Laboratory practical interest as a correlate of students' perceived competence and academic performance in practical chemistry

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(*Corresponding Author*)

Victor Oluwatosin Ajayi[1]
Samuel Terver Agamber[2]
Rachael Folake Ameh[3]
Musa James Adejoh[4]

[1]*Department of Science Education, Prince Abubakar Audu University, Anyigba, Nigeria.*
[1]*Email: drvictorajayi@gmail.com*
[2]*Department of Biology Education, College of Education Oju, Benue State, Nigeria.*
[2]*Email: terversamuel2016@gmail.com*
[3]*Department of Science Education, Federal University Lokoja, Kogi State, Nigeria.*
[3]*Email: ameh4comfort@gmail.com*
[4]*Department of Biology Education, Joseph Sarwuan Tarka University, Makurdi, Nigeria.*
[4]*Email: adejohmj@gmail.com*

ABSTRACT

The study examined the correlation between students' laboratory practical interest and thier perceived competence and academic performance in the context of practical chemistry. The study adopted a correlational research design. Laboratory Practical Interest Questionnaire (LPIQ), Perceived Competence Scale (PCS) and Chemistry Practical Performance Test (CPPT) were the instruments used for data collection. A sample of 179 students drawn from 4 schools in Anyigba, Kogi State, Nigeria was selected using multi-stage sampling techniques. Pearson correlation was used to answer the research questions and null hypotheses that guided the study. The study revealed that there was a significant correlation between students' laboratory practical interest and perceived competence, particularly in their ability to solve practical chemistry related questions (r =.881, P<0.005). Students who are genuinely interested in laboratory practical are more engaged in active learning because students' interest fuel their perceived competence, making students more persisted through challenges and put in the necessary effort to learn and achieve higher academic performance in practical chemistry. Thus, science teachers should use innovative learning strategies to foster students' interest and school authorities should provide infrastructure and 21st century laboratory facilities needed by science teachers to maintain students' interest in laboratory practical.

Keywords: *Laboratory practical interest, Perceived competence, Academic performance, Practical chemistry.*

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Highlights of this paper

- The purpose of the research was to investigate the correlation between laboratory practical interest and students' perceived competence and academic performance in the context of practical chemistry in Anyigba, Kogi State, Nigeria, using correlational research design.
- The correlation between students' laboratory practical interest and thier perceived competence and academic performance was measured by administration of the instruments (LPIQ, PCS and CPPT) to a sample of 179 students drawn from 4 schools in Dekina LGA was selected using multi-stage sampling techniques
- A significant positive correlation was found between students' laboratory practical interest and their perceived competence ($r = .881$, $P<0.005$) and academic performance ($r = .832$, $P<0.005$) respectively in the aspect of practical chemistry.

1. INTRODUCTION

Laboratory practical work is a hands-on learning approach where students conduct experiments, observations and investigations in a laboratory setting. It complements theoretical knowledge by allowing students to apply concepts and develop practical skills. Laboratory practical work is a key component of chemistry that helps students to understand scientific processes, develop self-competence and critical thinking (Ajayi & Ogbeba, 2017). In other words, laboratory practical work is a distinctive technique for teaching and learning chemistry because it allows students to observe and manipulate things, thereby arousing their interest to show specific parts of the subject matter learned in class through discussions and textbooks. Chemistry laboratory practical can provide opportunities to learn how to manipulate apparatus and carry out chemical experiments. Thereby, enhancing students' laboratory skills and scientific understanding. Roberts (2008) opines that practical laboratory activity appear as a way of allowing students to actively participate in the process of constructing knowledge through hands-on experimentation. Laboratory practical work is a vital component of scientific study especially chemistry because it provides students with real-life applications of theoretical knowledge.

