TEACHERS' PERCEPTIONS OF THE DETERMINANTS AND IMPLICATIONS OF STUDENTS' UNDER-PERFORMANCE IN PHYSICS PUBLIC EXAMINATIONS IN ILORIN METROPOLIS, NIGERIA

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Abstract

This study analysed the perception of physics teachers towards the determinants and implications of students' under-performance in physics public examinations with a view to proffering evidence-based solutions. The study employed a quantitative descriptive survey research type. Purposive sampling technique was used to select Ilorin Metropolis from Kwara State. Simple random sampling technique by means of lottery method was used to select a sample size of 20 physics teachers in public secondary schools within Ilorin metropolis, one limitation being the security challenge at the satellite towns and suburbs. Instruments for data collection included validated structured questionnaire entitled 'Questionnaire on Physics Teachers' Perception of Determinants and Implications of Secondary School Students Under-performance in Physics Public Examinations. Coefficient of reliability was calculated using Cronbach's Alpha as 0.75. Descriptive statistics of frequency, percentages and mean were used to answer the two research questions that guided the study. The study revealed that teachers have relatively high perception of the determinants, implications and possible remedies for students' under-performance in Physics public examinations with mean scores ranging from 2.70 to 3.45. The study recommends continuous professional development for in-service physics teachers and result-oriented and specialized preparation programme for pre-service physics teachers. Others include the urgent need to provide and maintain well-equipped physics laboratories in schools offering physics, students to be motivated for good performance in physics public examinations through scholarships and teachers to use innovative instructional delivery strategies such as project-based learning, cooperative learning, flipped classroom, virtual and augmented reality, blended learning and gamification.

Keywords: Causes and effects of students' under-performance, physics public examinations, physics teachers' perception, STEM-related fields

Introduction

Physics is one of the fundamental science subjects in the Nigerian secondary school curriculum and vital for various fields of science, technology, engineering and mathematics (STEM). Such fields include renewable energy, information technology, genetics, biotechnology, artificial intelligence, environmental, data and computer science and variegated engineering applications. Physics plays prominent role in the development of scientific and technological competencies in students through its basic laws and theories describing the behaviour of energy, matter, space and time (Yusuf

et al., 2024). From the way people's smartphones work to the forces that keep airplanes in the sky, physics helps mankind to make sense of the world. From the motion of planets to the behaviour of atoms, physics enables the conceptualization of how things work in the physical world. At its core, **physics education enables the development of structured critical thinking, problem-solving, and analytical skills,** which are valuable even beyond the classroom (Mwima & Ounyesiga, 2025). Understanding physics enables individuals to make informed decisions regarding energy consumption, medical issues, renewable energy, artificial intelligence and other technological innovations. Many global challenges, such as climate change, energy crisis, conflicts, regional/ food insecurities and space exploration all require physics-based solutions and the making of a physics-literate society (Dahal', 2022). Teaching-learning of physics is essentially aimed at equipping the students with knowledge, competencies, attitudes and innovative ideas and fostering of problem-solving skills, inculcating scientific literacy and inspiring of innovative ideas for technological and scientific breakthrough (Mamedu et al., 2024).

Despite the value attached to the subject, students' performance in physics public examinations in Nigeria has been consistently below expectations over the years. The West African Examinations Council (WAEC), the National Examinations Council (NECO) and the National Business and Technical Examinations Board (NABTEB) have reported low credit pass rates in physics (Ogunbiyi & Oni, 2017), (Awodun, 2021), (Job & Paul, 2022) and (Ismaila & Rilwanu, 2025). The low students' performance in physics public examinations has raised concerns amongst educators, policymakers and other stakeholders in the education industry; and with a far-reaching implication for the country's scientific and technological advancement. The determinants and implications of students' under-performance in physics public examinations have become a recurring topic of discussion amongst educators and researchers.

