

DOES TEACHER'S LIKABILITY INFLUENCE STUDENT'S PERCEPTION OF PHYSICS: AN EMPIRICAL STUDY OF SECONDARY SCHOOL STUDENTS IN EBONYI STATE, NIGERIA

Benson Chisom Eze

**Department of Physics Education, Federal College of Education, Technical, Isu, Ebonyi State, Nigeria*

Abstract

Physics is one of the most important scientific disciplines taught in Nigeria's secondary school curriculum. Students poor performance in physics has become a growing concern. This study aimed to see if teacher likability could impact students' views about physics. A cross-sectional survey was used in this investigation. The survey's participants are secondary school students from Ebonyi State, Nigeria. Male and female senior secondary school students took part in the study. The majority of them came from science class. A total of 139 students were involved in the research. Data was collected using a Teacher's Likability Scale and the Physics Attitude Scale (PAS). The results revealed that most respondents had a negative attitude toward the subject ($M = 0.87$, $SD = 0.35$), while only a handful ($M = 0.18$, $SD = 0.39$) had a favorable attitude. A linear regression model was used to test the central hypothesis. The findings revealed that teachers' likability statistically significantly influenced students' attitudes toward physics $F(1,137)$, 40.16 $p.05$. According to the findings, a teacher's likability predicts students' attitudes toward physics. As a result, it is suggested that teachers act more as facilitators than harsh educators.

Keywords: teacher's likability, students, attitude, physics

Introduction

The goal of today's global education strategy is to equip people with essential skills (Ince, 2018). Higher-order skills, such as logic, creativity, and problem-solving, are more valued in today's schooling (Bao & Koenig, 2019; Ludwig et al., 2017; Qablan et al., 2019). Science education is vital for every country's progress, including Nigeria's (Ankeli, 2019; Clement et al., 2017; Okwuoyibo, 2012; Olufunke, 2012). Science is intended to improve the overall quality of life, thus making the world better. As stated in the national policy and educational curriculum, the government of Nigeria recognizes the importance of science education to the growth and development of learners (Adolphus, 2019; Aina, 2013; Ogunjuyigbe et al., 2006; Sambo et al., 2014). This significance emphasizes science education's critical role in achieving the STEM (science, technology, engineering, and mathematics) dream. Modern and advanced nations are built on the foundation of science (Aderonmu & Obafemi, 2015; Fuwape et al., 2019; Aina, 2013; Odu, 2020). Any society's progress is determined by its technological level, and physics education is essential in advancing technology.

Physics describes a science discipline concerned with energy and matter and how they interact (Faridi et al., 2021; Daramola & Omosewo, 2012). Physics is one of the most crucial science disciplines in Nigeria's secondary school curriculum (Ojediran, 2016; Onah & Ugwu, 2010; Mobolaji et al., 2017; Daramola & Omosewo, 2012; Mbamara & Eya, 2015). The subject aims to give young learners fundamental physics literacy to function in society, learn critical scientific abilities, and develop favorable attitudes toward ever-increasing technological advancement. Fundamental conceptions and scientific principles are essential for national technological progress (Agbele et al., 2020; Adeyemo, 2010). Physics also encourages pupils to solve more problems without delay, resulting in genuine learning achievement (Santayasa et al., 2020). It is critical to science and technology (Bortfeld & Jeraj, 2011; Bunyamin et al., 2020; Chu, 2020; Moraga-Calderón et al., 2020; Ukoh & Onifade, 2020). As a result, secondary school teachers and students must pay close attention to the subject's teaching and learning for Nigeria to achieve long-term technical progress.

