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Psychological predictors of physics learners' achievement: The moderating influence of gender

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Abstract

Psychological factors like motivation and self-efficacy have been found to have significant predictive powers on learners' achievement in physics but literature is silent on how gender influences their predictive powers. Based on this premise, the researchers sought the predictive powers of motivation and self-efficacy on physics learners' achievement based on gender. A correlational survey research design was adopted for the study with a sample of 375 senior secondary 3 physics learners. Learners' Psychological Factors scale was used for data collection. The internal consistency reliability indices of the items of the two clusters of the instrument were obtained as 0.78 and 0.81 using the Cronbach alpha method. Data were analyzed using regression analysis and t-test of independent samples. Results showed that gender had a significant moderating influence on the predictive powers of motivation and self-efficacy on learners' academic achievement in physics in favor of male physics learners. This implies that male physics learners had higher motivation and self-efficacy than their female counterparts, thereby having higher achievement in physics than later. It was recommended that a favorable academic environment should be provided for female learners to promote their motivation and self-efficacy.

Keywords: Gender, Learners' Achievement, Moderating Influence Physics, Psychological predictors

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1. Introduction

The performance of students in both internal and external physics examinations has not encouraging over the years and this raises a lot of concern to physics educators and other education stakeholders. Students' underachievement in the sciences, most especially in physics has become a reoccurring decimal (Akanbi et al., 2018). Ugwuanyi et al. (2019) found that there is a high rate of poor academic achievement of students in public examinations in Nigeria. There has been a record of poor performance pf students' in physics examinations (Ugwuanyi et al. 2020a; Ugwuanyi and Okeke 2020). Ugwuanyi et al. (2020b) found that there has been a decline in the learners' achievement in physics. Gana et al. (2020) noted that students' performance in physics concepts especially specific heat capacity and specific latent heat over a decade now has been poor.

According to Erdemir (2009), physics has recorded lower learners' performance than biology and chemistry. This alarming trend has become a great threat to the nation's future and survival in terms of science and its benefits. However, most research in physics education focused more on the cognitive aspect of learners than their psychological factors. According to Antonio et al. (2017), psychological factors like motivation, self-efficacy, etc are potential determinants of learners' school achievement. According to Cook and Artino Jr (2016), Hartnett et al. (2011), Keller (2008b), Svinicki and Vogler (2012), the interaction of the environment with learners' factors is termed as motivation. In other words, learners' self-efficacy can determine their motivation level (Bandura, 1977; Zimmerman et al., 2017).

Self-efficacy is the innate ability of a learner to believe in what he/she can do. Bandura (1977) defined self-efficacy as individuals' beliefs related to his or her judgments and capabilities to organize the actions for reaching their designated goals. Veronica (2017) noted that motivation and self-efficacy are scarcely studies in science teaching and education (Veronica, 2017). This study, therefore, explored the predictive powers of motivation and self-efficacy on learners' achievement in physics as moderated by gender within the theoretical frameworks of B.F Skinner and A. Bandura.

1.1 Theoretical Background of the study

This study was guided by the theoretical frameworks of Skinner's Theory of Operant conditioning and Bandura's Social Cognitive Theory. Skinner's Theory of Operant Conditioning states that there is a possibility of repeating a behavior that was reinforced which gave birth to what is known as the law of effect. This theory goes to show that adequate motivation or reinforcement of learners, produces high achievement on the part of the learners thereby increasing the person's self-efficacy as postulated by Bandura in his social cognitive theory (SCT).

Social Cognitive Theory (SCT) refers to a psychological model of behavior that emerged primarily from the work of Bandura (1977). Social cognitive theory (SCT) states that learning occurs through direct observation of others within the context of social interactions. The theory states the behavior of a role model shapes the behavior of those observing the model by imitation. SCT states that learning occurs in a social context and that much of what is learned is gained through observation (Bandura, 1977). Bandura's Social Learning Theory shows a direct relationship between self-efficacy and behavioral change of learners.