Various factors have been found to contribute to the under-performance which include inadequate teaching resources, shortage of modern ICT learning tools/gadgets, poor teaching methodologies, lack of students' motivation and insufficiency of physics laboratories and infrastructural facility (Awodun, 2021). But there is a need to examine teachers' perceptions of these factors. Teachers play a significant role in the teaching-learning process and are well positioned to provide useful insights into the challenges faced by students (Mekonnen, 2014). An effective and efficient physics teacher facilitates learning by guiding students in exploring physics concepts, conducting experiments and encouraging inquiry-based learning in addition to mentoring and motivating students for curiosity and growth mindset (Mamedu et al., 2024). An effective and efficient physics teacher also integrates technology, real-world examples and deploys innovative teaching strategies to make the subject engaging and relevant. Therefore, a good understanding of teachers' perceptions of the determinants and implications of students' under-performance in physics is vital for developing effective strategies to improve students' learning outcomes in the subject.

One effective approach to strengthening the connection between physics education and science literacy is hands-on learning, where students conduct experiments and engage in inquiry-based activities (Lawal et al., 2023. Project-based learning and

science competitions can also make physics more engaging by showing its real-world applications. The use of technology can further enhance understanding by making abstract concepts more concrete. Virtual labs, simulations, and interactive digital tools, such as augmented reality models of electric fields or planetary motion, could help students visualize complex ideas more effectively (Dahal', 2022). Another strategy is cross-disciplinary learning, which demonstrates the relevance of physics by connecting it to fields like environmental science, healthcare, robotics, and computer programming. Public engagement in science should be encouraged through activities such as science fairs, public lectures, and debates on scientific topics. These events allow students to see the practical applications of physics in everyday life, fostering a deeper appreciation and passion for the subject (Mwima & Ounyesiga, 2025). Furthermore, to improve learning outcomes, Physics teachers could implement techniques such as segmentation (breaking complex topics into smaller parts), dual coding (combining verbal and visual explanations), and reducing unnecessary information to optimize cognitive load. On the other hand, students are expected to engage actively in the segmented lessons, process information and connect concepts as well as utilize visuals and texts using dual coding technique, combining diagrams, charts and images with written explanations (Sumeracki, 2019). These strategies could help students focus on key concepts, prioritize information to reduce mental overload. This approach is supported by the theory of Attribution as propounded by Weiner (1985).

The Attribution theory as originated by Weiner (1985) assumes that individuals attribute their successes and failures to various factors which include either or both of internal or external causes, temporary or permanent factors and controllable or uncontrollable causes. Attributions such as ability, luck, task difficulty level, factors within or beyond one's control have capacity to influence motivation, emotion and future behaviour (Zuo et al., 2022). This theoretical framework explains how teachers attribute students' under-performance to internal and external factors. These attributions tend to influence teachers' expectations, emotions and actions which consequently affect students learning outcomes. The internal factors could be student-related, while the external factors could be circumstances-related. Teachers might attribute students' under-performance in physics to internal factors such as lack of efforts, low interest or poor motivation in physics with the implication of focusing attention on fixing the students, rather than examining their own practices (Lawal et al., 2023). Teachers might attribute students' failure in physics to external factors such as inadequate resources/ infrastructure or difficult examination format with the implications that teachers feel less responsible for the students' under-achievement. This is not just a statistical issue but one that affects academic progress and future of students who desire to pursue career in STEM related fields. Understanding teachers' perception of the determinants and implications of students' under-performance in physics is necessary in tackling the challenges faced by students, teachers, and the society at large.

Several studies have applied Attribution theory to determine teachers' perceptions of students low learning outcomes in science subjects including physics. Research findings suggest that teachers often tend to attribute students' difficulties to internal, stable factors such as ability or personality, rather than external or controllable factors as teaching methods or efforts (Wang & Hall, 2018). A study by Weiner (1985)

observed that teachers who attribute students' failure to low ability might provide less encouragement and assistance, thereby perpetuating a cycle of poor performance. Some other studies have explored the relationship between teacher attributions and students' motivation and found that teachers' emphasis on efforts and some controllable factors could foster a growth mindset and improve students' academic performance (Jager & Denessen, 2015). One vital finding from these studies include teachers attributing students' failure to internal and stable factors such as ability level, personality rather than external or controllable factors such as teaching methods and efforts. Other finding being that teachers' attributions have capabilities of influencing their instructional behaviours, with those attributing failure to low ability providing less assistance and encouragement (Ocal et al., 2025). Students could be motivated for growth mindset and improved academic performance by emphasizing efforts and controllable factors.

