STUDENTS' LOCUS OF CONTROL AND LEARNING APPROACHES IN MIXED ABILITY PHYSICS CLASSROOMS

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Abstract

This study investigated the predictive power of students' locus of control as well as learning approaches on ability levels in Physics classrooms in secondary schools. Five research questions were answered, and five null hypotheses were tested. A correlational survey research design was adopted for the study. The study was conducted in Makurdi Metropolis of Benue State. The study sampled 550 science students offering Physics as a school subject in Term II for 2021/2022 Academic Session from 89 senior secondary schools in the study area using simple random sampling technique. The instruments for data collection were Approach to Study Inventory (ASI), Locus of Control (LOC) and Ability Group Test (AGT). The instrument ASI developed by Biggs, Kember, and Leung, (2001) and LOC developed by Rotter (1966) was adapted in the study. The instruments were face validated by three experts. Construct validation was also done for ASI and LOC using factor analysis. The internal consistency estimate obtained through Cronbach's Alpha was 0.72 for ASI and 0.76 for LOC. Data collected were analyzed using regression analysis to answer the research questions and test the null hypotheses at 0.05 level of significance. Findings revealed that surface learning approach, deep learning approach, internal locus of control, external locus of control as well as the combination of students' learning approaches and locus of control have significant predictive power on students' ability levels in Physics. Based on these findings, the following recommendations were made among others that Physics teachers should give students opportunity to participate in the class and give tasks that are within their ability and School counselors should encourage external control-oriented students not to avoid or neglect striving hard or to remain idle even when anticipating that luck and fate could determine their success.

Key words: locus of control, deep learning approaches, surface learning approach cognitive ability, Physics.

Introduction

Physics is a natural science that involves the study of matter along with related concepts such as energy and force. According to Achor, Ellah and Omaga (2022), physics is the most basic of all sciences. It is at the root of every field of sciences and underlines all natural phenomena. In other words, physics is the mother of all sciences. It is not a set of facts and rules to be memorized. Instead, memorization is a fruitless way to try to learn physics. This observation by Bueche (1988) is in line with the assertion by Achor, et al., (2022) that Physics is a difficult course to construct meaningful learning and so the achievement of students in physics is very low. There are some factors affecting students' achievement in physics. Some of them are related with students, like students' learning approaches, preconceptions, mathematics achievement, cognitive development level, attitudes towards physics, prior experience with the related fields, socio-economic level, age, and gender.

Among all these factors, students' learning approaches play important role. Students' learning approaches in this context is described as the students' approach to study whether systematic, efficient, or inefficient. In the study of students' study process, Fakeye and Amao (2013) described it as the adopted way and manner a student plans his private readings, after classroom learning so as to attain mastery of the subject. Students' approaches to learning is conceived as forming part of the total system in which an educational event is located, the approaches used in studying by student is dependent upon a host of factors, such as students' values and motives, their perceptions of task demands, teaching and assessment methods and classroom climate mutually interact forming a dynamic system. Study habits are good assets to learners' study approaches because they may also assist students to attain mastery in area of specialization and consequent excellent performance. Students' learning approaches are learning tendencies that enable students to work confidentially. Going by this definition, it literally means that enhanced learning approaches produces excellent academic performance while inefficient learning approaches leads to academic failure (Nworgu, Ellah & Achor, 2018).

Study processes are separated into two categories the deep and surface learning. Surface learners put forward low-level learning products while deep learners put forward high-level learning products. Etem (2013) found that students better understand what they read and give better answers to questions in the deep learning approach in which comprehending the meaning predominates, rather than in the surface learning approach where memorization is predominant. Besides, research studies carried out on this subject matter Nworgu, Ellah and Achor (2018) put forth that deep learning has more influence on student's academic achievement. The memorizing-remembering process aims to generate meaning for the student who learns knowledge on the surface; this situation refers to the end of the learning process for the surface learners. While a deep learning approach rests on the student's active restructuring and formation of knowledge (Dart, et al., 2000).