There has been growing concern about the poor performance of physics students worldwide (Coffie et al., 2020; Ebong, 2021; Falode & Ajala, 2014; Folashade & Akinbobola, 2009; Madu & Udoh, 2016; Onah & Ugwu, 2010). Scholars have blamed the trends on various causes, including lousy learning environments, poor teaching strategies, inexperienced instructors, learning methodologies, cognitive patterns, job motivation, peer and family influence, and certain demographic variables (Erdemir, 2009). Indeed, most authors cited student attitudes toward physics as a critical factor in poor physics performance. Meanwhile, the previous study has linked students' attitudes to their academic success (Awang et al., 2013; Guido, 2018; Kabunga et al., 2016; Lumintac, 2014; Nagy, 2018; Ndifor & Ngeche, 2017; Ogembo et al., 2015; Veloo et al., 2015).

Attitudes are a social psychological construct with considerable implications for human behavior. It is commonly conceptualized as an individual's evaluation of any aspect of their social world. In other words, it can likely impact a student's preferences and dislikes of a subject. In the case of physics, a previous study found a link between students' attitudes and their success in the subject (Godwin & Okoronka, 2015). Understanding the connection between physics and attitude has spawned a large body of literature (Abdulkarim & Raburu, 2013; Bedemo, 2020; Ibrahim et al., 2019; Kurniawan et al., 2019; Maison et al., 2020; Mastura et al., 2010; Choudhary et al., 2019; Venida & Sigua, 2020; Vilia & Candeias, 2020). Recognizing learners' attitudes toward physics is critical to developing a practical strategy for improving students' physics proficiency and motivation. More so, prior research has looked at relevant predictors of physics attitudes. For example, (Kapucu 2017) found that student attitudes about physics were influenced by comprehension. Agu and Iyamu (2020) found a link between metacognitive scaffolding and a positive attitude toward physics. The cooperative learning technique improved students' attitudes toward physics (Akinbobola, 2009). Their grade and age disparities influenced students' perceptions of physics (Kaya & Boyuk, 2011). Virtual laboratory experiences improved students'

attitudes toward physics (Aşiksoy & Islek, 2017). This study aims to look at the impact of a teacher's likability on students' attitudes toward physics.

Present study

Investigating the variables influencing school success (Abubakar, 2020) is critical for educational development. As a result, this research aims to look into teacher likability as a factor that may account for differences in secondary school students' attitudes toward learning physics. The learners' general favorable attitude toward the teacher is called the teacher's likability (Feistauer & Richter, 2018). The term relates to a person's overall impression of attractiveness, friendliness, and pedagogy. Students may be more impacted by the instructor's personality traits and develop a good attitude toward the teacher and the subject taught by the teacher. As a result, according to Cottringer (2002), likable factors benefit others. Academic likability has already been explored in various domains (Chatelain, 2015; Delucchi & Pelowski, 2000). In the Nigerian setting, however, little is known regarding the relationship between teachers' likeability and students' attitude toward physics. This research aims to see how perceived teacher likability affects secondary school students' attitudes toward physics.

Hypothesis: teacher's likeability predicts students' attitudes toward physics

Method

The study's population comprises secondary school students in Ebonyi State, Nigeria. Participants were both male and female seniors in secondary school. The majority of them came from science class. Between January and April of 2023, 162 pupils were approached with the assistance of school teachers and administrators. Before the study's initiation, the research goal was communicated to and explained to the students. 155 out of 162 students approached agreed to participate in the study and were given the questionnaire to complete on the spot. Except for the 16 incorrectly completed questions, the remaining 139 questionnaires were subjected to statistical analysis.

Measure

Respondents rated the teacher's likability on a 10-item Linkert scale with 5-point evaluations ranging from 1 (not at all liked) to 5 (very likable) (very likable). Following a pilot investigation, a Cronbach alpha reliability coefficient of 0.78 was determined for the scale. A higher score implies a more likable teacher. Attitude toward physics was measured using the Physics Attitude Scale (PAS) (Kaur & Zhao, 2017), designed to measure students' attitudes toward physics. A Cronbach alpha .78 reliability coefficient was obtained in the study.

Result

The mean and standard deviation scores of attitudes towards physics revealed ($M = 0.87$, $SD = 0.35$) negative attitude and ($M = 0.18$, $SD = 0.39$) positive attitude. This indicates a higher negative attitude towards physics among the respondents.

