	students to grasp experimental concepts effectively.		
16.	Low interest and motivation levels among students make my teaching of Physics practical ineffective.	2.0	0.816

The mean scores of Teachers' Responses to items 13 to 16 section D of the Teachers' questionnaire are 3.2, 3.1, 2.9, and 2.0. This shows that Inadequate laboratory equipment like accumulators, cell batteries, convex mirrors, and concave mirrors leads to limited student participation, Lack of maintenance and insufficient funding of Physics apparatus like resistance boxes, stopwatches, ammeters, and voltmeters makes it difficult to conduct experiments regularly, poor laboratory conditions discourage active participation, making it challenging for students to grasp experimental concepts effectively and low interest and motivation levels among students does not make the teaching of Physics practical ineffective.

Research Question Three:

Do years of Experience impact the effective teaching of Physics practical in Senior Secondary School II in Ovia North LGA of Edo State?

Table 4.6: Presentation of Data on Teacher's Responses to Item 7,8 & 9 Section C of the Teachers Questionnaire.

S/N	Items	X	S.D
7.	My years of teaching experience have enabled me to effectively engage students in Physics practical activities	3.3	0.919

8.	My years of teaching experience have equipped me to effectively utilize available resources to support my teaching of Physics practicals.	2.7	1.056
9.	My years of teaching experience have enabled me to effectively manage the classroom during Physics practicals activities	2.9	0.876

The mean scores of Teachers' Responses to items 7,8 &9 section D of the Teachers' questionnaire are 3.3, 2.7, and 2.9. The mean scores are above the decision rule for an item to be acceptable. This shows that Professional development programs have significantly improved teaching strategies for Physics practical, years of teaching experience have enabled the teacher to effectively engage students in Physics practical activities, years of teaching experience have enabled the teacher to effectively manage the classroom during Physics practical activities. Therefore, years of Experience & Teacher's Competency impact the effective teaching of Physics practical in Senior Secondary School II in Ovia North LGA of Edo State.

Table 4.6: Presentation of Data on Students' responses to items 9 to 12, section B of the students' questionnaire

S/N	ITEMS	X	S.D
9	My Physics teacher's years of experience make their teaching of practical more effective	2.92	1.081
10	My Physics teacher's participation in professional	2.85	0.717

	development programs improves the quality of their teaching in practical		
11	My Physics teacher's years of experience helped me understand complex concepts in Physics Practical	3.11	0.859
12	My Physics teacher's years of experience helped them manage the classroom effectively during practicals.	3.16	0.779

The mean scores of students' responses to items 9 to 12 are 2.92, 2.85, 3.11, & 3.16. The mean scores are above the decision rule for an item to be acceptable. This shows that the Physics teacher's years of experience make their teaching of practical more effective, The Physics teacher's participation in professional development programs improves the quality of their teaching in practical, the Physics teacher's years of experience has helped the students understand complex concepts in Physics Practical, The Physics teacher's years of experience has helped them manage the classroom effectively during practical.

Research Question 4:

Does the interest of Students impact the effective teaching of Physics practical in Senior Secondary School II in Ovia North LGA of Edo State?

Table 4.7: Presentation of Data on Teachers Responses to item 16, section D of the Teachers' questionnaire

S/N	Items	X	S.D
16.	Low interest and motivation levels among	2.0	0.816

	students make my teaching of Physics practical ineffective.		

The mean Score of items 16 is 2.0. This is below the decision rule for an item to be acceptable. Thus, Low interest and motivation levels among students doesn't make the teaching of Physics practical ineffective

4.2 Discussion of Findings

The findings from the analysis of the items from research question 1 revealed that respondents agreed that the factors affecting the effective teaching of Physics practicals in senior secondary schools II in Ovia North-East Local Government Area of Edo State are: the absence of lab technicians and lab attendance, lack of master alternative to Physics practical textbook, no alternative power sources such as generators, solar panels which makes it impossible to conduct experiments that involve electrical circuits, electromagnetism, and optics, Insufficient Physics practical textbook, insufficient laboratory apparatus such as accumulator, glass prism, etc for conducting practicals on electricity and waves, student not been able to set up apparatus, student not been able to write Physics practical report. Ali (2023) in his research indicates that many schools lack the necessary equipment and resources to conduct comprehensive physics experiments, leading to a reliance on theoretical instruction.

