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EXPLORING THE IMPACT OF LOCUS OF CONTROL AND SELF-EFFICACY IN PHYSICS PERFORMANCE

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Abstract

The study investigated the effects of locus of control and self- efficacy on performance of senior secondary school students in physics. Answers were provided to four research questions within the blueprint of a descriptive survey design and a total of three hundred and fifty six physics students of intact classes sampled from six public secondary schools in Yaba Local Government Area of Lagos state, Nigeria participated in the study. Data were collected using students' locus of control and self-efficacy questionnaire (primary source) and students' performance in physics (continuous assessment and examination scores) were obtained from the sampled schools (secondary source). The instrument was validated and its Cronbach alpha values $r=0.93$ (locus of control scale) and $r= 0.76$ (self- efficacy scale). The data collected were analysed using independent sample t-test, mean, standard deviation, analysis of variance (ANOVA) and multiple regressions. The result showed a significant three-way interaction effects locus of control, age, and gender on students' performance in physics. Also, a significant relationship existed between locus of control and self efficacy as well as between locus of control and performance in physics. Locus of control was found to be the most potent predictor of performance in physics. The results were discussed and recommendations as well as policy implications were highlighted.

Keywords: *Locus of control, Self- efficacy, Physics*

Introduction

Over the years, the performance of students in physics at both internal and external examinations such as the end of the term and promotion examinations as well as the Senior Secondary School Examination (SSCE), the Unified Tertiary Matriculation Examination (UTME), the National Examination Council (NECO) and the General Certificate Examination (GCE) has been persistently poor in Nigeria. This has posed a serious challenge on physics researchers in search for factors responsible as well as suggesting practical solutions for improved performance. Prominent among numerous factors are teachers and students factors. However, teachers' methodology of teaching the subject has been extensively reported (Ogunleye, 1996; Iroegbu, 1998; Okoronkwa, 2004; Babajide, 2010, 2012;

Babajide & Ngurukwem, 2013; Afolabi, 2012; Ukoh, 2012) while vital student factors such as locus of control (Awofala, Awofala, Fatade, & Nneji, 2012) and self- efficacy (Akinsola & Awofala, 2009) are yet to be fully investigated in Nigerian senior secondary school physics. Locus of control has been widely reported in social and behavioural psychology studies (Levenson, 1973; 1981; Levenson & Miller, 1973; Rotter, 1954, 1966, 1990; Slagsvold & Sorenson, 2008; Jatkevicius, 2010). Locus of control is a degree or extent to which individuals perceive the outcome of an event results from their own behaviours or from forces that are external to themselves (Rotter, 1966). Daum and Weiber (2003) asserted that locus of control is a measure of the extent to which students attribute success or failure to factors under or not under their own control. The implication of this is that students may

attribute their successes or failures in school subjects such as physics to their abilities or to forces outside their own control which may be good or bad luck. This has been referred to as the psychological defense mechanism (Weiner, 1986).

Literature reveals that there are two types of locus of control namely internal and external (Rotter, 1954; 1975; 1966; 1990; Awofala et al, 2012). Generally people with internal locus of control believe they are responsible for whatever happen to them; hence, they work very hard to achieve success (Rotter, 1966; Awofala et al, 2012). People with internal locus of control are generally inquisitive; psychologically healthier and more successful in life, they also believe that their power controls their destiny (Rotter, 1990). Rotter (1975) therefore linked internal locus of control with attribution of efforts and external locus of control with attribution of luck. People with external locus of control believe that things that happen to them are out of their control; they attribute causes of events and actions to external factors that are beyond their control and view the world as complex and difficult to predict (Rotter, 1966; 1975). The externals are not motivated easily to struggle (Grant, 2006) as they tend to be more agreeable and likely to result to failure by giving up all hopes of hard work; thinking that working hard is futile probably because of disappointment their efforts have produced and therefore perceived failure as their destiny (Awofala et al, 2012).