Table 1:

Attitude towards physics	N	Mean	S D
Negative attitude	81	0.87	0.35
Positive attitude	58	0.18	0.39
Total	139	0.58	0.49

Testing the study hypothesis

The primary assumption of the study is that teachers' likability would account for the variation in students' attitudes towards physics. A linear regression model was conducted to test the hypothesis. The result of the linear regression established a statistically significant effect of teacher's likability on students' attitude towards physics, $F(1,137)$, 40.16 $P < .05$ with R^2 of .173. Thus, the result offered support to the central hypothesis of the study.

Table 2:

	B	SEB	β	t	R2	Sig
Constant	1.85	.047		38.77	.173	.000
Teacher's likability	.69	.062	.69	11.17		.000

Discussion

The study aimed to establish whether a teacher's likability influences students' attitudes toward physics. The mean and standard deviation score of attitudes toward physics revealed that most respondents ($M = 0.87$, $SD = 0.35$) had a negative attitude toward the subject, while only a minority ($M = 0.18$, $SD = 0.39$) had a positive attitude. This finding implies that respondents have a more negative view of physics. This is consistent with prior research (Godwin & Okoronka, 2015), which found a significant positive link between students' attitudes and academic achievement in physics. Therefore, a negative attitude toward physics may be associated with low physics performance among youngsters.

In addition, a linear regression model was applied to determine the variation in student attitudes about physics predicated on the teacher's likeability. The analysis found that the predictor variable strongly predicted attitude toward physics $F(1,137)$, 40.16 $p < .05$, with the adjusted R^2 indicating that the predictor variable contributed 17.3% of the variance in attitude toward physics. Thus, the result confirmed the study's hypothesis that the teacher's likeability would explain the variation in physics attitudes. This conclusion is congruent with the findings of Morgan and Bergeron (2007). They found a substantial link between teacher likeability and the likelihood of future enrollment increases in courses taught by a likable teacher. Students are significantly influenced by instructors

who serve as role models (Choudhary et al., 2019). Possibly, the qualities of a teacher are crucial to learning, particularly in early education. This study suggests that a teacher's likability considerably impacts students' views toward any subject, including mathematics and chemistry. Additionally, a teacher's likability may increase students' motivation to engage in academic activity.

In contrast, a teacher's likeability does not inevitably improve physics performance. Students who established a positive attitude toward the subject due to the features of the teacher may not have a greater understanding of general physics. Better general physics performance depends on the processing and storing information (Solis-Foronda, 2020). However, a teacher's likeability gives a means by which a student's ability to learn could be boosted.

Strength, Limitations, and future direction

The study demonstrated the significance of a teacher's likeability in influencing students' attitudes toward physics learning. The recent discovery may provide education stakeholders, parents, and the general public with essential information for improving students' performance in general physics. Despite this finding, caution is suggested when generalizing the study's outcome because the self-report measure used in the research may be problematic. In addition, the sampling technique may influence the generalizability of the finding. However, the study suggests that future researchers employ other data collection methods and increase sample sizes for a complete result.

Conclusion

This study investigated the factors influencing attitudes toward learning physics among secondary school students. The likeability of the teacher was selected as the independent variable. The outcome indicated that the predictor variable explained the variance in physics attitudes. Therefore, it may be inferred that a teacher's likeability is a substantial predictor of physics attitude. Thus, the study suggests that teachers strengthen their pedagogical traits to engage students.

