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The West African Journal of Education (WAJE) pioneered academic/professional publishing in the Sub-region in the late 1950s. It has also nurtured the development of a good number of academic journals that have expanded the frontiers of educational research and information exchange over the years. The WAJE, in its revised form maintains the goal of becoming the most widely cited education journal in the sub-region, hence the current efforts that are being made to enhance the quality of reports and other discourses published in it.

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EDITORIAL STATEMENT

Institutions are set up in every part of the World to promote what is considered as desirable learning. In these institutions, the expectations from the learners are the acquisition of approved knowledge while the responsibility of imparting it dwells on the teacher. We are happy to publish in this volume ten articles which focus attention on the stakeholders involved in teaching-learning for effectiveness of education at all levels.

Obialo and Emeke generated data on the effects of Psycho-social factors and creativity of undergraduates in South-West Nigeria while Atanda's article clearly indicates remarkable roles which institutional support and teacher performance can play in attaining the objectives of setting up secondary schools in Akinyele Local Government Area of Oyo State, Nigeria. Other areas presented in this volume include; Constructs and dimensionality of instruments on undergraduates' personal variables and academic performance in the Faculty of Science, University of Ibadan, Nigeria; Evaluation of the Undergraduate Chemistry Education Programme in Universities in Rivers State, Nigeria and Estimating Generalizability and Dependability Studies of Students' Scores in Teaching Practice Assessment in a Nigerian College of Education.

Two papers from our contributors focused specifically on the roles of teaching methods punctuated with the needed teaching materials on the level of achievement by the learners (Effect of Game-Based Learning (GBL) and Gamification on Senior Secondary School Students Learning Outcomes in Physics and Assessment of the Integration and Challenges of Information and Communication Technologies (ICTS) in Tertiary Institutions in Nigeria). Lastly, psychological issues as they impact on learners achievement were discussed in three different papers (Psychological factors as predictors of senior secondary students' attitude toward environmental concepts in biology in Lagos, Nigeria; Assessment of Secondary School Students' Awareness, Attitude and Readiness for Forestry Education in Awka South Local Government Area of Anambra State, Nigeria and Fostering Mathematics Achievement: The impact of age, gender and self-esteem using the Rosenberg Self-Esteem Scale on Secondary School Students in South West, Nigeria).

No doubt, the time has come when these identified factors have to be integrated into the school curriculum to aid all round development of learners.

Thank you.

Monica N. Odinko

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CONTENTS

Psychosocial Factors and Creativity of Undergraduates in South-West Nigeria
Felix-Kingsley Obialo & Adenike E. Emeke 1

Institutional Support and Teacher Performance in Secondary Schools in Akinyele Local Government Area of Oyo State, Nigeria
A. I. Atanda 15

Constructs and Dimensionality Of Instruments On Undergraduates' Personal Variables and Academic Performance in the Faculty of Science, University Of Ibadan, Nigeria
Benedicta Omeghie, Isunueo 26

Psychological Factors as Predictors of Senior Secondary Students' Attitude Toward Environmental Concepts in Biology In Lagos, Nigeria
Oladipo, Adenike J., Ogundiwin, Oluyemi Akinleye & Ngwu, Nora Uche 40

Effect of Game-Based Learning (GBL) and Gamification on Senior Secondary School Students Learning Outcomes in Physics
Adisa, Ibrahim Oluwajoba; Adetunmbi, L. Akinyemi & Ayotola Aremu 53

Assessment of the Integration and Challenges of Information and Communication Technologies (ICTS) in Tertiary Institutions in Nigeria
Babatunde Adeniyi Adeyemi & Rita Uloaku Onu 67

Assessment of Secondary School Students' Awareness, Attitude and Readiness for Forestry Education in Awka South Local Government Area of Anambra State, Nigeria
Appah, Ogechukwu Rose & Tokede, Abiodun Morenike 81

Fostering Mathematics Achievement: The impact of age, gender and self-esteem using the Rosenberg Self-Esteem Scale on Secondary School Students in South West, Nigeria.
Osiesi, Mensah Prince & Fajobi, Olutoyin Olufunke 92

Evaluation of the Undergraduate Chemistry Education Programme in Universities in Rivers State, Nigeria
Mathew Christian & Modupe M. Osokoya 103

Estimating Generalizability and Dependability Studies of Students' Scores in Teaching Practice Assessment in a Nigerian College of Education
S. T. Bamidele , S. B. Adebara, Usman Muhammed & Ameen Akeem 116

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Table 1.2: Adjusted Mea ns for Treatment Effects and Critical Thinking

Independent Variable		Critical Thinking			95% Confidence Interval	
Treatment		M	SD	Std Error	Lower Bound	Upper Bound
(i)	Collaborative task method	58.18	11.14	1.26	55.70	60.67
(ii)	Self-directed learning	59.12	9.97	1.23	56.71	61.53
(iii)	Collaborative task method & Self-directed learning	59.17	9.72	1.13	56.94	61.39
(iv)	Traditional Method	57.71	12.75	1.16	55.42	59.99

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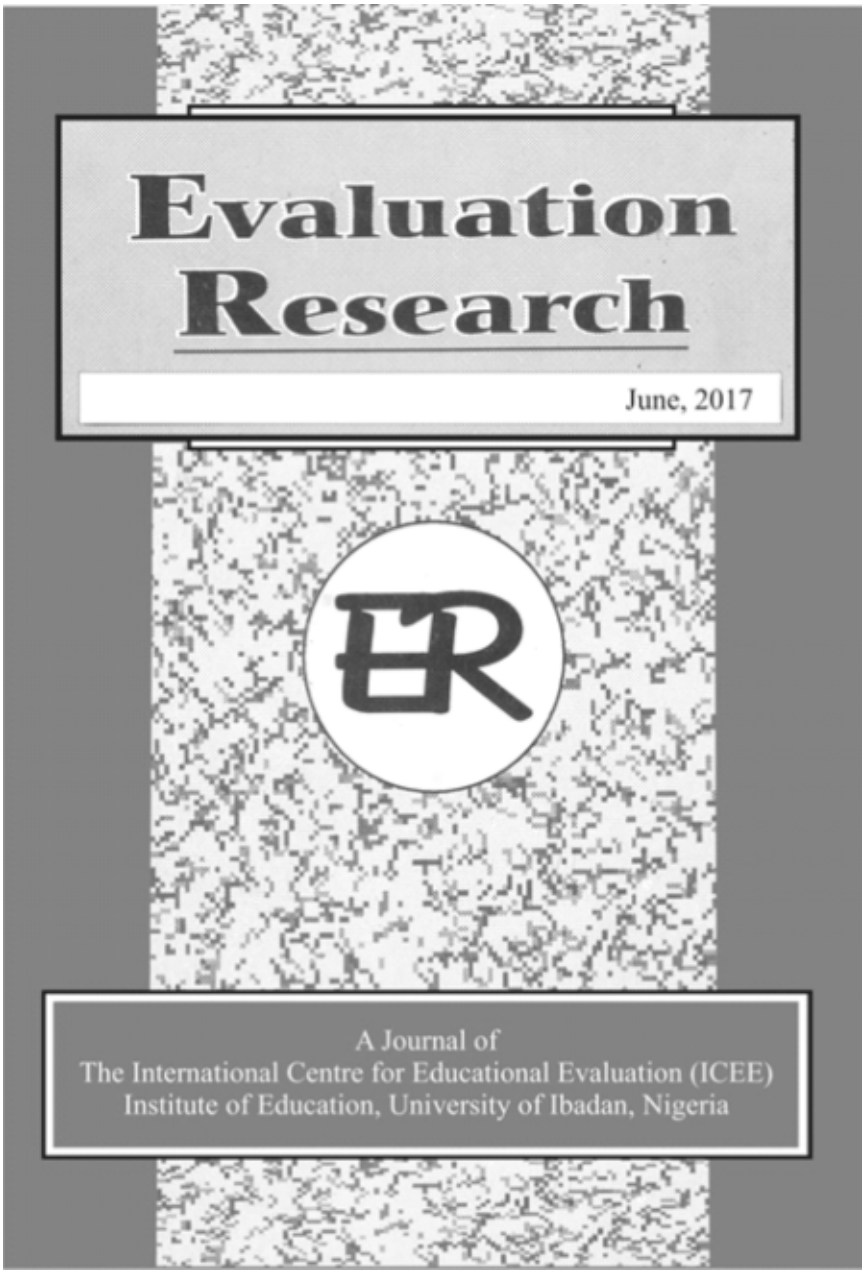
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Psycho-social Factors and Creativity of Undergraduates in South-West Nigeria

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Submitted October 25, 2019; Revised , March, 31, 2020; Accepted June, 9, 2020

Abstract

The fact that the individual is at the centre of creative expression continues to influence studies that focus on the individual and their roles in the quest for a more creative society. In an attempt to grow and develop, Nigeria relies on the graduates of higher institutions, especially the universities, to supply the pool of leaders that would utilize creativity for developmental goals. This agrees with the universal trend that makes university graduates the fulcrum on which a nation's workforce is built. The concern is whether these future leaders possess the qualities that would facilitate the nurturing of creativity. Eight psychosocial variables (knowledge of creativity, attitude towards creativity, risk taking behaviour, parental influence, age, peer pressure, gender and course of study) that are peculiar to the conditions of undergraduates and might influence creativity were examined. Three valid and reliable instruments were designed and another adopted for the purpose of surveying participants. Using the multistage sampling, 651 respondents were sampled (330 females and 321 males). It was discovered that six psychosocial factors (knowledge of creativity, attitude towards creativity, risk taking behaviour, parental influence, age, and course of study) significantly correlated with creativity in that order. Findings portend hope for the Nigerian search for a more creative set of graduates and workforce. The study articulates suggestions for stakeholders in the educational system in the hope that Government at all levels will facilitate a nurturing environment for creativity among the country's undergraduates.

Keywords: Creativity, Undergraduates, South-west Nigeria, Psychosocial variables

Introduction

Researchers have continuously underscored the importance of creativity in human growth and development. Puccio (2012) described creativity in human growth and development as an essential life skill. One can, therefore, assert that creative living is a way of life whose purpose is living a deeper and richer life (Puccio, Mance, Switalski and Reali, 2012). If creativity is a way of life, it becomes necessary to promote it. Understanding and

promoting creative living is a function of a number of factors which researchers and practitioners of creativity have grappled with since the beginning of research into the phenomenon of creativity. In spite of the groundbreaking successes recorded in the global creativity literature, Nigeria cannot qualify as a country that has truly made creativity a deliberate part of her existence (Obialo, 2017a). This lack of the promotion of deliberate creativity in Nigeria has brought more challenges for Nigerian creativity researchers who have to evolve solutions that would facilitate the transformation of the Nigerian experience through the promotion of deliberate creativity.

Rhodes (1961) introduced the idea of the 4Ps of creativity into the creativity discourse; this means that creativity can be understood from four broad perspectives which represent the foundations for research in the field of creativity. These cornerstones are the person, process, product and press (environment). For creativity to thrive therefore there is need to begin with the individual creator. “Literature suggests that highly creative individuals are characterized by a number of dispositional traits that predict achievement (Dawson and Andriopolous, 2014). Runco (2018) asserted that, “Creativity can indeed be an entirely personal thing”. Rhodes (1961) explaining the “person” in his 4Ps model of creativity, posits that, "The term person, as used here, covers information about personality, intellect, temperament, physique, traits, habits, attitudes, self-concept, value systems, defense mechanisms, and behaviour." (p. 307).

What then are the qualities in the individual that foster creativity? While this concern might not be a serious worry for other societies that have made creative living a deliberate part of their systems, it might not be the case for a society like Nigeria. There is therefore the need to establish those factors that foster creativity among people. Nigeria relies on quality manpower development as the bases for growth and development (Obialo, 2017a). This is found in the higher institutions of learning whose products are major determiners of the direction the country heads. That is why the outcomes of researches on the circumstances of these future leaders are necessary guides in judging them The present study investigates the relationship between the psychosocial conditions of university undergraduates in south-western Nigeria and creativity. This will promote an understanding of how interactions between the variables and creativity will enhance deliberate techniques to nurture creativity in university undergraduates. The variables are parental influence, risk taking behaviour, peer pressure, knowledge/awareness, attitude, age, course of study and gender.

The study focused on the following research questions:

1. Is there any significant relationship between the predictors (parental influence, risk taking behaviour, peer pressure, knowledge/awareness, attitude, age, course of study and gender) and creativity?
2. What are the relative contributions of parental influence, risk taking behaviour, peer pressure, knowledge/awareness, attitude, age, course of study and gender to level of creativity among undergraduates in Oyo, Osun and Lagos States?

Methodology

a) Sample

Multistage sampling was used to purposively select four public (federal and state) universities in south-western Nigeria on the basis of age, availability of courses and location (coastal or hinterland). The sample was put together through stratified cluster sampling procedure. Consequently, 651 respondents were sampled (330 females and 321 males). Their ages ranged from 20 to 35years (Mean=20.84; SD=1.82).

b) Instrumentation

Four valid and reliable instruments were used to generate data:

1. Predictors of Creativity among Nigerian University Undergraduates Questionnaire (POCANUQ) (Obialo, 2011)

The investigators adopted the Predictors of Creativity among Nigerian University Undergraduates Questionnaire. The POCANUQ is in four (4) parts. Part I elicited demographic information from the undergraduates. Name of the university, gender, course of study, level of study and age of the respondent were obtained in this part. Part II is about the parental influence on undergraduates. It consists of fifteen (15) items responded to on a four point Likert Scale: Very Much Like Me(VMLM); Just Like Me(JLM); Unlike Me(UM) and Very Much Unlike Me(VMUM). The reliability coefficient was 0.87(Cronbach Alpha).

Part III measured the risk taking behaviour of undergraduates. It comprised eighteen (18) items responded to on a four point Likert Scale of Very Much Like Me(VMLM); Just Like Me(JLM); Unlike Me(UM) and Very Much Unlike Me(VMUM). The reliability coefficient was 0.86. Part IV concerned the influence of peer pressure on undergraduates. This was also measured on a four point Likert Scale of Very Much Like Me (VMLM); Just Like Me (JLM); Unlike Me (UM) and Very Much Unlike Me (VMUM). The reliability coefficient was 0.88 (Cronbach Alpha). The overall reliability coefficient of the whole instrument was 0.87 (Cronbach Alpha).

2. Knowledge/Awareness of Nigerian Undergraduates on Creativity Questionnaire (KNUCQ) (Obialo, 2011)

The researchers adopted this instrument. It is divided into two parts. Part I generated information on the following demographical aspects of the undergraduate, name of university, course of study, level of study, gender and age. Part II measured the respondent's knowledge/awareness of creativity. This was achieved by the respondent's answer to seventeen (17) items on a four point Likert Scale of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD) indicating the extent of agreement or disagreement with each statement. The reliability coefficient of 0.78 was obtained (using Cronbach Alpha).

3. Attitude of Nigerian Undergraduates towards Creativity Questionnaire (ANUCQ) (Obialo, 2011).

This instrument was divided into two parts. Part I generated information on the following demographical aspects of the respondent, name of university, course of study, level of study, gender and age. Part II tested the attitude of the undergraduate towards creativity. It was divided into two response formats. The first consisted of twelve (12) items, which were on a four point Likert Scale of Scale of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD). A reliability index of 0.78 was obtained. In the second section, the respondents simply answered True or False to each of the four statements. The reliability coefficient was 0.79 (using KR20 formula).

4. Creativity Assessment Package (CAP) (Williams, 1993).

The researchers adopted this instrument. It is a three- in- one package designed to measure creativity based on the Williams Model of Creativity (Williams, 1993). The first instrument is the Test of Divergent Thinking (Forms A and B). The second is Test of Divergent Feeling. The last instrument is a rating scale for parents and teachers. These instruments are used to screen, identify and evaluate the most important factors of creativity found in children (Williams, 1993).

The researchers adopted Test of Divergent Feeling for this study. This instrument is a 50-item multiple choice exercise. It tests respondents' curiosity and imagination (ideation), complexity and risk taking by asking them to indicate how they believe they fare in all the aforementioned factors. Out of the 50-items, 12 items measure curiosity, 12 items also measure imagination while 13 items measure risk taking and another 13 items measure complexity. All these are affective factors connected to creativity. The reliability indices as quoted by the author are between 0.71 and 0.76 (Test retest Method). However, the researchers revalidated the instrument-Exercise in Divergent Feeling and obtained a reliability coefficient of 0.71(Cronbach Alpha).

Data Collection and Analysis

The instruments were administered by the investigators with the support of trained research assistants in three states and the four universities for about two months. Multiple regression analysis was used to examine the relationship between the psychosocial factors and creativity.

Results

Research Question 1: Is there any significant relationship between the predictors (parental influence, risk taking behaviour, peer pressure, knowledge/Awareness, attitude, age, course of study and gender) and the criterion (creativity)?

	Parental Influence	Risk Taking	Peer Influence	Knowledge/ Awareness	Attitude	Williams Creativity Test	Age	Course of Study	Gender
Parental Influence	1.000								
Risk Taking	.157*	1.000							
Peer Pressure	.227*	.615*	1.000						
Knowledge/ Awareness	.205*	.159*	.280*	1.000					
Attitude	.182*	.155*	.363*	.427*	1.000				
Williams Creativity Test	.064	.007	.200*	.545*	.532*	1.000			
Age	-.023	-.029	-.018	.124*	-.099*	.104*	1.000		
Course of Study	-.050	-.149*	-.071	.051	.003	-,047	-.209*	1.000	
Gender	.116*	-.147*	-.074	.016	-.017	.036	-.170*	0.000	1.000

***Significant at P <0.05**

Table 1b Relationship between the criterion and the predictors

Variable	Criterion (Williams Creativity Test)	P value
Parental influence	0.064	0.106
Risk taking behavior	0.007	0.868
Peer Pressure	0.200	0.000*
Knowledge/Awareness of Creativity	0.545	0.000*
Attitude towards Creativity	0.532	0.000*
Age	0.104	0.008*
Course of Study	-0.047	0.235
Gender	0.036	0.368

***Significant at P <0.05**

Tables 1a and 1b present the correlation coefficients among the predictors (parental influence, risk taking behaviour, peer pressure, knowledge/awareness, attitude, age, course of study and gender) and the criterion (creativity). Table 1b shows that peer pressure, knowledge/awareness of creativity, attitude and age show positive and significant correlation with creativity. For instance, peer pressure and creativity have a correlation of 0.200 meaning direct relationship. Knowledge/awareness of creativity and creativity have a correlation of 0.545. The correlation between attitude and creativity is 0.532 and it is statistically significant showing direct relationship. The correlation between age and creativity is 0.104. This shows that age and creativity have direct relationship because of the positive relationship. However, the correlation between gender and creativity is 0.036, which is not statistically significant. Risk taking behaviour and creativity have a correlation of 0.007 which is not statistically significant. The correlation between parental influence and creativity is 0.064; it is not statistically significant. Course of study and creativity have a correlation of -0.047 which is not statistically significant. This shows that gender, risk taking behaviour, parental influence and course of study have no direct relationship with creativity.

Research Question 2: What are the relative contributions of parental influence, risk taking behaviour, peer pressure, knowledge/awareness, attitude, age, course of study and gender to level of creativity among undergraduates in Oyo, Osun and Lagos States?

Table 2: Relative Contributions of the predictors to the Criterion

Model	Unstandardized Coefficients		Standardized coefficients		
	B	Std. Error	Beta β	T	Sig.
(Constant)	-19.045	12.60		-1.511	.131
Parental influence	-.368	.128	-0.090	-2.884	.004*
Risk Taking behaviour	-.431	.127	-0.132	-3.409	.001*
Peer Pressure	.184	.155	.048	1.189	.235
Knowledge/awareness of Creativity	1.463	.129	.392	11.305	.000*
Attitude to Creativity	1.511	.137	.390	11.050	.000*
Age	1.088	.432	.080	2.520	.012*
Course of Study	-1.184	.554	-0.067	-2.137	.033*
Gender	2.247	1.529	.046	1.469	.140

***Significant at P <0.05**

Table 2 shows the standardized regression weight (β), the standard error of estimate (SEβ), the degree of freedom(df), the T-ratio and the level at which the T-ratio is significant for each of the independent variables, The table also shows that out of the eight independent variables, the value of T-ratio associated with the respective variables, indicates that six out of the eight predictor- variables (parental influence-β=0.090, t(639)=2.884; risk taking behaviour-β=-0.132, t=(639)=3.409; knowledge of creativity-β=0.392, t=(639)=11.305; attitude towards creativity-β=0.390, t(639)=11.050; age- β= 0.80, t=2.520, and course of study-β=-0.067, t(639)=-2.137, contributed significantly to the students' results in creativity. Two of the predictor variables, peer pressure and gender, did not contribute significantly to the criterion. The values of the standardized regression weights associated with the six significant variables indicate that knowledge of creativity is the most potent contributor to the prediction. This is followed by attitude towards creativity, risk taking behaviour, parental influence, age, and course of study in that order.

Discussion

Knowledge of a construct influences how information about it is sourced, promoted and protected. We live in a world transiting from knowledge-based economy to creativity based economy (McWilliams, 2007). The quest for knowledge is perceived as the foundation of progress and development. As such, creativity assists in using the knowledge as tool for the transformation of individuals, groups, societies and phenomena. Lack of knowledge means absence of information because as attested to by

Runco, (2007) knowledge transforms information and brings understanding. Obialo (2017b) reviewed the different methods of teaching creativity to different groups of individuals and reported that teaching people deliberate creativity truly changes their ability to think and excel in different endeavours. Consequently, creativity is needed to transform any form of knowledge an individual possesses.

Mostert and Frijling (2001), Burnett and Figliotti (2015) and Obialo (2017b and 2018) showed that providing knowledge or awareness to people transforms their performance in creativity. Shriki (2009) also reported a complete transformation of not only the creative performance of his sample, which comprised mathematics teachers in creativity, but also in their mathematical and didactic knowledge. This shows that creative knowledge is not restricted to only a domain of ability. It transforms the entire person. Creativity could thus be described as revolutionary.