The researchers such as school counselors and teachers have observed that in many instances some students in secondary schools who happened to get higher marks claim to

have obtained it by themselves. Those with lower marks claim to have been failed by their teachers, using a popular statement. “The teacher has failed me” (Achor, Ellah & Omaga, 2022). The process of how students’ learning approaches can be managed to improve academic performance of the learners is still a complex task for school counselors and Physics teachers. In the light of this, this study focuses on the influence of learning approaches and locus of control on students’ ability levels in mixed ability Physics classroom. Learning does not take place in a vacuum. Manjula, Stewart, Wilson, and Muhammed (2012) opined that environmental, social, political, and many other learner-external factors interact in complex ways to determine learning outcomes. Moreover, the way learners observe the world has a great influence over their educational achievements.

Locus of control has certainly generated much research in psychology in a variety of areas. It was first introduced by Rotter in Social Learning Theory (1966). Locus of control indicates how a person believes about control over life events; locus of control refers to whether individuals relate their success or failure to their own behavior (Sabiha 1. Borooah, 2017). Rotter proposed a continuum for locus of control with externalisers and internalisers at the two opposing extremes. According to Gatawa and Yusuf (2015), internalisers feel personally responsible for everything that happens to them in their lives whereas externalisers believe that factors beyond their control determine what would happen in their lives. For example, college students with a strong internal locus of control may believe that their grades were achieved through their own abilities and efforts, whereas those with a strong external locus of control may believe that their grades are the result of good or bad luck and are hence less likely to work hard for high grades. This has obvious implications for differences between internals and externals in terms of their motivation and achievement. Nworgu Ellah and Achor (2018) suggested that internal locus is linked with higher levels of progress. Due to their locating control outside themselves, externals tend to feel they have less control over their fate. People with an external locus of control tend to be more stressed and prone to clinical depression. Gatawa and Yusuf (2015) found that locus of control affects achievement as a predictor of persistence in education. Both internal and external loci of control are linked with desirability, but over relying on either end of the continuum are associated with anxiety and frustration. Mohammad (2015) found that internalizers were better achievers than externalizers although the observed difference between the two groups was not large enough to reach statistical significance. Moreover, fluctuations in achievement were greater for externalizers than for internalizers. These fluctuations could not, however, be solely credited to locus of control. Other factors such as teachers' inconsistency in scoring, learners' motivation and cognitive ability levels may also explain these changes.

Cognitive ability is the characteristics mode of functioning that an individual shows in intellectual activities in a highly consistent and persuasive way. Nworgu, Ellah and Oparah (2019) identified three levels of cognitive ability in relation to teaching-learning situations viz: high, medium, and low. According to them, high ability individuals are better than medium or low ability learners who might be better in other tasks that have to

do with the use of hands. However, medium ability level learners performed relatively better than the low ability levels on learning activities involving social materials and are likely to require external defined goals and reinforcement. The achievement of low ability level is below average, and the cause of under-achievement was attributed to social disadvantages (low income, poor health), peer influence on educational choices, quality of teaching, domination and organization of the curriculum of senior secondary schools by public examination and sex-difference (Nworgu, Ellah & 2019).

In recognizing the significance of the disparity in ability levels of students, Nworgu, Ellah and Oparah (2019) also opined that high ability learners are more intelligent than the low ability or medium ability learners in solving tasks in science subjects. Intelligence, according to them, is the general level of cognitive functioning as reflected in the ability to understand ideas and to utilize abstract symbols in the solution of intellectual problems. Some of these claims are verifiable because they might not have anything to do with students' learning approaches, locus of control and disparity in students' ability levels in Physics class. To be specific, the study intends to:

& Determine the predictive power of surface learning approach on students' ability levels in Physics.

& Determine the predictive power of deep learning approach on students' ability levels in Physics.

1. Determine the predictive power of external locus of control on students' ability levels in Physics.

IV. Determine the predictive power of internal locus of control on students' ability levels in Physics.

1 Determine the predictive power of the combination of learning approaches and locus of control on students' ability levels in Physics.

Research Questions

4. What is the predictive power of surface learning approach on students' ability levels in Physics?

1. What is the predictive power of deep learning approach on students' ability levels in Physics?

2. What is the predictive power of external locus of control on students' ability levels in Physics?

IV. What is the predictive power of internal locus of control on students' ability levels in Physics?

& What is the predictive power of the combination of learning approaches and locus of control on students' ability levels in Physics?

Hypotheses

- There is no significant influence of surface learning approach on students' ability levels in Physics.

- There is no significant power of deep learning approach on students' ability levels in Physics.
- There is no significant power of external locus of control on students' ability levels in Physics.