1.2 Review of Related Empirical Studies

Chow and Seng Yong (2013) found that students' motivational orientations and science achievement of learners had a significant positive relationship. Mohammad (2017) found that there is a positive association between motivation and learners' reading comprehension activities. Wenty and Slamet (2019) found that there was a significant relationship between self-motivation and achievement of students in biology. Taştan et al. (2018) revealed that learners' achievement in science is dependent

on teacher motivation. According to Metriana as cited in Tokan and Imakulata (2019), motivation and self-efficacy are major determinants of learners' achievement. Learners' achievement in biology depends on their intrinsic and extrinsic motivation (Tokan & Imakulata, 2019). Achufusi et al. (2019) found that motivation was a significant determinant of students' achievement. However, Caroline (2017) found that learning motivation determines the achievement of physics students.

Ghazanfar and Akam (2014) found a highly significant positive relationship between student self-efficacy and their cumulative grade point average score (CGPAS). Physics self-efficacy significantly predicted learners' physics achievement (Kapucu, 2017). Van Rooij, Jansen and Van de Grift (2017) found that academic interest and ability are positively related to self-efficacy. Ozkal (2019) found that students' self-efficacy beliefs significantly predicted their Mathematics achievement. Rahman et al. (2019) found that learners' goal achievement in learning depends on teachers' self-efficacy. Wenty and Slamet (2019) found that self-efficacy had a significant positive relationship with the achievement of students in biology. Suprayogi, Ratriana and Wulandari (2019) found that academic efficacy had a significant impact on learners' academic achievement. Taştan et al. (2018) reported a significant impact of teacher self-efficacy on learners' academic achievement in science education. Gana, Ugwuanyi and Ageda (2020) found that motivation and self-efficacy significantly predicted students' achievement in physics. Ugwuanyi, Okeke and Asomugha (2020) found that psychological factors such as emotional intelligence, self-esteem, and self-efficacy had significant predictive powers on students' academic achievement in mathematics.

From the foregoing, it can be seen that a lot of studies have been conducted on the impact of motivation and self-efficacy on learners' achievement. Careful examination of the findings of those studies showed that there are a lot of inconsistencies in the findings of the studies coupled with the fact that no study explored the predictive powers of learners' achievement based on gender. However, most of the studies were conducted in other countries other than Nigeria. Thus, the researchers deemed it necessary to carry out this research within the Nigerian context.

1.3 Objectives of the Study

1. Determining the predictive power of motivation on learners' achievement in physics based on gender.
2. Determining the predictive power of self-efficacy on learners' achievement in physics based on gender.

1.4 Research Questions

1. What is the predictive power of motivation on learners' achievement in physics based on gender?
2. What is the predictive power of self-efficacy on learners' achievement in physics based on gender?

1.5 Hypotheses

Ho_1: Gender has no significant influence on the predictive power of motivation on learners' achievement in physics based on gender.

Ho_2: Gender has no significant influence on the predictive power of self-efficacy on learners' achievement in physics based on gender.

2. Methods

2.1 Research design

A correlational study which according to Creswell (2014) seeks to establish the kind of relationships that exist between two or more variables, was adopted for the study. Thus, this design was deemed appropriate since the researchers sought the nature of the relationships that exist among motivation, self-efficacy, and learners' achievement in physics. This design has been used by Gana et al. (2020), Ugwuanyi & Okeke (2020b) and Ugwuanyi, Okeke and Asomugha (2020) in similar studies.

2.2 Participants

A sample of 375 senior secondary 3 Physics learners was used for this study. 15 physics learners from each of the 25 senior secondary schools sampled for the study formed the study participants. Disproportionate stratified random sampling technique was used to arrive at the sample size.

2.3 Instrumentation and procedure

Learners' Motivation Scale and Self-efficacy scale were used for data collection for the study. The Learners' Motivation Scale developed was a 20-item instrument structured on a 4-point Likert scale to elicit responses on the students' motivation.

The self-efficacy scale developed by the researchers was a 15-item instrument structured on a 4-point Likert scale to elicit responses on the students' self-efficacy. The response options for both instruments are Strongly Agree, Agree, Disagree, and Strongly Disagree.