An undergraduate that exhibits a negative attitude towards the idea of creativity might see creativity as a waste of time because attitude involves outlook, compassion and trust (Akinboye, 2003). Trust would therefore manifest in how persons exposed to creativity perceive it as capable of transforming their life for good. In spite of the general notion that anyone can be trained to acquire the knowledge of creativity, Keong & Soon (1996), found that attitude was important to the process of attaining the knowledge of creativity. They found that despite the training aimed at changing the attitude of managers and executives, the negative attitude of some of them did not change. The lack of passion for creativity made the training a waste as the trainees had neither trust nor confidence that the training was designed for their good. This finding suggests that some trainees may not be prepared for creativity training because of their negative attitude.

When an undergraduate feels as found in the questionnaire, that "Passing exams is more important than thinking about creativity"; "It does not matter whether one is creative or not"; "Creativity should be the least of people's concerns in the university" and "There is no need to lose sleep over creativity", one can rightly assert that the undergraduate has a negative attitude towards creativity. On the contrary, respondents with a positive attitude will be well disposed to receiving new facts about creativity. This attitude will shape their outlook towards the novel idea called creativity (Akinboye, 2003; Keong and Soon, 1996).

Next in the hierarchy of significance to the prediction is risk-taking behaviour. Literature (McWilliams and Dawson, 2007; Piirto, 2004; Driver, 2001 and Beetlestone, 1998) identified risk as an important element in creativity. The quest to discover is a constant characteristic of creative people (Akinboye, 2003). Discovery entails risks as they think outside the box and venture into areas where conventions and expectations do not accommodate. Undergraduates are generally prepared to assume positions of leadership and responsibility in their respective societies (Kenawy, 2006) and the Nigerian university system needs to address this fact the present Driver (2001) discovered that risk-taking behaviour aimed at preparing students for the challenges of

the work place increased the creativity of business education undergraduates. . This study reiterates the global quest for more creative workers to drive both industry and other areas of the creative economy.

Literature reports different types of environments that influence creativity (Bowkett, 2007; Sawyer, 2006 & Pirrto, 1998). The family, as the first environment of the student, is crucial in shaping their creativity. This fact explains the significance of parental influence in predicting the creativity of Nigerian undergraduates. Kemple and Nissenberg (2000) studied the role of families in fostering creativity and reported that the environment in which children live, work and play could develop or stifle their creativity. Parental influence becomes relevant in Nigeria where a lot is expected by society from parents in the upbringing of their children. Moreover, the numerous ethnic groups in the country tend to impose many responsibilities on institutions that are considered traditional. The family is one. It is a common practice to find many undergraduates living with their parents since the free education programme of the various tiers of government does not cover university education. Parents become catalysts for creativity. They nurture creativity in their children in accordance with the level of awareness they have of the concept of creativity (Mostert & Frijling, 2001). Consequently, parents who have good knowledge and are positive towards creativity to nurture creativity in their children, no matter their ages.

Age comes next to parental influence. Kuster (2005), Nwazuoke, Osiki and Nwazuoke, (2000) and Nesvetailov, (1999) revealed conflicting facts on the best age for creative accomplishments. They however showed that both the young and the old can be creative. This suggests that there may be some extraneous factor contributing to the creativity of people no matter their age. Gable (2000) suggests that the younger one is the more prone the person will be to psychosocial factors which nurture creativity because youths seem to enjoy freedom from conventions, societal expectations and even peer pressure. This sense of freedom is manifested in the leeway provided at times by parents of creative people for their children to freely express themselves at an early age (Dacey, 2007b). The ability to freely express oneself thus becomes a prelude to creative manifestations.

Dacey (2007b) identified six critical periods during which creativity is best cultivated. These are the first five years of life, early adolescence, early adult years to about 20 years; from 29 to 31 years; the early forties, and from 65 to 70 years. The present study showed the average age of the sample to be 20.8 years. Dacey's finding gives credence to this study as the result shows that the subjects returned a moderate creativity score with a mean score of 72.73. Since, the average age of the sample is 20.8 years, there is a possibility that the sampled undergraduates are gradually leaving the critical period of vibrant creativity and are left with average creative ability. The consequence is that the sample is averagely creative. By the time they graduate from the university, they might have lost their creative skills or tendencies. Loss of creative

ability at the point of employment would seem to be responsible for the lack of creativity noticed in graduates by stakeholders.

Nevertheless, since age did not correlate highly with creativity in comparison with other variables like knowledge/awareness, attitude, risk taking behaviour and parental influence, it might be explicable in the sense that the university system might have acted as a leveler of some sort for all categories of undergraduates. The transition from home to the university in terms of freedom from parental control seems insignificant as most undergraduates in Nigerian universities might still be living with their parents. This fact differentiates this sample from samples from the developed world where children usually stop living with their parents when they go to the universities or when they are 18 years (Gould, 1978). The fact that those who are 18 years and above do not enjoy independence in the Nigerian society might be what Runco (2007) refers to as age differences in cultures. Thus while the samples in the developed world enjoy some kind of freedom, the Nigerian sample does not. This freedom is very important in determining creative abilities as creative people thrive in an atmosphere of freedom (Sawyer, 2006). The absence of true independence on the part of the Nigerian undergraduates might impede the creative potential since the parents still exercise great influence on them. In this circumstance, creativity might not make any difference to the undergraduate no matter the age. This position supports the report of Dacey (2007a) that there is no ideal age for creativity as it seems to be a matter left to the individual (Runco, 2007).

Course of study is next in the hierarchy of significance. . This work revealed no discrimination in terms of courses and supports earlier findings that all academic disciplines require creativity (Animashahun, 2002, Akinboye, 2003, Runco, 2007 & Obialo, 2017). This fact seems to have motivated Akinboye's (2003) work on categories of creativity and his affirmation that creativity is interdisciplinary. Every aspect of human development is driven by new ideas borne out of creativity. Driver, (2001), Akinboye (2003) and Kuster (2005) reported different aspects of disciplinary creativity confirming that all disciplines make use of creative skills as tools. Creativity is, therefore, not the preserve of any domain of knowledge.

As if in corroboration of Gable's (2000) findings, peer pressure showed no significant relationship in this study. Braun (2008) identifies desire for acceptance as a reason why people submit to pressure. Once this desire to conform and be socially accepted is fulfilled, it provides some sense of security to the individual. . The desire to conform can lead to temporary decrease in creativity (Gable, 2000). This should be further explicable from this present study in the sense that the average Nigerian undergraduate sampled might be enjoying a kind of freedom that shields from peer pressure. The results show the sample to be creative. The findings also revealed a strong correlation between creativity and knowledge. It could be safe to say that the sample is creative due to knowledge of creativity and since the average undergraduate is at the

stage of self-actualization and independence (Gould, 1978), it could not be influenced by their peers in matters of creativity.

Gender is not significant to the prediction. This is not surprising because the ability to create or be creative is a natural endowment of everyone (Akinboye, 2003, Etuk, 2007 & Runco, 2007) which is not gender biased. This result thus confirms earlier studies that gender has no significance in predicting creativity (Dacey, 2007b & Runco, 2007 &Sawyer, 2006). That gender has no significant correlation with creativity in this study could be accounted for by the fact that the Nigerian society is opening up to the global movement to make all genders to equally realize their potentials. Lack or presence of creativity might no longer be a gender based consideration.

The changing perception of the female gender in the society could also have removed the differences in their creativity score. This shift in perception would rub off positively on the female undergraduates as the changing trend would make them scale the wall of discrimination and bias and see themselves as equals with their male counterparts. This changing perception would mean that the female undergraduates would likely share attitudes and perceptions with their male colleagues as they are now provided the same level playing ground by society, especially the university community. The female respondents thus share the same opportunities and undergo the same experiences while in school. This result is even more important in the sense that the sample for this study had nine more female than the male participants. Thus there were 330 female participants to 321 male respondents. This was as a result of more females returning their questionnaires after the participants were sampled.

Conclusion

The results presented in this study proved an empirical source for positing that stakeholders of the university system in Nigeria, especially lecturers, use the six significant psychosocial factors (knowledge of creativity, attitude towards creativity, risk taking behaviour, parental influence, age, and course of study) as a predictor set in understanding and promoting creative living among university students in the country. Policy makers should design deliberate strategies that would facilitate a synergy between the homes/families of undergraduates so that whatever they learn in the university to nurture creativity in them would be sustained by the family environment. Curriculum developers should facilitate creativity content of the university curriculum. The National Universities Commission (NUC), as a matter of urgency, should review the current university educational curriculum to incorporate deliberate creativity. It would also be beneficial to the Nigerian society if the corporate world would fund the training of undergraduates in deliberate creativity.

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Institutional Support and Teacher Performance in Secondary Schools in Akinyele Local Government Area of Oyo State, Nigeria

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Abstract

Teachers' poor job performance resulting in low achievement of students in Senior School Certificate Examinations (SSCE) necessitated this study. The study examined the relationship between institutional support (supervision of instruction, staff development and instructional materials) and teacher performance in secondary schools in Akinyele Local Government Area of Oyo State, Nigeria. The study adopted the descriptive survey research design. A total of 349 participants (comprising 328 teachers and 21 principals) were sampled through multi-stage sampling procedure. Four hypotheses were tested at 0.05 level of significance using two self-constructed instruments for data collection: 'Institutional Support Questionnaire' (0.79) and 'Teachers' Job Performance Rating Scale' (0.89). 325 teachers and 21 principals returned their questionnaires representing 99% of the questionnaire administered. Pearson product moment correlation formula was used to analyze the data obtained from the respondents. Findings showed that no significant relationship exists between instructional supervision (r = 0.145), staff development (r = -0.211) and teacher performance. A significant relationship however exists between instructional materials and teacher performance (r = -0.588). Finally, a significant relationship was found between institutional support and teacher performance (r= -0.570).The study concluded that institutional support could improve teacher performance and lead to effective achievement of school goals. Therefore, government should ensure regular staff development programmes, provision of adequate instructional materials and effective supervision of instruction to further improve the performance of teachers in the classroom.

Keywords: Institutional support, Staff development, Instructional supervision.

Introduction

The place of teaching cannot be undermined in the educational process. Learning could take place without the consciousness of the person facilitating such learning process (whereby one learns from another person without direct teaching),

however, teaching is an intentional effort that requires teachers who facilitate learning. Teaching is conceived as a communication between two or more people who influence each other by their ideas and learn something in the process of interaction (Okunogbe, 2005). It is referred to as the core assignment of teachers in any school and it is expected to be handled by professionally competent individuals (Atanda, 2013). Teaching is also, filling the mind of the learner with information and knowledge for future use. It helps people acquire the knowledge they need to become responsible citizens, earn a living, and live a rewarding life. Stressing the importance of teaching and quality of teachers, Osokoya (2003) asserted that teaching is important in any educational system because the quality of teachers determines, to a great extent, the quality of the system. Recognizing the importance of teachers in education, the Federal Government of Nigeria, (FRN, 2013) stressed that teacher education will continue to be given a major emphasis in all educational planning, since no education system can rise above the quality of its teachers.

Teachers are drivers of educational development because they play basic and dynamic roles in the educational system. It could be said that high performance of students depends upon effective teaching by their teachers. For teachers to worth their exalted position as a key factor in effective learning, they have to be role models and exhibit to their students a commitment to scholarly values and life-long learning. The increased importance in teacher's job performance has made it extremely important to identify the factors that influence teacher's job performance. Job performance refers to an act of accomplishing or executing a given task (Griffin, 2012). Teacher job performance can also be defined as duties performed by a teacher at a particular period in the school system in achieving school goals (Gunbayi, 2007). It can be measured through tasks accomplished by teachers in schools.

The effectiveness of teaching is reflected in students' performance in internal and external examinations. Though, there has been arguments that students' performance does not solely depend on teacher performance, teachers' role appears to be paramount. The learning outcomes of Nigerian secondary school students in external examinations in recent times is worrisome. Table 1 contains general performance of secondary students in Oyo State Senior Secondary School Examinations (SSCE) conducted by West African Examinations Council from 2014 through 2018.

Table 1: Percentage of candidates with credit and above in five subjects including English and Mathematics in Oyo State, Nigeria

2014 (%)	2015 (%)	2016 (%)	2017 (%)	2018 (%)
34.0	53.0	50.0	43.0	38.0

***Source*: WAEC, October 2018**

Result in Table 1 indicates five trends of students' performance in SSCE conducted by WAEC. 34 percent of students had credit in five subjects and above including English Language and Mathematics in 2014, 53%, 50%, 43% and 38% in 2015, 2016, 2017 and 2018 respectively. Secondary school graduates are expected be able to transit to higher institutions of their interest. However, with this trend of performance, more than 50% of the candidates who sat for the examinations could not transit to higher institutions immediately.

Ferguson (1992) revealed that effective teachers have positive impacts on students examination score. Sanders (1988) and Wenglinsky (1992) asserted that the most important factor affecting the academic growth students is the effectiveness of individual classroom teachers. This indicates that the role of teachers in determining students' academic performance cannot be over-emphasized.

However, teachers do not perform their assigned roles in isolation of the school setting; their performance could be a function of enabling institutional support in the school. This study investigated whether institutional support such as instructional supervision, staff development and instructional materials have any relationship with teachers' performance. Atanda and Jaiyeoba (2011) investigated the effects of school based quality factors on secondary school students' achievement in English language in South-western and North-central Nigeria and reported that supervision of instruction had a significant relationship with students' academic performance in English language. Ikegbusi and Eziamaka (2016) also found that both internal and external supervision of instruction have positive effects on teacher effectiveness in secondary schools. Ughamadu (2015) confirmed that external supervision improves not only teaching and academic environment, but also promotes effective learning of pupils. Usman, Bushra, and Talat, (2018) affirmed that supervisory practices of principals are helpful in attaining better performance of teachers and their overall growth.

When supervision of instruction exerts positive influence on teachers, their morale rises. Schacter and Thum (2004) asserted that high teacher morale could have positive effects on their job performance and produce a richer and more effective learning experience for students. School administrators can, therefore, encourage effective performance of their teachers by identifying their needs during supervisory exercises and trying to satisfy them. When there are laudable education plans, meaningful school programmes, capable staff and enough facilities, what remains is an

effective administrative leadership to coordinate all these for maximum achievement by the school. The key to effective leadership is the ability to lead effectively, coordinate a complex situation and show concern for available human and material resources. This emphasises the significant role of school principals in steering the affairs of their schools towards the achievement of laudable educational goals by facilitating the availability and utilisation of instructional materials.

The usefulness of instructional materials in facilitating effective performance of teachers cannot be undermined. Ikerionwu (2000) referred to instructional materials as objects or devices which help the teacher to make a lesson clearer to learners and invariably makes the teacher's task simpler. Ibode (2004) explained instructional materials as anything that the teacher himself uses during the teaching process for effective job performance. This implies that instructional materials could be resources teachers can use to achieve their instructional objectives. The provision of instructional materials in the right quantity and quality and their effective utilization is a major input required to ensure high teachers performance (Adesoji, 2006). This implies that students taught with instructional materials could outperform those taught without instructional materials. Ogaga, Igori, and Egbodo (2016) revealed that selection of relevant instructional materials, availability and ability of the teacher to utilise them had significant relationship with the teaching and learning of social studies. However, Tuimur and Chemwei (2015) explained that teachers lacked sufficient instructional materials for effective teaching of emerging issues in primary schools. A similar situation could be what is obtainable in secondary schools where the utilisation and improvisation of instructional materials could also be facilitated by skills acquired through training and staff development programmes.

Staff development can be defined as the process of providing opportunities for employees to improve their knowledge, skills, and performance in line with the goals and values of the organization. It is indispensable if the goals of the organization are to be realized and needs of the employees met. Staff development has been described as professional growth, in-service education, continuing education, recurrent education, on-the-job staff training, human resources development, staff improvement, renewal and talent management (Atanda, 2018; Atanda, and Imam, 2016; Emechebe, 2008).

The relationship between teachers' performance and staff in-service development schemes such as seminars and periodic workshops cannot be over emphasized. Ekpoh, Edet and Nkama (2013) revealed that teachers who participated in staff development programmes displayed higher knowledge of subject matter and were more effective in classroom management, teaching methods and evaluation of student's work. This is in consonance with Mahgoub and Elyas (2014) whose study found significant difference between teacher's performance before and after the development of teacher performance. This confirms that the development of teacher performance improved teaching activities among the trainers. Similarly, Hervie and Winful's (2018)

study revealed that poor performance of teachers was due to lack of frequent in-service training, lack of teaching and learning materials, lack of incentives and motivation, and improper supervision.

Tuimur and Chemwei (2015) found that many of the primary school social studies teachers had not attended any in-service courses to induct them on how to teach emerging issues in the current primary curriculum. It implies that such teachers are likely to be deficient in essential skills required to drive effective teaching; therefore, Ogunbiyi (2004) recommends that teacher's attendance at in-service programmes or workshops will sharpen teachers skills and enable them to know more about the recent developments in their subject areas. This will improve their job performance as well as students' learning outcomes. Yewande (2000) recommended that workshop programmes should be organized periodically on teaching strategies in order to avail teachers the opportunity to further improve their skills and job performance.

It is against this background that this study investigated the relationship between institutional support (supervision of instruction, instructional materials and staff development) and teacher performance in secondary schools in Akinyele Local Government Area of Oyo State.

Statement of the Problem

Recent students' performance in the Senior School Certificate Examinations falls below the expectation of stakeholders. In most cases, teachers are blamed for poor job performance as it hinders the achievement of secondary education goals. In spite of several studies on some aspects of working conditions of staff, student attitude to learning, staff development and supervision of instruction as they affect students and teachers' performance there is still need for improvement in the teaching-learning process as secondary schools have not recorded 100 percent success in external examinations.

Hypotheses

1. There is no significant relationship between instructional supervision and teacher performance in Akinyele Local Government Area of Oyo State.
2. There is no significant relationship between instructional materials and teacher performance in Akinyele Local Government Area of Oyo State.
3. There is no significant relationship between staff development and teacher performance in Akinyele Local Government Area of Oyo State.
4. There is no significant relationship between institutional support (instructional supervision, staff development and instructional materials) and teacher performance in Akinyele Local Government Area of Oyo State.

Methodology

The study adopted the descriptive survey research. The target population for this study comprised of all the 692 public secondary school teachers and 35 principals in the 35 secondary schools in Akinyele Local Government Area of Oyo State.

The sample for the study was selected through a multi-stage procedure. The first stage involved sampling of 60% of the total number of public secondary schools in Akinyele Local Government Area through the simple random sampling technique. The percentage was chosen for reasonable generalisation of findings. This gave a sample size of 21 schools comprising of 477 teachers and 21 principals as population. At the second stage, a sample of 70% of the population of teachers was made through proportionate to size technique given 328 teachers while the principals of the 21 schools were enumerated. 325 teachers and 21 principals returned their questionnaires.

Two self-constructed questionnaires, Institutional Support Questionnaire (ISQ) and Teachers' Job Performance Rating Scale (TJPRS), were used for data collection. The Institutional Support Questionnaire (ISQ) was administered on teachers while the Teachers' Job Performance Rating Scale (TJPRS) was administered on principals. Their reliability coefficients were 0.79 and 0.89 respectively. The hypotheses raised were tested using the Pearson correlation coefficient at 0.05 significance level.

Results

Hypothesis 1: There is no significant relationship between instructional supervision and teacher performance in Akinyele local Government Area of Oyo State.

Table 2: Correlation between instructional supervision and teacher job performance

Variables	N	Mean	SD	R	P	Remark
Teacher Performance	346	98.45	13.056	.145	.520	**Not Significant**
Instructional supervision		11.49	2.779			

Table 2 shows correlation between instructional supervision and teachers' job performance. The r value of 0.145 shows 14.5% a weak relationship and a P value of 0.520 which is greater than 0.05 means that there is no significant relationship between teacher performance and instructional supervision. Hypothesis 1 is not rejected.

Hypothesis 2: There is no significant relationship between instructional materials and teacher performance in Akinyele Local Government Area of Oyo State.

Table 3: Correlation between instructional materials and teacher performance

Variables	N	Mean	SD	r	P	Remark
Teacher Performance	346	98.45	13.056	-.588	.006	**Significant**
Instructional materials		15.63	2.582			

Table 3 indicates the correlation between instructional material and teacher performance. The r value of -.588, which shows a 58.8% strong relationship and a P value of 0.006, which is less than 0.05, suggests that there is a significant relationship between teacher performance and instructional materials. Therefore, hypothesis 2 is rejected.

Hypothesis 3: There is no significant relationship between staff development and teacher performance in Akinyele Local Government Area of Oyo State.

Table 4: Correlation between staff development and teacher job performance

Variables	N	Mean	SD	R	P	Remark
Teacher Job Performance	346	98.45	13.056	-.211	.360	**Not Significant**
Staff development		16.11	3.288			

Table 4 reveals a correlation between development and teacher performance with r value of -0.211, which shows 21.1% weak relationship and a P value of 0.001 which is less than 0.005 and implies that there is no significant relationship between teacher performance and staff development. Thus, hypothesis 3 is not rejected.

Hypothesis 4: There is no significant relationship between institutional support (instructional supervision, staff development and instructional materials) and teacher performance in Akinyele Local Government area of Oyo State.

Table 5: Correlation between institutional supports and teacher performance

Variables	N	Mean	SD	r	P	Remark
Teacher Performance	346	98.45	13.056	-.570	.042	**Significant**
Institutional supports		88.07	8.15			

Table 5 shows a correlation between institutional support (instructional supervision, staff development and instructional materials) and teacher performance. The r value of -0.570, which shows 57% strong relationship, and a P value of 0.042, which is less than 0.05, suggests that there is significant relationship between institutional support and teacher performance. Therefore, hypothesis 4 is rejected.

Discussion of Results

Results obtained from the analysis of hypothesis one showed that there is no significant relationship between instructional supervision and teacher job performance. This could mean that the instructional supervision was not effective. The supervisory method could be strict and not improvement oriented for better job performance by teachers. This contrasts with the findings in previous studies by Ikeegbusi and Eziamaka, (2016) which established a significant relationship between the variables.