IV. There is no significant power of internal locus of control on students' ability levels in Physics.

- There is no significant power of the combination of learning approaches and locus of control on students' ability levels in Physics.

Method

A correlational survey research design was adopted for the study. A correlational survey research design is one which seeks to establish relationship between two or more variables or phenomena being investigated (Emaikwu, 2019). The study was conducted in Makurdi Metropolis of Benue State. The population for the study comprised 4148 science students in senior secondary schools in the study area. The sample of the study was 550 science students offering Physics as a school subject in Term II for 2021/2022 Academic Session from 89 senior secondary schools in the study area. The sampled schools were drawn from the area used for the study using simple random sampling technique using lucky dip with replacement.

The instruments for data collection were Approach to Study Inventory (ASI), Locus of Control (LOC) and Ability Group Test (AGT). The instrument ASI developed by Biggs, Kember, and Leung, (2001) and LOC developed by Rotter (1966) was adapted in the study. The ASI is a four-point scales with response indicators based on Deep Motive (DM), Deep Strategy (DS), Surface Motive (SM), and Surface Strategy (SS). The LOC is 29 items with higher scores indicating external locus of control on internal-external dimension of the scale. Ability Group Test (AGT) was used to determine the cognitive ability levels of the respondent. The AGT is a 20-item multiple choice tests adapted from Test Booklet General Ability Test (TBGAT, 2003). The test questions were read to the students by the researcher, and they were allowed one minute to provide answers to each question. The instruments were face validated by three experts. One expert in Measurement and Evaluation from Department of Educational foundations, University of Agriculture, Makurdi and an expert in Physics Education from Science and Mathematics Education Department, Benue State University Makurdi as well as an experienced Physics teacher.

Construct validation was done for ASI and LOC using factor analysis. This is because learning approaches and locus of control are psychological constructs (Emaikwu, 2019). Based on the extraction method of principal component analysis and the rotation method of Varimax with Kaiser Normalization, items which were factorially pure with a factor loading of 0.40 and above on a single factor were identified to form part of the final form of the instruments. Estimate of internal consistency was obtained through Cronbach's Alpha for both LOC and ASI. The internal consistency estimate was found to be 0.72 for

ASI and 0.76 for LOC. The instruments were administered by the researchers with the assistant of the regular Physics teacher in each of the sampled senior secondary schools. Five days was used for data collection. Permission was sought from the school management to administer the instruments. The raw data collected for all variables was submitted to a linear normalization procedure and transformed into t-scores, to allow easier comparison and eliminate some ambiguity resulting from differences between the various schools. To ensure the correctness of the procedure the mean and standard deviation of each variable were assessed after normalization. Data collected were analyzed using regression analysis to answer the research questions and test the null hypotheses at 0.05 level of significance.

RESULTS

Table 1: Summary of Stepwise Regression Analysis of Predictive Power of Learning Approaches and Locus of Control on Students' Ability Level in Physics

Variables	R	Regression Square (R^2)	*B*	β(Reg. Weight)	*t*	Sig.
Surface learning approach	0.473	0.224	0.366	0.344	8.413	0.000
Deep learning approach	0.547	0.299	0.570	0.669	7.230	0.000
External locus of control	0.373	0.139	0.346	0.444	9.013	0.000
Internal locus of control	0.747	0.558	0.372	0.569	6.210	0.000
Learning approaches and locus of control	0.773	0.598	0.446	0.644		

Table 1 reveals that the correlation between surface learning approach and students' ability levels is 0.473 with coefficient of determination is 0.224. The regression weight is 0.344. This implies that the predictive power of surface learning approach is 34.4 percent. The table further reveals that the probability associated with the calculated value of t(8.413) is 0.05. The probability value of 0.000 is less than 0.05 level of significance and this means that surface learning approach significantly predicts students' ability levels in Physics. The analysis further reveals that the correlation between deep learning approach and students' ability levels is 0.547 with coefficient of determination is 0.299. The regression weight is 0.669. This implies that the predictive power of deep learning approach is 66.9 percent. The table further reveals that the probability associated with the

calculated value of t(7.230) is 0.05. The probability value of 0.000 is less than 0.05 level of significance and this means that deep learning approach significantly predicts students' ability levels in Physics.