One of the main goals of chemistry laboratory practical work is to improve students' understanding of chemical concepts. Despite the emphasis of scholars such as Ajayi and Ogbeba (2017); Roberts (2008); Abrahams and Millar (2020); and Ameh, Sor and Ajayi (2025) on the importance of laboratory practical work for effective understanding of scientific concepts, interest of students and teachers in chemistry laboratory practical work remain low which often blamed on lack of necessary laboratory resources, limited time, and poor commitment. Interest is seen as been enthusiastic towards one's feeling of want properly and the potential to generate or preserve such attention. In this study, laboratory practical interest might be conceived as the students' natural curiosity for chemistry laboratory practical works. Interest in laboratory practical stems from students potential or curiosity to engage in a more active and hands-on learning experience, leading to deeper understanding of concept. Interest in laboratory practical activity may allow students to apply practical knowledge gained to real-word situations, fostering a more meaning learning process because interest in laboratory practical activities may offer students the opportunity to physically interact with apparatus, making learning more concrete and retainable. However, Enebechi (2019) noted that some chemistry teachers do neglect to perform chemistry practical alongside every topic covered in class until few days before examinations, when they will hurriedly use West Africa Examination Council (WAEC) specimens to conduct practical for their students.

WAEC Chief Examiners' report (2023/2024) on Chemistry result indicates that students had poor performance in chemistry especially in practical chemistry aspect, despite formal teaching. Adewunmi (2024) opine that lack of interest, fear of laboratory accident, lack of practical skills, insufficient resource and ineffective teaching methods may contribute to students' poor academic performance in chemistry especially in the context of practical chemistry.

Contradictory, Taber (2024) opine that most students seem to enjoy laboratory practical work due to activities such as the mixing of chemicals and working with beakers and test-tubes that perhaps seems to offer a taste of being a scientist. Despite this, students' level of perceived competence in solving problem related to practical chemistry is appear to have persisted which is often blamed on the level of students' interest in chemistry laboratory practical work. Perceived competence is a psychological construct based on self-evaluation of one's effectiveness or capability to effectively interact with their environment and achieve their goals.

Perceived competence refers to beliefs, judgements, and feelings about one's physical abilities and competencies. In other words, perceived competence is an individual or self-perception of their talents and capacity to manage their surroundings or circumstance are referred to as perceived competence. It refers to how skilled effective a person believes they are in a certain scenario. Individuals usually select tasks that are appropriate for their skill level (Ajayi, Ameh, & Alabi, 2025). In this study, perceived competence can be explained as self-evaluation of one's capabilities and skills in solving problems related to practical chemistry. According to Babajide (2023) students low perceived competence that, they don't have the capability needed to complete the cognitive-ability test or specific academic task has also been attributed to the students' level of interest in such task. By implication, students' interest in laboratory practical work may facilitate or debilitate their perceived competence in solving problems related to practical chemistry.

Studies by Okeke (2019) and Thomas and Mohammed (2024) found that learning interest is a strong determinant factor of academic performance students in biology and mathematics respectively. In the same vein, Ajayi and Audu (2023) and Arhin and Yanney (2020) found that high academic performance has a link with interest in biology among students in a technology-enhanced learning environment and mathematics respectively. Hence, scarcity of study on the correlation between laboratory practical interest and perceived competence and academic performance has informed this study. Thus, the study investigated if laboratory practical interest has any correlation with students' perceived competence and academic performance in practical chemistry in Anyigba, Kogi State, Nigeria.

1.1. Purpose of the Study

The purpose of this study is to investigate the correlation between laboratory practical interest and students' perceived competence and academic performance in the context of practical chemistry in Senior Secondary Schools in Dekina LGA of Kogi State, Nigeria. Specifically, the study seeks to:

1. Determine if laboratory practical interest is a correlate of students' perceived competence in practical chemistry.
2. Determine if laboratory practical interest is a correlate of students' academic performance in practical chemistry.

1.2. Research Questions

The following research questions were used to guide the study:

1. What is the correlation between laboratory practical interest and students' perceived competence in practical chemistry?
2. What is the correlation between laboratory practical interest and students' academic performance in practical chemistry?

1.3. Hypotheses

The following null hypotheses were tested:

1. There is no significant correlation between laboratory practical interest and students' perceived competence in practical chemistry.
2. There is no significant correlation between laboratory practical interest and students' academic performance in practical chemistry.