It is desirable for one to have both internal and external locus of control; because each has its own advantage. For example, in a scenario where an internal locus of control person without a high management style and does not give room for individual differences may therefore tend to be arrogant. As such other people working with him/her may not cooperate with him/her which may retard rate of development. Hence, certain degree of

external locus of control is needed. People with both internal and external locus of control are referred to as Bi-local. Research reports showed that locus of control is not fixed; it varies with age and sex (Schieman, 2001). The researcher submitted that as people grow older they tend towards a more internal locus of control. Also, men tend to have internal locus of control than women (Slagsvold & Sorenson, 2008). This assumption is at variance with the findings of Schultz and Schultz (2005) that locus of control increases internally until middle age and become external at a later age. Also, men may have internal locus of control for questions related to academic achievement only. Studies have equally shown that there is a positive relationship between internal locus of control and academic achievement of students which is independent upon socioeconomic status of the students (Bar-tal, Bar-zohar & Chen 1980; Ross & Broh, 2000) as cited by Awofala et al (2012). The researchers reported that internals showed significantly higher grade than externals. Whyte (1978, 1980) investigated the relationship between locus of control and academic success of students enrolled in higher education courses. The results showed that students with more internal locus of control performed academically better than those with external locus of control. Various studies have equally shown a perfect relationship between locus of control and education. Specifically, more education leads to increase in internal locus of control (Slagsvold & Sorenson, 2008).

Self-efficacy is a person's belief in one's own ability to succeed in a particular situation. Bandura (1994) views self-efficacy as the belief in ones capabilities to organize and execute the courses of action required to manage prospective situation. In other words the Bandura affirmed that self-efficacy is a person's belief in his or her ability to succeed in a particular situation for it determines how

people think, behave and feel. Self-efficacy construct has a major role to play in the field of education and science education in particular. This is due to the fact that virtually all people can identify goals they want to accomplish, they would want to change and those they would like to achieve, hence, individual self-efficacy plays a major role in how these goals, task and challenges are achieved. Corroborating earlier definition, Akinsola and Awofala (2009) view self- efficacy as one's self judgments of personal qualities to initiate and successfully carry out specified tasks at designated levels, expend greater efforts and persevere in the face of adversity. People can have strong or weak self-efficacy; people with strong or high self- efficacy view challenging problems as task to be achieved. They develop deeper interest in the activity in which they participate and form a stronger sense of commitment and interest to activities. They also recover quickly from setbacks and disappointments. On the other hand people with weak or low self-efficacy avoid challenging task and believe that difficult task and situations are beyond their capabilities, focusing on personal failure and negative outcomes as well as quickly losing confidence in personal abilities.

Akinsola and Awofala (2009) in a review of extant literature reported that self-efficacy has great power in predicting and explaining performance in various academic domains and could enhance problem solving abilities in the learning of mathematics. Pajare and Miller (1994) found that self-efficacy had greater predictive power for problem solving success than mathematics self concept, background in mathematics and perceived usefulness of mathematics. The result of the study conducted by Norwich (1987) showed no significant relationship between self-efficacy and mathematics achievement. The present study therefore investigated the effects of locus of control and self-efficacy on

students' performance in physics at the senior secondary school level in Nigeria. It also investigated the moderating effects of age and gender on the dependent variable as well as the joint contribution of locus of control, self-efficacy, gender and age on students performance in physics.

Research Questions

1. Is there any significant effect of locus of control on students' performance in physics?
2. Is there any significant effect of self-efficacy on students' performance in physics?
3. Are there any significant interaction effects of locus of control, age and gender on students' performance in physics?
4. Is there any significant relationship among locus of control, self -efficacy, age and gender on students' performance in physics?

Objectives of the study

1. To find out if locus of control has a significant effect on performance of students in physics.
2. To find out if self-efficacy has a significant effect on performance of students in physics.
3. To find out if there is any significant interaction effect of locus of control, age and gender on students' performance in physics.
4. To find out if there is there is any significant relationship among locus of control, age and gender on students' performance in physics.