Statement of the Problem

The persistent decline in performance of secondary school students in physics, particularly in public examinations in Nigeria poses a serious educational concern to stakeholders in education. Despite the crucial role of physics as a cornerstone in scientific and technological transformation of nations, many students have demonstrated lack of interest and motivation towards the subject. The consequence of the situation is a shortage of physics entrepreneurs needed to drive innovation and address local challenges. Inability of physics graduates to translate theoretical concepts and principles learnt into practicality, functionality and relevance has raised doubts as to the determinants and implications as well as remedies to the problem. The WAEC Chief Examiners' reports on Physics (2017, 2018, 2019, 2020, 2021, 2022, 2023), with a focus on performance trends indicate that while the Physics examination has maintained a consistent standard in terms of structure, quality, and syllabus coverage, students' performance has shown fluctuations over the years. Candidates continue to struggle with theoretical applications, problem-solving, data interpretation, and graphical representation of physics concepts and principles. While some factors have been identified to be the determinants of this under-performance, this study investigated teachers' perception of these factors. The study therefore examined and analysed teachers' perception of the determinants and implications of students' under-performance in physics public examinations in Ilorin Metropolis, Nigeria.

Research questions

The following research questions were formulated and guided the study:

1. What are physics teachers' perception of the factors contributing to students' under-performance in physics public examinations in Ilorin Metropolis, Nigeria?
2. What are the implications of students' performance in physics for academic and career prospects as perceived by the teachers?

Methodology

This study adopted a descriptive survey research type and the population constitutes physics teachers in public secondary schools within Ilorin Metropolis, Kwara State. It was carried out between March and June 2025. Ilorin Metropolis was purposively selected for the study as heightened insecurity at the satellite towns and suburbs posed a limitation. A simple random sampling technique by means of drawing names of schools from a hat (lottery method) was employed to select a sample size of 20 physics

teachers. The instrument for data collection was researcher-developed and validated structured questionnaire entitled 'Questionnaire on Physics Teachers' Perception of Determinants and Implications of Secondary School Students Under-performance in Physics Public Examinations'. The questionnaire focused on different items that evaluated the determinants of under-performance in physics and the implications. The clarity, effectiveness, and comprehensiveness of the instruments in measuring the variables of the study were checked by Physics lecturers in the Department of Science Education, University of Ilorin and the psychometric properties of the test items were validated by experts in Measurement and Evaluation. The internal consistency was calculated using Cronbach's Alpha and Coefficient of reliability gotten as 0.75. Informed consents were sought from the participants before administering the questionnaire. The data collection process spanned two weeks, with all completed questionnaires being collected immediately after the participants had finished filling them. Responses were rated on a Likert's scale beginning with 'Strongly Agree' (SA) to 'Strongly Disagree' (SD) with weights of 4, 3, 2 and 1 assigned respectively. The benchmark mean is 2.5. The data collected was coded, sorted and analysed using descriptive statistics of frequency count, percentage, mean and standard deviation.

Results

Research Question 1: What are physics teachers' perception of the factors contributing to students' under-performance in physics public examinations in Ilorin Metropolis, Nigeria.

From Table 1 below, most teachers in Ilorin Metropolis secondary schools believe they have adequate qualifications and training to teach Physics effectively, with 45% strongly agreeing and 55% agreeing, and none disagreeing or strongly disagreeing with a mean score of 3.45. A majority also believe outdated teaching methods contribute to students' poor performance in Physics, with 70% strongly agreeing and 10% agreeing, while 10% disagree and 10% strongly disagree. For item 3 on integrating technology, pedagogy and content knowledge being a cause of students' under-performance, recorded 25% disagreeing and 45% strongly disagreeing with a mean score of 2.00. For limited professional development opportunities being a hinderance to adopting innovative teaching strategies, 15% strongly agreed and 40% agreed, while 25% disagree and 20% strongly disagree with a mean score of 2.50.

