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# ASSESSMENT OF DETERMINANTS FOR EFFECTIVE TEACHING AND LEARNING OF PHYSICS ON ACADEMIC PERFORMANCE AMONG SENIOR SECONDARY SCHOOL IN KATAGUM ZONE, BAUCHI STATE

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## Abstract

The study assesses the determinants of effective teaching and learning of physics on academic performance among senior secondary school in Katagum Zone, Bauchi State, Nigeria. The study adopted a descriptive survey research design, population of the study consists of all 35 physics teachers and 19200 physics students from 48 public secondary schools in Katagum Zone. Due to their manageable size entire 35 physics teachers were used in the study and sample of 218 students, selected using simple random sampling technique were used in the study. 5 points-Likert scale Teachers-Disposition Questionnaire and students' end-of-term examination results were the instruments used for data collection. The questionnaire was validated by experts from Faculty of Education, Sa'adu Zungur University Bauchi. The reliability of the questionnaire was determined using Cronbach's Alpha method, and reliability coefficient of 7.5 was obtained. The data collected was analyzed using frequency count and mean to answer the research question and Pearson Product Moment Correlation to test the hypotheses at 0.05 level of significant. The findings of the study

**Keywords:** Assessment of Determinants; Academic Performance; Teaching and Learning; Teacher's disposition; Equipment for teaching physics.



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revealed that; teachers' disposition and equipment for teaching and learning physics influences students' academic performance in physics to high extent. The finding also revealed that, there is significant relationship between teachers' disposition, equipment for teaching and learning physics and students' academic performance in physics. Based on the findings it was recommended that, to improve students' academic performance, the government at all levels should contribute to school requirements while good standard or current teaching and learning equipment.

## Introduction

Physics, as one of the core science subjects in secondary education that plays critical role in technological advancements and national development. Physics is one of the requirements for admission to study science-related courses in institutions of higher learning, such as in medicine, engineering, and physical science, due to its significance and application. The study of the interaction between matter and energy in all of its manifestations is called physics. According to Assem et al., (2023) physics is a branch of science that focuses on the nature and properties of both matter and energy and how they interact. The topics covered in physics include mechanics, heat, light, sound, electricity, magnetism, and the structure of atoms. Physics is a discipline that students learn by experience, giving them the chance to observe and experiment, apply knowledge of what they learnt to solve theoretical and practical problems in real life situation, discover, and explore their environment, and further develop their talents.

Consequently, Physics is considered as the most fundamental among all natural science subjects and its wide and diverse application in many sectors of economic development such as security, health, entertainment, Information and Communication Technology (ICT) the teaching and learning of physics have become a great concern to educationalists (Olusola et al., 2020). National Policy on Education (NPE, 2013) specified the acquisition of basic literacy in physics by secondary school students as one of the ways to prepare the students for functional living in the society. It is crucial that students perceive the physics in their everyday lives and understand how knowing physics may enhance the beauty of the world, rather than merely memorizing abstract concepts like grocery lists or song lyrics (Akinbobola & Adesokan, 2021).

With all the roles Physics plays in the scientific, economic, social and technological development of every nation Njan and Ubana (2024) reported that students' academic performance in Physics is not encouraging. This problem of poor students' academic performance has been attributed to numerous factors that includes teachers' inability to



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consider and linked students' previous knowledge with new knowledge, students' lack of background on physics concepts, students' lack of interest or negative attitude towards physics, poor teacher preparation, inadequate qualified physics teachers, inadequate instructional materials, teachers' inability to pay attention to students' individual differences and learning characteristics and application of ineffective teaching methodologies (Josiah et al., 2020; Peni et al., 2022). This implies that, number of factors can affect a secondary school student's performance in physics, so it's critical for parents and teachers to encourage their children's study and help them build a solid foundation in the subject. It is evident from the aforementioned data that nearly all of the researchers studied in other regions of the nation, with only a small number focusing on secondary schools in Nigeria's Bauchi North Senatorial District and a small number on universities, polytechnics, and colleges of education. Consequently, this motivated the investigation into the study in Government secondary schools in Katagum Zone of Bauchi State, the challenge of poor achievement in physics is particularly pronounced. Teachers' pedagogical practices, students' attitudes towards learning physics, inadequate facilities, and lack of laboratory equipment have been widely identified as central to this issue. While previous research has examined these determinants in isolation, there is limited empirical work assessing how these determinants interact to shape students' performance in physics.