Learners' achievement in physics was obtained through their cumulative results for first, second, and third term results in SS 2. Those records were made available to the researchers by the head of physics in each of the schools sampled for the study.

2.4 Instruments validation, reliability, and administration

The instruments were properly faced validated and trial-tested. The reliability indices estimated for the learners' motivation scale and learners' self-efficacy scale using Cronbach alpha were 0.78 and 0.81 respectively.

Finally, copies of the instruments were administered to the selected schools through visitation to the sampled schools by the Researchers. The researchers adopted the spot administration and collection of copies of the instruments after completion by the respondents. Physics teachers in the schools served as research assistants.

2.5 Ethical measures

To conduct this study, the researchers sought ethical clearance from the Research Ethical Committee of the Faculty of Education, University of Nigeria. Thus, the study was granted ethical approval by the Research Ethical Committee of the Faculty of Education. The researchers prepared informed consent letters and presented them to the participants for their approval through the appendage of their signatures. The participants were assured by the researchers that the information provided by them would be used solely for research purposes and would be handled confidentially. Contact details of the researchers were left with the participants in case there is a need to contact us.

2.6 Data analyses

Data were analyzed using regression and t-test of independent samples. The hypothesis was tested at 5% probability level using the t-test of independent samples.

3. Results

Ho_1: Gender has no significant influence on the predictive power of motivation on learners' achievement in physics.

Table 1: Regression and t-test analysis of the predictive power of motivation on physics learners' achievement based on gender

Gender	n	r	r^2	df	t	p
Male	159	.501	.251	373	16.723	.000
Female	216	.392	.154			

Table 1 shows that the magnitude of the relationship between motivation and male learners' achievement in physics is 0.501, while that of the female physics learners' is 0.392. Moreover, 25% change in male learners' achievement in physics can be attributed to motivation, while 15.4 % change in female learners' achievement in physics can be attributed to motivation. Thus, gender had a significant moderating influence on the predictive power of motivation on learners' achievement in physics in favor of male learners, t (373), = 16.723, $p < .05$.

Ho_2: Gender has no significant influence on the predictive power of self-efficacy on learners' achievement in physics.

Table 2: Regression and t-test analysis of the predictive power of self-efficacy on physics learners' achievement based on gender

Gender	n	r	r^2	df	t	p
Male	159	.583	.340	373	11.609	.000
Female	216	.401	.161			

Table 2 shows that the magnitude of the relationship between self-efficacy and male learners' achievement in physics is 0.583, while that of the female physics learners' is 0.401. The analysis revealed that 34% change in male learners' achievement in physics can be attributed to self-efficacy, while 16.1% change in female learners' achievement in physics can be attributed to self-efficacy. Besides, Table 2 reveals that gender had a significant moderating influence on the predictive power of self-efficacy on learners' achievement in physics in favor of male learners, t (373), = 11.609, $p < .05$.

4. Discussions

This study has empirically determined the predictive powers of motivation and self-efficacy on learners' achievement in physics based on gender. The outcome of the regression analysis showed that motivation and self-efficacy had significant predictive powers on learner's achievement in physics as moderated by gender. These findings have strengthened the theoretical basis of operant conditioning theory by B.F Skinner and social cognitive theory by A. Bandura. From the theoretical basis of Skinner,

the effective motivation of learners produces a positive outcome for the learners on a particular task. In the same vein, social learning theory shows a direct correlation between a person's perceived self-efficacy and behavioral change. These findings are in tandem with the findings of previous studies such as Mohammad (2017), Metriana as cited in Tokan and Imakulata (2019), Tokan and Imakulata (2019), Achufusi et al. (2019), Wenty and Slamet (2019), Taştan et al. (2018), Caroline (2017), Akam (2014), Ozkal (2019), Van Rooij, Jansen and Van de Grift (2017), Rahman et al. (2019), Gana, Ugwuanyi and Ageda (2020), Ugwuanyi, Okeke and Asomugha (2020).