For item 5, most teachers in Ilorin Metropolis, secondary schools do not agree that their schools have well-equipped physics laboratory for practical Physics lessons, with only 10% strongly agreeing and 35% agreeing, while 50% disagreeing and 5% strongly disagreeing and with a mean score of 2.50. A majority believe that a lack of instructional materials, such as textbooks and multimedia tools, affects their ability to teach Physics, with 35% strongly agreeing and 45% agreeing, compared to 15% disagreeing and 5% strongly disagreeing and with a mean score of 3.10. Similarly, most teachers report that inadequate laboratory facilities limit students' understanding of Physics concepts, with 25% strongly agreeing and 60% agreeing, while 15% disagree and none strongly disagree and a mean score of 3.10.

Based on item 8, most teachers in Ilorin Metropolis, secondary schools believe that students' perception that Physics is difficult leads to poor performance in examinations, with 50% strongly agreeing and 40% agreeing, while 10% disagree and none strongly disagree and with a mean score of 3.40. A majority also report that

students are motivated when Physics is taught with practical demonstrations, with 35% strongly agreeing and 55% agreeing, compared to 0% disagreeing and 10% strongly disagreeing and with a mean score of 3.15. Similarly, most teachers note that negative attitudes toward Physics reduce students' learning outcome in the subject, with 35% strongly agreeing and 55% agreeing, while 5% disagree and 5% strongly disagree and with a mean score of 3.20. Additionally, most believe that students' lack of confidence in Physics affects their class engagement, with 30% strongly agreeing and 50% agreeing, compared to 10% disagreeing and 10% strongly disagreeing and with a mean score of 3.00.

Table 1: Summary of Physics teachers' perception of factors contributing to students' under-performance in physics public examination

S/N	**Items**	**Frequency, Percentage**					Mean Deviation	Std
		N	**SA**	**A**	**D**	**SD**	X	δ
1	I have adequate qualifications and training to teach Physics effectively.	20	9 (45)	11 (55)	0 (0)	0 (0)	3.45	0.95
2	Outdated teaching methods contribute to students' poor performance in Physics.		14 (70)	2 (10)	2 (10)	2 (10)	3.40	0.90
3	Integrating technology, pedagogy and content knowledge contribute to students' under-performance in Physics.		3 (15)	3 (15)	5 (25)	9 (45)	2.00	0.50
4	Limited professional development opportunities hinder my ability to adopt innovative teaching strategies .		3 (15)	8 (40)	5 (25)	4 (20)	2.50	0.00
5	My school has a well-equipped physics laboratory for practical Physics lessons.	20	2 (10)	7 (35)	10 (50)	1 (5)	2.50	0.00
6	The lack of instructional materials (e.g., textbooks, multimedia tools)		7 (35)	9 (45)	3 (15)	1 (5)	3.10	0.60

	affects my ability to teach Physics.							
7	Inadequate laboratory facilities limit students' understanding of Physics concepts.		5 (25)	12 (60)	3 (15)	0 (0)	3.10	0.60
8	Students' perception that Physics is difficult leads to poor performance in examinations	20	10 (50)	8 (40)	2 (10)	**0**	3.40	0.90
9	Students are motivated when Physics is taught with practical demonstrations.		7 (35)	11 (55)	0 (0)	2 (10)	3.15	0.65
10	Negative attitudes toward Physics reduce students' learning outcome in the subject.		7 (35)	11 (55)	1 (5)	1 (5)	3.20	0.70
11	Students' lack of confidence affects their engagements with contents in physics class.		6 (30)	10 (50)	2 (10)	2 (10)	3.00	0.50

Research Question 2: W**hat are the implications of students' performance in physics public examinations for academic and career prospects as perceived by the teachers?**