The analysis also reveals that the correlation between external locus of control and students' ability levels is 0.373 with coefficient of determination is 0.139. The regression weight is 0.444. This implies that the predictive power of external locus of control is 44.4 percent. The table further reveals that the probability associated with the calculated value of t(9.013) is 0.05. The probability value of 0.000 is less than 0.05 level of significance and this means that external locus of control significantly predicts students' ability levels in Physics. The analysis also reveals that the correlation between internal locus of control and students' ability levels is 0.747 with coefficient of determination is 0.558. The regression weight is 0.569. This implies that the predictive power of internal locus of control is 56.9 percent. The table further reveals that the probability associated with the calculated value of t(6.210) is 0.05. The probability value of 0.000 is less than 0.05 level of significance and this means that internal locus of control significantly predicts students' ability levels in Physics. The analysis also reveals that the correlation between the combination of learning approaches and locus of control on students' ability levels is 0.773 with coefficient of determination is 0.598. The regression weight is 0.644. This implies that the predictive power of the combination of learning approaches and locus of control is 64.4 percent.

Table 2: Analysis of Variance of the Combination of Learning Approaches and Locus of Control on Students' Ability Level in Physics

Model		Sum of square	Df	Mean Square	F	Sig
	Regression	911.825	2	455.913		
2	Residual	1253.188	548	2.287	8.857	.000[c]
	Total	1503.296	550			

Table 2 reveals that the calculated value of F(8.857) has an associated probability value of 0.000. Since the probability value of 0.000 is less than the 0.05 level of significance, it implies that the combination of learning approaches and locus of control significantly predict students' ability levels in Physics.

Discussion of Findings

The study determined the predictive power of surface learning approach, deep learning approach, internal locus of control, external locus of control and the combination of learning approaches and locus of control on students' ability levels in Physics using bivariate and multivariate approaches. The analysis of data revealed that both affective

variables are relevant predictors of student's cognitive ability levels in Physics as a school subject. In fact, the results of the regression analysis were statistically significant with the presence of affective variables as predictors in the models for all the variables, this confirms the initial assertion that students' cognitive ability level is best predicted when using bivariate and multivariate approaches including affective variables.

Finding revealed that surface learning approach has moderate predictive power and significantly predicts students' ability levels in Physics. This implies that surface learning approach is a determinant of students' ability levels in Physics. The finding agrees with that of Sharma (2012) that good study habit was associated with high level of academic achievement. The finding collaborates with that of Anwar (2013) that positive relationship exists between academic achievement and study habit and that the degree of relationship was high. The finding is also consistent with that of Siahi and Maiyo (2015) that there is a positive relationship between study habit and academic achievement and that students who exercise good study habit are likely to excel than those with poor study habit.

Finding further revealed that deep learning approach has moderate predictive power and significantly predicts students' ability levels in Physics. This implies that deep learning approach is a determinant of students' ability levels in Physics. The finding agrees with that of that of Cerna and Pavliushcheko (2015) that study habit is an important determinant of academic performance. The finding is also consistent with that of Sherafat and Murthy (2016) that study habit is an important correlate of academic achievement. However, the finding is contrary to the finding of Egbo (2015) that there is no significant relationship between students' study habit and their academic performance.

In spite of these contrasting views, the present findings offer further support for the use of the students learning approaches, being a recurring phenomenon, an age-long phrase used in educational parlance to connote the consistency with which an individual plans and undertakes studies or learning activities routinely. The positive relationship and significant predictive effect could be due to the fact that Physics students engaged in this wholesome practice adhere conscientiously to the learning strategically outlined on a regular basis and as scheduled. The modus operandi in a good learning approach entails regular class attendance, painstaking attention to details in notetaking, regular and/or consistent reading of previous works. This could enhance the Physics students' modification of misconceptions, creativeness to make proper connections, organization, and integration of scientific concepts into students' long-term memory which could help to enrich their scientific concept vocabularies in and outside the classroom.

Finding again revealed that external locus of control has moderate predictive power and significantly predicts students' ability levels in Physics. This implies that external locus of control is a determinant of students' ability levels in Physics. However, the finding disagrees with that of Onyekuru and Ibegbunam (2014) that there existed a weak and insignificant negative correlation between external locus of control and academic achievement of the students. The finding also disagrees with that of Sabiha and Borooah

(2017) that the correlation between external locus of control and academic achievement was not significant.