References

- Abdulkarim, R., & Raburu, P. (2013). Determining the attitude of undergraduate students towards physics through concept mapping. *Mediterranean Journal of Social Sciences*, 4(3). <https://doi.org/10.5901/mjss.2013.v4n3p331>
- Abubakar, M. B. (2020). Impact of instructional materials on student's academic performance in Physics, in Sokoto-Nigeria. *IOP Conference Series: Earth and Environmental Science*, 476(1). <https://doi.org/10.1088/1755-1315/476/1/012071>
- Aderonmu, T. S. B., & Obafemi, D. T. A. (2015). Ordeals of physics instruction in Nigerian secondary schools: the way forward for attaining global competitiveness. *Journal of Education and Practice*, 6(20).
- Adolphus, T. (2019). The Aims and purposes of science education: social-scientific issues in the science curriculum in Nigeria. In *American Research Journal of Humanities Social Science (ARJHSS)R* 2019 *ARJHSS Journal*. www.arjhss.com

- Agbele, A. T., Oyelade, E. A., & Oluwatuyi, V. S. (2020). Assessment of students' performance in physics using two teaching techniques. *International Journal of Research and Scientific Innovation*, 07(07). <https://doi.org/10.51244/ijrsi.2020.7702>
- Agu, P. A., & Iyamu, C. O. (2020). Effect of metacognitive scaffolding teaching strategy on secondary school physics students' achievement and attitude to thermal energy. *International Journal Of Scientific Advances*, 1(2). <https://doi.org/10.51542/ijscia.v1i2.5>
- Akinbobola, A. O. (2009). Enhancing students' attitude towards Nigerian senior secondary school physics through cooperative, competitive, and individualistic learning strategies. *This Journal Article is posted on Research Online. Recommended Citation Akinbobola, Akinyemi Olufunmini* (Vol. 1, Issue 1). <http://ro.ecu.edu.au/ajte/vol34/iss1/1> Available at: <http://ro.ecu.edu.au/ajte/vol34/iss1/1>
- Ankeli, G. O. (2019). Scientific infrastructure: a necessary tool for national security and development in Nigeria. *World Journal of Innovation and Modern Technology* (Vol. 3, Issue 1). www.iiardpub.org
- Aşıksoy, G., & Islek, D. (2017). The impact of the virtual laboratory on students' attitudes in a general physics laboratory. *International Journal of Online Engineering*, 13(4). <https://doi.org/10.3991/ijoe.v13i04.6811>
- Awang, M. M., Ahmad, A. R., Bakar, N. A., Ghani, S. A., Yunus, A. N. M., Ibrahim, M. A. H., Ramalu, J. C., Saad, C. P., & Rahman, M. J. A. (2013). Students' attitudes and their academic performance in nationhood education. *International Education Studies*, 6(11). <https://doi.org/10.5539/ies.v6n11p21>
- Bao, L., & Koenig, K. (2019). Physics education research for 21st-century learning. *Disciplinary and Interdisciplinary Science Education Research*, 1(1). <https://doi.org/10.1186/s43031-019-0007-8>
- Bedemo, S. (2020). Effects of problem-based learning on students' achievement and attitude towards physics (mechanics): the case of Gilgel Beles college of teachers education. *Science Journal of Education*, 8(3). <https://doi.org/10.11648/j.sjedu.20200803.12>
- Bortfeld, T., & Jeraj, R. (2011). The physical basis and future of radiation therapy. In *British Journal of Radiology* (Vol. 84, Issue 1002). <https://doi.org/10.1259/bjr/86221320>
- Bunyamin, M. A. H., Talib, C. A., Ahmad, N. J., Ibrahim, N. H., & Surif, J. (2020). Current teaching practice of physics teachers and implications for integrated STEM education. *Universal Journal of Educational Research*, 8(5 A). <https://doi.org/10.13189/ujer.2020.081903>
- Chatelain, A. M. (2015). The effect of academics' dress and gender on student perceptions of instructor approachability and likeability. *Journal of Higher Education Policy and Management*, 37(4), 413–423. <https://doi.org/10.1080/1360080X.2015.1056598>
- Chu, R. (2020). GaN power switches on the rise: Demonstrated benefits and unrealized potentials. In *Applied Physics Letters* (Vol. 116, Issue 9). <https://doi.org/10.1063/1.5133718>
- Clement, I., Bello, M., & Abdullahi Sunusi, S. (2017). Science education and Nigeria national development effort: the missing link. *International Journal of Education and Evaluation* (Vol. 3, Issue 5). www.iiardpub.org