**Statement of the Problem**

Teachers are expected to possess positive professional dispositions such as enthusiasm, commitment, creativity, and effective pedagogical skills that stimulate students' curiosity and interest in physics concepts. Students, on their part, should exhibit positive attitudes toward learning physics, participate actively in lessons, and apply scientific reasoning to real-life situations. Moreover, schools should be adequately equipped with modern laboratories, instructional facilities, and functional equipment that enable practical, hands-on experiences (Olufunke, 2022). However, the actual situation in many secondary schools deviates significantly from this ideal. Recent studies reveal that many physics teachers demonstrate low professional motivation, poor teaching dispositions, and limited commitment to innovative instructional methods (Ede, 2024). As a result students often develop negative attitudes toward physics, perceiving it as abstract, difficult, and irrelevant to everyday life which translates to poor academic performance. Therefore, there is a critical need to assess the determinants of effective teaching and learning of physics on academic performance among senior secondary school in Katagum Zone, Bauchi State, Nigeria.



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**Objectives of the Study**

The objective of the study was to assess the determinants of effective teaching and learning of physics on academic performance among senior secondary school in Katagum Zone, Bauchi State, Nigeria. The specific objectives are to:

1. To examine the influence of teachers' dispositions on students' academic performance in physics.
2. To investigate the extent to which equipment for teaching and learning physics influences students' academic performance in physics.

**Research Questions**

The following research questions were formulated to guide this study.

1. To what extent does teachers' disposition influences students' academic performance?
2. To what extent do equipment for teaching and learning physics influences students' academic performance?

**Hypotheses**

The following null hypotheses were postulated to be tested at 0.05 level of significance:

**$H_{01}$.** There is no significant relationship between teachers' disposition and students' academic performance in Physics.

**$H_{02}$.** There is no significant relationship between equipment for teaching and learning physics and students' academic performance.

**Literature Review**

The role of physics to making the world a worthwhile place to live and elevating the status of several nations are too numerous to list. Physics expertise contributed to the development of devices like X-rays, which are used to take pictures of a patient's interior structure and treat cancer, and ultrasounds, which scan the human body for diagnosis at hospitals and other healthcare facilities, among other uses. In order to have a sufficient foundation and knowledge in physics that will be required for the advancement and development of science and technology, students must have an understanding of physics concepts through effective teaching, proper curriculum implementation, and adequate instructional strategies (Mankilik & Mailafiya, 2024). Effective teachers are known to have a significant impact on a large number of young people by giving them confidence and assurance when they need it most. Students who feel safe, appreciated, and involved in the school community will learn more effectively and contribute to a better culture by encouraging positive attitudes and behaviors (Olaoluwa, Sunday, & Hamisu, 2025).



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Teacher disposition refers to the attitudes, beliefs, values, professionalism, and related behaviours that teachers bring into their teaching practice (e.g., enthusiasm, beliefs about student capacity, work ethic, and commitment). Several empirical studies in Nigeria and elsewhere show that aspects of teacher disposition are meaningfully connected to how well students perform in physics (Afolakemi & Babalola, 2020; Olufisayo, 2024). Quality of teachers' implementation of curriculum has greater effect on the academic performance of students. Regardless of how well-resourced the school is or how extensive the curriculum is, teaching methods also have a significant impact on students' academic progress as well as how easier for a misconception is to be dispelled.

**Methodology**

The study employed descriptive survey research design. Descriptive survey research design is a research design used for the purpose of gathering information about variables from a representative sample of the population (Eggon et al., 2024). This design is appropriate in this study because the researcher has no control over teachers and students and it also enables the researcher to collect data from the respondents through the use of questionnaire. The population of this study consists of all thirty five (35) physics teachers and nineteen thousand two hundred (19200) Physics students from the forty-eight (48) public secondary schools within Katagum Zone of Bauchi State. Due to their manageable size all the 35 physics teachers were used in the study and sample of 218 students drawn from the population using Krejcie and Morgan's (1970) table of sample size determination and the samples of the study were selected using simple random sampling technique.