Theoretical frame work

This study is based on the theory of attribution (Heider, 1958; Jones, Kannouse, Kelley, Nisbett, Valins, & Weiner, 1972; Weiner, 1974; 1986). This theory is based on

how individual person interprets events and how these interpretations relate to individual thinking and behaviour. The theory assumes that people try to determine why people do what they do, thereby attributing one or more causes to that behaviour. Heider (1958) posited that one can make two types of attribution namely internal and external. According to him internal attribution is the inference that a person behaves in certain way because of something relating to that person such as attitude, character or personality. This is related to internal locus of control or high self-efficacy, when people attribute causes or consequences of events and action to one's ability and efforts. On the other hand external attribution according to Heider is associated with reasons behind peoples' action and behaviour. This is related to external locus of control; when people blame others for what happen to them, believing that they have no control over the action or event. They believe that failure is due to bad luck and not their ability, they doubt their ability and that success is due to good luck or who you know or to other factor outside their own control, and does not increase their confidence and pride. People attribution is driven by emotions and motivations, blaming other people and avoiding personal recrimination. They also make attribution to defend what they perceived as attack and pointing to injustice in an unfair world as well as apportioning blames to victims and seek to distance self from thought of suffering similar plight. People who have internal attributions are high achievers and possess high self efficacy; they believe that success is as a result of hard work, high ability and efforts and they have confidence in themselves and so success builds their pride and confidence

Methodology

The study is an expose-facto form of survey research design. The population

consisted of all senior secondary physics students from Yaba Local Government area of Lagos state from which a sample of three hundred and fifty six physics students were drawn from six randomly selected secondary schools in the local Government. Two research instruments obtained from primary and secondary sources; a questionnaire and scores of students in continuous assessment test and second term examination obtained from the sampled schools respectively were used in collecting data. The questionnaire is called locus of control and self- efficacy (LOCSE) Scale. It consisted of two sections A and B. Section A dealt with demographic information and section B consisted of 33 items the first 23 items addresses questions on students general locus of control of 2 points format of Agree (A) and Disagree (D) while the remaining 10 items addresses questions on students self- efficacy (SE) of 4 points format of Not at all (N), Hardly true(H), Moderately true (M) and Exactly true(E). The LOC Scale was adapted from Rotter (1990) and the SE Scale was adapted from Schwarzer and Jerusalem (1995). The LOCSE Scale was subjected to both face and content validation and the empirical validity was equally ensured through pilot-testing in a neutral school and reliability coefficient value (r) was calculated as $r=0.93$ for LOC and $r= 0.76$ for SE using Cronbach alpha

Administration and Scoring

The questionnaire items were administered to the participants in their various schools and their respective scores in physics which were a measure of their performance were collected from the respective physics teachers. The items were scored as follows: for LOC a score of 1point goes to Agree and a score of 0 point goes to Disagree. This was used to categorize students into internal and external locus of control. A score of 13 and above=external and a score of

below 13 =internal. For SE, Not at all true=1point. Hardly true=2 points. Moderately true=3points and exactly true=4points.This was used to classify students into high and low self-efficacy. A score of 25points and above was classified as high and a score of below 25 points is classified as low self- efficacy.

Results

Research Question One: Is there any significant effect of locus of control on students' performance in physics?

Table 1: t- test for Locus of control and performance in physics

Level LOC	N	Mean	St.Deviation	t	Df	Sig
External	289	66.8685	10.14051	-1.207	354	.228
Internal	67	68.5075	9.46344			
Total	356					

Table 1 show there is no significant effect of Locus of control on students' performance in physics. Nevertheless, students with internal locus of control have higher mean score in

physics (68.5075). Hence; they performed well than those who have external locus of control (66.8685).

Research Question Two: Is there any significant effect of self- efficacy on students' performance in physics?

Table 2: t- test of Self- efficacy on students' performance in physics.

Level SE	N	Mean	St Deviation	t	Df	Sig
High	226	67.7832	9.32532	1.507	354	.133
Low	130	66.1231	11.09439			
Total	356					

Table 2 shows that there is no significant effect of self- efficacy on performance of students in physics. Students who have high self- efficacy performed better (67.7832) than those with low self efficacy (66.1231).

Research Question Three: Are there any significant interaction effects of locus of control, age and gender on students' performance in physics?