- Coffie, I. S., Frempong, B. B., & Appiah, E. (2020). Teaching and Learning Physics in Senior High Schools in Ghana: The Challenges and the Way Forward. *Advances in Research*. <https://doi.org/10.9734/air/2020/v21i330192>
- Delucchi, M., & Pelowski, S. (2000). Liking or learning?: the effect of instructor likeability and student perceptions of learning on overall ratings of teaching ability. *Radical Pedagogy*.
- Ebong, S. T. (2021). The influence of parental background on students' academic performance in physics in WASSCE 2000 - 2005. *European Journal of Science and Mathematics Education*, 3(1). <https://doi.org/10.30935/scimath/9419>
- Erdemir, N. (2009). Determining students' attitude towards physics through problem-solving strategy. *Asia-Pacific Forum on Science Learning and Teaching*, 10(2).
- Falode, O. C., & Ajala, N. A. (2014). Availability and teachers' awareness of the existence of software packages for developing physics instruction for secondary school students in Minna, Nigeria. *Chemistry*, 23(3).
- Faridi, H., Tuli, N., Mantri, A., Singh, G., & Gargish, S. (2021). A framework utilizes augmented reality to improve students' critical thinking ability and learning gain in Physics. *Computer Applications in Engineering Education*, 29(1). <https://doi.org/10.1002/cae.22342>
- Feistauer, D., & Richter, T. (2018). Validity of students' teaching evaluations: Biasing effects of likability and prior subject interest. *Studies in Educational Evaluation*, 59. <https://doi.org/10.1016/j.stueduc.2018.07.009>
- Folashade, A., & Akinbobola, A. O. (2009). Constructivist problem-based learning technique and the academic achievement of physics students with low ability level in Nigerian secondary schools. *Eurasian Journal of Physics and Chemistry Education*, 1(1).
- Fuwape, I. A., Ogunjo, S. T., & Owoola, E. O. (2019). *The Dutch approach to gender balance in physics AIP Conference*. 2109, 50028. <https://doi.org/10.1063/1.5110103>
- Godwin, B. A., & Okoronka, U. A. (2015). Attitude and academic performance of senior secondary school students in physics in Nigeria. Proceedings of societies international conference on education, social sciences and humanities. 8th – 10th June 2015. *International Conference on Education, Social Sciences and Humanities*, 2.
- Guido, R. M. D. (2018). Attitude and motivation towards learning physics. In *arXiv*.
- Ibrahim, N., A. Zakiang, M. A., & Damio, S. M. (2019). Attitude in learning physics among form four students. *Social and Management Research Journal*, 16(2). <https://doi.org/10.24191/smrj.v16i2.7060>
- Ince, E. (2018). An Overview of Problem Solving Studies in Physics Education. *Journal of Education and Learning*, 7(4). <https://doi.org/10.5539/jel.v7n4p191>
- Jacob Kola, Aina. (2013). Importance of Science Education to National Development and Problems Militating Against Its Development. *American Journal of Educational Research*, 1(7). <https://doi.org/10.12691/education-1-7-2>

