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Motivation and Self-efficacy as Predictors of Learners' Academic Achievement

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ABSTRACT This research sought to determine the relationship between motivation and self efficacy, and learner performance, respectively, in Physics within the theoretical framework of Skinner's Theory of Operant Conditioning and Bandura's, Social Cognitive Theory. A correlational-survey research design was adopted for the research, with a sample of 375 senior secondary three Physics learners. Learner psychosocial-factor scales were used for data collection. The internal consistency reliability indices of the two clusters of scales were 0.78 and 0.81 using Cronbach's alpha. Simple linear regression was used to analyse the data. The results showed that motivation and self-efficacy had significant positive relationships with learner performance in Physics. One implication is that low motivation and self efficacy of learners will result in low performance in Physics. It is recommended that a favourable academic environment should be created for learners to promote their motivation and self-efficacy

INTRODUCTION

Learners' underperformance in Physics examinations causes great concern to Physics educators in Nigeria. At different levels of education, learner performance in Physics examinations has been discouraging (Ugwuanyi and Okeke 2020; Ugwuanyi et al. 2020a; Onah et al. 2020). Ugwuanyi et al. (2020b) found that there has been a decline in the performance and retention of students in Physics. Gana et al. (2020) noted that student performance in Physics concepts especially, specifically heat capacity and latent heat, has been poor for over a decade. Evidence from the West African Examinations' Council [WAEC] (2014; 2015) Chief Examiner's reports of student performance in Physics show that 685,669 candidates enrolled for the examination in the subject in May-June 2014, with a raw mean of 16.00 and standard deviation of 8.77 recorded. In the next year, in May-June 2015, a raw mean of 19.00 and standard deviation of 9.90 were recorded for 658,393 candidates enrolling for the same examination.

According to Erdemir (2009), performance in Physics is lower than for other scientific subjects such as Biology and Chemistry. This alarming trend has become a great threat to Nigeria's future and survival in terms of science and its benefits. However, most research in Physics education has been focusing more on the cognitive aspects of learners than on psychological aspects. According to Antonio et al. (2017), self-efficacy and hope or motivation, among other variables, are important psychological variables in an academic context. As a case in point, Antonio et al. (2017) mentioned that the influence of these psychological variables on academic performance in Science has been scarcely studied.

Motivation is an internal drive that spurs one into action. According to Schumacher and Ifenthaler (2018a), motivation is an important psychological variable that drives a person's actions. Motivation is a construct that instigates and sustains goal-driven activity (Schunk et al. 2008). Students' regulated effort towards learning attainment is controlled by motivational factors such as interest, autonomy, competence, etc. (Vansteenkiste et al. 2004; Zimmerman and Schunk 2008; Eseryel et al. 2014). Motivation is produced by the association of individual and environmental factors (Keller 2008; Hartnett et al. 2011; Svinicki and Vogler 2012; Cook and Artino Jr 2016). This implies that a person's motivation, such as their self-efficacy beliefs, is determined by internal or external motivational factors (Bandura 1977; Zimmerman et al. 2017).

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Self-efficacy is the innate ability of an individual to believe in what he or she can do. Bandura (1977) defined self-efficacy as an individual's beliefs regarding his or her judgments and capabilities to organise the actions necessary for reaching their designated goals. According to Zimmerman (2000), there is a close relationship between self-efficacy and academic achievement. Pajares and Schunk (2001) observed that having a higher level of self-efficacy increases an individual's accomplishments. Kapucu (2017) opined that individuals who have a high level of self-efficacy are more confident in mastering difficult tasks and persist in achieving in these tasks. Therefore, learners' self confidence in their capabilities is critical in determining their academic achievement (Pajares and Schunk 2001). In line with the above views, the researchers of this manuscript explored the impacts of motivation and self-efficacy on learner performance in Physics within the theoretical frameworks of B.F Skinner and A. Bandura.

Theoretical Background of the Research

This research was carried out within the theoretical frameworks of B.F Skinner's Theory of Operant Conditioning and A. Bandura's Social Cognitive Theory (SCT). Skinner's Theory of Operant Conditioning states that pleasant consequences lead to the repetition of behaviour, with bad consequences leading to a break in behaviour. Skinner (1938) believed that reinforced behaviour tends to be repeated (that is strengthened), whereas behaviour that is not reinforced tends to die out or be extinguished (that is weakened). This theory thus shows that adequate motivation or strengthening of learners produces high performance on the part of the learners.

Social Cognitive Theory (SCT) is a psychological model of behaviour that emerged primarily from the work of Bandura (1977). Social Cognitive Theory holds that an individual's learning in a particular context can be achieved through direct observation of others within the context of social interactions. The theory states that the sequence of events experienced by an individual and their use of information to guide subsequent behaviours can result from observing a model performing a behaviour and the consequences of that behaviour (Bandura 1977). Social Cognitive Theory states that learning occurs in a social context and that much of what is learned is gained through observation (Bandura 1977). Bandura's SCT establishes an association between an individual's self-efficacy and behavioural change.