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Ghazanfar and Akam (2014) found a highly significant positive relationship between student self-efficacy and their cumulative grade point average score (CGPAS). Physics self-efficacy significantly predicted learners' physics achievement (Kapucu, 2017). Van Rooij, Jansen and Van de Grift (2017) found that academic interest and ability are positively related to self-efficacy. Ozkal (2019) found that students' self-efficacy beliefs significantly predicted their Mathematics achievement. Rahman et al. (2019) found that learners' goal achievement in learning depends on teachers' self-efficacy. Wenty and Slamet (2019) found that self-efficacy had a significant positive relationship with the achievement of students in biology. Suprayogi, Ratriana and Wulandari (2019) found that academic efficacy had a significant impact on learners' academic achievement. Taştan et al. (2018) reported a significant impact of teacher self-efficacy on learners' academic achievement in science education. Gana, Ugwuanyi and Ageda (2020) found that motivation and self-efficacy significantly predicted students' achievement in physics. Ugwuanyi, Okeke and Asomugha (2020) found that psychological factors such as emotional intelligence, self-esteem, and self-efficacy had significant predictive powers on students' academic achievement in mathematics.

This current study has been able to determine the predictive powers of motivation and self-efficacy on learners' achievement in physics based on gender using secondary school students in Benue as participants. The study has contributed to the body of knowledge by empirically determining the predictive powers of motivation and self-efficacy on learners' achievement in physics based on gender. This will help physics educators in designing appropriate physics instructions that will motivate the learners and as well increase their self-efficacy to enhance their academic achievement.

4.1 Significance of the study

Theoretically, the findings of the study strengthened the tenets of Skinner's theory of operant conditioning and Bandura's social cognitive theory. The findings demonstrated the place of motivation and self-efficacy in the learning context of the learners as postulated by Skinner and Bandura respectively. In practical terms, the physics teachers, students, and education stakeholders would find the findings of this study valuable, in the sense that they will be better informed of the impacts of motivation and self-efficacy on the learners' achievement in physics.

4.2 Limitations

This study considered only the participants from a particular cultural orientation. Thus, determining the moderating influence of cultural orientation on the impact of motivation and self-efficacy was not possible. This may have limited the generalizability of the findings to learners of different cultural orientations. Also, non-inclusion of the age and school location as possible moderators may limit the generalizability of the findings. Based on that, the researchers suggested that future researchers should consider the moderating influences of cultural orientation, age, and school location on the predictive powers of motivation and self-efficacy on learners' achievement in physics.

4.3 Conclusion and Recommendations

Motivation and self-efficacy had significant predictive powers on learners' achievement in physics as moderated by gender. In order words, high motivation and self-efficacy lead to high learners' achievement in physics. Thus, motivation and self-efficacy of learners should not be looked down on to achieve an enhanced learners' achievement in physics. Based on the findings of this study, the researchers made the following recommendations.

1. A conducive environment that will enhance the motivation and self-efficacy of the learners especially female learners should be maintained in the schools.
2. Physics teachers should adopt the best instructional strategies that will motivate and increase the self-efficacy of the learners to have improved academic achievement of the learners.

Reference

Achufusi, N.N., Utakaj.N., Onuh, C.C & Okonkwoe, O. (2019). Secondary school students' self-efficacy and motivation as correlates of their achievement in physics. *IOSR Journal of Research & Method in Education (IOSR-JRME), 9*(3):75-80 *www.iosrjournals.org* DOI: 10.9790/1959-0903017580.

Akanbi, A.O., Omosewo, E.O. & Ilorin, B.O.N (2018). Teachers' characteristics and availability of laboratory as predictors of senior school students' performance in physics in Ilorin, Nigeria. *Journal of Teacher Education and Educators, 7(1): 43-55.*

Antonio, G., Marıa-Victoria, C. F & Paola-Veronica, P. (2017). Hope and anxiety in physics class: exploring their motivational antecedents and influence on metacognition and performance. *Journal of Research in Science Teaching, 54*(5):558–585.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2): 191–215.

Caroline, L.K.S. (2017). *The relationship between learning motivation and academic achievement among second year physics student*. (Unpublished Masters Dissertation), School of Higher Education Studies Faculty of Education, University of the Free State

Chow, O & Seng, H. (2013). Secondary school students motivation & achievement in combined science. *US-China Education Review, 3*(4) 21-29.