- Jacob Kola, Aina. (2013). Perceived causes of students' low enrolment in science in secondary schools, Nigeria. *International Journal of Secondary Education*, 1(5). <https://doi.org/10.11648/j.ijsedu.20130105.11>
- Kabunga, A. & M. H. & M. Christina., Mohamed, H., & Mnjokava, C. (2016). Learners' attitudes and performance in science subjects in a-level in secondary schools, in Mbarara, Uganda. *The Journal of Educational Research*, 2, 10–25.
- Kapucu, S. (2017). Predicting physics achievement: Attitude towards physics, self-efficacy of learning physics, and mathematics achievement. *Asia-Pacific Forum on Science Learning and Teaching*, 18(1).
- Kaur, D., & Zhao, Y. (2017). Development of physics attitude Scale (PAS): An instrument to measure students' attitudes toward physics. *Asia-Pacific Education Researcher*, 26(5). <https://doi.org/10.1007/s40299-017-0349-y>
- Kaya, H., & Boyuk, U. (2011). Attitudes towards physics lessons and physical experiments of the high school students. *European Journal of Physics Education*, 2(1).
- Kurniawan, D. A., Astalini, A., & Sari, D. K. (2019). An evaluation analysis of students' attitude towards physics learning at senior high school. *Jurnal Penelitian Dan Evaluasi Pendidikan*, 23(1). <https://doi.org/10.21831/pep.v23i1.20821>
- Ludwig, P. M., Nagel, J. K., & Lewis, E. J. (2017). Student learning outcomes from a pilot medical innovations course with undergraduate nursing, engineering, and biology students. *International Journal of STEM Education*, 4(1). <https://doi.org/10.1186/s40594-017-0095-y>
- Lumintac, M. T. Q. (2014). Students' Negative Attitude to Physics Influences Low Academic Achievement. *International Journal of Education*, 12(1). <https://doi.org/10.7718/iamure.ije.v12i1.942>
- Madu, B. C., & Udoh, A. (2016). Exploring Senior Secondary School Two Students' Alternative Conceptions of Current Electricity in Physics in Nigeria. In *SAUSSUREA* (Vol. 6, Issue 4).
- Maison, Lukman, A., Jannah, N., Putra, D. S., & Puspitasari, T. O. (2020). Review of educational psychology: Attitude towards physics and biology. In *Humanities and Social Sciences Reviews* (Vol. 8, Issue 2 Special issue). <https://doi.org/10.18510/HSSR.2020.82E20>
- Mastura, T., Soh, T., Arsad, M., & Osman, K. (2010). The relationship of 21 st century skills on students' attitude and perception towards physics. *Procedia Social and Behavioral Sciences*, 7, 546–554. <https://doi.org/10.1016/j.sbspro.2010.10.073>
- Moraga-Calderón, T. S., Busiman, H., & Cramer, J. (2020). The relevance of learning quantum physics from the perspective of the secondary school student: A case study. In *arXiv*. <https://doi.org/10.30935/scimath/9545>
- Morgan, T. Z., & Bergeron, A. (2007). The effect of teacher likability on student compliance. In *Journal of Undergraduate Psychological Research* (Vol. 2). http://www.sq.4mg.com/Cottringer_article.htm