The results also show that there is a significant relationship between instructional materials and teacher job performance and corroborate the findings of Olayinka (2016); Ogaga, Igori and Egbodo (2016).This suggests that instructional materials are useful in improving students' knowledge, abilities and skills and contribute to their overall development and upbringing. Instructional materials also clarify important concepts to arouse and sustain students' interest as well as provide students with the opportunity to share experiences necessary for new learning to take place.

The findings of hypothesis three showed that there is indeed no significant relationship between staff development and teacher performance in Akinyele Local Government Area of Oyo State. This did not confirm previous findings by Ekpoh et al, (2013) which revealed a significant relationship between staff development and teachers' job performance. Ekpoh et al (2013) recognized the important role that staff development plays in raising teachers' performance and their interest in the subject they teach. They further stressed the need for teachers to be regularly provided with opportunities to improve their knowledge of the subject they teach and their teaching skills. This is based on the recognition that we are living in a rapidly changing world such that whatever knowledge and skills teachers learnt in their pre-service training becomes stale very fast, as new challenges and realties emerge in the socio-economic and political environment.

Result of hypothesis four shows the existence of a significant relationship between institutional support (instructional supervision, staff development and instructional materials) and teacher job performance. This implies that the staff development programmes, availability of instructional materials and instructional supervision which exist in the schools play a significant role in teacher job performance. The result appears to suggest that a more conducive institutional support will result in better teacher job performance.

Conclusion

The findings of this study affirm the importance of instructional materials in facilitating effective performance of teachers in secondary schools. This implies that the more relevant instructional materials are provided the better the performance of teachers. In addition, institutional support (instructional supervision, instructional material and staff development) have significant joint relationship with teacher performance.

Recommendations

1. Based on the findings of this study the following recommendations are made.
2. Government should endeavour to provide instructional materials to facilitate effective performance of secondary school teachers. This will in turn facilitate improved academic performance of students in both internal and external examinations.
3. The school leadership should be creative in facilitating improvisation of instructional materials by teachers in the absence of ready-made instructional materials from the government.
4. Teachers are also encouraged to be creative and to use the knowledge of instructional technology taught them while undergoing teacher training. They should be committed to the teaching profession by being resourceful in making their teaching interesting through the use of instructional materials.
5. Since the three types of institutional support have significant relationship with teacher performance, staff development should not be taken for granted. Regular refresher courses should be floated for teachers in the relevant areas.
6. Finally, instructional supervision should not be undermined. School administrators should be friendly in their approach as this could facilitate improved teacher performance.

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West African Journal of Education, Vol. XXXIX 2019 Page 24-37

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Constructs and Dimensionality of Instruments on Undergraduates' Personal Variables and Academic Performance in the Faculty of Science, University of Ibadan, Nigeria

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Abstract

Preferential use of cognitive measures such as Senior Secondary Certificate Examinations (SSCE), Unified Tertiary Matriculation Examination (UTME) and Post-Unified Tertiary Matriculation Examination (Post-UTME) scores over non-cognitive measures such as students' personal variables (interest in university education, career aspiration and mental ability) to assess candidates prior admission into the university has caused much concern. Some first year university undergraduates who had outstanding results in these examinations were advised to withdraw because of poor performance in their first year examinations. Therefore, this paper determined the constructs dimensionality of instruments designed to measure students' personal variables and academic performance of first year undergraduates in the Faculty of Science, University of Ibadan, and its suitability to determine undergraduates who will do well in their studies. Primary data was the source of information while SEM-PLS was used to validate the instruments. Findings revealed that the 3 dimensional model was the highest dimensionality model that produced an approximately 10% or greater percentage reduction in the RMSR (Root Mean Square Residual). The instruments can suitably measure undergraduates' interest in university education, career aspiration and mental ability at three sub-constructs or abilities. Instruments for measuring undergraduates' personal variables should be implemented by university management for effective selection of candidates who will cope with their studies after admission.

Keywords: Academic performance, Undergraduates, Mental ability, Interest in University education, Career aspiration.

Introduction

Qualitative university education, often measured by the performance of undergraduates during and after the close of a programme, is a tool for realising the sustainable development goals of a nation as well as the fulfillment of individual

student's dreams and aspirations. The performance of university undergraduates permeates all domains of learning such as cognitive, affective and psychomotor and is a benchmark for determining the competencies of a learner from which his hidden capabilities can be inferred.

However, the performance of undergraduates in Nigerian universities has raised great concern lately because of their poor academic output even as early as the first year in their programmes. According to Kpolovie (2010), there have also been reports of dropout, probations, spending of extra years and even withdrawals from the university. It becomes questionable if after learners go through rigours to qualify for admission into the university, their academic performance is described as poor.

Employers of labour are also bothered because some of the graduates' performance at their duty posts fall below expected standards. This is because by the time the learners graduate from the university and are employed, their skills, performances and productivity are relatively poor. In Nigeria, the entry examinations include the Senior Secondary School Certificate Examinations (SSCE), Unified Tertiary Matriculation Examinations (UTME) and Post Unified Matriculation Examination organised by the universities. Over the years, measuring, assessing, determining and predicting academic performance of undergraduates have brought much concern to universities, the governments, parents and even undergraduates. The concern have been linked to the use of only cognitive measures to determine academic performance of candidates aspiring to gain admission into the universities (Akiri and Ugborugbo, 2009; Bamidele and Bamidele, 2013). In spite of several efforts and policies introduced and implemented by the federal government to address the issue of undergraduates' poor academic performance, reports and researches still show inconsistencies (Kpolovie 2010).

In educational testing today, assessment is typically a measure of learner's learning judged by a set of academic standards (Vansickle, 2008). It is also a measurement tool in education administered on a learner to obtain information through which the learner's performance is evaluated in a given period of time (Adegbile, 2009). For instance, the results are used to take important decisions about learner's performance and educational programmes including determining levels of curriculum mastery, report card grades, grade level promotions, honours, and graduation (Carter, Webby, Hughes, Johnson, Plank, Barton-Arwood and Lunsford, 2005). However, mandatory and periodical measurement of undergraduates' personal variables such as undergraduates' interest in university education, career aspiration and mental ability is yet to be introduced by Nigeria universities and other tertiary institutions.

Akinlana (2013), identified mental ability as an important variable that portrays a person's brain power in diverse areas of competencies like verbal, mathematical, spatial and logical reasoning. Psychomotor skills such as reaction time are also taken to be cognitive abilities. Psychologists agree that mental ability refers to an individual's

capability to study as well as recall information, identify, ideas and their response and apply the information to their own conduct in an adaptive manner (Neiserr, et.al. 1996).

Akinlana (2013) investigated the relative and composite contributions of academic optimism, mental capability and motivation towards secondary school performance in Ogun East Senatorial District, Nigeria. The work adopted the descriptive design of ex-post facto type using five hundred and eighty-eight (588) learners selected through stratified random sampling technique. The results revealed that mental ability, academic optimism and motivation affect performance as " a strong desire to do something".

Career aspiration of learners in the university determines how much effort learners can put into academics in order to achieve a career in the future. It is a person's strong desire to become what one likes after university education. Vanden-Boss (2007) described career aspiration as a long-term goal. Miler, DeBackar, and Green (1999) claimed that it is a learner's future goal which shape their views on the worth of both the contents being studied and their academic achievement.

Onuoha and Unegbu (2013) investigated career aspiration as a predictor of students' performance in cataloguing and classification with the major objectives of identifying the link between the career aspiration of students and their academic performance. The study employed descriptive design, while the population comprised one hundred and twenty-nine (129) learners in the Information Resources Management Department, Babcock University, Nigeria. The findings revealed that very few undergraduates desired to work as librarians or archivists. However, participants who chose librarians as a career were consistent in their perceived use of classification and cataloguing. They even did better in achievement tests compared to those seeking to be bank staff and system analysts.

Interest can be defined as the attention received or given with a sense of concern, empathy, and the power to sustain such attention (Typhoon International Corp, 2004). Interest plays a major role in psychology where recent studies found that it has to do with motivation, personality, reasoning, growth, reaction, career, quality, conduct, hobbies, and information processing (Silvia, 2006). Interest has also been found to affect readability and the processing of texts that have coherence and clarity as they tend to stimulate the reader unlike texts lacking such features.

Kpolovie and Okoto (2014) applied multiple prediction design to determine the extent of correlation and likelihood that learners' interest and disposition to school individually and collectively have on their performance. The finding revealed that there was a significant correlation and multiple prediction of performance.

In Nigeria, a common quantitative approach used for impact evaluation, such as survey method of enquiry, has been found to be the most appropriate, transparent and accountable research method (Guthrie and Klauda, 2014). The survey type of research

presents a broad overview of the status of a research body which enhances easy comparison among variables, easy data analysis and minimizes researcher bias. Careful wording and question construction increases the reliability of resulting data (Guthrie and Klauda, 2014). The dimensionality and construct of items for the development of instruments are key to answering research questions as well as achieving research objectives. The construction of scales is to design a questionnaire that provides a quantitative measurement of an abstract theoretical variable. The most obvious key is that a scale uses a moderately large number of items to measure a single construct. The items within a scale are typically interchangeable since the response to one item has exactly the same theoretical meaning as the response to any other item within the scale. Each item is designed to be a different way to "ask" about the same theoretical variable. Some questions may be written so that more positive responses indicate less of the variable in question, but the expectation is that the magnitude of the correlations between items (whether positive or negative) should be relatively high throughout a scale. Additionally, after a participant completes a scale the responses are aggregated in some way, such as by taking the average, to produce the actual measurement. Good scales possess both validity and reliability.

In Nigeria, although cognitive measures such as SSCE results, UTME and Post-Unified Tertiary Matriculation Examinations scores have been found to be the only cognitive measures being to predict academic success of newly admitted undergraduates, how these measures can accurately predict the academic success of undergraduates' GPAs remains unclear. There is a need to determine the dimensionality and construct of scales to measure and investigate the effects of other non-cognitive factors such as undergraduates' mental ability, interest in university education, career aspiration of first year undergraduates in the Faculty of Science, University of Ibadan.

This paper examined the construct dimensionality of instruments designed to measure students' personal variables and academic performance of first year undergraduates in the Faculty of Science, University of Ibadan, and its suitability to determine undergraduates who will do well in their studies.

Research Questions

The following research questions were raised.

1. What is the dimensionality of the latent variables mental ability in determining the academic performance of undergraduates in the faculty of science, University of Ibadan?
2. What is the dimensionality of the latent variables career aspiration in determining the academic performance of undergraduates in the faculty of science, University of Ibadan?
3. What is the dimensionality of the latent variables (mental ability, career aspiration and interest in university education) in determining the academic performance of undergraduates in the faculty of science, University of Ibadan?

Method

The population of the study comprises all undergraduate science students in the faculty of science, University of Ibadan. Multi-stage sampling procedure was used to select participants in the study. Purposive sampling was adopted in selecting two courses (PHY 103 and MATHS 121). At the second stage, purposive sampling was also used to select 6 out of 11 departments in the faculty of science. This was because they were the departments that offered the two selected 100 level courses (PHY 103 and MATH 121) that were used to measure the performance of undergraduates in the faculty of science. At the third stage, all 100 level undergraduate learners in the six departments offering PHY 103 and MATH 131 were purposively sampled. Hence, a total of two hundred and eighty six (286) undergraduates constituted the sample for the study.

Table 1. Undergraduates in the sampled departments in the Faculty of Science who responded to the questionnaires by gender

S/N	Department	No of Males	No Females	Total	% of Males in the Sampled Population	% of Females In the Sampled Population
1.	Chemistry	12	28	40	5.56	9.78
2.	Computer Science	45	7	52	20.83	2.44
3.	Geology	31	11	42	14.35	3.85
4.	Mathematics	41	12	53	18.98	4.20
5.	Physics	50	2	52	23.15	0.69
6.	Statistics	37	10	47	17.12	3.67
Total	**6**	**216**	**70**	**286**	**75.54**	**24.46**

Table 1 shows the analysis of the number of respondents by gender from the sampled departments who had met the criteria for selection. A total of 286 undergraduates comprising of 216 males and 70 females responded to the questionnaires. The male undergraduates has 75.5% of the sampled population while 24.46% were female undergraduates in the Faculty of Science, University of Ibadan.

Items on undergraduates' interests in university education were generated by the researcher and from sources in order to build a comprehensive pool of items. Career aspiration items was adapted from O'Brien's Karen (1992) Career Aspiration Scale (CAS) and from a kit of career education assessment and evaluation instruments developed by the Wisconsin k-12 career education consortium which was a third draft of an instrument piloted during the 1974-75 school year in science classes at Medium West High School in the United States. While the Mental Ability test instrument was adopted from the series of Sawaal and India Bix Mental Ability Test. The items were used to capture information on undergraduates' mental ability. The instrument comprises items on logical sequence of

questions and answers, blood relations questions and answers and verification of truth of statements. Cronbach alpha's of 0.78 were obtained for the mental ability test, 0.82 for career aspiration and 0.83 for students' interest in university education.

The study applied a 25-item mental ability test, 18-item interest in university education and a 27-item career aspirations scale version to measure first year undergraduates' mental ability, interest in university and career aspiration in the faculty of science, University of Ibadan. Participants indicated how true each statement was for them on a scale ranging from 'Not at all true of me' to 'Very true of me' for the interest in university education and the career aspiration scale. The mental ability test had 5 options with only one correct answer in the options. After approval and permission from the Dean of Faculty of Science, University of Ibadan, the instrument was distributed to first year undergraduates in the six selected departments in the faculty of science in the university. Analytical procedures were advanced by assessing the viability of the measurement mode.

Results and Discussions

The dimensionality of the latent variables (mental ability, career aspiration, interest in university education) was assessed by subjecting the responses of the respondents to the dichotomous (i.e., cognitive ability) nonlinear factor analysis implemented Normal Ogive Harmonic Analysis Robust Method package (Fraser, McDonald & NOHARM, 2003) and the polytomous based items (career aspiration and interest in university education) to the full information factor analysis implemented in mirt package of R language and environment for statistical computing (Chalmers, 2012). To achieve this feat, the data was calibrated under the hypothesis that one dimension fitted the data. Thereafter, the data set was calibrated under the hypothesis that two dimensions underlie and then the fitness of one and two dimensions were compared. Again, if two dimensions fit the data better than one dimension, the data is further calibrated under the hypothesis that three dimensions fit the data and the fitness of two dimension and three dimensions was compared in a similar manner. This procedure continued until the optimal dimension underlying the model was identified.

Research Ques. 1: What is the dimensionality of the latent variable, mental ability, in determining the academic performance of undergraduates in the faculty of science, University of Ibadan?

Table 2: Dimensionality of mental ability

NO OF DIMEN	GFI	RMSR CRITERION	RMSR	DIFF IN RMSR	REDUCTION IN RMSR	PERCENTAGE REDUCTION
1	0.920	0.0555	0.016			
2	0.938	0.0555	0.014	0.002	0.121	12
3	0.957	0.0555	0.012	0.002	0.167	17
4	0.963	0.0555	0.012	0.001	0.066	7

Table 2 presents the number of dimensions underlying the mental ability. Column 1 represents the dimensions hypothesized to underlie the data. GFI on Column 2 is the Tanaka's (1993) Goodness-of-Fit Index (GFI). McDonald (1999) suggests that a GFI of 0.90 indicates an acceptable level of fit, a value of 0.95 indicates "good" fit, while GFI = 1 indicates perfect fit. The column labeled RMSR CRITERION is the benchmark for judging the overall fitness of a model. The RMSR (Root Mean Square Residual) is the square root of the average squared difference between the observed and predicted covariance. Therefore, small values of RMSR indicate good fit. This overall measure of model–data misfit is evaluated by comparing with the RMSR criterion which is four times the reciprocal of the square root of the sample size (i.e., the "typical" standard error of the residuals; McDonald, 1997).

Table 2 shows that 1-dimension, 2-dimension, 3-dimension and 4-dimension models fitted the data (RMSR for 1-dimension, 0.015568 was less than the criterion 0.05547002. This same trend was observed for 2-dimension, 3-dimension and 4-dimension respectively and the GFI for the four dimensions hypothesized to underlie were greater than 0.90). To identify the optimal dimensions underlying the data, the fitness of the data to the four hypothesized dimensions models were compared. The table shows that from the first dimension to the second dimension, RMSR value decreased by 12%. According to Tate criteria, this is a significant amount of reduction; showing 2 dimensions significantly fitted the data better than the 1 dimension.

Furthermore, the table shows that when 3-dimension was hypothesized to underlie the data set, the percentage in reduction in RMSR between the 2-dimension and 3-dimension model was approximately 17%. This shows that 3 dimensions significantly fitted the data better than 2 dimensions. However, when the fitness of 4 dimensions was compared to that of the 3 dimensions, the reduction in RMSR value was less than the criterion, 10%. Consequently, the highest dimensional model that still produced an approximately 10% or greater percentage reduction in the RMSR over the preceding model was the 3-dimensional model. Thus, 3-dimensional model is the most parsimonious model that fits well. This implies that performance on the mental ability depended on three dimensions or abilities which are logical sequence, quantitative reasoning and situation reaction.

Table 3: Items for the 3 Sub-Constructs in the Mental Ability Test

ITEM NO		F1 Item (Logical Sequence of Words)
1.	MEN 1	1. Elephant 2. Cat 3. Mosquito 4. Tiger 5. Whale
2	MEN 2	1. Heals. 2. Shoulder 3. Skull 4. Neck 5. Knee 6. Chest 7.Thigh 8. Stomach 9. Face 10. Hand
3	MEN 4	1. Adult 2. Child 3. Infant 4. Boy
4	MEN 6	1. Rainbow 2. Rain 3. Sun 4. Happy 5. Child
5	MEN 8	1. Grain 2. Plant 3. Sandwich 4. Bread 5. Dough
6	MEN 9	1. Shoulder 2. Wrist 3. Elbow 4. Palm 5. Finger
7	MEN10	A is B's sister, C is B's mother, D is Cs father. E is D's mother. Then, how is A related to D?
8	MEN 11	Find out the wrong term in the series 2, 5, 10, 50, 500, 5000
		F2 Items (Quantitative Reasoning)
9	MEN 5	1. Ceiling 2. Room 3. Floor 4. Wall 5. Foundation
10	MEN 12	1, 2, 3, 10, ?, 9802
11	MEN 14	How many pairs of letters in the word 'CHAIRS' have as many letters between them in the word as in the alphabet?
12	MEN21	Select the best alternative. Horse: Jockey: Car?
13	MEN 23	Rubber is related to tree in the same way as Silk is related to
14	MEN 24	Select the best alternative Anthropology: Man: Anthology: ?
		F3 Items (Situation Reaction)
15	MEN 15	You are passing by a river and you can swim. Suddenly, you hear the cry of a drowning child. You would:
16	MEN 16	You are in a bus . The bus reaches your stop but still you have not purchased the ticket because of a heavy rush. What will you do?
17	MEN 17	You are a visitor at a diner. The host asks you to take one more chapati after your stomach is full. You would:
18	MEN 18	You are playing football in a park. When you kick the ball, it strikes and breaks the window pane of a nearby house. You would
19	MEN 19	If in an Examination hall, you find that the question paper is too tough to be answered satisfactorily by you, the best thing to do is to:
20	MEN 20	You find that the person whom you call your friend has been cheating you. What would you do?

Research Ques. 2: What is the dimensionality of the latent variable, career aspiration, in determining the academic performance of undergraduates in the faculty of science, University of Ibadan?

Table 4: Dimensionality of Career Aspiration

Dimension	AIC	AICc	SABIC	BIC	LogLik	X2	Df	P
	comparing the fitness of one and two dimensions							
1	14944.49	15057.07	15010.52	15356.25	7363.245	363.297	26	0.000
2	14633.19	14829.56	14714.97	15143.18	7181.596			
	comparing the fitness of two and three dimensions							
2	14633.19	14829.56	14714.97	15143.18	7181.596	174.781	25	0.000
3	14508.41	14826.44	14605.33	15112.84	7094.206			
	comparing the fitness of three and four dimensions							
3	14508.41	14826.44	14605.33	15112.84	7094.206	111.773	24	0.000
4	14444.64	14937.97	14556.1	15139.73	7038.320			

Table 4 reveals the analysis of the number of dimensions underlying the career aspiration scale. The fitness of the hypothesized model was evaluated using Akaike Information Criterion (AIC), Akaike Information Criterion corrected (AICc), Bayesian Information Criterion (BIC) and the sample size adjusted BIC (SABIC). The nested log-likelihood was evaluated by comparing two times the differences of the log-likelihoods from each model. The difference was then compared to a χ^2 distribution with degrees of freedom (df) equal to the difference in the number of items on the scale and the number of dimensions of the simplest model.

According to Sclove, (1987), Depaoli, Tiemensma and Felt, (2018), the information criteria identify the optimal dimension as the model with the lowest values on a specific information criterion (i.e. when AIC, AICc, BIC and SABIC for model 1 and AIC, AICc, BIC and SABIC for model 2 are compared respectively). Table 4 also indicates that when the fitness of one-dimension model was compared to 2-dimension model, 2-dimension model fitted the data better (AIC = 14633.19, AICc = 14829.56, BIC = 15143.18 and SABIC = 14714.97 for 2-dimension was respectively less than AIC = 14944.49, AICc = 15057.07, BIC = 15356.25 and SABIC = 15010.52 for 1 dimension, $\chi 2$ (26) = 363.297, $p < 0.05$). When the fitness of 2 and 3-dimension models were compared, the table showed that 3 dimensions fitted the data better than the less complex 2-dimension model (AIC = 14508.41, AIC = 14826.44, BIC = 15112.84, SABIC = 14605.33 for 3-dimension was respectively less than (AIC = 14633.19, AICc = 14829.56, BIC = 15143.18 and SABIC = 14714.97) for 2 dimensions.