Cook, D. A & Artino, A.R Jr. (2016). Motivation to learn: An overview of contemporary theories. *Medical Education,* 50: 997–1014.

Erdemir, N. (2009). Determining students' attitude towards physics through problem solving strategy. *Asia-Pacific Forum on Science Learning and Teaching, 10* (2)

Eseryel, D., Law, V., Ifenthaler, D., Ge, X., & Miller, R. (2014). An investigation of the interrelationships between motivation, engagement, and complex problem solving in game-based learning. *Educational Techonolgy & Society, 17*(1): 42–53.

Ghaffar, S., Hamid, S & Thomas, M. (2019). The impact of teacher's self-efficacy on student's motivation towards science learning. *Review of Economics and Development Studies, 5* (2), 225-234. DOI: 10.26710/reads. v5i2.540

Gana, C.S., Bashir, A.U., Ogala, T., Josiah, M.M., Paul, D.D., & Ugwuanyi, C.S. (2020). Perception, Motivation and Satisfaction of Secondary School Physics Students Based on Learning Pattern on Lesson Study in Federal Capital Territory Abuja, Nigeria. *International Journal of Sciences: Basic and Applied Research (IJSBAR)*, 50(2):20-32. https://www.gssrr.org/index.php/JournalOfBasicAndApplied/issue/archive).

Gana, C.S., Ugwuanyi, C.S., & Ageda, T.A. (2019). Students' psychological predictors of academic achievement in physics. *International Journal of Research and Innovation in Social Science (IJRISS), III (*IX): 23-28. https://www.rsisinternational.org/journals/ijriss/Digital-Library/volume-3-issue-9/23-28.pdf

Hartnett, M., George, A. S., & Dron, J. (2011). Examining motivation in online distance learning environments: Complex, multifaceted, and situation-dependent." *The International Review of Research in Open and Distributed Learning, 12*(6): 20–38.

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):1

Keller, J. M. (2008b). An integrative theory of motivation, volition, and performance. *Technology, Instruction, Cognition & Learning, 6*(2): 79–104.

Mohammad, R.A. (2017). The impact of motivation on reading comprehension. *International Journal of Research in English Education*.

Ozkal, N. (2019). Relationships between self-efficacy beliefs, engagement and academic performance in math lessons. *Cypriot Journal of Educational Science*. *14*(2), 190–200.

Pajares, F., & Schunk, D. H. (2001). *Self-beliefs and school success: Self-efficacy, self-concept, and school achievement*. In R. Riding & S. Rayner (Eds.), Self-perception (pp. 239-266). London: Ablex Publishing.

Schumacher, C., & Ifenthaler, D. (2018). Features students really expect from learning analytics." *Computers in Human Behavior, 78*: 397–407. https://doi.org/10.1016/j.chb.2017.06.030.

Schumacher, C & Ifenthaler, D. (2018). The importance of students' motivational dispositions for designing learning analytics. *Journal of Computing in Higher Education, 30*:599–619. https://doi.org/10.1007/s12528-018-9188-y(01

Schunk, D. H., Pintrich, P. R., & Meece, J. L. (2008). *Motivation in education* (3rd ed.). Upper Saddle River: Pearson/Merrill Prentice Hall.

Suprayogi, M.N., Ratriana, L. & Wulandari, A P J. (2019). The interplay of academic efficacy and goal orientation toward academic achievement. *Journal of Physics: Conf. Series* 1175. 012132. doi:10.1088/1742-6596/1175/1/012132.

Svinicki, M. D., & Vogler, J. S. (2012). *Motivation and learning: Modern theories*. In N. M. Seel (Ed.), Encyclopedia of the sciences of learning (pp. 2336–2339). New York: Springer.