The findings from the analysis of the items from research question 2 revealed that respondents agreed that inadequate laboratory equipment like accumulators, cell batteries, convex mirrors, and concave mirrors lead to limited student participation, Lack of maintenance and insufficient funding of Physics apparatus like resistance box, stopwatches, ammeter and voltmeter makes it difficult to conduct experiments regularly, poor laboratory conditions discourage active participation, making it challenging for students to grasp experimental concepts effectively and

low interest and motivation levels among students does not make the teaching of Physics practical ineffective.

The findings from the analysis of the items from research question 3 revealed that respondents agreed that Professional development programs have significantly improved teaching strategies for Physics practical, years of teaching experience have enabled the teacher to effectively engage students in Physics practical activities, years of teaching experience have enabled the teacher to effectively manage the classroom during Physics practical activities. Therefore, years of Experience & Teacher's Competency impact the effective teaching of Physics practical in Senior Secondary School II in Ovia North LGA of Edo State.

The findings from the analysis of the items from research question 4 revealed that respondents agreed that Low interest and motivation levels among students doesn't make the teaching of Physics practical ineffective

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary

The study investigated the key factors influencing the effective teaching of physics practicals in senior secondary schools in Ovia North-East Local Government Area, Edo State. The research focused on examining the availability of laboratory equipment practical manuals, lab technicians and attendance, teachers' competency in performing Physics practicals, students' engagements, and administrative support. Data was collected through surveys and interviews with teachers, students and administrators to identify major challenges and their impact on students' learning outcomes.

Findings revealed that inadequate laboratory equipment, absence of lab technicians, lack of alternative power sources, poor funding, and insufficient time allocation for practical sessions were major obstacles. Additionally, students exhibited a lack of interest and motivation towards Physics practicals due to poor exposure and limited hands-on experience.

5.2 Conclusion

The study concludes that the effectiveness of teaching Physics practicals in senior secondary schools is significantly hindered by infrastructural deficiencies, lack of laboratory technicians and lab attendance, and poor student engagement. Without adequate resources and proper instructional strategies, students struggle to grasp fundamental physics concepts, affecting their performance in both practical and theoretical aspects of the subject.

5.3 Recommendations

To improve the teaching and learning of physics practicals in senior secondary schools, the following recommendations are proposed:

1. Provision of Adequate Laboratory Equipment: The government and school authorities should invest in equipping physics laboratories with modern and functional apparatus.
2. Employment of Qualified Physics Teachers: More trained and experienced physics teachers should be recruited and provided with regular professional development programs.
3. Increased Funding for Science Education: Schools should receive adequate financial support to maintain and upgrade laboratory facilities.
4. More Time Allocation for Practical Sessions: School timetables should include sufficient time for hands-on experiments to reinforce theoretical lessons.
5. Encouraging Student Engagement: Teachers should adopt interactive teaching methods, demonstrations, and real-life applications to stimulate students' interest in physics practicals.
6. Policy Implementation and Monitoring: Educational stakeholders should implement policies that ensure compliance with practical-based teaching standards and conduct regular supervision to improve teaching quality.

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APPENDIX I

DEPARTMENT OF CURRICULUM AND INSTRUCTIONAL TECHNOLOGY

FACULTY OF EDUCATION, UNIVERSITY OF BENIN, BENIN CITY

QUESTIONNAIRE ON

"IDENTIFICATION OF FACTORS AFFECTING THE EFFECTIVE TEACHING OF PHYSICS PRACTICAL IN SENIOR SECONDARY SCHOOL II IN OF EDO STATE"

TEACHERS' QUESTIONAIRE

Dear Respondent,

This research is for the purpose of identifying the factors affecting the effective teaching of Physics practical in senior secondary school II in Edo State. It is purely an academic exercise and a final year project which is part of the requirement for B.Sc/B.Ed certificate in Education and Physics in the university of Benin.

Your response will be treated with high degree of confidentiality. Your cooperation in this regard is highly appreciated. Thank you.

SECTION A

Name of School: ……

Gender: …….

Age: …….