Finding again revealed that internal locus of control has moderate predictive power and significantly predicts students' ability levels in Physics. This implies that internal locus of control is a determinant of students' ability levels in Physics. The finding agrees with that of Awofala, Awofala, Fatade and Nneji (2012) that internal locus of control is an essential factor for students to have a thorough understanding of science and Mathematics. The finding also agrees with that of Oludipe (2013) the individuals with an internal locus of control engage in activities that will improve their situation and work hard to develop their knowledge, skills and abilities

Locus of control depends on ability and change with uncertainty. It deals with attitude of the individuals who have less tolerance resist changes. Locus of control is identified as the reaction of the individuals according to their status. Internal locus of control students' belief that they can manage or set situations according to their abilities while external locus of control students' belief that all the situations are due to external factors. This belief is responsible for the significant predictive power of external as well as internal locus of control on students' ability levels in Physics

Finding again revealed that the combination of learning approaches and locus of control has moderate predictive power and significantly predicts students' ability levels in Physics. This implies that the combination of learning approaches and locus of control are determinant of students' ability levels in Physics. The finding agrees with that of Ogunmakin (2013) that is locus of control have a positive relation between academic performance and academic achievement. The finding also agrees with that of Gatawa and Yusuf (2015) that locus of control affects achievement as a predictor of persistence in education. The finding is consistent with that of Muhammad and Kanwal (2016) that there is a positive relationship between locus of control and academic performance and that there is significant relationship between academic performance and locus of control. However, the finding disagrees with that of Abbas, Omid, and Sajad (2012) that locus of control scores cannot predict high school learner's language achievement.

The robust interplay between the combination of students' learning approaches and locus of control observed in Physics class among students in this study raises important issues that merit further consideration. Perhaps locus of control would prove advantageous in individualistic educational systems, but that does not automatically render an internal orientation a universal educational advantage. As the current results showed, students' learning approaches and locus of control are determinant of ability levels in Physics class and can facilitate rather than inhibit progress. Any linkage of locus of control with high ability level students at best may misrepresent the role locus of control plays in learning. The rich intertwining of students' learning approaches and locus of control as determinant of ability levels in Physics within the focus groups points to several areas of students' learning approaches and locus of control that need further clarification. Students' learning approaches and locus of control may require greater refinement as psychological

constructs, especially regarding the nature of surface and deep approaches as well as internal and external locus of control. The constructs although do not offer a clear distinction between affiliation and dependency.

The results of the current study demonstrate how learning approaches and locus of control operate synergistically as well as peacefully in the ways students approach learning in Physics class. The focus group discussions provide insight from students themselves regarding how they manage the relationship between learning approaches and locus of control when faced with the challenge of adapting varieties of learning approaches given their locus of control. Perhaps the most adept students combine intrepid self-direction with gracious acceptance of direction from others. This is responsible for the significant predictive power found for the combination of learning approaches and locus of control on students' ability levels in Physics.

Conclusion

The study concludes that students' learning approaches and locus of control have moderate predictive power on students' ability levels in Physics. Students' surface as well as deep learning approaches is determinant of students' ability levels in Physics. Similarly, Students' internal as well as external locus of control is determinant of students' ability levels in Physics. The study further conclude that the combination of students' learning approaches and locus of control are determinant of cognitive ability levels in Physics and affects achievement as a predictor of persistence in education. Both surface and deep learning approaches as well as internal and external locus of control are linked with desirability, but over relying on either end of the continuum are associated with anxiety and frustration. This would likely make the students in Physics class to assume the third orientation of locus of control which is Bi-Local. Students that have Bi-local characteristics are known to handle their case and cope with their problems more effectively by having the mixture of internal and external locus of control.

Recommendations

The study therefore recommends that:

- School counselors should build confidence in external control-oriented students to strive harder even when anticipating that luck and fate could determine their success.

AI. School counselors should encourage internal control-oriented students on the need to develop more self-efficacy, competency and use opportunity to enable them to attain their desired goals.

c. Physics teachers should enlighten their students on how to use their efforts in enhancing study habit and relate it to fate, luck and other factors in attaining their goals. In many instances efforts coincide with luck.

IV. School counselor should also counsel students on how they could set achievable goals in relation to the efforts they make. Students should be made to realize where

they make mistakes, so that they don't attribute their expected failure to the teachers or something else.

d. Physics teachers should give students opportunity to participate in the class and give tasks that are within their ability.

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