This result showed that 3-dimension fitted the data better than 2-dimension. Also, when the fitness of 3-dimension was compared with 4-dimension, 3-dimension

fitted the data better than the 4-dimension (AIC = 14633.19, AIC = 14829.56, BIC = 15143.18 and SABIC = 14714.97AIC = 14633.19 for 3-dimension, were respectively smaller than AIC =, AICc = 14829.56, BIC = 15143.18 and SABIC = 14714.97 for 3-dimension. The result showed that the three dimension model fitted the data better than the 1-dimension, 2-dimension and the more complex 4-dimension model. Thus, the more parsimonious 3-dimension model fitted the data model better than any other possible dimension. The implication of the result is that there are 3 possible sub-constructs that reflect the career aspirations of the undergraduates. These are career exploration, institutional guidance and career aspiration.

Table 5: Items in the 3 Constructs of Career Aspiration Questionnaire

ITEM NO		F1 Item (Career Exploration)
1.	B23	I have explored my likes and dislikes as they relate to my future career goals.
2.	B24	I have had opportunities to develop skills that will allow entry into an occupation (take a job) immediately after graduation.
3.	B25	I have talked to people now working (employed) regarding on-the-job training.
4.	B26	I have had opportunities to share with my parents discussions concerning my career aspirations.
5.	B27	I have been provided opportunities to identify a primary profession or occupation in which I am interested.
F2 Items (Institutional Guidance)		
6.	B20	I discuss work values (work satisfaction, economic rewards, challenges and security) and the importance of my attitude towards the values with my course adviser.
7.	B21	My department organizes field trips which include observing workers and the conditions under which they work.
8.	B22	My department provides opportunities to discuss my personal work habits (i.e. ability to follow instructions.
F3 Items (Career aspiration)		
9	B1	I hope to become a leader in my field.
10	B2	I want to be among the very best in my field.
11	B3	When I am established in my field, I would like to manage other employees.
12	B4	I plan to reach the highest level of education in my field.
13	B5	I want my work to have a lasting effect on my field.
14	B6	I aspire to have my contributions at my field recognized by my lecturers.
15	B7	I will pursue additional training in my area of interest.
16	B8	I will always be knowledgeable about recent advances in my field.
17	B12	When I am established in my career, I would like to train others.
18	B14	I plan to develop as an expert in my field.
19	B15	I would like to pursue postgraduate training in my career.

Research Que. 3: What is the dimensionality of the latent variables (mental ability, career aspiration and interest in university education) in determining the academic performance of undergraduates in the faculty of science, University of Ibadan?

Table 6: Dimensionality of Interest in University Education

Dimension	AIC	AICc	SABIC	HQ	BIC	logLik	X2	Df	P
	comparing the fitness of one and two dimensions								
1	18937.81	19073.83	19007.96	19113.99	19379.07	-9351.905	431.189	28	0.000
2	18562.62	18804.56	18649.56	18780.97	19109.48	-9136.31			
	comparing the fitness of two and three dimensions								
2	18562.62	18804.56	18649.56	18780.97	19109.48	-9136.31	307.806	27	0.000
3	18308.81	18710.92	18411.95	18567.82	18957.5	-8982.407			
	comparing the fitness of three and four dimensions								
3	18308.81	18710.92	18411.95	18567.82	18957.5	-8982.407	130.78	26	0.000
4	18230.03	18875.97	18348.76	18528.19	18976.78	8917.017			

Table 6 presents the model-data fit assessment showing the dimensionality of interest in university education scale. When the fitness of 1-dimension and 2-dimension models to the data were compared, the result showed that the 2-dimension had AIC = 18562.62, AICc = 18804.56, SABIC = 18649.56, BIC = 19109.48 values that were less than the AIC = 18937.81, AICc = 19073.83, SABIC = 19007.96, BIC = 19379.07 values of the 1 dimension. In addition, the Likelihood that 2 dimensions fitted the data better than 1 dimensions model was statistically significant (χ^2 (28) = 431.189, $p < 0.005$). These results showed that Model 2 fitted the data better than Model 1. In a search for a better model for the data, the fitness of 2 models to the data was in turn compared to the fitness of 3 models to the data. The result showed that the 3-dimension model fitted the data better than the 2-dimension model (3-dimensions model's AIC = 18308.81, AICc = 18710.92, SABIC = 18411.95, BIC = 18957.5 values were respectively less than the 2-dimension model's AIC = 18937.81, AICc = 19073.83, SABIC = 19007.96, BIC = 19379.07; the Likelihood ratio that 3-dimensions model fitted the data better than 2 dimension model was statistically significant, ($\chi^2(28) = 307.806$, $p < 0.005$).

However, when the fitness of 3-dimension was compared with the 4-dimension, the 3-dimension fitted the data better than the 4-dimensions (AIC = 18330.03, AICc = 18875.97, BIC = 18976.78 and SABIC = 18348.76 for 4-dimension, were respectively larger than the AIC = 18308.81, AICc = 18710.92, SABIC = 18411.95, BIC = 18957.5, for 3-dimension. The result showed that 3-dimension fitted the data better than the 1-dimension, 2-dimension and more complex 4-dimension models. Thus, the more parsimonious 3-dimension model fitted the data model better than any other possible dimensions. The implication of the result is that there are 3 possible sub constructs that reflect the interest of undergraduates in university education. They are engagement, motivation and participation of undergraduates.

Table 7: Items for the 3 Sub-Constructs of Interest In University Education

ITEM NO		F1 Item (Engagement of Undergraduates)
1	C9	I enjoy listening to my lecturers.
2	C10	I perform better when I attend lectures.
3	C17	I want to continue with my current discipline because my grades in my course work are above average.
4	C18	I always attend my lectures punctually.
F2 Items (Motivation of Undergraduates)		
5	C1	The university is a place where I feel fulfilled.
6	C2	Attaining a university degree makes me feel fulfilled.
7	C3	I want to go to the university not to please my parents.
8	C4	I want to go to university not because my friends are going to university.
9	C6	I will make more money and faster as a university graduate than being a non-university graduate.
10	C7	Going to school makes me feel important.
F3 Items (Participation of Undergraduates)		
11	C11	I am satisfied with my course grades at the end of the semester.
12	C12	I contribute to class discussion during lectures.
13	C13	My lecturer commends my contributions to class discussion.

Conclusion and Recommendations

The poor academic performance of some first year university undergraduates has given much concern to the federal government and other stakeholders in university education. . Several policies have been introduced over the years to address the issue as the use of only cognitive measures to examine and select candidates for admission into the universities has not been able to tackle the challenge. The cognitive measures include the Senior Secondary School Examinations (SSCE), Unified Tertiary Matriculation Examination (UTME) and Post Unified Tertiary Examinations (Post-UTME). Measuring of non-cognitive measures such as students' personal variables (mental ability test, undergraduates' interest in university education and career aspirations) have great possibilities in determining and enhancing the academic performance of first year undergraduates in the faculty of science.

This paper, therefore, recommends:

(i) The development and use of dimensionality and construct of items of students' personal variables (undergraduates' interest in university education, career aspiration and mental ability) by the federal government and university management for accessing undergraduates during admission process and throughout the years of schooling in the university as they have strong validity and reliability.

(ii) The measurement and assessment of undergraduates' interest in university of education, career aspiration and mental ability scale before admission into the university can enhance early detection and rectification of challenges that might arise in the future after placement into the various departments.

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Psychological Factors as Predictors of Senior Secondary Students' Attitude toward Environmental Concepts in Biology in Lagos, Nigeria

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Abstract

Studies have shown that psychological factors such as cognitive style, self -esteem and self-efficacy are influential in determining students' attitude towards certain school subjects but the extent to which these combine to influence students' attitude to biology has not enjoyed much research focus, especially in Nigeria. This study examined students' psychological factors (cognitive style, self- esteem and self -efficacy) as predictors of students' attitude towards environmental concepts in biology in Lagos, Nigeria. The research design adopted was the descriptive survey of correlation type. Fifteen (15) SS2 classes of forty (40) students each drawn from 15 randomly selected schools in the 5 local government areas of Educational Districts II and VI were used; this gave a total of 600 students. Three research questions were raised and answered. Four instruments, including; Students' Biology Attitude Questionnaire, (r=0.78), Students' Self-Efficacy Scale (r=0.781), Students' Self-Esteem Scale (r=0.82) and Cognitive Style Test (r=0.89) were used. Data collected were analysed using Pearson Product Moment Correlation to Multiple Regression Analysis. The findings of the study revealed that there was a significant joint effect of self-efficacy, self-esteem and students' cognitive style on students' attitude towards environmental concepts in biology;(F (3, 596) = 25.285; R= .693, R^2 = .480, adj. R^2 0.461; p<.05). The relative contribution of self-efficacy (β=. 262) and self-esteem (β=.580) were significant. Based on these findings, self-efficacy and self-esteem must be taken into consideration for improved students' attitude towards environmental concept in biology.

Keywords: Self-efficacy, Self-esteem, Students' Cognitive Style, Students' Attitude, Environmental Concepts, Biology.

Introduction

Biology is the natural science that is concerned with life and living organisms, their characteristics, forms, functions and relationship with each other and with the environment. Biology is an aggregate of many specialised disciplines which engages students in varied process skills such as observation, clarifying, and interpreting, predicting, designing experiments, organizing information and reporting.

In Nigeria, the curriculum of the Federal Ministry of Education (FME, 2013; pp ii.) states the following objectives for teaching and learning biology:

1. adequate laboratory and field skills in biology;
2. meaningful and relevant knowledge of biology ;
3. ability to apply scientific knowledge to everyday life in matters of personal and community health, and agriculture ;
4. reasonable and functional scientific attitude.

The curriculum is intended to provide a modern biology course as well as meet the needs of the learner and the society through relevant and functional contents, methods, processes and applications. As one of the prerequisite subjects for many courses like medicine, forestry, agriculture, biotechnology and nursing, biology contributes immensely to the technological growth of any nation. Knowledge of ecology is necessary for students' understanding of interactions between living organisms and their physical world. . It is therefore expected that every citizen should be taught biology (Achor, Wade, & Duguryil, 2013). Basic concepts relating to the environment and ecology are referred to as environmental concepts in biology.

Science educators have agreed that the development of a positive attitude towards science should be an important goal of the school curriculum. Although, there is a wide range of definitions of attitude, it is generally agreed that an attitude is the tendency to think, feel, or act positively or negatively toward objects in our environment. Social psychologists have long viewed attitudes as having three components: the cognitive, the affective, and the behavioural. C*ognitive* component is a set of beliefs about the attributes of an object; it is assessed by using paper-and-pencil tests (questionnaires). A*ffective* component refers to feelings about an object. It is assessed using psychological indices like heart rate. Finally, the *behavioural* component, which pertains to the way people act toward an object, is assessed with directly observed behaviours.

Attitude of students toward science have been extensively studied. It is defined as students' predispositions to react in their interpersonal relationships, particularly in interacting with teachers and the students. Attitudes tend to influence behaviour and are an important aspect of education (Nelson, 2011). Consequently, attitudes are acquired through learning and can be changed through persuasion using varieties of techniques. Although attitude changes gradually, people constantly form new attitudes and modify old ones when they are exposed to new information and new experiences (Adeoye,

2011). Attitude towards science is closely related to performance in science (Jegede, 2007, Oladipo & Adeniyi, 2015) as a positive attitude may lead to a higher performance in science. The attitude of teachers, to a large extent, affects the knowledge and attitude of students in science. Adesoji (2008) asserted that a number of factors have been identified as related to students' attitude to science. Such factors include teaching methods, teachers' attitude, and influence of parents

Attitude, like achievement, is an important outcome of teaching science. One of the goals of teaching science, particularly biology, is to help students develop reasonable and functional attitude toward biology and biosocial problems. Researches over the years have established the fact that in spite of efforts geared towards improving the teaching-learning process in biology, students' attitude to the subject still remains negative (Okafor, 2006). Poor performance had been attributed to the indifferent attitude of some students to biology. Okafor, (2006) also noted that when high levels of learning occur, learners feel good about themselves and the materials they are learning especially when teachers use instructional time efficiently. The way teachers interact with students influences their attitude toward school and their academic performance (Maldonaldo, 2005).

Several research findings have also reported that students in secondary schools have a negative attitude towards science, especially biology (Ogundiwin 2013, Oladipo and Adeniyi, 2015). The deterioration in knowledge and poor attitude have been attributed to inappropriate teaching strategies hence the call for urgent attention to investigate learning methods that can enhance student's positive attitude towards biology.

Cognitive style is a psychological disposition which shows how an individual is inclined to think, learn and process information. According to Ige (2001), student's cognitive styles have been found to mediate learning. Most of the differences encountered in students' learning could be described in terms of different manners in which students perceive and analyse a stimulus configuration (i.e. their cognitive styles). Each individual responds differently when exposed to stimulus. Some act on first impulse, some examine isolated components of what is presented to them before responding while others respond on the basis of contextual or holistic manner (Awolola, 2010). This calls for a better understanding by the teacher in making a choice and usage of teaching strategies. Ogundiwin (2013) concluded that matching a student's cognitive style with the instruction can improve academic achievement and student attitudes toward learning. Various cognitive styles or activities that focus on how students learn best need to be addressed in the classroom Oloyede (2014).

Most science students' thoughts and feelings about themselves are not predictable; they change daily based on their daily experience about themselves. Furthermore, the grade they get in examination and classroom situations can also have a temporary impact on how learners feel about themselves; hence, students' self-esteem comes into play. Student self-esteem, however, is something more fundamental than the normal ups and downs associated with situational changes. According to *Kristen &* Harper, (2011), for students with high self-esteem, normal ups and downs may lead to temporary fluctuations

in how they feel about themselves, but only to a limited extent. In contrast, for students with low self-esteem, these ups and downs drastically impact the way they see themselves. Oladipo and Adeniyi (2015) while studying which psychosocial factors predicted the academic performance of open distance learners (ODL) concluded that self-regulation and high perceived stress predicted ODL academic performance.

Germer, (2009) opined that students with low self-esteem often rely on how they are doing in the present to determine how they feel about themselves. They need positive external experiences (e.g., compliments from friends) to counter the negative feelings and thoughts that constantly plague them. Even then, the good feeling (such as from a good grade or compliment) is usually temporary. High self-esteem is based on the ability to assess oneself accurately and still accept who one is. This means being able to acknowledge one's strengths and weaknesses and at the same time recognize that one is worthy.

Self-efficacy refers to a person's personal belief in his or her capability to achieve a set goal. Wagner (2005) defines self-efficacy as the belief in one's ability to succeed in particular situations. According to Wikipedia (2008), self-efficacy is the belief that one is capable of performing in a certain manner to attain certain goals. Adeoye (2011) defines self-efficacy as one's self judgment of personal capabilities to initiate and successfully perform specific tasks at designed levels, expend greater effort, and persevere in the face of adversity.

Perceived self-efficacy is defined as people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives (Adeoye, 2011). He further explained that self-efficacy beliefs determine how people feel, think, motivate themselves and behave. The beliefs produce diverse effects through cognitive, motivation, affective and selection processes. A strong sense of self-efficacy enhances accomplishments and personal wellbeing in many ways.

This study hinges on attribution theory which was first proposed by Heider (1958) and further developed by Weiner (1986). It is concerned with how individuals interpret events in relation to their thinking and behaviour. . Attribution theorists claim to determine why people do what they do; they attribute causes to human behaviour. A person seeking to understand why another person did something may attribute one or more causes to that behaviour. Attribution theorists state that a three-stage process underlies an attribution: (i) the person must perceive or observe the behaviour, (ii) the person must believe that the behaviour was intentional, and (iii) the person must determine if they believe the other person was forced to perform the behaviour (in which case the cause is attributed to the situation) or not (in which case the cause is attributed to the other person).

Weiner (1974) focused his attribution theory on attitude. He identified ability, effort, task difficulty, and luck as the most important factors affecting attributions for achievement. Attributions are classified along three causal dimensions: locus of control, stability, and controllability. The locus of control dimension has two poles: internal versus external locus of control. The stability dimension captures whether causes change over time or not. For

instance, ability can be classified as a stable, internal cause, and effort as unstable and internal. Controllability contrasts causes one can control, such as skill/efficacy, with causes one cannot control, such as aptitude, mood, others' actions, and luck.

Attribution theory has been widely applied in education, law, clinical psychology, and the mental health domains. Weiner (1980) opined that causal attributions determine affective reactions to success and failure. The theorists stress the relationship between *effort* and academic *achievement*. Attribution theorists state that individuals are considered as active beings that seek to understand and master themselves and their environment (Elliott, Neil. Hufton, Wayne & Leonid, 2005). Based on this assumption, it is argued that the outcome of individuals' behaviour can be determined by both external and internal attributions. Li (2012) described external attributions as those factors that individuals are unable to control (e.g. difficulty of the task) while internal attributions refer to those factors that individuals are able to control (e.g. the amount of time students spend on homework). Elliot et al. (2005) posited that both internal and external attributions play a role in affecting individuals' subsequent behaviour, like task engagement and persistence. However, some researchers argued that internal attributions played a more influential role than external attributions.

Attribution theory provides a strong foundation for this study as the study attempts to investigate the extent to which internal attributions (cognitive style and self-efficacy) and external attribution (self-esteem) would predict students' attitude to biology. Students who have high self-efficacy and positive attitude tend to attribute success in biology to internal factors while those with high self-esteem tend to attribute success in biology to the external factor of self -efficacy.

Statement of the Problem

Biology is one of the science subjects offered in senior secondary schools because of its numerous values. In spite of the importance of the subject, results from schools and public examination bodies reveal that students' attitude to the subject is not encouraging due to the fact that students are unable to tackle some of the prevailing biological problems. They find it difficult to explore the problem solving situation and reflect on their experiences; this is in addition to their poor knowledge of ecological concepts. Gallagher (2000) as cited by Oladipo (2009) affirmed that only a small percentage of students who studied science, particularly biology, in secondary schools come out with any degree of understanding or 'love' of science. It becomes more worrisome because majority of senior secondary school students offer biology as their only science subject and may not encounter science again in life. Poor handling of ecological concepts by teachers who do not consider students' psychological factors, such as cognitive style, self-esteem and self-efficacy, has also aggravated the problem of mastery of biological concepts. Studies have shown that the psychological factors influence students' attitude toward school subjects but the extent to which they could combine to influence students'

attitude to biology has not enjoyed much research focus in Nigeria. This study seeks to examine students' psychological factors as predictors of students' attitude towards environmental concepts in biology.

Research Questions

Based on the stated problem, the following questions were raised to guide the study:

1. What is the relationship between students' psychological factors (self-efficacy, self-esteem and cognitive style) and students' attitude toward environmental concepts in biology in Lagos, Nigeria?
2. What is the composite contribution of students' psychological factors on students' attitude toward environmental concepts in biology in Lagos, Nigeria?
3. What are the relative contributions of students' psychological factors on students' attitude towards environmental concepts in biology in Lagos, Nigeria?

Methodology

The research design adopted for this study was the descriptive survey of correlation type.

The population for the study comprised senior secondary class II students in Lagos State, Nigeria. Multi-stage sampling technique was employed because there were more than one secondary sampling unit (Educational district level, local government level, and school level). From the six education districts (EDs) in Lagos State, Education Districts II and VI were purposively selected based on the criterion that they were far enough from each other to avoid the problem of contamination. The two EDs were stratified into five (5) local government areas: Kosofe, Somolu, Oshodi-Isolo, Ikeja and Mushin. At the first stage of sampling, simple random sampling technique was used to select twenty five (25) schools = five (5) senior secondary schools from each local government area. This was later reduced to three (3) randomly selected schools to give a total of fifteen (15) schools for the research. From each of the selected schools, one (1) intact class of forty (40) SS2 students was selected to make a total of fifteen (15) intact classes. In all, a total of six hundred (600) SS2 students were involved in the study.

Four instruments designed by the researchers were used for data collection. They are Students Biology Attitude Questionnaire. (SBAQ), Students Self=Efficacy Scale (SSES), Students' Self-Esteem Scale (SSES), and Cognitive Style Test (CST).

Students' Biology Attitude Questionnaire (SABQ) was designed by the researcher to measure students' attitude to biology. The questionnaire consists of two sections. Section A contains the personal data of the respondent, gender, school type, name of school, while Section B assesses students' attitude towards biology. SBAQ consists of 25 items on a five Likert-type response. The items were rated on 5-Likert type ordinal scale ranging from Strongly Agree (SA), Agree (A), Neutral (N), Disagree (DA), and Strongly Disagree (SD). It comprised of 5 items on interest toward biology, 10 items on future career in biology, 3 items on the biology teacher, 4 items on difficulty and 3 items on equipment.

The face and content validity of SBAQ were done by showing the 25 items to three (3) science educators to determine their suitability in terms of clarity of ideas, language of presentation, class level, coverage, relevance, and application to the study. Cronbach Alpha was used to obtain the reliability index of the instrument at 0.78.

A general self-efficacy questionnaire was adopted from Ukoh (2012) and modified by the researcher to measure students self –efficacy in biology. It consists of ten (10) items that were graded based on four Likert scale ranging from Strongly Agree, Agree, Strongly Disagree, and Disagree. Using Cronbach's alpha, the reliability and internal consistency value obtained was 0.781. The student self-esteem scale (SSES) was designed and modified by the researcher to measure the students' self-esteem in biology for the purpose of this study. . This instrument consists of twenty (20) graded items based on a four point scale ranging from Strongly Agree, Agree, Disagree to Strongly Disagree. The positive statements were graded 4,3,2,1, respectively while the reverse was the case for the negative statements. The reliability coefficient of the instrument was calculated using the Cronbach alpha and the value obtained was 0.82.

Cognitive Style Test (CST) refers to the preferred way an individual processes information. Styles describe a person's typical mode of thinking, remembering or problem solving. A number of cognitive styles have been identified and studied over the years. The cognitive style that was adapted in this study is in line with Kirton's model (1976; 2003) of cognitive style test which suggests that some human beings, called adaptors, tend to use what is given to solve problems through time-honoured techniques. Alternatively, innovators look beyond what is given to solve problems with the aid of innovative technologies. Kirton suggests that while adaptors prefer to do well within a given paradigm, innovators would rather do differently, thereby striving to transcend existing paradigms. In this study, the problem was presented to the students and their response was used to classify them into adaptors or innovators based on the characteristics of each group as presented by Kirton. CST was validated using the split half reliability method and a reliability of 0.89 was obtained.