2. RESEARCH DESIGN AND PROCEDURE

This research adopted the correlational research design. The choice of this design is informed by the fact that the correlational design seeks to establish what relationship exists between two or more variables. The study area is Anyigba, Kogi State, Nigeria. Anyigba is a town in Dekina Local Government Area of Kogi State located between latitudes $7^0$15'N - $7^0$29'N and longitudes $7^0$11'E - $7^0$32'E and with an average altitude of 385 meters above sea level and total land mass area of 420 Sq. Km^2 and has an estimated population of 189, 976 (National Population Commission, 2016). The major ethnic groups in Anyigba are Igala, Ebira, Gbagyi, Okun (Yoruba), Bassa, Nupe, Ogori, Igbo, Idoma, Hausa and so on.

The population for this study comprises all the students offering chemistry in senior secondary school two in Anyigba, numbering 6,837 students from all the 56 approved senior secondary schools in Anyigba (Kogi State Teaching Service Commission, 2022). The sample of this study was made up of 179 Senior Secondary 2 students that were drawn from 4 schools in Dekina Local Government Area of Kogi State, Nigeria using purposive sampling technique. The 4 senior secondary schools used includes Christ the Good Shepherd academy Anyigba, Elegant science academy Anyigba, Muslim high school Anyigba, and Mater Misericordiae International secondary school, Anyigba.

Laboratory Practical Interest Questionnaire (LPIQ), Perceived Competence Scale (PCS), and Chemistry Practical Performance Test (CPPT) were the instruments used for data collection. Laboratory Practical Interest Questionnaire (LPIQ) was a researcher made 30 items inventory which was intended to help students express their interest toward practical chemistry instruction. Each of the items is a 4-point Likert modified rating scale with 4 response options. The options are NI (Not Interested), SI (Slightly Interested), MI (Moderately Interested) and VI (Very Interested). The items were developed from information acquired through review of relevant literature by the researchers. Perceived Competence Scale (PCS) is a researcher made 30 items questionnaire which is intended to help students express their perceived competence in solving questions related to practical chemistry. The PCS assesses students' feelings of competence in engaging and solving problem in the context of practical chemistry. Each of the items is a 4-point Likert-rating scale with 4 response options. The options are Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). Chemistry Practical Performance Test (CPPT) is a 30 items tests made of short practical activities which students are expected to carry out the laboratory activities, then make their observation and draw inferences. LPIQ, PCS and CPPT items were developed from information acquired through review of relevant literature by the researchers.

The instruments were validated by 2 experts in Science Education and 1 expert in Measurement and Evaluation. The experts scrutinized the instruments in the areas such as general content validation, clarity, simplicity of language and scope or coverage of each variable. The experts made relevant suggestions for improvement. Upon validation were trial-tested to establish the reliability of the instruments. Cronbach Alpha was used to ascertain the reliability index of Laboratory Practical Interest Questionnaire (LPIQ), Perceived Competence Scale (PCS) and Chemistry Practical Performance Test (CPPT) which gave reliability values of 0.86, 0.89 and 0.87

respectively. However, According to Ajayi (2023) the coefficients of 0.50-0.99 indicate that the instruments are reliable. During the main study, the instruments were administered to the 179 respondents using the direct contact approach in order to minimize non-response from respondents. This method enabled the researcher and his assistants to thoroughly explain the purpose, importance and confidentiality of all information involved to respondents. Copies of the LPIQ and PCS were given to each of the respondents to fill and short laboratory experiments were carried to answer the CPPT. The instruments were administered and return the same day of visit to any four senior secondary schools used to avoid the lost of questionnaires or test answers. Pearson Product Moment Correlation (PPMC) was used to answer the research questions and test the null hypotheses.

3. RESULTS

Presentations in this section are based on research question and null hypotheses.

3.1. Research Question 1

What is the correlation between laboratory practical interest and students' perceived competence in practical chemistry? The answer to research question one is presented on Table 1.

Table 1. Correlation analysis between laboratory practical interest and perceived competence.