A 5 point-Likert scale self-develop structured Teachers-Disposition Questionnaire and students' end-of-term examination results were the instrument used for data collection. The questionnaire was validated by three experts for face and content validation, two in Physics Education and one expert from the Test, Measurement and Evaluation Unit, Educational Foundation, Faculty of Education, Sa'adu Zungur University Bauchi. The reliability of the questionnaire was obtained using Cronbach's Alpha method, and reliability coefficient of 7.5 was obtained. The data collected for the study was analyzed using descriptive statistics of frequency count and mean to answer the research question and inferential statistics of Pearson Product Moment Correlation to test the hypotheses at 0.05 level of significant.

**Results**

**Research Question 1:** To what extent does teachers' disposition influences students' academic performance?



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Table 1: Mean distribution of respondents rating on the extent to which teachers' disposition influences students' academic performance

| S/n | Statements | SA | A | N | D | SD | N | Mean | Decision |
|---|---|---|---|---|---|---|---|---|---|
| | | 5 | 4 | 3 | 2 | 1 | | $\bar{X}$ | |
| 1. | I motivate students to develop interest in physics. | 14<br>70 | 11<br>44 | 5<br>15 | 3<br>6 | 2<br>2 | 35<br>133 | 3.80 | Accepted |
| 2. | I attend workshops or training related to physics teaching. | 10<br>50 | 12<br>48 | 6<br>18 | 4<br>8 | 3<br>3 | 35<br>127 | 3.63 | Accepted |
| 3. | I use a variety of teaching methods to make lessons effective. | 17<br>85 | 10<br>40 | 4<br>12 | 2<br>4 | 2<br>2 | 35<br>143 | 4.08 | Accepted |
| 4. | I always prepare my lesson plan before teaching physics. | 16<br>80 | 11<br>44 | 3<br>9 | 3<br>6 | 2<br>2 | 35<br>141 | 4.03 | Accepted |
| 5. | I assess students regularly to monitor progress. | 12<br>60 | 14<br>56 | 5<br>15 | 3<br>6 | 1<br>1 | 35<br>138 | 3.94 | Accepted |
| 6. | I use real-life examples to explain physics concepts. | 19<br>95 | 10<br>40 | 4<br>12 | 2<br>4 | 0<br>0 | 35<br>151 | 4.31 | Accepted |
| 7. | I maintain a positive relationship with my student. | 15<br>75 | 12<br>48 | 4<br>12 | 2<br>4 | 2<br>2 | 35<br>141 | 4.03 | Accepted |
| | **Grand mean** | | | | | | | **3.83** | **Accepted** |

Source: Field work, 2025

Table 1 presents the mean distribution of respondents rating on the extent to which teachers' disposition influences students' academic performance in Physics. The mean responses of all the seven items listed in Table 4.2 ranges from 4.31 – 3.63. Since the mean benchmark point is 3.00, it can therefore, be deduced that the responses analysis revealed that all the seven items on the questionnaire were accepted to influences students' academic performance in Physics. The analysis revealed the mean score of each statement as "I motivate students to develop interest in physic (mean of 3.80)", "I attend workshops or training related to physics teaching (mean of 3.63)", "I use a variety of teaching methods to make lessons effective (mean of 4.08)", "I always prepare my lesson plan before teaching physics (mean of 4.03)", "I assess students regularly to monitor progress (mean of 3.94)", "I use real-life examples to explain physics concepts (mean of 4.31)" and "I maintain a positive relationship with my student (mean of 4.03)". The grand mean score of the responses was 3.8 which was greater than the benchmark point of 3.00. This implies that, the responses analysis revealed that, teachers' disposition influences students' academic performance to high extent.



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**Research Question 2:** To what extent does equipment for learning physics influences students' academic performance?