Table 3: ANOVA table of Performance of students in physics, Self efficacy, age and

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	535.054 ^a	7	76.436	.736	.641
Intercept	686206.255	1	686206.255	6609.404	.000
LEVELLOC	100.045	1	100.045	.964	.327
SEX	9.097	1	9.097	.088	.767
AGE	6.987	1	6.987	.067	.795
LEVELLOC * SEX	234.330	1	234.330	2.257	.134
LEVELLOC * AGE	1.228	1	1.228	.012	.913
SEX * AGE	4.108	1	4.108	.040	.842
LEVELLOC * SEX * AGE	20.543	1	20.543	.198	.003
Error	34572.963	333	103.823		
Total	1569343.000	341			
Corrected Total	35108.018	340			

a. R Squared = .015 (Adjusted R Squared =.005)

Table 3 shows that there is a significant interaction effect of locus of control, age and gender on students' performance in physics. These variables accounted for 1.5% of the variance in students' performance in physics; this implies that other variable not investigated in this study will be responsible for the remaining 98.5%. Graphs of the interaction effect is presented in figures 1 and 2 below.

Fig 1: Interaction effects of Locus of control, Age and Gender on performance in physics below 15years

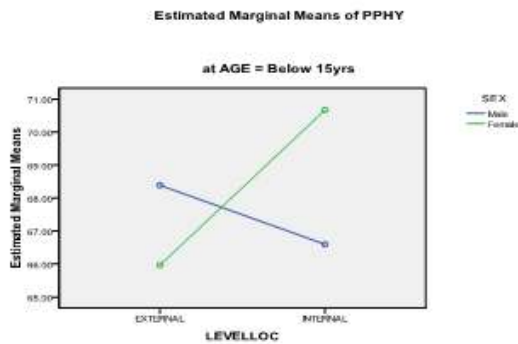


Fig 1 shows that female students who have internal locus of control performed better than male students who are internal. Also male students who are external performed better than female students who are external.

Fig 2: interaction effect of Age, Gender, LOC and performance of students in physics above age 15years

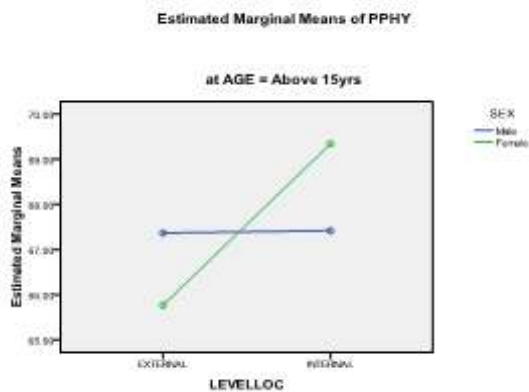


Fig 2 show that female students who have internal locus of control performed better than male students who are internal. Also male students who are external performed better than female students who are external.

Research Question Four: Is there any significant relationship among locus of control, self-efficacy, age and gender on students' performance in physics?

Table 4: Mean, standard deviation, and intercorrelations among the predictors and performance in physics for total sample (n=356)

	Variables				
	1	2	3	4	5
1. Performance	1.00				
2. Locus of Control	.073	1.00			
3. Self-efficacy	.072	.154*	1.00		
4. Gender	.045	.054	.016	1.00	
5. Age	.048	.007	.123*	.056	1.00
Mean	67.08	1.19	1.37	1.51	1.75
SD	10.16	.50	.48	.50	.43

*p<.05

Table 4 shows that there is a significant relationship between self-efficacy and locus of control ($r=0.15$, $p<0.05$), and also, there is a significant relationship between self efficacy and age ($r=0.12$, $p<0.05$).

Table 5: Summary of Regression results
 $F=1.142$, $R^2=.020$, Adjusted $R^2=.009$

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	708.223	4	177.056	1.729	.143
Residual	34399.794	336	102.380		
Total	35108.018	340			

a. Predictors: (Constant), TOTALSE, SEX, AGE, TOTALLOC

b. Dependent Variable: PPHY

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	75.770	4.873		15.547	.000
Gender	-.1370	1.103	-.058	-1.061	.290
AGE	-.300	1.277	-.013	-.235	.814
TOTALLOC	-.480	.194	-.136	-2.473	.014
TOTALSE	.032	.105	.017	.305	.761

Table 5 shows that gender made a contribution of .058, ages contributed .013, LOC contributed .136 and SE contributed .017. Hence, LOC made a significant contribution; meaning it is the most potent predictor of students' performance among the entire variables that were investigated. Jointly the variables accounted for a total of 2% of the variance in students in performance physics. Regression equation, Performance in physics predicted = $75.770 - .136 \text{ locus of control} + .017 \text{ self-efficacy} - 0.058 \text{ gender} - 0.013 \text{ age}$.