Variables	N	Mean x	Std.dev δ	R	Remark
Laboratory practical interest	179	3.1478	0.56740	0.881**	**Strong correlation**
Perceived competence	179	3.2668	0.63071		

Note: ** $p < 0.05$.

Table 1 reveals the correlation between laboratory practical interest and students' perceived competence in practical chemistry. The result indicated that there is a strong positive correlation between laboratory practical interest and students' perceived competence (r =.881). This implies that as laboratory practical interest changes, students' perceived competence also changes in a strong magnitude. The simple scatterplot graph of correlation between laboratory practical interest and perceived competence revealed a trendline with a positive correlation (that is the higher students' interest in laboratory practical works, the higher their perceived competence in solving problems in the context of practical chemistry) as shown in Figure 1.

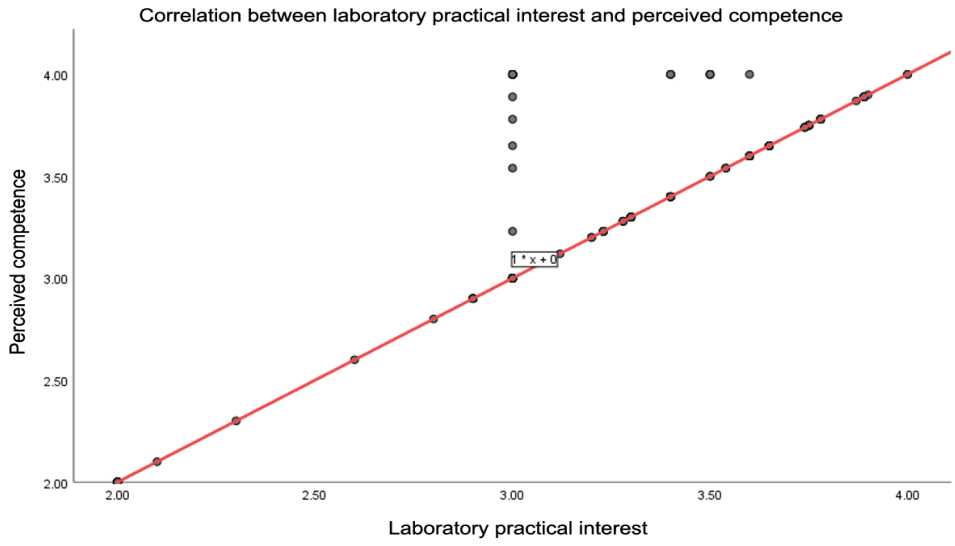

Figure 1. Scatterplot graph of correlation between laboratory practical interest and perceived competence.

3.2. Research Question 2

What is the correlation between laboratory practical interest and students' academic performance in practical chemistry? Research question two is presented on Table 2.

Table 2. Correlation analysis between laboratory practical interest and academic performance.

Variables	N	Mean x	Std.dev δ	R	Remark
Laboratory practical interest	179	3.1478	0.56740	0.832**	Strong correlation
Academic performance	179	22.5642	6.33176		

Note: ** $p < 0.05$.

Table 2 reveals the correlation between laboratory practical interest and students' academic performance in practical chemistry. The result indicated that there is a strong positive correlation between laboratory practical interest and students' academic performance (r =.832). This implies that as laboratory practical interest changes, students' academic performance also changes in a strong magnitude. The simple scatterplot graph of correlation between laboratory practical interest and academic performance revealed a trendline with a positive correlation (that is the higher students' interest in laboratory practical works, the higher their academic performance in the context of practical chemistry) as shown in Figure 2.