Table 2: Mean distribution of respondents rating on the extent to which equipment for learning physics influences students' academic performance

| S/n | Statements | SA<br>5 | A<br>4 | N<br>3 | D<br>2 | SD<br>1 | N | Mean<br>$\bar{X}$ | Decision |
|---|---|---|---|---|---|---|---|---|---|
| **14.** | Students are allowed to use the laboratory equipment under supervisions. | 12<br>60 | 14<br>56 | 4<br>12 | 3<br>6 | 2<br>2 | 35<br>136 | 3.88 | Accepted |
| **15.** | Faulty instruments are repaired promptly. | 10<br>50 | 9<br>36 | 6<br>18 | 4<br>8 | 6<br>6 | 35<br>118 | 3.37 | Accepted |
| **16.** | Practical lessons are conducted as scheduled. | 7<br>35 | 6<br>24 | 7<br>21 | 8<br>16 | 7<br>7 | 35<br>103 | 2.94 | Rejected |
| **17.** | The available physics apparatus are sufficient for practical lessons. | 11<br>55 | 10<br>40 | 8<br>24 | 3<br>6 | 3<br>3 | 35<br>128 | 3.66 | Accepted |
| **18.** | The apparatus are in good working condition. | 12<br>60 | 11<br>44 | 6<br>18 | 4<br>8 | 2<br>2 | 35<br>135 | 3.77 | Accepted |
| **19.** | I regularly demonstrate experiments using the apparatus. | 8<br>40 | 7<br>28 | 10<br>30 | 5<br>10 | 5<br>5 | 35<br>113 | 3.23 | Accepted |
| **20.** | There are enough measuring instruments in the laboratory. | 6<br>30 | 6<br>24 | 5<br>15 | 10<br>20 | 8<br>8 | 35<br>97 | 2.77 | Rejected |
| | **Grand mean** | | | | | | | **3.37** | **Accepted** |

Source: Field work, 2025

Table 2 presents the mean distribution of respondents rating on the extent to which equipment for teaching and learning physics influences students' academic performance in Physics. The mean responses of all the seven statements listed in Table 8 ranges from 3.88 – 2.77. Since the mean benchmark point is 3.00, it can therefore, be deduced that, the responses analysis shown that only statements 16 "practical lessons are conducted as scheduled (mean of 2.94) and statement 20 "there are enough measuring instruments in the laboratory (mean of 2.77) on the questionnaire were rejected. The remaining five statements on the questionnaire were accepted to influences students' academic performance in Physics. The analysis revealed the mean score of each statement as "students are allowed to use the laboratory equipment under supervisions (mean of 3.88)", faulty instruments are repaired promptly (mean of 3.37)", "the available physics



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apparatus are sufficient for practical lessons (mean of 3.66)", "The apparatus are in good working condition (mean of 3.77)" and "I regularly demonstrate experiments using the apparatus (mean of 3.23)". The grand mean score of the responses was 3.37 which was greater than the benchmark point of 3.00. This implies that, the responses analysis revealed that equipment for teaching and learning physics influences students' academic performance in Physics to high extent.

**Hypothesis One:** There is no significant relationship between teachers' disposition and students' academic performance in Physics.

Table 3: Pearson Product Moment Correlation's Analysis of Teachers' Disposition and Students' Academic Performance in Physics

| | | Teachers' Disposition | Students' Performance |
|---|---|---|---|
| **Teachers' Disposition** | Pearson Correlation | 1 | .173** |
| | *P* (2-tailed) | | .024 |
| | N | 35 | 35 |
| **Students' Performance** | Pearson Correlation | .173** | 1 |
| | *P* (2-tailed) | .024 | |
| | N | 35 | 218 |

Correlation is significant at the 0.01 level (2-tailed).

Result presented in Table 3 presents the relationship between teachers' disposition and students' academic performance in Physics which was investigated using Pearson Product Moment Correlation. The result revealed that, (Pearson Correlation coefficient **r** = 0.173, *P* = 0.024) since the *P* value 0.024 is less than the 0.05 level of significance (*P* < 0.05) this implies that, there was significant relationship between teachers' disposition and students' academic performance in Physics. Therefore, it was concluded that, the hypothesis one which states that "There is no significant relationship between teachers' disposition and students' academic performance in Physics" was rejected. Therefore, there is significant relationship between teachers' disposition and students' academic performance in Physics. This implies that, the positive correlation suggests that as teachers' disposition increases, students' academic performance in Physics also tends to increase, which is counterintuitive. It was concluded that, teachers' disposition greatly influence the students' academic performance.