Review of Related Empirical Research

Empirical evidence exists on the relationship between motivation and self-efficacy, and learner performance. According to Metriana (as cited in Tokan and Imakulata 2019), learner performance is significantly determined by motivation, learning behaviour, and self-efficacy. Tokan and Imakulata (2019) found that the performance of learners in Biology is dependent on intrinsic and extrinsic motivation and learning behaviour. Mohammad (2017) stated that motivation has a considerably positive effect on learner performance. Achufusi et al. (2019) found that motivation is a significant determinant of student performance, with Chow and Seng (2013) having found that students' motivational orientation and Science achievement are positively related. According to Wenty and Slamet (2019), there is a low-significance positive relationship between self motivation and performance of high school students in Biology. Furthermore, Tastan et al. (2018) reported that teacher motivation significantly determines academic achievement of learners in Science education. Another interesting finding is by Stofile (2017), who found that there is no significant relationship between learning motivation and academic achievement amongst second year Physics students.

Regarding self-efficacy, Ozkal (2019) found that students' self-efficacy beliefs in learning have a significant positive relationship with their performance in Mathematics. Furthermore, students' academic interests have a significant relationship with their self-efficacy (Van Rooij et al. 2017). Attaining active learning and an active learning environment is dependent on teachers' self-efficacy, which also has a positive impact on Science-learning achievement (Ghaffar et al. 2019). Wenty and Slamet (2019) revealed that self-efficacy and high school student perfor-

mance in Biology have a low-significance positive relationship.

Kapucu (2017) determined that learners' self-efficacy in Physics learning and Mathematics achievement is a positive predictor of their performance in Physics. In addition, Suprayogi et al. (2019) showed that academic efficacy and goal orientation have a significant impact on academic achievement. Teacher's self-efficacy has a significant influence on learners' performance in Science education, as stated by Tastan et al. (2018). According to Gana et al. (2019), motivation, self-efficacy and locus of control significantly predicted students' academic achievement in Physics. Gana et al. (2020) found that learning pattern of physics students depends on motivation and satisfaction. Ugwuanyi et al. (2020c) found that psychological factors such as emotional intelligence, self-esteem, and self-efficacy have significant predictive capabilities on students' academic achievement in Mathematics.

The foregoing shows that multiple studies have been conducted on the relationship between motivation and self-efficacy, and learner performance. Careful examination of the findings of these studies show that there are a lot of inconsistencies. Most of the studies were conducted in countries other than Nigeria, with adequate data of this phenomenon in Nigeria still lacking. Nonetheless, the study area for this research, Benue State, has continued to witness poor performance of learners in external Physics examinations, indicating that more empirical research is required to unravel the problem of poor learner performance in the area. Thus, the researchers deemed it necessary to carry out this research within a Nigerian context by using secondary school Physics learners in Benue State.

Objectives of the Research

The following objectives were sought for the research:

1. To determine the relationship between motivation and learner performance in Physics.
2. To determine the relationship between self-efficacy and learner performance in Physics.

Research Questions

To achieve the research objectives, the following research questions have been formulated:

1. What is the relationship between motivation and learner performance in Physics?
2. What is the relationship between self-efficacy and learner performance in Physics?

Hypotheses

Ho_1: Motivation and learner performance in Physics are not significantly related.

Ho_2: Self-efficacy and learner performance in Physics are not significantly related.

MATERIAL AND METHODS

Research Paradigm and Approach

This research is based on the theoretical assumptions of Skinner's Theory of Operant Conditioning and Bandura's SCT. Skinner (1938) believed that reinforced behaviour has the entire tendency to reoccur. To Bandura, learners' execution of a task is dependent on their abilities. This research adopted a pure quantitative research methodology. Quantitative methods emphasise objective measurements and the statistical analysis of data collected through surveys or other means of data collection (Creswell 2014).

Research Design

This research adopted a correlational survey research design. This type of research seeks to establish what relationships exist between two or more variables. Also, this type of research indicates the direction, magnitude and strength of the relationships between the variables (Creswell 2014). This design has been used by Gana et al. (2019), Gana et al. (2020) and Ugwuanyi et al. (2020c) in similar studies.

Participants

A sample of 375 SS 3 Physics learners formed the study's participants. This sample was drawn from a population of 6,205 senior secondary three (SS 3) Physics learners in the 89 public second-

ary schools in the seven local government areas (LGAs) of Zone B education zone of Benue State in Nigeria. The sampling was done in stages. At the first stage, simple random sampling technique was used to draw 4 LGAs from the said education zone. Secondly, 25 secondary schools were sampled from the 4 local governments using a disproportionate stratified random sampling technique. Finally, 15 SS 3 Physics learners were selected from each of the schools sampled using a disproportionate stratified random sampling technique making a total of 375 SS 3 Physics learners.