Procedure for Data Collection

The researcher collected a letter of introduction from the Department of Science Education, University of Lagos to the schools used for the research in order to administer all the instruments constructed for the study. The researcher visited the schools, discussed with the principals, and obtained their consent and that of the class teachers. The researcher trained eight research assistants (who are also biology teachers) on the techniques to use in administering the research instruments. Thus, the researcher along with the trained research assistants numbered the instruments before administering them in all the sampled schools.

Data collection lasted five (5) weeks in the selected local government areas in Lagos, Nigeria. The instruments were given to some secondary school biology teachers as well as their senior secondary II students (SS II). One week was spent on familiarisation visits to the schools and four weeks on training the research assistants who administered the students' based test.

Data collected was analysed using Pearson Product Moment Correlation and Multiple Regression Analysis to determine the measure of relationship between independent and dependent variables. Multiple Regression was used to determine the joint contribution of independent and dependent variables as well determine which of the variables predicted students" attitude to biology.

Results

Research Question 1: What is the relationship among students' psychological factors (self-efficacy, self-esteem and cognitive style) and students' attitude towards environmental concepts in biology in Lagos, Nigeria?

Table 1: Correlation Matrix Showing Relationship between Independent Variables and Dependent Variables

Variables	Student Attitude to Environmental concepts (SAEC)	Self-efficacy	Self -esteem	Cognitive style
SAEC	1			
Self-efficacy	.411**	1		
Self -esteem	.641**	.259**	1	
Cognitive style	.025	.140	.046	1
Mean	33.8000	28.9550	28.4600	5.5150
S.D	5.9672	3.2490	7.0217	1.9670

****Sig at 0.01 Level*Sig at 0.05 Level**

The result from Table 1 shows significant correlation among independent variables and dependent variables. There is a positive significant relationship between student attitude to environmental concepts in biology and self-efficacy (r= .411); student attitude to environmental concepts in biology and self-esteem (r= .641); student attitude to environmental concepts in biology and cognitive style (r= -.022). The mean and standard deviation scores suggest that as self- efficacy and self-esteem levels improve, attitude towards environmental concepts, especially the ecological concepts in biology, improves.

Research Questions 2: What is the composite contribution of students' psychological factors on students' attitude towards environmental concepts in biology in Lagos, Nigeria?

Table 2: Summary of Regression Analysis Showing Composite Contribution of Combined Independent Variables to Dependent Variables

Source variation	Sum of squares	Df	Mean square	F	Sig
Regression	3398.948	3	485.564		
Residual	3687.052	596	19.203	25.285	**.000**
Total	7086.000	599			

R= .693R^2 = .480Adj R^2 =.461

The joint effect of the three students' psychological factors (self-efficacy, self-esteem and cognitive style) on students' attitude towards environmental concepts in biology in Lagos, Nigeria was significant (F (3, 596) = 25.285; R= .693, R^2 = .480, adj. R^2 0.461; p<.05). About 46% of the variation in students' attitude towards environmental concepts in biology in Lagos, Nigeria was accounted for by the independent variables.

Research Question 3: What are the relative contributions of students' psychological factors on students' attitude towards environmental concepts in biology in Lagos, Nigeria?

Table 3: Multiple Regression Analysis Showing Contribution of the Independent Variables to the Dependent Variables

	Unstandardized Co-efficient		Standardized Co-efficient Beta	T.	Sig.
	B	Std Error	B		
Constant	9.830	5.746		1.711	.089
Self-efficacy	.480	.103	.262	4.660	.000
self-esteem	.493	.049	.580	10.156	.000
Cognitive style	-.148	.166	-.049	-.897	.371

Table 3 reveals the relative contribution of each of the independent variables to the dependent variable as follows: self-efficacy (β=. 262, P <.05); self -esteem (β=580, P<..05); cognitive style (β= -.049, P<.05); on students' attitude towards environmental concepts in biology in Lagos, Nigeria. While self-efficacy and self-esteem were significant, cognitive style was not.

Discussion

Self-esteem had positive relationship with students' attitude towards environmental concepts in biology in Lagos, Nigeria. This finding is consistent with that of *Germer,* (2009) who established that the self-esteem of the teacher positively affects the attitude of the student. Rehman & Haider (2013) found that self-esteem is directly related to the classroom behaviour of students. Self-esteem, according to Ukoh (2012), is an individual's own capacity, positive or negative judgements about himself. This means that self-esteem

is not a function of skills; it is the belief about having the ability to put skills into use. Self-esteem belief has an important effect on providing quality education.

That self-efficacy had positive relationship with students' attitude towards environmental concepts in biology supports Pajares (2006) assertion that students with a strong sense of efficacy are more likely to challenge themselves with difficult tasks and be intrinsically motivated. Such students will put up a high degree of effort in order to meet their commitments, and attribute failure to things which are in their control rather than blaming external factors. Self–efficacious students also recover quickly from setbacks, and ultimately are likely to achieve their personal goals. They attribute failure to insufficient effort or deficient knowledge and skills which are acquirable. Students with low self-efficacy believe they cannot be successful and these are less likely to make any concerted, extended effort. Elsevier (2009) investigated the structural relations among self-efficacy, academic aspirations, and delinquency on the academic achievements 935 students, aged 11-18 years, from ten schools in Australia and found that academic and self-regulatory efficacy had effect on academic achievement. Academic and social self-efficacy had positive and negative relationships respectively with academic aspirations and academic achievement.

However, while self-efficacy and self-esteem were significant, having positive relative contributions to students' attitude to environmental concepts, cognitive style was not. This contradicts the findings of Ellah & Achor (2015) whose study indicates that high cognitive ability level students have positive attitude toward science and high variation in students' attitude towards science is as a result of the variation in their conitive style.

Conclusion

The findings of this study show that self-efficacy, self-esteem and students' cognitive style are important in the teaching and learning of biology in Lagos State**.** The variables must be adequately taken into consideration for improved students' attitude towards environmental concepts in biology in Lagos, Nigeria**.**

Recommendations

1. Students' self-efficacy and self-esteem need to be taken into consideration by biology teachers before dealing with the attitude of students towards environmental concepts in biology.
2. To achieve number 1 above, teachers should be given regular training, workshops, seminars and lectures on the influence of psychological factors, especially self-efficacy and self-esteem of students, on their affective or psychological skills in the teaching-learning process.

3. Teacher training education should be enhanced with more practical studies on psychological factors especially self-efficacy and self-esteem of students on their cognitive styles.
4. Government and state ministries of education should consider self-efficacy and self-esteem level of individual grades of students during curriculum reform and implementation in the nation's institutions.

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Effect of Game-Based Learning (GBL) and Gamification on Senior Secondary School Students Learning Outcomes in Physics

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Abstract

New trends in teaching and learning have shown game-based learning (GBL) and gamification as potential viable tools for enhancing students' learning experience and outcomes. The promise of using this strategy is that play, fun and learning would occur simultaneously in order to create a changed social environment that would stimulate and motivate learners into having a better learning experience. This study therefore developed a GBL package (using board game) and gamification instructional package that determined its effect on senior secondary school students' achievements, attitude and motivation towards physics. The self-determination and socio-constructivist theory of Vygotsky provided the framework, while the study employed the pretest-posttest control group quasi-experimental design. Participants in the study consisted of 94 senior secondary school one students that were drawn from three public secondary schools. Results from analysis of covariance, estimated marginal mean, and descriptive statistics show that game-based learning and gamification enhanced students' achievement ($F_{2,74}$= 2.484, p > .05) and positively influenced their attitude ($F_{2,74}$ = 4.73, p>.05) and engagement ($F_{2,74}$ = 5.42, p > .05). Although the two treatments were effective in enhancing students' learning outcomes in physics, gamification was more effective than game-based learning in enhancing motivation towards physics while game-based learning was more effective than gamification in enhancing students' attitude and achievement in physics. Based on these findings, the study concluded that game-based learning and gamification enhanced senior secondary school students learning outcomes, motivation and attitude in physics and should therefore be adopted in teaching secondary school subjects.

Keywords: Game-Based Learning, Gamification, Achievement, Attitude and Motivation

Introduction

The importance of physics to the scientific and technological development of any nation cannot be over-emphasized especially in this digital age where information and communication technology is a vehicle with great potentials for national and economic development. It is in view of this that Ibeh, Onah, Umahi, Ugwuonah, Nnachi, and Ekpe (2013) argued strongly that the specific priority of physics in the scientific and technological

development initiatives of a nation is so important that regression and dependence on other countries will be the reward of any nation with poor records in physics. Nonetheless, physics remains the least favoured science subject among senior secondary school students and is generally considered boring (Veloo, Nor, and Khalid, 2015). Learning physics has often proven to be a difficult endeavour for many students because of calculations and abstract concepts which are fundamental to understanding the intricacies of the relationships between the different constituent parts of the world we live in.

This must have caused students' poor attitude and lack of motivation in learning physics (Ozden, 2007 and Saleh, 2014), hence, physics has become a subject of least choice in schools (Alexander, Kuppam, Shaik Kadir, and See, 2010). These challenges have continued to result in poor learning outcomes in physics and fewer enrolment in physics and physics-based courses at higher levels of study.

Many factors have been highlighted as contributing factors to students' poor learning outcomes in physics among which was teaching strategy (Adeyemo and Babajide, 2014). Asikhai (2010) opined that mass failure of students in senior secondary school physics examinations is mainly due to the use of inappropriate or ineffective teaching strategies by physics teachers. According to Mari (2002) teaching strategy is a variable that can easily be manipulated by teachers to improve students' learning outcomes as well as reduce gender bias in performance in physics. The major function of pedagogy is to ensure that ideas and information are meaningfully and logically presented in a creative manner that allows students to retain and apply all that has been learnt over a long period of time. As such, the teaching of physics in the absence of appropriate teaching strategy may result in poor outcomes of learning on the part of students.

Physics is a practical and applied subject that should be taught in a manner that fosters the easy integration of current innovations, especially in this technology-driven era where teachers are now facilitators and students now play a central role and take responsibility for their learning. Physics lessons ought to be activity packed and situated within the context of students' experience and immediate environment. This may not be possible using the rote learning method of instruction where mere teaching occurs. According to Al-Azawi, Al-Faliti, and Al-Blushi (2016) many studies and systems that use ”pleasure” and ”fun” as inherent aspects of games to improve learner's motivation have been developed in the field of the learning environment. A game is a competitive physical or mental activity governed by rules, especially engaged in for the purpose of entertainment and directed towards an explicit goal (Kapp, 2012). It can also be defined as activity that must have the following features:-

i. Fun: the activity is chosen for its light-hearted character.
ii. Separation: it is circumscribed in time and place.
iii. Uncertainty: the outcome of the activity is unforeseeable.
iv. Non-productive: participation does not accomplish anything useful.

v. Governed by rules: the activity has rules that are different from everyday life.

vi. Fictitious: it is accompanied by the awareness of a different reality (Al-Azawi, *et. al* 2016)

Innovations like game-based learning and gamification which involves the use of real games and game elements played within and outside the classroom could improve the attitude, motivation and performance of students in physics.

Game-based learning employs the use of games to enhance the learning experience and meet learning outcomes while gamification takes the entire learning process and turns it into a game. To do this, instructional designers use game design elements which are digital objects and elements that make an experience game like. Studies have shown that the incorporation of games into the teaching and learning process is usually more effective than the conventional teaching approach by actively engaging the learner, arousing learners' interests, and enhancing learning motivation (Kirikkaya, Iseri, and Vurkaya, 2010). Game-based learning can provide an effective way to offer engaging and motivating learning experiences that would increase students' interest in physics and improve students' academic performance (Musselman, 2014). In recent years, many researchers have investigated the effectiveness of digital and indigenous games in the promotion of learning of science-related school subjects. Liu and Chen (2013) used game-based learning in an energy course and discovered that students generally accepted the method and their achievement was significantly higher after playing the game.

Through game-based learning, motivation and efficiency can be improved. Students learn more actively and construct knowledge for themselves, enabling the learned content to have a deeper and lasting imprint that may not be possible under conventional teaching methods (Papastergiou, 2009). Gamification, on the other hand, is the application of game elements and digital design techniques to games to achieve educational objectives, attract the attention of learners, raise motivation and solve the problem of low academic achievement. It allows educators to encourage students to master a set of objectives, by empowering them to revise and try again in a positive, non-threatening and productive way (Elshemy, 2017).

In a study carried out by Smith, Herbert, Kavanagh and Reidsema (2013) on the effect of gamification (leaderboard and badges) on the participation and quality of an online technical course discussion, it was discovered that gamification was an effective means of motivating students through higher students' participation as well as feedback during instruction. In a similar study, Turan, Avinc, Kara and Goktas (2016) reported that the experimental group students who were taught using gamification had better achievement scores than those taught using the conventional approach. However, most studies on game-based learning and gamification have focused on digital game-based learning and gamified courses while neglecting the possible effect of students' self-regulation ability (Boticki, Baksa, Seow, and Looi, 2015; Mekler, Brühlmann, Tuch, and Opwis, 2017) . Fewer Nigerian studies have also explored game-based learning in the form of educational

board games. It is hoped that the findings of this study will demonstrate the effectiveness of GBL and gamification in enhancing engagement and learning outcomes in the learning process. The study therefore, examined whether there is

- significant main effect of treatment in students' achievement in physics
- significant main effect of treatment on students' attitude to physics.
- no significant main effect of treatment on student motivation to learn physics.

Literature Review

Game-Based Learning (GBL) refers to the application of games to teaching and learning situations in order to enhance learning experience and meet learning outcomes (Poulsen, 2011) A GBL environment describes an approach to instruction where learners explore relevant aspects of games and gameplay in an organized learning context designed by the instructor (Chen, Yen and Chang, 2015). The purpose of adopting game for instructional purpose is to create a highly motivated and engaging learning experience (Ke, Xie, and Xie 2015). Games create a highly social, emotional and sometimes complex environment that helps learners think and reflect critically, take risks in a space with reduced consequences, assume multiple identities, receive reward, learn new skills, interact experimentally with the game environment, discover knowledge from experience and apply such knowledge to real life situations (Liu and Chen, 2013; Alfaifi, 2013).

This approach is designed to balance instructional content or knowledge with gameplay and foster the retention and application of such knowledge to the real world by the learners. The instructor and students also collaborate in order to construct ideas and add depth and perspective to the experience of playing the game. In recent years various studies relating to the use of GBL have reported the potentials of using this approach for instruction. Alfaifi (2013) found that GBL using board games was effective in enhancing college students' intrinsic motivation in learning physics. A study by Divjak and Tomic (2011) also reported that students' achievement and attitude towards learning was greatly improved with GBL approach. Liu and Chen (2013) also reported the positive effect of GBL on students' achievement and motivation in science learning. In a similar study by Yien, Hung, Hwang and Lin (2011) it was reported that a properly designed GBL environment has a positive effect on students' achievement and attitude. Meanwhile, few studies have also reported that GBL has no significant effect on students' learning outcomes (Giannakos, 2013; Chen, Yeh and Chang, 2015).

Gamification, on the other hand refers to the use of elements common in game plays in the design of learning processes for the purpose of motivating learners (Kapp, 2012; Huang and Soman, 2013). According to Kapp (2012) gamification involves the use of game-based aesthetics to promote learning or to engage and motivate individuals to solve a given problem. In using gamification, researchers attempt to integrate the engagement and motivation that exist in games to enhance participation, motivation and achievements in various activities other than game (Richter, Raban and Rafaeli, 2015).

The rationality for the gamification of learning is that the incorporation of elements that are found in games to learning activities will foster engagement and immersions such as is experienced in games and ultimately change learners' behaviour in a desirable way (Codish and Ravid, 2015; Holman, Aguilar and Fishman, 2013). In recent years, gamification has gained popularity among researchers

and its use in educational programmes is enabling instructors to find the balance between achieving instructional objectives and meeting evolving student needs (Huang and Soman, 2013). A study conducted by Elshemy (2017) in an elementary school showed that gamification was effective in enhancing elementary school students' achievement and motivation to learn. Reichelt (2015) also reported that gamification using points and levels could be effective in improving students' academic achievement and motivation.

Methodology

This study adopted a pre-test and post-test quasi-experimental control group design. The independent variables were the different teaching strategies. The experimental groups were taught using GBL and gamification, while the control group received instruction with the conventional lecture method. The dependent variables were learning achievement, attitude towards physics and physics motivation.

Participants

The participants in this study included 94 senior secondary one students in three classes that were purposively selected from three public senior secondary schools. One class consisting of 30 students (16 males and 14 females) was experimental Group A, another class with 32 students (19 males and 11 females) was the experimental Group B and the last class with 30 students (12 males and 18 females) was the control group. To prevent the influence of different instructors on the experimental results, the experimental classes were taught by the same instructor. The students in experimental group A learned with the GBL, experimental group B learned with gamification while those in the control group learned with the conventional instruction method.

Measuring Tools

Three research instruments were used for data collection. These were the Physics Achievement Test (PAT), Students' Attitude to Physics Questionnaire (SATPQ) and Students' Motivation to Learning Physics Questionnaire (SMTLPQ). To evaluate the learning achievement of the students, the physics achievement test was developed by the researcher based on purposively selected contents on the concept of "motion" in the senior secondary school physics curriculum. The test items were designed to measure the first four levels of the cognitive domain according to Bloom's taxonomy of cognitive

skills. The test consists of 15 multiple response items which were validated by seasoned physics teachers. Respondents were required to choose a correct answer among four possible choices, A to D. Each item was awarded 4 marks if the student gave the correct answer. The reliability index was 0.78.

To measure the students' learning attitude towards physics, the questionnaire that was developed by Barmby, Kind and Jones (2008) on science attitude was adapted. It consisted of 37 items on a 4-point Likert scale. The Cronbach's test of internal consistency had a value of 0.73 showing good reliability.

To evaluate the motivation of the students in learning physics, the questionnaire developed by Tuan, Chin, and Shieh (2005) was adopted. The instrument was modified by the researcher to collect information about respondents' level of motivation in the physics class. It consisted of 22 items that were based on five constructs of motivation which are self-efficacy, active learning strategies, performance goal, achievement goal and learning environment stimulation. The respondents were required to give their sincere opinions on a 4 point Likert scale. The questionnaire has a Cronbach's alpha value of 0.80.

The game-based learning system

The framework used in designing the game-based learning system was based on the ADDIE instructional design model. The model involved five processes - analysis, design, development, implementation, and evaluation. Analysis was to the process of determining the instructional goals and objectives, including the learners' characteristics, preferences and environment. Design consisted of the specific knowledge and skills the learners ought to attain at the end of the study while development involved the integration of game-based learning strategy with the identified learners' characteristics, need and other environmental logistics. The board game package that was employed for this study was also developed based on Bates, Brown, Cranton and Lewis' (2010) six steps requirement for the design of a board game. These are content analysis, incubation, chunking, aligning, drafting, and incubating.

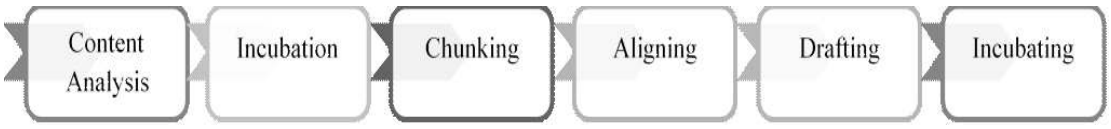


Figure 1: Board game six steps model according to Bates, Brown, Cranton and Lewis (2010)

The board game was designed to teach learners the concept of motion in senior secondary school one physics course. The activities involved included the awareness of motion, identification of different types of motion, explanation of position, displacement and velocity, awareness of force, identification and description of friction,

and exercise unit. In achieving these objectives, the board game divided numbered and coloured squared paths from start to finish using the principle of traditional monopoly and snake/ladder game. The game also had chance squares, problem squares and knowledge squares for giving learners more opportunity to learn about the concept of motion

Figure 2 shows the interface of the board game. The game required more than one player. Each player chooses a character (car, airplane, power bike and ship toys), and moves on the board based on the number that he or she gets of the dice. At problem squares, players can answer the questions based on the topic taught to collect a colour piece and the attached prize from the banker. Players who land on a property can either purchase it (if not yet purchased by other players) or pay the accompanying rent fee. Chance squares were designed to give players wild cards during the game play. Knowledge cards give players the opportunity to learn more during the instructional process. The player(s) who was able to collect all or most colour pieces of question card, as well as own the highest number of properties becomes the winner.

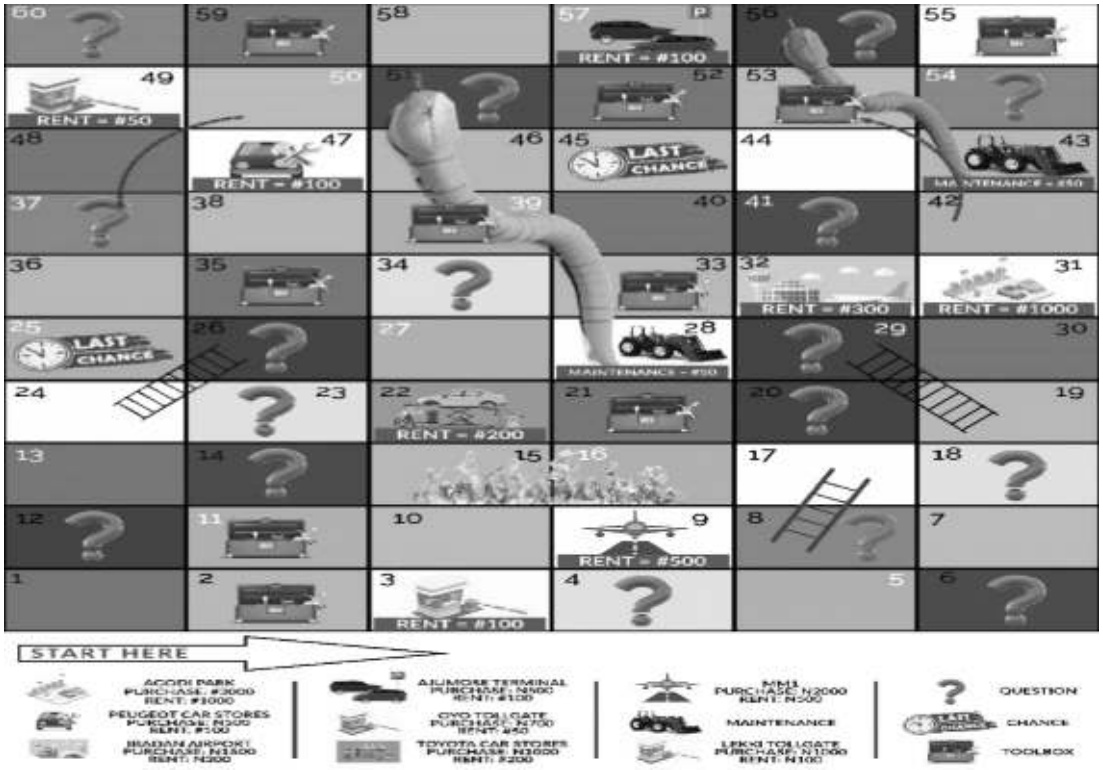


Figure 2: *The board game interface*

The gamified learning system

1. The game-play learning system was designed using the ADDIE model to teach the concept of motion. The elements of gamification that were employed were points, badges and leader boards as shown in Figure 3. Regular physics classes were broken into short frames, with each frame adopting activities that allowed individual students and group of students to earn points. Class activities were in two modes - individual and group activities. Individual activities were the activities set for each student while the group activities were the activities that involved groups of learners working together. Individual activities were rewarded with points and badges while the group activities were awarded points and leader board. The researcher also implemented a class-wide reward system where everyone celebrated individual and collaborative accomplishments.