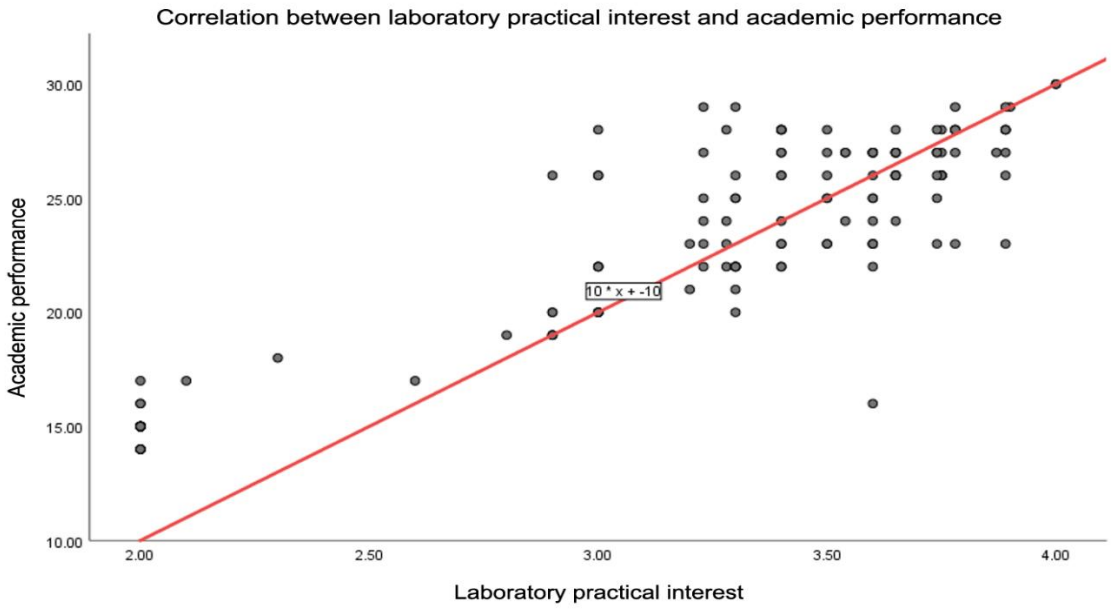

Figure 2. Scatterplot graph of correlation between laboratory practical interest and academic performance.

3.3. Hypothesis One

There is no significant correlation between laboratory practical interest and students' perceived competence in practical chemistry. The answer to hypothesis one is presented on Table 3.

Table 3. Pearson correlation between laboratory practical interest and perceived competence.

Variables	N	r	$p-value$	Remark
Laboratory practical interest	179			
Correlation 'r'		0.881**	0.000	Significant
Perceived competence	179			

Note: ** $p < 0.05$.

Table 3 presents Pearson correlation test result for the laboratory practical interest and students' perceived competence in practical chemistry. The data in Table 3 reveal that the Pearson product correlation of laboratory practical interest and students' perceived competence was found statistically significant (r =.881, P<0.005). Hence, the null hypothesis that there is no significant correlation between laboratory practical interest and students' perceived competence was rejected. This implies that there is a significant correlation between laboratory practical interest and students' perceived competence in practical chemistry.

3.4. Hypothesis Two

There is no significant correlation between laboratory practical interest and students' academic performance in practical chemistry. The answer to hypothesis two is presented on Table 4.

Table 4. Pearson correlation between laboratory practical interest and academic performance.

Variables	N	r	$p-value$	Remark
Laboratory practical interest	179			
Correlation 'r'		832**	0.000	**Significant**
Academic performance	179			

Note: ** p < 0.05.

Table 4 presents Pearson correlation test result for the laboratory practical interest and students' academic performance in practical chemistry. The data in Table 3 reveal that the Pearson product correlation of laboratory practical interest and students' academic performance was found statistically significant (r =.832, P<0.005). Hence, the null hypothesis that there is no significant correlation between laboratory practical interest and students' academic performance was rejected. This implies that there is a significant correlation between laboratory practical interest and students' academic performance in practical chemistry in Dekina Local Government Area of Kogi State, Nigeria.

4. DISCUSSION OF FINDINGS

This research investigated the correlation between laboratory practical interest and students' perceived competence and academic performance in the context of practical chemistry in Dekina Local Government Area, Kogi State, Nigeria. Finding of this study revealed that there was a significant correlation between laboratory practical interest and students' perceived competence in practical chemistry. Though, there was scarcity of studies on correlation between laboratory practical interest and perceived competence of students in solving practical chemistry related problems. However, this finding is in line with Chen (2024) who examined the effect of learning interest on academic performance of secondary school students. The author revealed that learning interest is a strong determinant factor of academic performance of secondary school students in Zhuhai, China. Okeke (2019) investigated the influence of chemistry practical on students' interest and academic achievement. The author concluded that practical chemistry exercises triggered interest and also promoted higher academic achievement in Awgu education zone.