Discussion

The results of this study showed that there is no significant effect of locus of control on performance of students in physics. This finding is at variance with previous study (Awofala et al, 2012) that reported a significant effect of locus of control on achievement of students in physics and mathematics. Although in the present study, students who have internal locus of control performed better than those who have external locus of control. This result is in line with the findings of Whyte (1978) and (1980) who reported that students with more internal locus of control performed academically better than those with external locus of control. The higher performance of students who have internal locus of control may be due to the fact that people with internal locus of control believe they are responsible to whatever happen to them, hence, they work very hard to achieve success (Rotter,1966;

Awofala et al, 2012). They are generally inquisitive; psychologically healthier and more successful in life, they also believe that their power controls their destiny. Also, the result shows no significant effect of self-efficacy on performance of students in physics. This result in a way contradicted the result of Akinsola and Awofala (2009) which indicated significant difference in the mathematics word problem achievement and self-efficacy beliefs of personalized and non-personalized groups. Students who have high self efficacy performed better than those with low self efficacy. The result also shows that female students who have internal locus of control performed better than male students who are internal. Also male students who are external performed better than female students who are external. A similar trend is obtained at age 15years below and above. On a general analysis, female internal exhibited an outstanding performance, this is at variance with the assumptions of Rotter (1990) who asserted that men are internal while women are external and that of Schultz and Schultz (2005) who reported that man may have internal locus of control for questions related to academic achievement. The non significant difference observed between locus of control and performance, and non significant effects of self efficacy on performance in physics may be due to the fact that students were examined at different times and were not made to answer the same questions. Or probably because the questions which measured students' performance did not pass through validation procedure (teachers constructed questions).

The finding of a significant relationship between self- efficacy and locus of control ($r=0.15, p<0.05$) recorded in this study contradicted the result of Norwich (1987) who found no significant relationship between self -efficacy and mathematics achievement. Also, result of this study

showed a significant relationship between self-efficacy and age ($r=0.12$, $p<0.05$). The study also found that locus of control is the most potent predictor of performance in physics (table 5). The result in table 5 indicated that 2% of the variance in physics performance was accounted for by the predictors (variables) when taken together. The relationship between locus of control, self efficacy and age implies that these variables should be monitored for improved performance in physics.

Summary of findings

1. There was no significant difference between internal and external locus of control on students performance in physics, although the internal performed better than the external.
2. There was no significant effect of self-efficacy on performance of students in physics, although high self-efficacy students performed better than low self- efficacy students.
3. Students with internal locus of control performed better than those with external locus of control. Female students of internal locus of control performed best than male students with internal and external locus of control.
4. There was a significant relationship between self-efficacy and locus of control. Also, there was a significant relationship between self-efficacy and age. Locus of control was the most potent variable out of the variables investigated that predicted performance of students in physics.

Conclusion

The study has found that a significant relationship existed between locus of control and self- efficacy and between self- efficacy

and age. There was a significant interaction effect of locus of control, age and gender on the performance of students in physics. These three variables mutually influenced the performance of students in physics to produce a joint effect.

Recommendation (Implication for Education Policy Makers)

Practicing physics teacher should adopt practical classroom strategies that will strengthen students' internal locus of control as well as developing high self-efficacy towards the subject physics, in particular and science in general. This is because internal locus of control is an essential factor for students to have a thorough understanding of science. Internals are more likely to develop an intrinsic orientation in which participation in the science task presents or because participation exhibits feeling of competence, mastery, control, and self-determination. Also, because students with high self-efficacy tend to develop greater confidence in their academic capabilities and this confidence extends equally across the learning of physics concepts for improved performance. Also, teachers' made questions should pass through some validation procedure.

Suggestion for Further Studies

This study can be replicated in other state of the Federation, measuring the effects of academic locus of control self -efficacy and other variables such as study habit and anxiety on students' achievement in physics where the students will be under the same examination conditions

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