
IMPACT OF PERCEIVED DIFFICULT CONCEPTS ON STUDENTS' INTEREST AND ACHIEVEMENTS IN PHYSICS IN SECONDARY SCHOOLS IN BENUE STATE, NIGERIA

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ABSTRACT

This study was carried out mainly on the impact of perceived difficult concepts on students' interest and Achievements in Physics in Secondary Schools in Benue state, Nigeria. Three research instruments were used for data collection. These include Physics Difficult Concepts Assessment Questionnaire (PDCAQ), Physics Interest Inventory (PII) and Physics Achievement Test (PAT). The population of the study was 120,780 SS3 students, which was made up of 72,468 males and 48, 312 females. A sample of 398 students from secondary schools in Benue State was drawn using Taro Yamane formula. Data collected was analyzed using means, standard deviation, linear regression and independent sample t-test statistics, The result of the analysis was supported with four hypotheses. The hypotheses that students perceive difficult concepts do not significantly affect male and female students' achievement in Physics is rejected; the data suggests that perceived difficulty does have a significant impact on physics achievement, with male students out performing female students. The study concluded that difficult concepts in physics have impact on students' interest and achievement. This therefore recommended that physics teachers should have more time on difficult concepts to enable students understand better.

KEYWORDS: Achievement, Impact, Interest, Perceived difficult concepts.

INTRODUCTION

The task of teaching and learning is demanding, especially in science subjects where abstract concepts often challenge students' understanding. Obafemi and Onwioduokit (2013)

observed that when students fail to understand concepts they perceive as difficult, they tend to lose interest in the subject, which eventually leads to poor academic achievement. This makes it important for teachers to adopt strategies that can stimulate students' interest and enhance their understanding of science concepts in order to improve performance.

Science is widely regarded as the foundation for national development in modern societies (Buah & Akuffo, 2017). Among the science subjects, Physics occupies a central position as it deals with the study of matter and energy and explains natural phenomena in their fundamental form (Farinde et al., 2015). Physics also plays a critical role in technological advancement and helps students acquire important skills such as problem-solving, numerical reasoning, and critical thinking. However, despite its importance, Physics is often perceived as difficult by students due to its abstract nature and the inclusion of complex concepts (Bello, Opaleye & Olatunde, 2018).

Several Physics concepts such as waves, electricity, magnetism, vectors, pressure, and nuclear physics are commonly identified as difficult for students (Otor, Achor & Musa, 2015). These difficulties are often linked to the abstract nature of the subject and the heavy use of mathematical principles, which make understanding more challenging (Aderonmu & Adolphus, 2021). Physics teaching in many schools tends to focus more on theoretical knowledge rather than practical understanding, thereby making it harder for students to grasp the "how" and "why" of concepts.

In Nigeria, students' performance in Physics has remained persistently poor, as reflected in public examinations such as WAEC and NECO (Chief Examiner's Report, 2022). Statistics show low enrolment and poor achievement in Physics compared to other science subjects like Biology and Chemistry. Research has also shown that a large proportion of Physics concepts in the senior secondary curriculum are considered difficult by students, which contributes significantly to their poor performance (Onwioduokit, 2013). This suggests that students' difficulty in understanding Physics concepts is a major factor affecting achievement in the subject.

Globally, similar challenges exist as students in different countries also struggle with Physics concepts such as motion, vectors, and electricity (Fisher, 2019). These difficulties are often attributed to teaching methods, textbooks, and the abstract nature of the subject. In many cases, the way Physics is taught does not adequately promote deep conceptual understanding, thereby limiting students' ability to apply knowledge effectively (Ornek, Robinson & Haugan, 2018).

Interest plays a crucial role in learning and academic achievement. It determines the level of attention, motivation, and effort students put into learning activities. Abakpa (2011) noted that interest energizes learning and enhances meaningful understanding. When students are interested in a subject, they are more likely to engage actively and achieve better results. Interest may be situational or long-term, but in both forms, it significantly influences learning outcomes (Kurt, 2021). Studies have also shown that lack of interest in Physics contributes to low performance and poor participation in the subject (Buabeng, Ossei-Anto & Ampiah, 2014).

Academic achievement refers to the extent to which learners accomplish educational goals and is often measured through performance in examinations. It is influenced by various factors such as interest, motivation, teaching methods, and individual differences (Suvarna & Bhata, 2015). In Physics, students' achievement has remained low despite its importance to national development. This poor achievement has been linked to factors such as teaching approaches, perceived difficulty of concepts, and lack of interest among students (Uchegbu et al., 2016).