Figure 3: Sample point and badges used in the study

Experimental Procedure

The experimental procedure consists of stages: the pre-test, the implementation of the packages and learning tasks, and the administration of post-test.

During the pre-test, all students in the three groups took the physics achievement pre-test, and completed both the motivation and the attitudinal questionnaires. This lasted for a period of one-week. After the pre-test the students were exposed to the instruction and learning activities which lasted six (6) weeks. During this period, the students in the experimental group A learned with the game-based learning approach. Those in experimental group B learned with the gamification approach while the students in the control group learned with the traditional teacher-centred method.

At the end of the administration of treatments, all the students took the post-test and completed the motivation and attitude questionnaire and achievement test. This lasted one-week.

Results

Hypothesis 1: There is no significant main effect of treatment on students' achievement in Physics

Table 1*:* ANCOVA result of the post -achievement scores of the three groups

Variable	Group		N	Mean	SD	Adjusted Mean	Std. Error	F
Post-test	**(EA)**	**Experimental group A**	**29**	**5.78**	**2.23**	**7.738**	**.320**	**18.53***
	(EB)	**Experimental group B**	**32**	**6.84**	**3.07**	**7.096**	**.300**	
	(C)	**Control group**	**32**	**5.41**	**1.64**	**4.795**	**.384**	

This study adopted the pre-test scores of the physics achievement test as the covariate for the analysis of covariance (ANCOVA) to avoid the possible influence of the pre-test on physics achievement. It was found that there was no significant interaction between the independent variable and the covariate of the physics achievement test ($F = 18.53$, $p > .05$; this implies that the three groups possessed equivalent physics knowledge before the experiment. Further ANCOVA analysis was subsequently conducted.

Hypothesis 2: There is no significant main effect of treatment on students' attitude to physics.

Table 2 : *ANCOVA result of the ratings of the attitudinal post -questionnaire rating of the three groups*

Variable	Group		N	Mean	SD	Adjusted Mean	Std. Error	F
Post-test	(EA)	Experimental group A	32	79.28	12.95	89.05	1.45	11.26*
	(EB)	Experimental group B	32	85.09	13.57	85.56	1.37	
	(C)	Control group	29	79.28	8.04	78.31	1.76	

After the experiment, ANCOVA was used to compare the post-attitudinal scores of the students by excluding the impact of the pre-attitudinal scores. Table 2 shows the descriptive data and ANCOVA result. The adjusted means of the experimental group A, experimental group B and the control group were 89.05, 85.56, and 78.31 respectively. Results also showed that the three groups had significant differences on their post-attitudinal ratings, with $F = 11.26$, $p < .05$. Pair comparison further showed that both experimental groups A and B outperformed the control group with the experimental group having the highest adjusted mean. This implies that both GBL and gamification approach in teaching physics could significantly enhance students' attitude towards physics.

Hypothesis 3: There is no significant main effect of treatment on student motivation to learn physics.

***Table 3*: ANCOVA result of the motivation post -questionnaire scores of the three groups**

Variable	Group		N	Mean	SD	Adjusted Mean	Std. Error	F
Post-test	**(EA)**	**Experimental group A**	32	77.19	8.13	75.93	.788	14.41*
	(EB)	**Experimental group B**	32	76.97	10.39	78.76	.759	
	(C)	**Control group**	29	73.00	7.15	72.21	.956	

The pre-test scores of the questionnaire on students' motivation towards physics were used as covariates for the ANCOVA. There was no significant interaction effect between the independent variable and the pre-test scores on motivation with $F=14.41$, $p > .05$. Table 3 shows the ANCOVA result of the post-motivation scores after the influence of the motivation pre-test scores were excluded. The adjusted mean of students in experimental group B was the highest (78.76), followed by experimental group A (75.93), while the control group had the least adjusted mean (72.21).

This implies that both GBL and gamification could significantly enhance the students' motivation compared to the traditional lecture method. Further comparison between the experimental groups showed that gamification could be more effective in enhancing motivation in physics than GBL.

Discussion

This study was borne out of the need to empirically investigate effective strategies for teaching and learning physics as possible solutions to the problems identified in the current strategy for learning physics. A game-based learning package that involved students playing a board game and a gamified learning environment where students could earn points and badges were developed. In other to evaluate the effectiveness of this approach, a learning activity on motion in the senior secondary school one physics was conducted to compare the learning achievements, attitude and motivation of the students who learned with the GBL approach, gamification approach and conventional instruction.

The experimental results showed that both GBL and gamification were more viable tools for enhancing learning achievements of students than the conventional lecture method. The estimated marginal mean score also showed that students in the game-based group had the highest mean score, followed by those in the gamification group while students in the conventional group had the least mean score. This finding agrees with Olaiya, Akinyemi and Aremu (2017) that GBL using board games significantly enhanced students' achievement. This may be due to the fact that students in a game-based group have more opportunities and time to work collaboratively. The strategic roles of collaboration and teamwork in promoting enhanced engagement and

improved performance of students at all levels of education in classroom settings has been emphasized . The high level of achievement attained by the students in the game-based group could therefore be due to the power of collaboration and interaction that energized the exchange of ideas among participants of the group. Moreover, the level of competition in the game-based group was more established than experienced in the other groups forcing the participants to give all it takes to succeed in the game play and become the "winner". This also could have accounted for their significantly high post-achievement scores.

In terms of attitude the result shows that there was a significant difference in the attitude of students towards physics in the three groups. This significant effect on attitude was found to be solely due to the post-test mean score of the students exposed to GBL and gamification. This corroborates Papastergious (2009); Cózar-Gutiérrez and Sáez-López's (2016) finding that students learn more actively with greater interest when the learned contents leave a deeper impression than would be possible using conventional methods. Pairwise comparison between the three groups also showed that the attitude of students in the GBL group was significantly higher than those taught using gamification and conventional approach. It therefore implies that GBL is more effective in enhancing students' attitude towards physics compared to gamification. This may be due to the fact that the students in the game-based group had the opportunity to take charge of their own instruction having gotten familiar with the rules and mechanics of the game.

On the other hand, it was found that the gamification group outperformed the other two groups in terms of motivation, while there was a significant difference in the motivation of the GBL group and conventional group. This finding agrees with various studies on gamification that reported favourable effects of gamification on students' motivation to learn (Elshemy, 2017; Reichelt, 2015). Kapp (2012) observed that games provide more engagement for the learner, more personalized learning opportunities, an environment for authentic and relevant assessment and teaches 21st century skills. These could have been responsible for the higher motivation towards physics. The gamified environment allowed students to earn individual and group points thereby fostering healthy competition within and between groups. On the other hand, participants in the game-based group had no opportunity to compete with each other within groups. This finding however negates that of Meyer (2008) who reported that the use of points had no effect on students' motivation to post in an online discussion forum.

Conclusion and Recommendations

Although the findings in this study have been able to show game-based learning and gamification as effective approaches to enhancing students' achievement, attitude and motivation towards physics, there is still a need to conduct longer experiments with larger samples of heterogeneous groups to further investigate the effectiveness of GBL and gamification. GBL and gamification can be applied to lower levels of education

such as pre-schoolers and primary school pupils to better understand possible interaction effect between pupils' age levels and abilities.

Furthermore, some improvement can be made to the current gaming model by making use of indigenous games that appeal to the students.

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Assessment of the Integration and Challenges of Information and Communication Technologies (ICTS) in Tertiary Institutions in Nigeria

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Abstract

The study examined the modes of integration of information and communication technologies (ICTs) in tertiary institutions in Nigeria. It determined the level of success in various areas where ICTs have been integrated in tertiary institutions and examined higher education staff attitude towards the integration of ICTs. Finally, it examined the challenges militating against effective integration of ICTs in higher institutions. The study adopted the descriptive survey research design. The population for the study comprised the staffs of tertiary institutions in Osun state, both the teaching and non-teaching. A sample size of 240 teaching and non-teaching staffs were purposively selected from three institutions in Osun State based on type, nearness and ownership. An instrument titled: Assessment of the Integration and Challenges of ICTs Questionnaire (AIICQ) was developed and validated before use. Four research questions were raised and answered. Data collected were analysed, using frequency counts, simple percentage mean and Relative Significance Index (RSI). The results showed that 74.2% of the staffs used ICTs blended with conventional/manual approach in their institutions. The study concluded that if information and communication technologies are to be effectively integrated into teaching and learning in tertiary institutions, there must be a positive level of acceptance by the staffs, higher institutions management as well as all agencies involved in the running of higher institutions in Nigeria.

Keywords: Integration, Information and Communication Technologies (ICTs), Tertiary Institutions, Challenges.

Introduction

Given the importance of tertiary education, many nations around the world have come to embrace it for optimal development. According to Idumange and Nwaeke (2011), through university education, the citizens of a nation acquire high level skills in various sectors like health, education, and engineering In pursuance of this, there is need for both students and

staffs of higher institutions to have a good grasp of Information and Communication Technologies (ICT). ICTs must be integrated into every aspect of higher education in order to produce students who are ICT literate and can easily adapt in the 21st century where technology permeates every sphere of life. Bingimlas (2009), in Owino (2009) affirms that the utilization of ICTs in teaching is a more effective way of preparing for the globalising job market. The world is in a computerised age where technology has created a web of interconnectivity between places and people far and wide.

Over the years, technology has undergone significant changes which have made it one of the most common elements in our society. This advancement has resulted in, Information and Communication Technologies (ICTs), otherwise known as 'new media'. According to the UNESCO reports (2002), ICTs are a combination of 'informatics technology' with other related communication technologies, chief of which is the internet, computer and smart phones. These cover internet services, telecommunication equipment, media and broadcasting, wire-based information services, and other related information and reception of knowledge activities. In clearer terms, ICTs can be described as computerised or electronic machines that can be used for a wide range of activities (Ofodu, 2007) as cited in Ajayi and Haastrup (2009).

For this study, ICTs will be taken to mean digital communication resources or materials which are applied in the teaching and learning process to improve education. Such resources include the internet, computers, projectors, smart phones, and other digital and audio visual resources. Information and Communication Technologies are increasingly having more influence on all aspects of the society as they have become an integral part of the society. They have a transformative impact on the way information is processed, stored, accessed and disseminated, and have made the world a global village (Agi, 2013; Garba, Singh, Yusuf and Ziden, 2013).

Industries all over the world, have witnessed significant improvement in their modus operandi with the integration of ICTs in their daily operations. According to Oliver (2002), despite the full scale adoption of ICTs in other fields, the education industry still lags behind in fully integrating ICTs, especially in primary and secondary schools. But as times continue to change, many factors have helped to awaken the need to adopt ICTs into the learning environment. Oliver (2002) observes that the factors include the need to make the teaching and learning process more efficient, effective and dynamic.

Zubairu (2015) asserts that ICTs have contributed immensely in evoking a positive change in the quality of research, teaching and learning. Researches Researchers have been carried out globally to prove that a boost in student exposure to educational ICTs through curriculum integration has a significant impact on student performance especially in terms of knowledge comprehension, practical and presentation skills (Kozma, 2005 and Fister and McCarthy, 2008). According to Ajayi (2008), with the adoption of ICTs, learning institutions have become more efficient and productive and are necessary prerequisites for upgrading the standard of education.

ICTs provide the opportunity to overcome the persistent problem of lack of staff, obsolete learning materials in Nigerian higher institutions and is a useful support for various educational activities (Idowu and Esere, 2013).

The means that ICTs have made it possible for learning to be more participatory, causing a shift from the teacher centred to the learner friendly environment which has also transformed instructors to facilitators. Scholars such as Grimus (2000) and Yelland (2001) have reasoned that the use of ICTs in the instructional process gives learners the chance to learn how to function in this era of digitalization, and that learners with ICT skills are in a better position to face new developments with better understanding in addition to being better equipped for the labour market.

While this may be the ideal situation in more advanced countries of the world where such facilities are readily available, the Nigerian situation may be slightly different as the integration of ICTs in education is still in its infancy due to a myriad of challenges and setbacks. Osakwe (2012) revealed that many Nigerian universities have problems accessing ICTs in other to attain improved standards of teaching and learning. According to Ajegbelen (2016) and Starr (2001) other impeding factors include lack of financial support, inadequate training for teachers, lack of motivation for the need to fully adopt ICTs as teaching aids, unstable power supply, lack of ease of access and high cost of internet services. Notwithstanding these challenges, ICTs in education have come to stay.

Against this backdrop, concerted efforts are being made to further enhance the implementation of ICTs in the education sector. The federal government of Nigeria, in a bid to access international best practices, reviewed the l998 national policy on education as stated in year 2004 to accommodate the introduction of ICTs into the school system. Furthermore, in an official publication released in 2017, the UNESCO noted that extra budgetary contributions through member states like the UNESCO–China Funds-in-Trust (CFIT) and the UNESCO-Korea Funds-in-trust (KFIT) projects are being harnessed to accelerate the process of implementing ICTs in education projects in Africa.

This study, therefore, investigated the extent to which information and communication technologies have been adopted in higher institutions in Nigeria with the aim of assessing the integration and challenges of Information and Communication Technologies in tertiary institutions in the country. Specifically, this study sets out to:

1. examine the modes employed in the integration of Information and Communication Technologies in higher institutions in Nigeria,
2. determine the level of success in various areas where Information and Communication Technologies have been integrated in higher institutions in Nigeria,
3. examine higher education staff attitude towards the integration of Information and Communication Technologies in higher education in Nigeria
4. examine the challenges militating against effective integration of Information and Communication Technologies in higher education.

Research Questions

From the objectives of the study, the following research questions were raised.

1. What are the modes of integration of Information and Communication Technologies in higher education in Nigeria?
2. What is the level of success in various areas where Information and Communication Technologies have been integrated in higher education in Osun State?
3. What is the higher education staff attitude towards the integration of Information and Communication Technology in higher education in Osun State?
4. What are the challenges militating against effective integration of Information and Communication Technology in higher education in Osun State?

Methodology

The design adopted was the descriptive survey research. The descriptive survey research design was appropriate for this study since it was a fact finding study investigating to what extent ICTs had been integrated in tertiary institutions in Nigeria, the areas of integration and the challenges. This is in line with Lokesh's (l988) assertion that descriptive survey studies usually collect detailed descriptions of existing phenomena with the purpose of employing data to justify current conditions and practices or making more informed plans for improvement. Survey studies are used in investigations of phenomena in their natural settings.

The population for the study comprised teaching and non- teaching staffs of all higher institutions in Osun State. The sample consisted of 240 teaching and non-teaching staff from higher institutions in Osun State. Three (3) higher institutions were purposively selected based on type, nearness and ownership. These include Obafemi Awolowo University, Ile-Ife, Federal Polytechnic, Ede and Osun State College of Education, Ilesha. Thirty one (3l) teaching staff and forty nine (49) non-teaching staff were selected using convenience sampling technique. These gave eighty (80) respondents in each of the institutions. In all, two hundred and forty (240) respondents were selected from the three institutions. The investigators personally visited all the three institutions and administered the instruments. Convenience sampling technique was employed in the three institutions to elicit information from the respondents.

The instrument titled 'Assessment of the Integration and Challenges of ICT Questionnaire (AIICQ) was designed by the researchers to assess the integration and challenges of Information and Communication Technologies in tertiary institutions. It was designed with both open ended and close ended questions that were related to the topic and research questions raised. The instrument consisted of two sections. Section A had six (6) close-ended and one (l) open-ended questions to get the demographic data of respondents. Section B, had four (4) sub- sections. Sub-section l, consisted of two (2) questions designed to elicit information on the mode of integration of ICTs in the tertiary

institutions. Sub-section 2, had l9 questions on the level of success of ICTs integration in tertiary institutions. There were l0 questions in sub-section 3 on the attitude and perception of tertiary institution's staffs towards ICTs while sub-section 4, had nine (9) questions that elicited information on the challenges militating against the effective integration of ICTs in tertiary institutions. The questionnaire had a total of 45 structured questions. To obtain the necessary information, the investigators personally administered the questionnaires and allowed the respondents to express their opinions freely. Data collected were analyzed using the frequency counts, simple percentage, mean and relative significance index (RSI).

Tab1e 1: Socio-Demographic Information of Higher Education Staff

Variab le	1evels	Frequency (f)	Percentage (%)
	University	80	33.3
	Polytechnics	80	33.3
Type of Institution	College of Education	80	33.3
	Total	**240**	**100.0**
	Male	112	46.7
	Female	104	43.3
Sex	No Response	24	10.0
	Total	**240**	**100.0**
Status in the	Teaching Staff	93	38.8
Institution	Non-Teaching Staff	147	61.2
	Total	**240**	**100.0**
	Below 18yrs	3	1.3
	18-30yrs	82	34.2
	31-43yrs	60	25.0
Age	44-57yrs	83	34.6
	58yrs and Above	8	3.3
	No Response	4	1.7
	Total	**240**	**100.0**
	OND/NCE	24	10.0
	HND/First Degree	118	49.2
Academic	Master Degree	71	29.6
Qualification	Ph. D.	27	11.3
	Total	**240**	**100.0**
	less than 5yrs	48	20.0
Years of Working	5-10yrs	88	36.7
Experience in the	5-20yrs	84	35.0
Institution	11-20yrs	20	8.3
	Total	**240**	**100.0**

Results

Research Question 1: What are the modes of integration of Information and Communication Technologies in higher institutions in Osun State?

Tab1e 2: M odes of Integrati on of Inf ormation and C ommunication Techn ology in Higher Institutions in Osun State

Areas of Activities	Mode of Integration	Frequency (f)	Percentage (%)
Te aching/learning/ Research Activities	Full integration of ICT	63	26.3
	ICT b lended with Conventional/manual	177	73.8
	Total	240	100.0
Administrative Re lated Functions	Full integration of ICT	62	25.8
	ICT b lended with Conventional/manual	178	74.2
	Total	240	100.0

Table 2 shows the modes of integration of information and communication technologies in higher institutions. As shown in the table, in teaching/learning/research activities, 26.3% of the higher institution staffs sampled indicated that full integration mode was adopted while for 73.8% of the respondents; the mode of integration was ICTs blended with conventional/manual. Similarly, in terms of administrative functions in the higher institutions, 25.8% of the staff indicated full integration of ICTs while 74.2% indicated that ICTs blended with conventional/manual approach was the mode adopted in their institutions. This result shows that the mode of integration of information and communication technologies in higher education was the blended approach in which ICTs were blended with the conventional/manual method.

Research Question 2: What is the level of success in various areas where information and communication technology has been integrated in higher institutions in Osun State?

The result of the level of success in various areas where Information and Communication Technologies have been integrated in higher institutions in Nigeria is presented in Table 3.

Tab1e 3: Level of Success in Various Areas Where Information and Communication Technologies have been integrated in Higher Institutions in Osun State

S/N	Areas of Application of ICT	NS		FS		S		VS			
		F	%	F	%	f	%	F	%	Mean	Rmks
1	Teaching and learning	28	11.7	87	36.3	95	39.6	30	12.5	**2.5**	FS
2	Curriculum development	27	11.3	98	40.8	84	35.0	31	12.9	**2.5**	FS
3	Staff development,	23	9.6	80	33.3	105	43.8	32	13.3	**2.6**	S
4	Research and information sourcing	20	8.3	83	34.6	103	42.9	34	14.2	**2.6**	S
5	Communication of research outcomes	21	8.8	88	36.7	94	39.2	37	15.4	**2.6**	S
6	Admission enquiry by students	12	5.0	71	29.6	110	45.8	47	19.6	**2.8**	S
7	Students admission and records	21	8.8	50	20.8	122	50.8	47	19.6	**2.8**	S
8	Examination results and transcripts	14	5.8	68	28.3	110	45.8	48	20.0	**2.8**	S
9	Finance database	24	10.0	82	34.2	93	38.8	41	17.1	**2.6**	S
10	Human resource database	25	10.4	88	36.7	86	35.8	41	17.1	**2.6**	S
11	Information management	23	9.6	72	30.0	104	43.3	41	17.1	**2.7**	S
12	Applying for admission through e-media	33	13.8	77	32.1	96	40.0	34	14.2	**2.5**	FS
13	Registration/enrolment of students	19	7.9	58	24.2	106	44.2	57	23.8	**2.8**	S
14	Course allotment and availability of information	42	17.5	98	40.8	73	30.4	27	11.3	**2.4**	FS
l5	Information about hostel accommodation	40	16.7	95	39.6	67	27.9	38	15.8	**2.4**	FS
16	Recruitment and w ork allotment of staff in the institution	48	20.0	87	36.3	81	33.8	24	10.0	**2.3**	FS
17	Attendance and leave management of staff members, and perf ormance appraisal	52	21.7	103	42.9	64	26.7	21	8.8	**2.2**	FS
18	Use of e -media f or scheduling/allocation of examination halls	61	25.4	84	35.0	76	31.7	19	7.9	**2.2**	FS
19	Payments of all forms of fees	39	16.3	68	28.3	80	33.3	53	22.1	**2.6**	S
20	Use of e -media f or the processing and disp lay of results of students	54	22.5	74	30.8	62	25.8	50	20.8	**2.5**	FS
	overall Average Mean									**2.6**	S

Mean Cut off Score: 1.0 -1.75= N0t at a11 successfu1 (NS); 1.76 -2.5= Fair1y Successfu1 (FS); 2.6-3.5= Successfu1 (S); 3.6-4.0= Very Successfu1 (VS)

Table 3 shows the level of success in various areas where information and communication technology has been integrated in higher education. It is shown that considering the mean cut off score, the level of success in areas such as integration of information and communication technologies in areas such as admission enquiry by students (Mean=2.8); students admission and records (Mean=2.8); examination results and transcripts (Mean=2.8); registration/enrolment of students (Mean=2.8); information management (Mean=2.7); staff development (Mean=2.6); research and

information sourcing (Mean=2.6); finance database (Mean=2.6); human resource database (Mean=2.6), and payments of all forms of fees (Mean=2.6) have been adjudged as successful. However, teaching and learning (Mean=2.5); curriculum development (Mean=2.5); applying for admission through e-media (Mean=2.5); use of e-media for the processing and display of results of students (Mean=2.5); course allotment and availability of information (Mean=2.4); information about hostel accommodation (Mean=2.4); recruitment and work allotment of staff in the institution (Mean=2.3); attendance and leave management of staff members, and performance appraisal (Mean=2.2), and use of e-media for scheduling/allocation of examination halls (Mean=2.2) have been adjudged fairly successful.