Taştan, S.B., Davoudi, S.M.M., Masalimova, A.R., Bersanov, A.S., Kurbanov, R.A., Boiarchuk, A.V & Pavlushin, A.A. (2018). the impacts of teacher's efficacy and motivation on student's academic achievement in science education among secondary and high school students. *EURASIA Journal of Mathematics, Science and Technology Education, 14*(6), 2353-2366 ISSN:1305-8223 (online) 1305- https://doi.org/10.29333/ejmste/89579.

Tokan, M.K. & Imakulata, M.M. (2019). The effect of motivation and learning behaviour on student achievement. *South African Journal of Education,* 39(1):

Ugwuanyi, C.S., Nduji, C.C., Gana, C.S., Nwajiuba, C.A., Ene, C.U., Okeke, A.O., Eseadi, C., & Okeke, C.F (2019). Effectiveness of flipped classroom instructional technology model in enhancing students' achievement in physics. *International Journal of u- and e- Service, Science and Technology*, *12(*4): 37-46.

Ugwuanyi, C.S., Okeke, C.I.O., Nnamani, P.A., Obochi, E.C., & Obasi, C.C. (2020a). Relative effect of animated and non-animated powerpoint presentations on physics students' achievement. *Cypriot Journal of Educational Science. 15*(2), 282–291. https://doi.org/10.18844/cjes.v15i2.4647.

Ugwuanyi, C.S., Nduji, C.C., Elejere, U.C, & Omeke, N.E (2020b). Effect of Flipped Classroom and Think Pair Share Strategy on Achievement and Retention Among Senior Secondary School Physics Students. *International Journal of Sciences: Basic and Applied Research (IJSBAR)*, 52(2), 136-148. https://www.gssrr.org/index.php/JournalOfBasicAndApplied/article/view/11250/681

Ugwuanyi, C.S., & Okeke, C.I.O. (2020a). Enhancing University Students ' Achievement in Physics using Computer-Assisted Instruction. *International Journal of Higher Education 9*(5), 115–124. https://doi.org/10.5430/ijhe.v9n5p115

Ugwuanyi, C.S. & Okeke, C.I.O. (2020b). Determinants of University students' interest in Science, Technology, Engineering and Mathematics Education in Nigeria: A case of a structural equation modelling. *International Journal of Mechanical and Production Engineering Research and Development,* 10(3): 6209–6218. http://dx.doi.org/10.24247/ijmperdjun2020590

Ugwuanyi, C.S., Okeke, C.I.O., & Asomugha, C.G. (2020). Prediction of learners' mathematics performance by their emotional intelligence, self-esteem, and self-efficacy. *Cypriot Journal of Educational Science*. *15*(3), 492-501. https://doi.org/10.18844/cjes.v%vi%i.4916.

Van Rooij, E.C.M., Jansen, E.P. W. A. & Van de Grift, W.J. C. M. (2017). Factors that contribute to secondary school students' self-efficacy in being a successful university student. *Research in Post-Compulsory Education, 22*(4):535–555. https://doi.org/10.1080/13596748.2017.1381301

Vansteenkiste, M., Simons, J., Lens, W., Sheldon, K. M., & Deci, E. L. 2004. "Motivating learning, performance, and persistence: The synergistic effects of intrinsic goal contents and autonomy supportive contexts." *Journal of Personality and Social Psychology, 87*(2): 246–260.

Wenty, N & Slamet, S. (2019). Efficacy and achievement of high school student in biology. *Journal of Physics: Conf. Series* 1233. doi:10.1088/1742-6596/1233/1/012009

Zimmerman, B.J. (2000). Self-efficacy: An essential motive to learn." *Contemporary educational psychology, 25*(1): 82-91.

Zimmerman, B.J., & Schunk, D. H. (2008). *Motivation an essential dimension of self-regulated learning.* In D. H. Schunk & B. J. Zimmerman (Eds.), Motivation and self-regulated learning: Theory, research, and applications (pp. 1–30). New York: Routledge.

Zimmerman, B.J., Schunk, D.H., & DiBenedetto, M.K. (2017). *The role of self-efficacy and related beliefs in self-regulation of Learning and Performance*. In A. J. Elliot (Ed.), Handbook of competence and motivation (2nd ed., pp. 313–333). New York, NY: Guilford Press.23456789.