Gender has also been identified as a factor influencing students' achievement and interest in Physics. Studies have shown that male students often perform better than female students in Physics due to environmental and societal factors, including lack of encouragement and gender stereotypes (Morgan & Aboagye, 2022). This imbalance further affects students' participation and achievement in the subject.

In conclusion, despite the importance of Physics in technological and national development, students continue to perform poorly due to perceived difficulty of concepts and low interest. These challenges are further influenced by teaching methods, gender differences, and the abstract nature of the subject. Therefore, there is a need to examine how perceived difficult Physics concepts affect students' interest and academic achievement in secondary schools in Benue State.

Statement of the Problem

Physics is one of the core subjects in Nigerian secondary school curriculum for students offering sciences at the senior secondary school level. It is by extension one of the subjects combination for studying science and technology at an advanced level, and as such any country willing to grow in technology advancement must imbibe the culture of teaching and learning physics seriously. The recent results of physics examinations conducted by WAEC, NECO and NABATEB (between year 2019 and 2021) continuously turned out to be poor.

The mass failure in physics over the years may impede the desire of the government of Nigeria's dreams to becoming one of the most advanced technological nations in the near future. The above argument becomes a question to ponder whether it is the physics concepts perceived difficult by students that have brought about the mass failure in physics. This is invariably affecting the enrolment of students at the higher institutions to study technology-related courses.

The researcher, therefore, embarks on this research to determine the impact of perceived difficult concepts in physics in Benue State, to ascertain whether it is the real cause of poor achievement by the students in physics. The researcher seeks also to determine the level of interest of male and female students on the perceived difficult concepts in physics. It is based on the above constraints, that, this study is poised to determine the impact of perceived difficult concepts on students' interest and achievements in physics in secondary schools in Benue State.

Objectives of the Study

The purpose of this study is to determine the impact of perceived difficult concepts on students interest and achievements in physics in secondary schools in Benue State. Specifically, the study sought to:

1. Identify physics concepts perceived to be difficult by secondary school students.
2. Determine the impact of perceived difficult concepts on secondary school students' interest in Physics.
3. Determine the impact of perceived difficult concepts on secondary school students' achievement in Physics.

Research Questions

The study was guided by the following research questions:

1. What are the Physics concepts perceived to be difficult by secondary school students?
2. What is the impact of the perceived difficult concepts on secondary school students' academic interest in Physics?
3. What is the impact of the perceived difficult concept on secondary school students' achievement in Physics?

Hypotheses

To achieve the objectives of this study, the following hypotheses were formulated and tested at 0.05 level of significance.

H₀₁: Perceived difficult concepts do not have significant impact on students' interest in Physics.

H₀₂: Perceived difficult concepts do not have significant impact on students' achievement in Physics.

METHOD

The study adopted a correlation survey research design. The population comprised 120,780 Senior Secondary Three (SS3) Physics students from 681 government and government grant-aided secondary schools in Benue State across the three educational zones. A sample of 398 SS3 students was drawn using the Taro Yamane formula, while six co-educational schools were selected through a combination of purposive and simple random sampling techniques to ensure fair representation across the zones and gender balance.

Three instruments were used for data collection in the study: Physics Difficult Concepts Assessment Questionnaire (PDCAQ), Physics Interest Inventory (PII), and Physics Achievement Test (PAT). The PDCAQ was developed by the researcher to assess students' perceived difficult Physics concepts, while the PII was adapted and modified to measure students' interest in Physics. The PAT was constructed from the SS1–SS3 Physics scheme of work to assess students' academic achievement in Physics. The reliability coefficients obtained for the instruments were 0.87 for PDCAQ, 0.83 for PII, and 0.89 for PAT. Research questions were answered using mean and standard deviation, while regression analysis and independent t-test were used to test the null hypotheses at 0.05 level of significance.

RESULT

Research Question 1: What are the Physics concepts perceived to be difficult by secondary school students?

Table 1: Mean and Standard deviation of Perceived Difficult Concepts in Physics.

S/N	Items	\bar{x}	S.D	Decision
1.	Motion	2.63	0.87	Agreed
2.	Forces	2.26	1.00	Disagreed
3.	Gravity	2.04	1.28	Disagreed
4.	Density and Pressure	2.77	0.96	Agreed
5.	Moments	2.83	0.84	Agreed
6.	Conditions for Equilibrium	2.50	1.10	Agreed
7.	Work	2.12	0.73	Disagreed
8.	Energy	1.82	1.14	Disagreed
9.	Power	1.93	0.88	Disagreed
10.	Concept of Temperature	2.39	0.80	Disagreed
11.	Thermometric Properties	2.61	1.14	Agreed