Research Question 3: What are the higher institutions staffs' attitudes towards the integration of information and communication technologies in higher institutions in Nigeria?

In order to answer this research question, responses to 10 items measuring attitude towards the integration of information and communication technologies in higher institutions were scored such that a Strongly Agree response was allotted 4, Agree response, 3, Disagree response 2 and Strongly Disagree response 1. On this attitude scale, higher scores connote positive attitude and vice versa. However, items such as 2, 3, 4, 6, 7, and 9 that were negatively worded were reversed in scoring. Individual's responses to these items were scored and cumulated. The minimum and maximum scores obtainable were 10 and 40 respectively with a range score of 30. The score obtained by individual respondents was categorized such that scores of l0-25 were adjudged as negative attitude while scores of 26-40 were considered positive attitude. This outcome was then subjected to a descriptive analysis. The result is presented in Table 4.

Table 4: Higher Institutions Staff Attitude towards the Integration of Information and Communication Technologies in Osun State

Attitude	Score Range	Frequency (f)	Percentage (%)
Negative	1-25	71	29.6
Positive	26-40	169	70.4
Tota1		240	100.0

Table 4 shows the higher institutions staffs attitude towards the integration of information and communication technology. While 29.6% of the sampled respondents expressed a negative attitude towards the integration of information and communication technologies in higher institutions, the attitude of 70.4% of the staff was positive. In other words, the majority of higher education staff demonstrated a positive attitude towards the integration of information and communication technology in their respective institutions.

Research Question 4: What are the challenges militating against effective integration of Information and Communication Technologies in higher education in Osun State?

In order to answer this research question, responses to items measuring the challenges militating against effective integration of information and communication technologies in higher education were subjected to descriptive analysis. The respective Relative Significance Index (RSI) value for each challenge was ranked and presented in Table 5.

S/N		SA		A		D		SD		RSI	Rank
	Challenges	**F**	**%**	**F**	**%**	**f**	**%**	**F**	**%**		
1	Lack of investment in ICTs for higher education development	76	31.7	114	47.5	33	13.8	17	7.1	0.44	**7th**
2	Lack of clear cut government policies on ICT	65	27.1	135	56.3	30	12.5	10	4.2	0.49	**3rd**
3	Lack of skilled manpower to manage available systems	55	22.9	108	45.0	56	23.3	21	8.8	0.48	**4th**
4	Inadequate training facilities for ICT education at the tertiary level	67	27.9	115	47.9	39	16.3	19	7.9	0.46	**6th**
5	Shortage of time for learning the required skills and competence for the integration of ICT on the part of the staff.	54	22.5	127	52.9	47	19.6	12	5.0	0.51	**2nd**
6	Attitudes of various managements in and outside institutions towards the development of ICT related facilities	51	21.3	143	59.6	33	13.8	13	5.4	0.53	**1st**
7	High cost of communication facilities	85	35.4	108	45.0	32	13.3	15	6.3	0.42	**8th**
8	Unstable power supply on the campus	108	45.0	83	34.6	31	12.9	18	7.5	0.34	**9th**
9	Staff resistance to change	43	17.9	105	43.8	55	22.9	37	15.4	0.48	**4th**

Table 5 shows the challenges militating against effective integration of information and communication technologies in higher institutions from the perspective of staffs in higher institutions. The 'attitudes of the various managements in and outside institutions towards the development of ICT related facilities' were considered the foremost challenges militating against effective integration of information and communication technology in higher institutions. The challenges had RSI value of 0.53 and ranked first. In addition, 21.3% and 59.6% of the respondents strongly agree and agree respectively to the challenges. Closely following this is shortage of time for learning the required skills and competence for the integration of ICT on the part of the staffs. It has an RSI value of 0.51

and ranked second. It is shown that 22.5% and 52.9% of the respondents strongly agree and agree respectively to this challenge. Ranked third is 'lack of clear cut government policies on ICT' with RSI value of 0.49. While 27.1% of the respondents strongly agreed, 56.3% agreed. 'Lack of skilled manpower to manage available systems', and 'Staff resistance to change' were ranked 4th with RSI value of 0.48. While 17.9% and 43.8% of the respondents agreed, 22.9% and 15.4% disagreed. Inadequate training facilities for ICT education at the tertiary level was ranked 6th with RSI value of 0.46 while lack of investment in ICTs for higher education development was ranked 7th with RSI value of 0.44. High cost of communication facilities was ranked 8th with RSI value of 0.42 while unstable power supply on the campus was ranked 9th with RSI value of 0.34.

This result shows that attitudes of various managements in and outside the institutions towards the development of ICT related facilities, shortage of time for learning the required skills and competence for the integration of ICT on the part of the staff were the factors militating against effective integration of information and communication technologies in higher institutions in Nigeria. Others were lack of clear cut government policies on ICT, lack of skilled manpower to manage available systems, staff resistance to change and inadequate training facilities for ICT education at the tertiary level.

Discussion

The findings of this study show that there is a blended approach in the modes of integration of information and communication technologies in higher institutions in Osun State. The findings are in agreement with Oladipo and Akinwumi (2015), who reported that higher institutions in Nigeria are yet to fully integrate with ICTs. Ndidi and Olibie (2010) and Ololube et al (2007) also indicated that Nigerian tertiary institutions are set to integrate ICT in all spheres of academic endeavours. However, ICT is considered an indispensable development in the education sector especially because of the demand for efficiency and effectiveness in higher institutions in Nigeria. The current trend of integrating ICT with the old practice of manual operations does not suffice.

The results of this study show that members of staff of the tertiary institutions have a positive attitude towards the use of ICTs in the various spheres of higher education. This outcome is supported by Bamigboye, Bankole, Ajibgoye, and George. (2013), who reported that lecturers in Nigerian universities have favourable attitude towards the use of ICTs in education. Researches have also shown that gender does not have any impact on the use of ICTs. However, Papaioannou and Charalam bous (2011) observed that males have more positive attitude towards ICTs than females.

Higher institutions are vested with the responsibility of equipping individuals with necessary skills to contribute to the overall growth and development of the nation. To achieve these, the institutions require ICT tools for teaching, learning and administrative activities. The study has shown that the availability of the needed resources is at a low level due to a number of militating factors like lack of investment in

ICTs, inadequate training facilities and a high cost of the facilities. Lack of skilled manpower, staff resistance to change, shortage of time for learning the required skills and competences for the integration of ICT and erratic power supply constitute another group of factors.

This result is similar to Oladipo & Akinwunmi (2015), Imhonobim & Urm (2012), Olise (2010) and Osei (2007) who found out that ICT availability in Nigerian tertiary institutions is rather low and in some cases a near total absence. It contradicts Korir and Omollo (2007) who reported high levels of availability of ICT resources in African universities.

The challenges to effective integration of ICTs in higher institutions are many. The findings of this study revealed that the attitudes of various managements in and outside tertiary institutions towards the development of ICT related issues ranked as the highest challenge facing ICT integration. This does not differ from the findings of (Albrini, 2006) who noted that the attitudes of various managements of universities towards the development of ICT related facilities such as the internet and purchase of computers is poor. In some instances there are no aids or support from the government.

Conclusion

In view of the findings, this study concluded that the integration of ICT in Nigerian tertiary institutions is yet to be full blown, that is, there is still a blend of the manual or traditional modes of carrying of work functions. This situation is due a number of challenges ranging from inadequate facilities and social infrastructure, lack of adequate technical know-how required for operating the technological tools, cost of purchase and maintenance of the facilities etc. needless to say that, the study concluded the major challenge is the attitude of various management in and outside the institution towards the development of ICT related facilities.

In spite of inherent challenges affecting the full integration of information and communication technologies, it was confirmed that tertiary institution staffs, *both of the academic and non-academic,* had a positive attitude towards ICT facilities and did not see them as a threat. The areas where ICTs have been adopted in the tertiary institutions have been successful and have high hopes of getting better. The findings of this study can be said to have answered the research questions.

Recommendations

Based on the findings of this study, it is recommended that higher institutions in Osun State fully adopt ICTs in all areas of higher education. It is also important that, management both in and outside the institutions, begin to realise the role ICT plays in educational development and treat it as such.

- The management of higher institutions should take more proactive measures in involving the private sector in contributing towards attaining full ICT integration in higher institutions.
- Government should also provide adequate power supply and other technical facilities to enable ICTs function optimally. In addition, the government should introduce and implement policies that will encourage the utilization of ICTs in higher institutions.
- Finally, the government should increase funding for the educational sector to enhance the integration of ICTs in the higher institutions.

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Assessment of Secondary School Students' Awareness, Attitude and Readiness for Forestry Education in Awka South Local Government Area of Anambra State, Nigeria

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Abstract

Forestry education offered in universities and technical institutions in Nigeria is a tool for socio-economic development and environmental sustainability. This study therefore, assessed the awareness, attitude and readiness of secondary school students towards forestry education. The population comprised all senior secondary school three (SS III) students in Awka South Local Government Area of Anambra State. Three hundred and twenty (320) students were selected from eight public secondary schools in Awka South Local Government Area using a three-stage sampling technique. The instrument for data collection is a questionnaire titled Awareness, Attitude and Students' Readiness towards Forestry Education (AASRFE). It was used to obtain information on awareness (R= 0.82), attitude (R= 0.78) and readiness (R= 0.86). Data were analysed using descriptive statistics and regression. The result revealed low awareness, negative attitude and low readiness for forestry education. It also revealed that awareness and attitude can predict students' readiness to enrol for forestry education. Majority of the students are not interested in forestry education, which means that they are not ready to enrol for any course in forestry. It is, therefore, recommended that various forestry agencies should increase forestry career campaigns and sensitization in urban and rural schools.

Introduction

Climate change and global warming have become major issues in Nigeria as well as globally. This is because the rise in temperature of the earth produces adverse effects on human beings and the environment. This leads to major global threats such as deforestation, water pollution and air pollution, desertification, soil degradation and others (Ravindra and Chintankumar 2018). This situation makes it expedient, therefore, to find solutions to emerging climatic changes as a result of global warming. Forest provide important environmental services that contribute to the well-being and security of human beings. They are needed to maintain the atmosphere as its their destruction is a major contributing factor resulting in rising level of carbon dioxides and global warming. Apart from environmental benefits, forests remain a major source of valuable

commodities such as timber, fibre, fuel wood, edible and medicinal plants (Bishop and Landell-Mill, 2002).

Due to the significant role forests play in protecting the earth's climate, more attention has been drawn to the importance of forest resources in recent times (Appah, 2016). To ensure the sustenance of forest resources and their roles in economic development and environmental protection, it is necessary to train sufficient numbers of foresters who will be required to identify and proffer solutions to the emerging problems of global warming (Daramola, 2011). Bandyopadhyay (2008), describes the objectives of education as to equip students with the skill, knowledge, capability to work in a team, carry out strategic thinking and acquire leadership qualities to become useful citizens. This implies that forestry education engenders access to training and empowerment opportunities and is a process by which one acquires relevant and effective knowledge and skills.

Forestry education is crucial to attaining national development goals. It is a tool for socio-economic development and environmental stability (Akande and Larinde 2004). Training to become a forest professional requires a diploma certificate from a technical and vocational institution or a degree from a university. This implies that forestry is offered in universities, technical and vocational training institutions. However, in Nigeria, certificate and diploma programmes in forestry have a much longer history than professional degree education in forestry (Soladoye, 1999). University of Ibadan was the first in Nigeria, to offer training in forestry. The Department of Forestry officially came into being on 2nd October, 1963 at the beginning of 1963/64 academic year (Wyatt-Smith and Redhead 1988). Presently, more than forty universities offer courses in agriculture, forestry and related disciplines in the country (JAMB, 2018).

Some of the current issues addressed by forestry education includes climate change and global warming, biodiversity conservation, soil and environmental education, forest policy, sustainable social and economic development, wildlife management, forest protection and conservation, production of timber and non-timber forest products, tree breeding or farming and natural resource management (JAMB, 2018). In spite of its rich course contents students' enrolment into forestry and its related fields in Nigerian tertiary institutions is not encouraging. This fact is supported by Aleo (2010) who stated that the average annual enrolment for forestry and its related courses both at technical level and professional levels calls for concern. The low enrolment could be attributed to the fact that many are not aware of what the profession entails.

There is, therefore, a need to create awareness of forestry education among Nigerian children starting from the primary and secondary levels. The incorporation of forestry education into the curriculum of schools at these levels will enhance the people's awareness of the dangers of environmental issues like climate change and global warming (Jekayinfa and Yusuf, 2008). At present, forestry education is absent in primary and secondary school curricula in Nigeria. It is only at the tertiary level that

forestry is known as a career. Also the attitudinal disposition of students towards forestry education can equally influence students' willingness to enroll for forestry. Attitude has been defined as a favourable or unfavourable response or disposition to things, people, events or ideas (Koballa 1995). Students' attitude towards forestry education can be defined as the emotion they associate with forestry education, which can affect their willingness to enroll for forestry education. Considering the fact that there is no trace of forestry as a subject in primary and secondary school curricula in Nigeria prompted the researchers to investigate the awareness and attitude of secondary school students' towards forestry education. This study will ascertain if students' awareness and attitude influence their readiness to study forestry in higher institutions.

Purpose of The Study

The purpose of the study is to determine the awareness, attitude and readiness of students from Awka South Local Government Area of Anambra State to study forestry and its related courses after secondary education. The local government area was selected because it is covered with grassland which makes it vulnerable to erosion. The study will come out with recommendations that will give rise to awareness and positive attitude towards forestry and improve students' enrolment in tertiary institutions that offer forestry and its related courses.

Research questions

Based on the stated purpose of this study, the study will address the following research questions:

1. What is the students' level of awareness of forestry education?
2. What is the attitude of students towards forestry education?
3. To what extent are students ready to study forestry at higher levels of education?
4. To what extent would awareness and attitude towards forestry education predict students' readiness to study forestry at the tertiary level?

Method

Descriptive and correlational survey were adopted for this study. Descriptive survey study is a type of study where data collected are described in a systematic manner based on the characteristics, features and facts about a given population. Correlational survey seeks to establish the relationship that exists between two or more variables. It does not involve manipulation of variables, rather, it entails the collection of data to describe existing phenomena. The study was carried out in Awka South Local Government Area (LGA) of Anambra State with its headquarters at Amawbia. The local government area (LGA) is made up of nine towns: Amawbia, Awka-ifite, Ezinato, Isiagu, Mbaukwu,

Nibo, Nise, Okpuno and Umuawulu, and. According to 2006 census reported by Federal Republic of Nigeria (FRN 2007), Awka South Local Government Area (LGA) has a population of 189,049 made up of 96,902 males and 92,752 females. Created in 1989 from Awka Local Government Area it is bounded in the north by Awka North L.G.A, in the east by Oji River L.G.A of Enugu State, in the west by Njikoka L.G.A and in the south by Aniocha L.G.A.

The target population for the study comprised all senior secondary school three (SS III) students in Awka South Local Government Area of Anambra State. This population was chosen because they are in their final year and will soon be ready for admission into tertiary institutions. A three stage random sampling procedure was used to select the sample. In the first stage, four towns were randomly selected - Awka-ifite, Nise, Mbaukwu, and Ezinato. In the second stage, two public secondary schools were randomly selected from each town, giving a total eight public secondary schools For the third stage, forty SSIII students (twenty males and twenty females) were randomly selected from each school. This gave a total of three hundred and twenty students.

A questionnaire which was developed by the researchers and titled "Awareness, Attitude and Students' Readiness for Forestry Education" (AASRFE) was used to collect information about students' awareness, attitude and readiness to study Forestry Education at higher levels of education. The questionnaire had four sections A, B, C and D. Section A comprised the student's demographic variables. Section B consisted of seventeen (17) items used to elicit information on students' awareness of what forestry education entails. The response to this was measured on a two-point scale (aware and unaware). Section C and D comprised of fifteen (15) items each, that sought information on students' attitude towards forestry education and their readiness to study forestry in tertiary institutions were measured on a four-point scale (strongly agree, agree, disagree and strongly disagree). The instrument was pilot tested on fifty (50) students who were not included in the sample. Sections B, C and D initially had twenty-five (25) items each before validation but were later reduced to seventeen (17) items for section B and fifteen (15) items for sections C and D. Lawshe Content Validity (CVI) was used to establish the content validity and the value obtained was 0.84. The internal consistency and reliability of the instrument in sections B, C and D were established using Cronbach Alpha to get the values of 0.82 and 0.78 and 0.86 respectively. The questionnaire was administered directly to the students to ensure valid results.

Data was analysed using descriptive statistics and regression at 5% level of significance.

Results

Research Question 1: What is the students' level of awareness of forestry education?

S/N	Items	Unaware	Aware	Mean	S.D
1	Sustainable Management	206(64.4%)	114(35.6%)	1.36	0.481
2	Watershed Management	222(69.4%)	98(30.6%)	1.31	0.462
3	Forest Management	148(46.3%)	172(53.7%)	1.54	0.499
4	Production of timber based pro duct for home and export market	202(63.1%)	118(36.9%)	1.37	0.483
5	Biodiversity Conservation	250(78.1%)	70(21.9%)	1.22	0.414
6	Agro forestry Development	199(62.2%)	121(37.8%)	1.38	0.486
7	Wildlife Management	161(50.3%)	159(49.7%)	1.50	0.501
8	Tree Cultivation or Farming	159(49.7%)	161(50.3%)	1.50	0.501
9	Renewal of Natural Resources Development	167(52.2%)	153(47.8%)	1.48	0.500
10	Environmental Management	200(62.5%)	120(37.5%)	1.38	0.485
11	Climate Change and Global Warming	188(58.8%)	132(41.2%)	1.41	0.493
12	Natural Resource Management	192(60.0%)	128(40.0%)	1.40	0.491
13	Curbing Environmental Management	178(55.6%)	142(44.4%)	1.44	0.498
14	Protection of National Resources	172(53.8%)	148(46.2%)	1.46	0.499
15	Food Production	247(77.2%)	73(22.8%)	1.23	0.420
16	Sustainable Social and Economic Development	195(60.9%)	125(39.1%)	1.39	0.489
17	Conservation of Nature	176(55.0%)	144(45.0%)	1.45	0.498

Table 1 shows that the respondents have a low level of awareness of forestry education. Apart from item 3 (forest management) and item 8 (tree cultivation or farming) where 53.7% and 50.3%, respectively, of the students indicated awareness, Other items recorded less than 50%. Over 60% of the respondents are not aware of what Forestry education is meant to address. When asked if sustainable management is included in forestry education, 64.4% were unaware. 69.4% of the respondents were not aware of watershed management. 63.1% of them were not aware of production of timber based products for home and export market, 78.1% were ignorant of biodiversity conservation, 62.2% were not aware of agro-forestry development, 62.5% were not aware of environmental management, 60.0% of them were not aware of natural resource management. 77.2% and 60.9%, respectively, were not aware that forestry education involves food production and sustainable social and economic development.

Research Question 2: What is the attitude of the students towards forestry education?

Table 2. Attitude of students towards forestry education.