In the same vein, Thomas and Mohammed (2024) who investigated the relation between students' interest and academic performance in secondary students in learning mathematics online. The authors concluded that students' interest in mathematics was strongly correlated with their performance in mathematics online. Thus, the likely explanation for this outcome may also be connected to the fact that interest is a powerful motivational process that energizes learning, guides academic and carrier trajectories, and is important to academic success. By implication, students interest highlights students' stable preference for laboratory practical works. Here, the immediate

experience of interest reflects a well-developed student's preference to enjoy and value laboratory practical works. Students interest in laboratory practical works is, therefore, a stable, underlying deposition activated during a class on practical chemistry, whether the practical chemistry lesson is entertaining or not, because their interest is more developed and less dependent on situational factors and thereby resulting to higher perceived competence in solving problems related to practical chemistry.

Finding of this study revealed that correlation between correlation between laboratory practical interest and students' academic performance in practical chemistry was statistically significant. However, this finding is in line with the study of Arhin and Yanney (2020) who investigated the relationship between students' interest and academic performance in Mathematics in Agogo State College. The finding of authors revealed that most students do not have interest in mathematics performed poor in mathematics examination while those students who students believe that mathematics has relevance in one's life and one's academics performed higher in mathematics examinations. Yunus and Ali (2018) conducted a study on attitude toward learning chemistry among secondary school students in Malaysia. The result of the study revealed that majority of the students has a positive attitude toward learning chemistry when they conduct chemistry experiments in the laboratory. Similarly, Ajayi and Audu (2023) conducted a study with primary aim of examining a possible association between interest and biology performance among students in a technology-enhanced learning environment. In the study, correlational analyses showed that interest was significantly correlated to biology performance among the students who had lower biology performance. Thus, student interest in laboratory practical work act as a vital motivator, encouraging students to learn and engage in practical chemistry. The level of students' interest in practical laboratory work can be linked to their sense of competence. When students enjoy practical laboratory work or activities, they feel more capable of performing tasks, solving problems and understanding practical chemistry concepts. Hence, this self-perception of competence can enhance students' academic performance in the context of practical chemistry. By implication, students with a strong interest persevere more through challenges and remain focused in practical chemistry and thereby enhancing their competence and academic performance in the context of practical chemistry examination(s) such as external examinations conducted by West African Senior Secondary Certificate Examination (WASSCE) and National Examination Council (NECO).

5. CONCLUSION

It is evident from the findings of this study that students' laboratory practical interest has a strong positive correlation with their perceived competence and academic performance respectively in practical chemistry. High interest of students in laboratory practical can lead to improve understanding of scientific concepts, improved skills, and higher academic performance in practical chemistry examinations especially in external examinations such as West African Senior Secondary Certificate Examination (WASSCE) and National Examination Council (NECO). By implication, this means that there will be an improvement in students' competence and academic performance in the context of practical chemistry respectively, if there is an improvement in students' interest in laboratory practical work and the reverse will be the case if there is a decrease in their interest in laboratory practical work. Based on the conclusion, the following recommendations were made.

1. Chemistry teachers should be encouraged to create a supportive and encouraging learning environment that promotes students' interest in laboratory practical in order to foster their competence and academic performance

2. Chemistry teachers should use innovative learning strategies to foster students' interest and school authorities should provide 21st century infrastructure and quality laboratory facilities needed by science teachers to maintain or promote students' interest in laboratory practical.
3. Students who have phobia for laboratory practical works in chemistry should seek counseling on chemistry laboratory protective measures so as to increase their interest in laboratory practical work and invariably enhance their perceived competence and academic performance in practical chemistry.
4. School authorities and Ministry of Education should motivate teachers through incentives and professional development training grants so that they may assist students in learning laboratory practical skills to increase students' interest in studying practical chemistry to foster competence and academic performance.

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