SECTION B

1. Educational Qualification:

N.C.E { }, H.N.D { }, B. Sc/Ed { } B.Sc { }, M.Sc Ed { }, Ph. D { }

Others please specify: ……

2. Teaching experience:

1-5 years { }, 6-10 years { } 11-15 years { }, above 15 years { }

3. What method of teaching are you using in teaching physics practical?

Lecture method { } Experimental method { }

Demonstration method { } Audio-visual Method { }

Others please specify: …….

4. How do you rate the performance of your students in practical work?

Good { } Bad { } Average { }

SECTION C

Instruction: below are items on factors affecting the effective teaching of Physics practical in senior secondary schools. Carefully indicate which option describes your thoughts and experiences by ticking any of Strongly Agree (SD), Agreed (A), Disagree (D), and Strongly Disagree (SD)

S/N	Items	S.A	A	D	S.D
1.	There are sufficient practical manuals in my school.				
2.	We have a lab technician in my school.				
3.	We have lab attendance in my school.				
4.	Professional development programs have significantly improved my teaching strategies for Physics practicals.				
5.	My students have a Comprehensive Physics practical textbook.				

6.	My students have mastered alternatives to practical physics textbooks.				
7.	My years of teaching experience have enabled me to effectively engage students in physics practical activities.				
8.	My years of teaching experience have equipped me to effectively utilize available resources to support my teaching of physics practicals.				
9.	My years of teaching experience have enabled me to effectively manage the classroom during physics practical activities.				
10.	I struggle to monitor and assess individual students due to large class sizes.				
11.	My school does not have alternative power sources (e.g., generators, solar panels) which makes me unable to conduct experiments that involve electrical circuits, electromagnetism, and optics.				
12.	Poor monitoring and evaluation of teaching standards in Physics practicals lead to inconsistent practical learning experiences.				

SECTION D

Instruction: below are items on the impact of availability of laboratory facilities, and student engagement on effective teaching of Physics practicals in Senior Secondary School II. Carefully

indicate which option describes your thoughts and experiences by ticking any of Strongly Agree (SD), Agreed (A), Disagree (D), and Strongly Disagree (SD)

S/N	Items	S.A	A	D	S.D
13.	Inadequate laboratory equipment like accumulators, cell batteries, convex mirrors, and concave mirrors leads to limited student participation.				
14.	Lack of maintenance and insufficient funding for Physics apparatus like resistance boxes, stopwatches, ammeters, and voltmeters makes it difficult to conduct experiments regularly.				
15.	Poor laboratory conditions discourage active participation, making it challenging for students to grasp experimental concepts effectively.				
16.	Low interest and motivation levels among students make my teaching of Physics practical ineffective.				

APPENDIX II

STUDENTS' QUESTIONNAIRE

Dear Respondent,

This research is for the purpose of identifying the factors affecting the effective teaching of Physics practical in senior secondary school II in Edo State. It is purely an academic exercise and a final year project which is part of the requirement for B.Sc/B.Ed certificate in Education and Physics in the university of Benin.

Your response will be treated with high degree of confidentiality. Your cooperation in this regard is highly appreciated. Thank you.

SECTION A

Name of School: ……

Gender: …….

Age: …….

SECTION B

Instruction: below are items on factors affecting the effective teaching of Physics practical in senior secondary schools. Carefully indicate which option describes your thoughts and experiences by ticking any of Strongly Agree (SD), Agreed (A), Disagree (D), and Strongly Disagree (SD)

S/N	ITEMS	S.A	A	D	S.D
1	We use an empty classroom building as a laboratory in my school.				

2	We frequently visit the Physics laboratory.				
3	We have physics practical textbooks in my school.				
4	There is no accumulator for conducting Physics practicals on electricity.				
5	There is no rectangular glass Prism for conducting Physics practicals on Waves.				
6	I have problems with calculations related to practical work.				
7	I have a problem with the setting of the apparatus.				
8	We never visit the Physics laboratory in my school.				
9	My Physics teacher’s years of experience make their teaching of practicals more effective.				
10	My Physics teacher's participation in professional development programs improves the quality of their teaching in practice.				
11	My Physics teacher’s years of experience helped me understand complex concepts in physics practicals.				
12	My Physics teacher's years of experience helped them manage the classroom effectively during practicals.				
13	I have a problem writing a Physics practical report.				
14	There is no space in the Physics laboratory for easy movement.				