Instrumentation and Procedure

The learner motivation and learner self-efficacy scales were used for data collection. The learner motivation scale was a 20-item questionnaire. The learner self-efficacy scale developed by the researchers comprised 15 item statements. The statements of both instruments were structured on a 4-point Likert scale of 'Strongly Agree' (SA), 'Agree' (A), 'Disagree' (D), and 'Strongly Disagree' (SD) to elicit responses from the respondents. Respondents were required to express their level of agreement or otherwise to each of the items, based on the same four Likert-scale choices as mentioned above.

The instruments were face-validated by two experts in measurement and evaluation and educational psychology. Copies of the validated instruments were trial-tested on 20 learners outside the study area to establish the reliability of the items of the instruments. The data obtained were used to estimate the internal consistency reliability indices of the items of the instruments (learner motivation and learner self-efficacy scales). The reliability indices estimated for the two scales using Cronbach alpha were 0.78 and 0.81, respectively. Information on the performance of the respondents in Physics, comprising their annual results in the 2018-2019 academic session, were gathered from the head of the Physics unit in each of the participating schools.

Finally, copies of the instruments were administered to the participating SS 3 Physics learners in the selected schools through visitation to the sampled schools by the researchers with the help of research assistants. The researchers adopted the on spot administration and collection of copies of the instruments after completion by the respondents. Physics teachers in the schools served as research assistants.

Ethical Measures

To conduct this study, the researchers sought ethical clearance from the Research Ethical Committee of the Faculty of Education, University of Nigeria. The study was thereby granted ethical approval accordingly.

Data Analysis

Simple linear regression analysis was used to answer research questions and test the null hypotheses. The correlation coefficient and coefficient of determination, which are aspects of simple linear regression, provided results to answer the research questions. The null hypotheses were tested at 0.05 level of significance using analysis of variance (ANOVA).

RESULTS

This section discussed the results of the study. Each research question was stated again, followed by its respective hypothesis, with a discussion following each.

Research Question 1: What is the relationship between motivation and learner performance in Physics?

Table 1 shows that the correlation between motivation and learners' academic achievement in Physics is 0.71, with a coefficient of determination of 0.51. This means that there is a positive relationship between motivation and learners' academic achievement in Physics. This means that the more learners are motivated, the better they will perform in Physics. In addition,

Table 1: Regression analysis of the relationship between motivation and learner performance in Physics

Model	*r*	*r-square*	*Std. error of the estimate*
1	0.71[a]	0.51	2.36

[a]Predictors: (constant), motivation

Table 2: Analysis of variance of the relationship between motivation and learner performance in Physics

Model		*Sum of squares*	*df*	*Mean square*	*F*	*Sig.*
1	Regression	12567.89	1	12567.89	125.99	0.000[b]
	Residual	37306.50	374	99.75		
	Total	49874.39	375			

[a]Dependent variable: learners' academic achievement in Physics
[b]Predictors: (constant), motivation

the coefficient of determination of 0.51 means that a fifty-one percent variation in learners' academic achievement in Physics is predicted by their motivation.

Ho$_1$: Motivation and learner performance in Physics are not significantly related.

Table 2 shows that motivation had a significant positive relationship with learners' performance in Physics, F (1, 374), = 125.99, $p < 0.05$. This indicates that fifty-one percent of the learners' academic achievement in Physics is attributed to motivation. The inference drawn is that learner motivation significantly predicts their academic achievement in Physics. Thus, null hypothesis 1 is rejected at $p < 0.05$.

Research Question 2: What is the relationship between self-efficacy and learner performance in Physics?

Table 3 shows that the correlation between self-efficacy and learners' academic achievement in Physics is 0.80, with a coefficient of determination of 0.63. This means that there is a positive relationship between self-efficacy and learners' academic achievement in Physics. This means that the higher the self-efficacy of learners, the higher their academic achievement in Physics. In addition, the coefficient of determination of 0.63 means that a sixty-three percent variation in learners' academic achievement in Physics is predicted by their self-efficacy.

Table 3: Regression analysis of the relationship between self-efficacy and learner performance in Physics

Model	*r*	*r-square*	*Std. error of the estimate*
1	0.80[a]	0.63	2.04

[a]Predictors: (constant), self-efficacy

Ho$_2$: Self-efficacy and learner performance in Physics are not significantly related.

Table 4 shows that self-efficacy had a significant positive relationship with learners' performance in Physics, F (1, 374), = 90.33, $p < 0.05$. This indicates that sixty-three percent of the learners' academic achievement in Physics is attributed to self-efficacy. The inference drawn is that the learners' self-efficacy significantly predicts their academic achievement in Physics. Thus, null hypothesis 2 is rejected at $p < 0.05$.