From Table 2, most Physics teachers in Ilorin Metropolis, secondary schools believe that students' success in Physics public examinations opens opportunities for high-demand technical careers, with 45% strongly agreeing and 55% agreeing, and none disagreeing or strongly disagreeing and with a mean score of 3.45. Similarly, a majority reports that poor performance in Physics reduces students' career prospects in STEM-related fields, with 45% strongly agreeing and 50% agreeing, while 5% disagree and none strongly disagree and with a mean score of 3.40. Additionally, all teachers agree that good performance of students in Physics is essential for Nigeria's scientific and technological development, with 40% strongly agreeing and 60% agreeing, and no disagreements and a mean score of 3.40.

Table 2: Summary of Teachers view of the implications of Physics students' performance in public examinations

S/N	Items	Frequency, Percentage					Mean Deviation	Std
		N	SA	A	D	SD	X	Δ
1	Students' Success in Physics public Examinations opens opportunities for high-demand technical careers	20	9 (45)	11 (55)	0 (0)	0 (0)	3.45	0.95
2	Poor performance in Physics public examinations reduces students' career prospects in STEM-related fields		9 (45)	10 (50)	1 (5)	0 (0)	3.40	0.90
3	Good performance of students in Physics is essential for Nigeria's scientific and technological development		8 (40)	12 (60)	0 (0)	0 (0)	3.40	0.90

Discussion of Findings

The findings from the analysis conducted in this study reveal teachers' perception of several significant factors contributing to students' under-performance in Physics public examinations. Most teachers are aware and in agreement that they have requisite qualifications and training to be able to impart physics knowledge and skills effectively with a mean score of 3.45. The strong consensus points to high confidence level of teachers in their own competence which could foster self-assessment as overly optimistic and bias. It is not certain what the result would look like if viewed from the perspectives of other stakeholders in the science education sector apart from the physics teachers. Teachers overwhelmingly perceive obsolete traditional teaching methods as critical barriers to students' performance. Such outdated teaching methods might include 'talk-and-chalk' method, 'text-book' centred method and lecture method. Practical teaching invariably motivates students effectively. Integrating technology, pedagogy and content knowledge to instructional delivery of physics lesson would not impact performance negatively for students in physics public examinations. In contrast, teachers downplay the integration of technology, pedagogy and content knowledge possibly an indication of already blending these effectively or lacking exposure. Moderate concern was shown towards professional development with only 55% agreeing it is a hindrance. Teachers view limited opportunity for professional development as a drawback to their deployment of innovative strategies in instructional delivery of physics lessons. There is a need for more targeted training of physics teachers.

On laboratory facility, there is a clear deficit on teachers' perception with a mean of 2.50 and 55% disagreeing on adequacy. Only 45% agree the laboratories are well equipped. There is a strong agreement on impact of instructional materials, 80% and a mean of 3.10 which highlights shortages of textbooks and relevant tools. 85% with a mean of 3.10 agree that laboratory facilities limits understanding thereby reinforcing resource control as a core problem. Teachers perceive inadequacy of learning resources in many schools as a limitation that undermine effective teaching and learning of physics. These patterns point to resource scarcity especially laboratory and materials which constitute primary teaching hurdles more than teacher skills. On students-related factor, teachers largely attribute under-performance to students' mindset. The mindset of seeing physics as a difficult subject could demotivate efforts. Students' attitudes played a crucial role in their performance in physics public examinations with negative attitudes leading to reduced learning outcomes. Possibly, this could be due to influences of peer pressure, fear of failure, and a general perception of the subject as being difficult. Confidence gap affects participation with low confidence resulting in poor engagement. Teachers' ability to motivate and engage students through practical demonstrations was identified as a determining factor in shaping students' willingness to study the subject. Physics teachers acquiesced that students' success in Physics is crucial for technical careers advancement. The teachers agreed that poor performance of students in physics limits their career prospects in STEM-related fields, and they believed strongly that Physics is vital for Nigeria's scientific and technological progress.