12. Concept of Heat	2.33	0.98	Disagreed
13. Heat Capacity	2.20	1.01	Disagreed
14. Specific Heat Capacity	2.00	0.84	Disagreed
15. Latent heat	1.97	1.08	Disagreed
16. Conduction	2.41	0.92	Disagreed
17. Convection	1.87	1.03	Disagreed
18. Radiation	2.44	0.90	Disagreed
19. Wave Phenomena	2.15	0.86	Disagreed
20. Resonance	2.41	1.07	Disagreed
21. Vibration in Strings and Pipes	2.56	0.75	Agreed
22. Laws of Reflection	2.42	0.85	Disagreed
23. Laws of Refraction	2.46	0.80	Disagreed
24. Lenses	2.43	0.86	Disagreed
25. Wave Nature of Light	1.98	0.87	Disagreed
26. Electromagnetic Spectrum	1.78	0.80	Disagreed
27. Electricity	2.12	1.17	Disagreed
28. Electromagnetism	2.39	0.94	Disagreed
29. Electron	2.37	0.87	Disagreed
30. Radioactivity	2.55	1.04	Agreed
Grand Mean	2.29	0.95	

Results in table 1 shows that the following Physics concepts; motion, density and pressure, moments, condition for equilibrium, thermometric properties, vibration in strings and pipes and radioactivity were agreed by the students as the perceived difficult concepts in Physics with mean scores of 2.63, 2.77, 2.83, 2.50, 2.61, 2.56 and 2.55 with standard deviations of 0.87, 0.96, 0.84, 1.10, 1.14, 0.75, and 1.04 respectively. However, of the 30 concepts, 7 were perceived to be difficult and 23 were not perceived to be difficult.

Research Question 2: What is the impact of perceived difficult concept on secondary school students' interest in Physics?

Table 2: Descriptive Statistics of Perceived Difficult Concepts and Students' Interest in Physics.

Variable	N	Mean	Standard Deviation
Perceived Difficult Concepts	398	2.21	0.41
Students' Interest	398	1.35	0.31

The descriptive statistics, as presented in the analysis in table 2, reveal a mean score of 2.21 for perceived difficult concepts with a standard deviation of 0.41. This suggests that students generally perceive Physics as moderately difficult, and their responses were relatively consistent across the sample. On the other hand, the mean score for students' interest in Physics was 1.35 with a standard deviation of 0.31. Given that the scale for measuring

interest is assumed to range from low to high (with 1 typically representing low interest), this result indicates that students generally expressed a low level of interest in Physics. The comparison of these findings suggests that a higher perception of difficulty in Physics concepts may be associated with a diminished interest in the subject. In other words, when students view Physics as conceptually challenging, their motivation to engage with the subject appears to decline.

Research Question 3: What is the impact of perceived difficult concepts on secondary school students’ academic achievement in Physics?

Table 3: Descriptive Statistics of Perceived Difficult Concepts and Students’ Academic Achievement in Physics.

Variable	N	Mean	Standard Deviation
Perceived Difficult Concepts	398	2.21	0.41
Students’ Academic Achievement	398	45.99	11.90

Analysis in table 3 revealed a mean score of 2.21 for perceived difficult concepts, indicating that, on average, students moderately perceive Physics concepts as difficult. The standard deviation of 0.41 suggests a relatively consistent perception among respondents. In terms of academic achievement, the students recorded a mean score of 45.99 with a standard deviation of 11.90, reflecting a generally low level of achievement and a wide variability in achievement across the sample. The juxtaposition of these findings suggests a potential inverse relationship between the perception of difficulty and academic achievement in Physics. That is, students who perceive Physics concepts as more difficult tend to perform less well in the subject. This trend highlights the significant influence that cognitive perceptions can have on learning outcomes. When students approach a subject with the belief that it is inherently difficult, it may hinder their motivation, engagement, and ultimately their performance.

Research Hypothesis 1: Students perceived difficult concept do not significantly affect their interest in Physics

Table 4: Regression Analysis showing the Impact of Perceived Difficult Concepts on Students’ Interest in Physics.

Model	df	F	B	t	Sig
1 Regression	1	182.100		.000 ^b	
Residual	396				
Total	397				

1 (Constant)	.591	5.497	.000
Perceived Difficult Concept	.022	13.494	.000

In table 4, the linear regression analysis was conducted to show the impact of perceived difficult concepts on students' interest in Physics. The overall model was not statistically significant, $F(1, 396) = 182.100$, $p < .005$, and the predictor (perceived difficult concepts) was significant ($B = .022$, $t = 13.494$, $p < .005$). Therefore, the null hypothesis was rejected and the alternative hypothesis which states that students perceived difficult concepts significantly affect their interest in Physics was accepted. This simply means that, when students think physics concepts are hard to understand, it has a big impact on how interested they are in the subject and conversely, when they find the difficulty engaging, their interest might increase.