- Nagy, J. T. (2018). Evaluation of online video usage and learning satisfaction: An extension of the technology acceptance model. *International Review of Research in Open and Distance Learning*, 19(1). <https://doi.org/10.19173/irrodl.v19i1.2886>
- Ndifor, T., & Ngeche, M. (2017). Student and teacher attitudes as correlates of performance in mathematics in Cameroon Secondary Schools. *International Journal of Humanities Social Sciences and Education (IJHSSE)*, 4. <https://doi.org/10.20431/2349-0381.0412001>
- Odu, K. O. (2020). Human capital development in science and technology education: challenges and new responsibilities of the teacher. *Contemporary Educational Technology*, 2(3). <https://doi.org/10.30935/cedtech/6056>
- Ogembo, J. O., Otanga, H., & Nthenya Yaki, R. (2015). Students and teachers' attitude and performance in chemistry in secondary schools in Kwale County, Kenya. *Global Journal of Interdisciplinary Social Science*, 4(3), 39–43. <http://lejpt.academicdirect.org/A18/001-008.htm>
- Ogunjuyigbe, P. O., Ojofeitimi, E. O., & Akinlo, A. (2006). Science education in Nigeria: Examining People's Perceptions about female participation in science, mathematics, and technology. *Journal of Science Education and Technology*, 15(3–4). <https://doi.org/10.1007/s10956-006-9014-6>
- Ojediran, Isaac. A. (2016). Philosophical relevance of science teacher education curricula in southwestern Nigerian universities to senior secondary school physics curricula. *Journal of Education & Social Policy*, 3(2), 128–134.
- Okwuoyibo Nwachukwu, C. (2012). Revisiting science education and national development: Nigerian situation and the way forward. *Arabian Journal of Business and Management Review* (Vol. 1, Issue 10).
- Olufunke, B. T. (2012). Effect of availability and utilization of physics laboratory equipment on students' academic achievement in senior secondary school physics. *World Journal of Education*, 2(5). <https://doi.org/10.5430/wje.v2n5p1>
- Onah, D. U., & Ugwu, E. I. (2010). Factors which predict performance in secondary school physics in Ebonyi North educational zone of Ebonyi State, Nigeria. *Pelagia Research Library Advances in Applied Science Research*, 1(3), 255–258. www.pelagiaresearchlibrary.com
- Qablan, F., Şahin, M., & Hashim, H. (2019). Critical Thinking in Education: the Case in Palestine. *Turquoise International Journal of Educational Research and Social Studies*, 1(1).
- Rasheed Choudhary, F., Javed, T., & Zaman, S. (2019). Learners' and Instructors' Attitude towards Physics Achievement at Secondary Level. *Global Regional Review (GRR)*, 4(4), 441–449. [https://doi.org/10.31703/grr.2019\(IV-IV\).48](https://doi.org/10.31703/grr.2019(IV-IV).48)
- Sambo, M. H., Kukwi, I. J., A. M. M., & Eggari, S. O. (2014). Comparative analysis of students' interest in the basic science curriculum in Nasarawa State-Nigeria. *Journal of Education and Practice*, 4(29), 84–91.
- Santyasa, I. W., Rapi, N. K., & Sara, I. W. W. (2020). Project-based learning and academic procrastination of students in learning physics. *International Journal of Instruction*, 13(1). <https://doi.org/10.29333/iji.2020.13132a>

- Segun M, O., Olayemi M, D., & Funmilayo J, B. (2017). Assessment of implementation of physics curriculum in public secondary schools in Ekiti State. *Journal of Scientific and Engineering Research*, 4(8), 45–49. www.jsaer.com
- S. O. Daramola, & Esther. O. Omosewo. (2012). An appraisal of the new Nigerian senior secondary school physics curriculum. *Journal of Education and Practice*, 3(8), 191–195.
- Solis-Foronda, M. (2020). Predictors of Students' Knowledge in General Physics. *Universal Journal of Educational Research*, 8(8). <https://doi.org/10.13189/ujer.2020.080840>
- Sunday A. Adeyemo. (2010). Pupil attainment in secondary school physics: the case of Nigeria, including implications for teachers and teacher educators. *International Journal of Educational Research and Technology*, 1(1), 99–111.
- Uchenna. S. Mbamara, & Patrick. E. Eya. (2015). Causes of Low Enrollment of Physics as a Subject of Study by Secondary School Students in Nigeria: A Descriptive Survey. *International Journal of Scientific Research in Education*, 8(8), 127–149.
- Ukoh, E. E., & Onifade, S. A. (2020). Pre-lesson assignments, formative assessment strategies, and interactive invention instruction on low achievers in physics. *Momentum: Physics Education Journal*. <https://doi.org/10.21067/mpej.v4i1.3846>
- Veloo, A., Nor, R., & Khalid, R. (2015). Attitude towards physics and another mathematics achievement towards physics achievement. *International Education Studies*, 8(3). <https://doi.org/10.5539/ies.v8n3p35>
- Venida, A. C., & Sigua, E. M. (2020). Predict-Observe-Explain Strategy: Effects on Students' Achievement and Attitude towards Physics. *Jurnal Pendidikan MIPA*, 21(1). <https://doi.org/10.23960/jpmipa/v21i1.pp78-94>
- Vilia, P., & Candeias, A. A. (2020). Attitude towards the discipline of physics-chemistry and school achievement: revisiting factor structure to assess gender differences in Portuguese high-school students. *International Journal of Science Education*, 42(1). <https://doi.org/10.1080/09500693.2019.1706012>