Overall implications based on the findings show a confident teaching workforce hampered by infrastructural deficit in terms of inadequacy of well-equipped laboratories, paucity of learning resources/ materials and negative students' attitudes. Teachers' professional qualification and modern pedagogy gaps are not as expedient as the other factors mentioned based on the teachers' view. Outdated teaching-learning methods and resources shortages emerge as top culprits for students' under-performance, while practical teaching motivates students effectively.

Corroborating the finding of this study, Mwima and Ounyesiga (2025) in a study conducted in Kigandalo Sub-County, Mayuge District, Uganda observed among other findings that negative attitudes of students towards physics is a contributory factor to students' low performance in physics public examinations. Findings of this study tally with that of Mekonnen (2014) carried out in Ethiopia which asserted that educators (teachers) have enormous role in fostering positive or negative attitude of students towards the subject matter of Physics. Findings of this study agree with that of Ocal et al., (2025) which highlighted the need to understand teachers' beliefs, as these beliefs have the capacity to shape instructional expectations and decisions. Results of this study are in tandem with that of Nweke et al., (2021) which identified the need for provision of funds for effective implementation of science education programmes of which physics teaching-learning is a critical part. The expediency of training for in-service physics teachers was highlighted by Nweke et al., (2021) which is in consonance with results obtained in this work. Findings suggest that future studies should include observational data and should involve larger sample size and consideration for interactive effect of teachers' gender.

Conclusion

In conclusion, teachers' perception of under-performance in Physics public examinations was shown to have serious academic and career implications. Students who performed poorly in the subject often found themselves ineligible for STEM-related courses at the tertiary level, thus missing out on competitive and high-paying career paths. The inability to succeed in Physics affects students' development of critical thinking, analytical reasoning, and problem-solving skills, competencies essential not only for academic success but also for success in real-world scenarios.

Recommendations

The following recommendations are made in line with the findings of the study:

1. Pre-service physics teachers should be offered specialized training in physics by teacher-training institutions and in-service physics teachers should be supported for continuous professional development on innovative teaching strategies. Though teachers feel trained, targeted professional development could bridge the remaining gaps.
2. Well-equipped modern physics laboratories and fortified with learning materials/ resources and ICT tools and gadgets be provided in all schools offering physics as a science subject for quick wins. Stakeholders such as government ministries of education and agencies in charge of secondary schools, policy makers, school administrators and funders should ensure the availability of good physics resources and teachers ensure optimum utilization of the resources provided with content drawn from the people's socio-cultural background.
3. Physics students should be inspired by using innovative and active teaching-learning strategies. Practical demonstration would likely build confidence in learners and help demystify the misconceptions and mysteries behind some physics concepts and principles. Such innovative instructional delivery strategies being advocated include the like of project-based learning, cooperative learning, flipped classroom, virtual and augmented reality, blended learning and gamification.
4. Incentives and scholarships should be given to physics students as motivating factors to aspire towards excellent performance in public physics examinations.

References

Awodun, A. O. (2021) Analysis of students' performance in physics in senior school certificate examinations from 2015 – 2018 in Ado LGA, Ekiti State, Nigeria. *Aworeb – International Journal of Innovative Studies, 1*(2). https://www.aijis.org

Dahal', B. K. (2022) Students' and teachers' perception on effective physics teaching and learning. *Curriculum Development Journal, Year 30*(44) 2022 A. D. DOI: https://doi.org/10.3126/cdj.v30i44.54972

Mamedu, A. I., Danjuma, A. I., Barau, A. M., Adamu, A. R., Bawa, Y. P., Abatakula, J. Y. & Bamaiyi, G. C. (2024) Improvement of physics education as a hallmark for economic growth and national transformation in Nigeria. *African Journal of Stability & Development (AJSD), 16*(2), 279-290. URL: journals.abuad.edu.ng DOI: https://doi.org/10.53982/ajsd.2024.1602.05-j