DISCUSSION

This study has empirically determined the relationship between motivation and self efficacy, and learner performance in Physics. The outcome of the regression analysis shows that motivation and self-efficacy have moderately significant positive relationships with learner performance in Physics. These findings have

Table 4: Analysis of variance of the relationship between self-efficacy and learner performance in Physics

Model		*Sum of squares*	*df*	*Mean square*	*F*	*Sig.*
1	Regression	3254.87	1	3254.87	90.33	0.000[b]
	Residual	13475.22	374	36.03		
	Total	16730.09	375			

[a]Dependent variable: learners' academic achievement in Physics
[b]Predictors: (constant), self-efficacy

strengthened the theoretical basis of B.F Skinner's Operant Conditioning Theory and A. Bandura's SCT. 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, SCT states that self-efficacy and behavioural change are directly related. These findings are in tandem with the findings of previous studies, such as those from Chow and Seng (2013), Stofile (2017), Mohammad (2017), Van Rooij et al. (2017), Achufusi et al. (2019), Ghaffar et al. (2019), Metriana (as cited in Tokan and Imakulata 2019), Ozkal (2019), Tokan and Imakulata (2019), and Wenty and Slamet (2019).

Chow and Seng (2013) found that students' motivational orientations and Science performance are positively related. Akra and Ghazanfar (2014) determined that students' self-efficacy highly correlates with their cumulative grade point average score (CGPAS). Mohammad (2017) and Schumacher and Ifenthaler (2018b) found that motivation had a considerably positive effect on student performance. Tastan et al. (2018) reported that teacher motivation significantly determines the academic achievement of learners in Science education. In addition, Achufusi et al. (2019) found that motivation is a significant determinant of student performance. Metriana (as cited in Tokan and Imakulata 2019) mentioned that learner performance is significantly determined by motivation, learning behaviour, and self-efficacy. According to Tokan and Imakulata (2019), the performance of learners in Biology is dependent on intrinsic and extrinsic motivation and learning behaviour. Wenty and Slamet (2019) found that self-efficacy and high school students' performance in Biology have a low-significance positive relationship. Contrary to these findings, Stofile (2017) established that there is no significant relationship between learning motivation and academic achievement amongst second year Physics students.

Furthermore, Kapucu (2017) found that learners' self-efficacy in Physics learning and Mathematics performance are positive predictors of their performance in Physics. Van Rooij et al. (2017) established that students' academic interests have a significant relationship with their self-efficacy. According to Ozkal (2019), students' self-efficacy beliefs in learning have a significant positive relationship with their performance in Mathematics. Ghaffar et al. (2019) have shown that the attainment of active learning and an active learning environment is dependent on the teachers' self-efficacy, which also has a positive impact on Science-learning performance.

In addition, teachers' self-efficacy was found to have a significant positive impact on performance goal and Science-learning value. Suprayogi et al. (2019) found that academic efficacy and goal orientation have a significant impact on academic achievement. According to Tastan et al. (2018), teacher's self-efficacy has a significant influence on learners' performance in Science education. Gana et al. (2019) revealed that motivation, self efficacy and locus of control determined students' academic achievement in Physics. Lastly, Ugwuanyi et al. (2020c) found that psychological factors such as emotional intelligence, self-esteem, and self-efficacy have significant predictive capabilities on students' academic achievement in Mathematics.

The current research was able to determine the impacts of motivation and self-efficacy on learner performance in Physics using secondary school learners in Benue State as respondents. The study has contributed to the body of knowledge by empirically determining the impacts of motivation and self-efficacy on learner performance in Physics. This will help Physics educators in designing appropriate Physics instructions that will motivate learners as well as increase their self-efficacy to enhance their academic achievement.

CONCLUSION

The findings of the study revealed that the motivation and self-efficacy of the learners had significant positive relationships with their performance in Physics. The researchers therefore conclude that motivation and self-efficacy are major determinants of learner performance in Physics. In other words, high motivation and self-efficacy may lead to high learner performance in Physics. Thus, motivation and self-efficacy of learners should not be disregarded in their ability to achieve enhanced learner performance in Physics.

RECOMMENDATIONS

Based on the findings of this study, the researchers made the following recommendations. Physics learners should be adequately motivated to improve their academic achievement. The best instructional strategies that will motivate and increase the self-efficacy of learners should be used by teachers during Physics instruction to enhance learner performance.

LIMITATIONS

This research considered only respondents 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 generalisability of the findings to learners of other cultural orientations. In addition, non-consideration of respondents' gender and their school location as possible moderators may limit the generalisability of the findings. Based on that, the researchers suggest that future research should consider the moderating influences of cultural orientation, gender and school location on the impacts of motivation and self-efficacy on learner performance in Physics.

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