Research Hypothesis 2: Students perceived difficult concepts do not significantly affect their achievement in Physics

Table 5: Regression Analysis showing the Impact of Perceived Difficult Concepts on Students' Achievement in Physics.

Model	df	F	B	t	Sig
1 Regression	1	.210	.647 ^b		
Residential	396				
Total	397				
1 (Constant)		47.479	5.497	.000	
Perceived Difficult Concept		-.023	-.459	.647	

In table 5, the linear regression analysis was conducted to show the impact of perceived difficult concepts on students' achievement in Physics. The overall model was statistically significant, $F(1, 396) = .210$, $p = .647$ which is greater than 0.05, and the predictor (perceived difficult concepts) was not significant ($B = -.023$, $t = .459$, $p = .647$). Hence $p > 0.05$, the null hypothesis which states that, students perceived difficult concept do not significantly affect their achievement in physics was accepted. This means that, how difficult students think physics concepts are, does not have a major impact on their grades or performance in the subject.

DISCUSSION

The result revealed that the concept perceived by secondary school students as difficult concepts are motion, density and pressure, moments, condition for equilibrium, thermometric

properties, vibration in strings and pipes, and radioactivity. This finding is in line with the findings of Bello, *et al.* (2018) who investigated Perceived Difficult Concepts in Physics among Senior Secondary School Students in Ife Central Local Government Area of Osun State and disclosed that, Simple Harmonic Motion; Projectile; Waves; and Gas laws among others concepts of Physics were mostly considered difficult by students.

Also, the study showed that, students who perceive Physics concepts as more difficult tend to perform less well in the subject. However, result in table 6 revealed that, how difficult students think physics concepts are, does not have a major impact on their grades or achievement in the subject. This result is not in agreement with the findings of Pember (2014) who reported in his study that, there exist a significant correlation between perceived difficulty and lower academic performance. This suggests that when students perceive concepts as overly challenging, their performance may suffer due to cognitive overload and decreased self-efficacy. However, the finding is in line with the findings of Dawud (2015) who found out in his study that, while students often perceive physics as a challenging subject, their actual academic performance is more closely linked to other factors such as teaching quality and study habits, rather than their perceived difficulty of the concepts.

The findings revealed that when students view Physics as conceptually challenging, their motivation to engage with the subject appears to decline. Also, when students think physics concepts are hard to understand, it has a big impact on how interested they are in the subject and conversely, when they find the difficulty engaging, their interest might increase. This result is in line with the findings of Bello *et al.* (2018) who investigated the perceived difficult concepts in Physics among senior secondary school students in Ife Central Local Government Area of Osun State and stated in their findings that, the perception of difficult concepts in Physics had a level of influence on secondary school students' interest in the subject.

CONCLUSION

This study examined how secondary school students' perceptions of difficult Physics concepts affect their interest and academic achievement. It identified topics such as motion, density and pressure, equilibrium, thermometric properties, vibrations, and radioactivity as commonly perceived as difficult. While these perceptions did not significantly hinder overall academic achievement, they were found to reduce students' interest and engagement in the subject, with both male and female students showing low enthusiasm. The findings also revealed that although male students perceived Physics as slightly more difficult, they

generally performed better than their female counterparts. Overall, the study concludes that improving students' perceptions of difficult Physics concepts through effective teaching strategies is essential for enhancing their interest and academic success.

Recommendations

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

1. Physics Teachers should integrate interactive and visual teaching tools to demystify complex physics concepts such as motion, density, and radioactivity. Utilize simulations, diagrams, and hands-on experiments in lesson plans. Regularly seek student feedback to gauge understanding and adjust teaching methods accordingly to student-base.
2. School Administrators should support the development and implementation of targeted professional development programs for teachers to address difficult physics concepts and gender disparities by organizing workshops that is focused on advanced instructional techniques and gender-sensitive teaching practices. Also, school administrators should allocate resources for these professional development initiatives.
3. Curriculum Developers should design a curriculum that incorporates differentiated instruction strategies to address the diverse learning needs and perceptions of students regarding difficult physics concepts. These should include a range of instructional materials and approaches in the curriculum that cater to various learning styles and levels of difficulty. Also, they should regularly review and update the curriculum based on student performance data and feedback.
4. Educational Policy Makers should design policies that promote equitable access to supplementary educational resources and support programs for students struggling with difficult physics concepts.

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