Ismaila, A. & Rilwanu Y. M. (2025) Students' academic performance in mathematics and physics in boarding and day senior secondary school examinations in Nasarawa North senatorial zone. *International Journal of Educational Research and Library science, 7*(8), 047. Taapublications.com https://doi.org/10.70382/tijerls.v07i8.047

Jager, L. & Denessen, E. (2015) Within-teacher variation of causal attributions of low achieving students. *Soc Psychol Educ 18*, 517-530. https://doi.org/10.1007/s11218- 015-9295-9

Job, E. P. & Paul, S. D. (2022) Effects of senior secondary school physics students' self- concept, on performance in Jos North LGA, Plateau State, Nigeria. *International Journal of Education and Evaluation (IJEE), 8*(7). DOI: 10.56201/ijee.v8no7.2022pg11.19 www.iiardjournals.org

Lawal, M. A., Mohammed, R. E. & Amuda, A. A. (2023) Teachers' perceptions of the causes of students' low enrolment in senior secondary school physics in Oyo North, Nigeria. *Sokoto Educational review, 22*(1), 174-186. www.sokedureview.org and researchgate.net/publication

Mekonnen, S. (2014) Problems challenging the academic performance of physics students in higher governmental institutions in the case of Arbaminch, Wolayita Sodo, Hawassa and Dilla Universities. *Natural Science, 6*(5) 14 pages. DOI:10.4236/ns.2014.65037. Scientific Research Publishing Inc. https://file.scirp.org

Mwima, H. & Ounyesiga, L. (2025) Causes of poor performance in physics at 'O' level secondary schools: a case study of selected secondary schools in Kigandalo Subcounty, Mayuge District. *International Digital Organization for Scientific Research IDOSR Journal of Science and Technology, 11*(1): 10-22. https://doi.org/10.59298/IDOSR/JST/25/111.1022

Nweke, C., Ogbaga, E. & Ikenga, C. N. (2021) Analysis of the trend of students' achievement in physics in west African examination council organized senior secondary school certificate examination. *Journal of Education and Practice, 12*(36). www.iiste.org and https://pdfs.semanticscholar.org

Ocal, T., Yavuz, S. & Ocal, M. F. (2025) Pre- and in-service teachers attribution beliefs for students' success and struggle in mathematics: first insights. *BMC Psychology, 13*: 703. National Institutes of Health (.gov) Doi: 10.1186/s40359-025-03038-8 URL: https://pmc.ncbi.nlm.nih.gov

Ogunbiyi, O. K. & Oni, S. A. (2017) Overview of students' performance in senior school certificate examinations (SSCE) in physics between 2010 and 2015 in Ekiti State, Nigeria. *IJRAR – International Journal of Research and Analytical Reviews, 4*(1), 108-113. https://ijrar.com

Sumeracki, M. (2019) Dual coding and learning styles. URL: https://www.learningscientists.org/blogs

Wang, H. & Hall, N. C. (2018) A systematic review of teachers' causal attributions: prevalence, correlates and consequences. *Frontiers in Psychology, 2018 Dec 17;9*:2305. Doi: 10.3389/fpsyg.2018.02305 pmc.ncbi.nlm.nih.gov/ wsu,edu frontiersin.org

Weiner, B. (1985) An attributional theory of achievement, motivation and emotion. *American Psychological Association Inc., 92*(4), 548-573. Psychological Review https://acmd615.pbworks.com

Yusuf, A. A., Akanbi, A. O., Ameen, K. S., Muhammed, R. E., & Kanu, A. C. (2025). Physics teachers' benefits of entrepreneurship skills acquisition. *Ilorin Journal of education. 45*(1), 150-162. https://ije.unilorinedu.sch.ng/index.php/ije/article/view/212

Zuo, B., Ye, H., Wen, F., Ke, W., Xiao, H. & Wang, J. (2022) Effect of attribution on the emotions and behavioural intentions of third-party observers toward intergroup discriminators during the COVID-19 pandemic. *SAGE Group Process Intergroup Relat. 2022, 13;26*(2):431-452. Doi: 10.1177/13684302211062367