**Hypothesis Two:** There is no significant relationship between equipment for teaching and learning physics and students' academic performance.

Table 4: Pearson Product Moment Correlation's Analysis of Equipment for Teaching and Learning Physics and Students' Academic Performance in Physics

| | | Teaching and Learning Equipment | Students' Performance |
|---|---|---|---|
| **Teaching and Learning Equipment** | Pearson Correlation | 1 | . 695** |
| | *P* (2-tailed) | | .000 |



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| | | Teaching and Learning Equipment | Students' Performance |
|---|---|---|---|
| | N | 35 | 35 |
| **Students' Performance** | Pearson Correlation | . 695** | 1 |
| | *P* (2-tailed) | .000 | |
| | N | 35 | 218 |

Correlation is significant at the 0.01 level (2-tailed).

Result presented in Table 4 presents the relationship between equipment for teaching and learning physics and students' academic performance in Physics which was investigated using Pearson Product Moment Correlation. The result revealed that, (Pearson Correlation coefficient **r** = 0.695, *P* = 0.000) since the *P* value 0.000 is less than the 0.05 level of significance (P < 0.05) this implies that, there was significant relationship between equipment for teaching and learning physics and students' academic performance in Physics. Therefore, it was concluded that, the hypothesis two which states that "there is no significant relationship between equipment for teaching and learning physics and students' academic performance in Physics" was rejected. This implies that, the positive correlation suggests that as equipment for teaching and learning physics increases, students' academic performance in Physics also tends to increase, which is counterintuitive. It was concluded that, the equipment for teaching and learning physics greatly influence the students' academic performance.

**Discussion of Findings**

This study assesses the determinants of effective teaching and learning of physics on academic performance among senior secondary school in Katagum Zone, Bauchi State. Finding from the first objective of the study revealed that, teachers' disposition influences students' academic performance in Physics (0. 024 < 0.05). This finding is in accord with that of Oviawe (2016); Oluwalola and Ogbudinkpa (2022); Fu and Huang (2024) who conducted studies on the influence of teachers' disposition influences students' academic performance and found significant relationship between teachers' disposition and students' academic performance. This implies that relationship exist between teachers' disposition and students' academic performance in physics as teachers' disposition include high level of creativity in analyzing, synthesizing and presenting knowledge in new and effective ways. It should instill in the learners the ability to be analytical, intellectually curious, culturally aware, employable and capable of leadership. Therefore, for teachers' disposition is a great predictor of students' academic success. However, this finding is in conflicts with that of Adeola, and Oviawe (2009) who asserted that students' academic performance do not reflect the quality of instruction because teachers' input is not the only factor that influences students' academic performance in schools.



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Finding from the second objective of the study revealed that, there is significant relationship between equipment for teaching and learning physics and students' academic performance in Physics (0.000 > 0.05). This finding is in harmony with that of Somba and Otieno (2022); Oparaji et al., (2023) who reported a significant relationship between equipment for teaching and learning and students' academic performance. Therefore, equipment for teaching and learning provide learning experiences in addition to academic success of the students. It could be revealed that well-equipped teaching facilities, such as laboratories, libraries, audio-visual aids, and technology resources, provide students with hands-on experiences and opportunities to engage with the subject matter more effectively. This implies that, for effective performance of educational programmes, the school equipment for teaching and learning and educational goals should be viewed as being closely interwoven and interdependent.

## CONCLUSION

Based on the findings, assess the determinants of effective teaching and learning of physics on academic performance among senior secondary school in Katagum Zone, Bauchi State, Nigeria conclude that teachers' disposition and equipment for teaching and learning physics have impacts on the academic performance of physics students. The study deduced that incompetent teachers and outdated or unavailability of teaching and learning equipment can have negative influence on the students' academic performance.

## RECOMMENDATION

Based on the findings of the study, the study recommended that; Government through the Ministry of Education should organize and provide opportunities for training and re-training programmes through seminars, workshops and conference in order to increase teachers' effectiveness in order to improve students' academic performance. Modern equipment for teaching and learning physics should made available in schools to ensure students' learning success.

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