S/N	ITEMS	Strongly Disagree	Disagree	Agree	Strongly Agree	Mean	S.D
1	I like forestry education.	170(53.1%)	126(39.4%)	11(3.4%)	13(4.1%)	1.158	0.746
2	Forestry education is not a waste of time.	129(40.3%)	116(36.3%)	37(11.6%)	38(11.9%)	1.95	0.997
3	Forestry education will increase my self - confidence.	141(44.1%)	101(31.6%)	47(14.7%)	31(9.7%)	1.90	0.984
4	The idea of being a forester makes me nervous.	102(31.9%)	60(18.8%)	81(25.3%)	77(24.1%)	2.42	1.169
5	Forestry education will provide me with useful knowledge and skills.	189(59.1%)	104(32.5%)	15(4.7%)	12(3.8%)	1.53	0.755
6	Forestry education will provide me with a suitable job.	198(61.8%)	96(30.0%)	13(4.1%)	13(4.1%)	1.50	0.759
7	I will not destroy my future by attending forestry school.	145(45.3%)	85(26.6%)	43(13.4%)	47(14.7%)	1.98	1.085
8	There are job opportunities for forestry professionals.	180(56.3%)	89(27.8%)	28(8.8%)	23(7.2%)	1.67	0.911
9	Forestry education will give me opportunity to do other things.	183(57.2%)	97(30.3%)	17(5.3%)	23(7.2%)	1.63	0.880
10	I will like to know more about forestry education.	46(14.4%)	48(15.0%)	93(29.1%)	133(41.6%)	2.98	1.069
11	I have negative feelings about forestry education.	169(52.8%)	123(38.4%)	12(3.8%)	16(5.0%)	1.61	0.784
12	Forestry education will fetch me a good job.	200(62.5%)	95(29.7%)	12(3.8%)	13(4.1%)	1.49	0.755
13	Forestry education will be useful for me in the future.	100(31.3%)	98(30.6%)	80(25.0%)	42(13.1%)	2.20	1.025
14	I like to spend my spare time farming.	95(29.7%)	92(28.8%)	67(20.9%)	66(20.6%)	2.33	1.109
15	Forestry education	148(46.3%)	80(25.0%)	40(12.5%)	52(16.3%)	1.99	1.114

As shown in Table 2, the findings of this study reflect a negative attitude of students towards forestry education. For instance, over 90% of them stated that they have negative feelings towards forestry education (item 11). Over 75% of them disagreed that forestry education will increase their self-confidence (item 3), provide them with useful knowledge and skills (item 5), provide them with suitable job (item 6), fetch them good jobs (item 12), help protect the environment from loss, waste and harm (item15). Over 60% disagreed that forestry education will be useful for them in the future (item 13), while over 70% of the students wanted to know more about forestry education (item 10).

Research Question 3: To what extent are students ready to study forestry at higher levels of education?

Table 3. Students' readiness to study forestry.

S/N	ITEMS	Strongly Disagree	Disagree	Agree	Strongly Agree	Mean	S.D
1	I will go to a forestry school after my secondary education.	206(64.4%)	97(30.3%)	8(2.5%)	9(2.8%)	1.44	0.683
2	I hate forestry education.	72(22.5%)	59(18.4%)	105(32.8%)	84(26.3%)	2.63	1.10
3	I wi ll be happy to study forestry in future	132(41.3%)	107(33.4%)	39(12.2%)	52(16.3%)	2.07	1.074
4	Forestry education will give me opportunities.	132(41.3%)	80(25.0%)	54(16.9%)	54(16.9%)	2.09	1.119
5	I will be proud to tell people I study forestry in university.	71(22.2%)	50(15.6%)	64(20.0%)	135(42.2%)	2.82	1.199
6	Forestry education will increase my love for forestry.	154(48.1%)	90(28.1)	45(14.1%)	31(9.7%)	1.85	0.995
7	I like to read forestry books.	160(50.0%)	107(33.4%)	33(10.3%)	20(6.3%)	1.73	0.884
8	Forestry education will be boring for me.	78(24.4%)	71(22.2%)	88(27.5%)	83(25.9%)	2.55	1.121
9	Forestry education will make me useful in the society.	77(24.1%)	83(25.9%)	60(18.8%)	100(31.3%)	2.57	1.164
10	I will choose forestry at the UTME	179(55.9%)	100(31.3%)	27(8.4%)	14(4.4%)	1.61	0.819
11	If offered forestry course in higher institution, I won't accept it.	87(27.2%)	70(21.9%)	71(22.2%)	92(28.8%)	2.53	1.172
12	I will like to watch commentaries about forestry education.	105(32.8%)	77(24.1%)	71(22.2%)	67(20.9%)	2.31	1.137
13	Forestry subjects should be included in secondary school curriculum.	81(25.3%)	84(26.3%)	75(23.4%)	80(25.0%)	2.48	1.122
14	Forestry subjects should be included in primary school curriculum.	79(24.7%)	84(26.3%)	75(23.4%)	82(25.6%)	2.50	1.123
15	I will only change to forestry course if my UTME score is low.	65(20.3%)	57(17.8%)	102(31.9%)	96(30.0%)	2.72	1.102

As shown in Table 3, the level of students' readiness to study forestry is low. Over 80% of the students reported that they would apply for other courses and not forestry when filling their Unified Tertiary Matriculation Examinations (UTME) forms (item 10), as they are not ready to attend forestry schools after their secondary education (item 1) and do not like to read forestry books (item 7). 76% of them reported that they will not be happy to study forestry course (item 3). However, 61% of the students reported that they will only go for forestry course if they don't score up to the cut off mark for the courses they like (item 15).

Research Question 4: To what extent would awareness and attitude towards forestry education predict students' readiness to study forestry at the tertiary level?

Table 4: Summary of multiple regression analysis showing the composite effect

Model	Sum of Square	df	Mean Square	F	Sig	Remark
Regression	2717.349	2	1358.675	54.200	.000	Significant
Residual	7946.448	317	25.068			
Total	10663.797	319				
R = .505 R^2= .255 Adjusted R^2 = .250						

Table 4 shows that the combination of predictor variables (students' awareness and attitude) is effective in predicting students' readiness for forestry education (F (2, 317) = 52.368 < 0.05). The multiple correlation coefficient of willingness and attitude with readiness for forestry education is .495 and the R Square Adjusted, which estimates the variance accounted for by the combined predictor variable and criterion variable, is .243. This means that awareness and attitude contributed to 24% of the variance in students' readiness to take up forestry education.

Table 5 Relative contribution of awareness and attitude towards students' readiness for forestry education

Model	Unstandardized Coefficients	Standardized Coefficients	T	Sig	Sig	Remarks
	B	**Std. Error**				
Constant	9.563	2.944		3.249	.000	
Awareness	.307	.108	.139	2.848	.003	**Significant**
Attitude	.538	.056	.468	9.587	.000	**Significant**

Table 5 shows relative significant contributions of the two dependent variables which are students' awareness and attitude. However, attitude is a more influential predictor of students' readiness to study forestry at the tertiary level than awareness (β = .468 t 9.587 p = .000).

Discussion

The findings from the study revealed that students have low awareness of issues related to forestry education. The finding of this study therefore affirms Areo, Oyewale and Oyewumi's (2019) observation that students are not aware of issues relating to forestry education. This can be attributed to the fact that enough effort has not been made by the stakeholders to educate people on the importance of forestry education to the country.

The result of the study revealed students' negative attitude towards forestry education the negative attitude could be as a result of their limited knowledge of the subject. They, therefore, need to be sensitized. This finding supports Baliyan and Nenty's

(2015) observation that the attitude of students towards agriculture should be improved by using motivational strategies. Students' negative attitude towards forestry could also be attributed to their perception of the prospects of forestry education as indicated in their response to items 5, 6 and 8 of the attitude to forestry questionnaire. This agrees with Adejoh, Edoka and Shaibu's (2016) discovery that students' attitude towards agricultural science can be attributed to misconceptions about careers in agriculture.

The result also indicated that majority of the students are not interested in forestry education. This could be attributed to the fact that students do not understand what forestry education is about and its prospects since it is not included in the primary and secondary school curricula. This finding corroborates that of Areo *el al.,* (2019) who stressed the need for massive public enlightenment on forestry education and its prospects in order to make the course attractive to students.

Findings from this study also show that students' awareness and attitude towards forestry education have a positive impact on students' readiness to study forestry courses after their secondary school education. It is remarkable that attitude contributed more significantly than awareness. The finding is also in line with Baliyan *et al.,* (2015) and Adejoh *et al.,* (2016) that awareness and attitudinal disposition of secondary school students are among the factors that influence their willingness to enroll for agriculture.

Conclusion

This study assessed the awareness, attitude and readiness of students in Awka South Local Government Area of Anambra State towards forestry education and revealed that majority of the students are ignorant of what is involved in forestry education. This can be attributed to the fact that the relevant agencies of government and tertiary institutions are not doing enough to create public awareness about forestry education and its prospects. The study also revealed that majority of the students are not interested in forestry education and are not ready to enrol for any course in that field. It is also important to note that although students' awareness and attitude towards forestry education could predict students' readiness for forestry, there are still other variables that if added will contribute to the remaining variance (86%) in students' readiness for forestry education.

Recommendations

Based on the findings of this study, the following recommendations are made.

1. Forest Research Institute, universities and colleges of forestry should educate and enlighten the public on the importance and prospects of forestry education.
2. There should be effective implementation of forestry education in the school system in Nigeria. Hence, there is a need to introduce forestry as a subject at the foundational levels of primary and secondary schools since, it is at these elementary stages that the potentials of students can be harnessed towards making them understand the need and importance of forestry.

3. Extension service providers need to put more effort in sensitizing students on the importance of forestry education. This will change the negative attitude of secondary school students towards forestry.
4. Since awareness and attitude towards forestry education can predict students' readiness to enrol for forestry, various forestry agencies should provide the means by which forestry campaigns can be increased in urban and rural areas.

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Fostering Mathematics Achievement: The impact of age, gender and self-esteem using the Rosenberg Self-Esteem Scale on Secondary School Students in South West, Nigeria.

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Abstract

The study investigated the impact of age, gender and self-esteem on students' mathematics achievement in south west, Nigeria. The study adopted the descriptive survey research design. The multistage sampling procedure was used to select two thousand (2000) senior secondary school two (SS2) students; of which five hundred (500) were randomly selected from the sampled states of Ekiti, Lagos, Osun and Oyo. Two instruments; the Rosenberg self-esteem scale (RSES) and a Mathematics achievement test (r = 0.82; r = 0.81, respectively) was adopted for data collection. Data were analysed using descriptive statistics and correlation coefficient at p<0.05. Findings revealed that the sampled students possess a high self-esteem; self-esteem does affect the academic achievement of students in mathematics; female students have a higher self-esteem than the males and students' age affects their self-esteem. It is recommended therefore, that stakeholders especially parents and teachers, should build up the self-esteem of their wards at home and school by letting them see the virtue and value they possess; guidance and counseling unit in schools should be established, as this could enhance students' self-esteem and their achievement in the subject.

Keywords: Rosenberg self-esteem scale, Age, Gender, Self-esteem, Mathematics achievement.

Introduction

Mathematics achievement is a fundamental indicator of the extent to which students' learning and understanding of mathematics concepts, principles and logic as taught by the teacher is measured. It represents the performance outcomes that indicate the extent to which students have accomplished specific mathematics goals as prescribed by the curriculum. It is a multifaceted construct that comprises different domains of learning.

Because the field of academic achievement covers a broad variety of educational outcomes, the definitions one could give mathematics achievement should depend on the indicators used to measure it at any point in time (Ricarda Steinmayr, Anja Meißner, Anne F. Weidinger and Linda Wirthwein, 2017). In attempting to decipher the factors that could play a role or the other in determining what, how and why students' mathematics achievement vary over time, many researchers (Adegoke, 2002; Adeleke, 2007; Akinlua, 1996; Ifamuyiwa, 1999; Awofala, 2002; Alieme and Odinko, 2015) have investigated and are still investigating these factors perceived to be fostering or hampering the achievement of learners in mathematics.

Several variables may be affecting the academic achievement of learners, including but not limited to cultural familiarity with the educational system (Deyhle and Swisher, 1997), linguistic proficiency (Lansford, Deater-Deckard and Bornstein, 2007), socioeconomic resources (Fuligni and Fuligni, 2007), parental involvement in education (Fuligni, 1997), parental aspirations (Taylor and Krahn, 2005), family obligation (Fuligni, 2001), academic self-concept (Cokley and Patel, 2007), academic motivation (Fuligni,2001) and self-esteem (Mohammad, 2010); to mention but a few.

Self-esteem refers to an individual's sense of his or her values/worth or the extent, to which a person sees, values, approves of, appreciates, likes or dislikes him or herself (Rahanami, 2011). According to Swenson (2003), Self-esteem is important as it can enhance students' academic performance and overall behavior and mental health. Students possessing high self-esteem are likely to lead a successful life as it provides them valuable perception about life, experiences, social-emotional competence and prepare them to be able to deal with problem/challenges in their present and future encounters. Thus, the development of self-esteem is considered as one of the most important developmental processes of young learners (Sirin and Rogers-Sirin, 2004). Mohammad (2010) study revealed that there exist a positive relationship between self-esteem and academic achievement but there was no significant difference found in self-esteem between males and females. The results suggested that high self-esteem is an important factor that can strengthen the prediction of academic achievement in students, the same is in concordance with the findings of Rubie, Townsend and Moore (2004); Fathi-Ashtiani, Ejei, Khodapanahi and Tarkhorani (2007); and Bray (2001).

A person's self-esteem is created based on abstract information related to him and mental evaluation about this information (Pezhman and Abbas, 2018). Persons with low self- esteem may have more probability to suffer from depression, academic failure, anxiety and addiction rather than those with high self-esteem. In contrast, it could be that self- esteem has a weak relation with academic achievement, because if a person does not have a good feeling about him or herself, it is unlikely to affect his or her academic achievement. These may be the factors for measuring Self-Esteem as: values individuals receives from others; experiences gained with success through what an individual has undergone; ones definition of success and failure and individual attitudes to criticism.

Baumeister, Campbell, Krueger and Vohs, (2003), conducted an investigation on self-esteem; the study findings has helped teachers, parents, counselors, psychologist, therapists in ways and efforts at improving and boosting self-esteem of individuals, on the premise that high self-esteem will cause positive outcomes and benefits to the society . It was reported from same study that self-esteem and school academic performance are correlated, stressing that high self-esteem results of good school academic performance. The study also revealed that several efforts to boost the self-esteem of students have not been shown to improve academic performance and may sometimes be counter-productive. Mohammad (2010) in his study on the relationship between self-esteem and academic achievement in the Pre-university students used Coppersmith questionnaire was to measure the students' grade in their current and previous semesters. The results from the study revealed that there was a significant positive relationship between self-esteem and academic achievement and there was significant difference in academic achievement between boys and girls from the study. However, no significant difference was found in self-esteem between males and females. Thus, to him, high self-esteem is an important factor that can strengthen the prediction of academic achievement in students.

Similarly, Akinleke (2012) conducted a study to discover how test anxiety and self-esteem affect academic performance while Sadaat, Ghasemzadeh and Soleimani (2012), conducted a study, with the purpose to study self-esteem and its determined link to academic achievement of university students. It was reported from the study that, male students had higher scores than female students. Abdullah (2000) conducted a study to examine the relationship among achievement motivation, self-esteem, and locus of control as well as academic performance of university students in a Nigerian University. The purpose of the study was to determine the extent at which university student's academic performance was influenced by these criterion variables. Results from multiple regression analysis revealed that the subjective independent variables did not predict objective measure of the students' academic performance.

In this vein, it became important to have an instrument that could measure or assess self-esteem; this led Rosenberg to develop a scale termed the Rosenberg Self-Esteem scale in 1965. According to Rosenberg 1995, cited by Martin-Albo, Nurez, Navarro and Grijalvo (2007). self-esteem is regarded as a component of self-concept. Rosenberg later defines it as an individual set of thought and feeling about him or her own worth and importance that has to do with positive or negative attitude towards oneself. The Rosenberg scale is regarded as a uni-dimensional instrument created from a phenomenological conjuncture of self-esteem that involves items that are globally identified with individual worth by means of 10-items scale, 5 positively worded items and 5 negatively worded items; answered on a four point scale ranging from strongly agree, agree, disagree and strongly disagree. According to Arshad, Zaidi and Mahmood (2015) the original sample for which the scale developed consist of 5,024 High school

Junior and Senior School students from 10 randomly selected school in New York, USA. The study revealed that personality characteristics are the most affecting factor on students" academic achievement; and reemphasized that self-esteem is one of the very important factors that can bring about academic excellent, creativity, identification of talent and this has made many researchers to be interested in it. Orth and Robins (2014) regarded self-esteem as an internal belief system of an individual about him/herself.

According to Rahamani (2011), the relationship between self-esteem and academic achievement has been well documented in the literature. Different studies have researched and concluded that academic achievement and self-esteem are positively correlated (Bankston and Zhou 2002,). However, the influence that self-esteem has on academic achievement remains diverse and unclear, thus further research is needed to assist with the understanding the relationship existing between them. The reason for the present study was to revealed students response pattern to the Rosenberg Self-Esteem Scale; the import of self-esteem on students' academic achievement in connection with gender. Hence, the study aims at providing the necessary information for educators, counselors, parents and teachers on the need to encourage and foster students' self-esteem in order to prevent the imbalance in their academic achievement in their classes even across gender.

Objectives of the study

i. To administer the Rosenberg self-esteem scale to a large population (the southwest student population in Nigeria; Ekiti, Lagos, Osun and Oyo state).
ii. To ascertain the response pattern of the said student population to the RSEC
iii. To ascertain the relationship between self-esteem and age
iv. To ascertain the relationship between self-esteem and gender
v. To ascertain the relationship between self-esteem and students' academic achievement in mathematics.

Statement of the problem

There exists a disconnection in literature on the significance of learners' self-esteem on their academic outcomes especially in core subjects like mathematics. Students need to achieve more in this subject as it is a major pre-requisite for their future academic pursuits. For this to be attained, the factors considered to be affecting these students (such as their self-esteem, age, gender) should be put into perspective. The researchers therefore, investigated the response pattern of secondary school students in south west, Nigeria, to the Rosenberg self-esteem scale in relation to their age, gender and mathematics achievement.

Research Questions

1. What is the response pattern of secondary school students to the Rosenberg self-esteem scale in south west, Nigeria?

2. Is there a relationship between self-esteem and mathematics achievement among senior secondary school students in south west, Nigeria?
3. Is there a relationship between students' self-esteem scores and their gender?
4. Is there a relationship between students' self-esteem scores and their ages?

Methodology

The study used the descriptive survey research design. The target population comprised all senior secondary school two students (SSS 2) in south west, Nigeria. Multistage sampling procedure was adopted in this study. First, purposive sampling was used to select the south western Nigeria. Systematic sampling was employed to select four states (Ekiti, Lagos, Osun and Oyo) from the south west. Simple random sampling technique was used to select 120 schools for the study. In all, a total sample of two thousand (2000) SS2 students; of which five hundred (500) of them were randomly selected from each sampled states.

The instruments for data collection were the Rosenberg self-esteem scale (RSES) and a Mathematics achievement test. The RSES consisted of two sections: A and B. Section (A) is on respondents personal bio-data which consists of: school name, students' gender, students' class and students' age. Section (B) consisted of ten (10) items measuring students' self-esteem. The participants responded along a 4-point likert scale response options, which are: (SA= Strongly agree, A= Agree, D= Disagree, SD= Strongly Disagree). The test-retest reliability coefficient of the instrument as obtained and stated by Rosenberg (1965) ranged from 0.82 to 0.85 while the internal consistency ranged from 0.77 to 0.88.

The second instrument was a mathematics test that was curbed from the senior secondary school two General Mathematics textbook. The test items were developed from the first term scheme of work as the data was collected during first term of the academic year. The mathematics test was validated (both for construct and content) by two professors in the department of mathematics, university of Ibadan, Nigeria. The test items were fifty (50) in number.

Results

Research Questions 1: What is the response pattern of secondary school students to the Rosenberg self-esteem scale in south west, Nigeria?

Table 1: Students Response Pattern to the Rosenberg Self-esteem Scale

S/ No	Items	Strongly Agree Freq (%)	Agree Freq (%)	Disagree Freq (%)	Strongly Disagree Freq (%)	Mean	Std. Dev
1	On the whole, I am satisfied with myself	144 (7.2)	100 (5)	683 (34.2)	**1073 (53.7)***	3.34	0.90
2	At times I think I am no good at all	**479 (24.0)***	565 (28.3)	669 (33.5)	287 (14.4)	2.38	1.01
3	I feel that I have a number of good qualities	57 (2.9)	147 (7.4)	767 (38.4)	**1029 (51.5)***	3.38	0.76
4	I am able to do things as well as most other people	51 (2.6)	159 (8.0)	848 (42.4)	**942 (47.1)***	3.34	0.74
5	I feel I do not have much to be proud of.	**410 (20.5)***	471 (23.6)	743 (37.2)	376 (18.8)	2.54	1.03
6	I certainly feel useless at times	**781 (39.1)***	537 (26.9)	480 (24.0)	232 (11.6)	2.06	1.04
7	I feel that I'm a person of worth, at least on an equal plane with others	129 (6.5)	171 (8.6)	761 (38.1)	**939 (45.0)***	3.25	0.87
8	I wish I could have more respect for myself	**990 (43.7)***	764 (38.2)	146 (7.3)	100 (5.0)	3.32	8.85
9	All in all, I am inclined to feel that I am a failure	**1165 (58.3)***	433 (21.7)	228 (11.4)	174 (8.7)	1.70	0.99
10	I take a positive attitude towards myself	133 (6.7)	123 (6.2)	577 (28.9)	**1167 (58.4)***	3.39	0.87
Weighted Mean					**2.87**		

NB: * = High Self-esteem, Mean Score < 1.7 = Low Self-esteem, Mean score ⩾1.70 = High self esteem

Table 1 shows the response pattern of the students to the RSES; it is evident that the students in south west Nigeria, possesses a high self-esteem from the weighted mean score of 2.87 obtained.

Research Questions 2: Is there a relationship between Self-Esteem and mathematics achievement among senior secondary school students in south west, Nigeria?

Table 2: Relationship between Self-Esteem and Academic Achievement

Variables	Mean	Std. Dev	D.F.	R	P	Remark
Self-Esteem Scores	28.70	3.13	1998	0.03	0.05	Significant
Academic Achievement	32.37	4.59				

***Significant at 0.05**

Table 2 shows the relationship between self-esteem and academic achievement. The result as evident from the table indicates that students' academic achievement has higher mean score of 32.37 as compared to self-Esteem mean score of 28.70. The mean difference is 3.67. There is a significant relationship between self-esteem and academic achievement ($r = 0.03$, $p < 0.05$). This is an indication that self-esteem of students do affect their academic achievement in mathematics.

Research Questions 3: Is there a relationship between students' self-esteem scores and their gender?

Table 3: Relationship between Self-Esteem and Gender.

Variables	Gender	No. of Students	Mean	Std. Dev	D.F.	R	P	Remark
Self-Esteem Scores	Male	960	28.59	3.248	1998	.007	0.05	Significant
	Female	1040	28.80	3.013				

***Significant at 0.05**

Table 3 shows the relationship between self-esteem and gender. The table indicates that the females mean scores of 28.80 is slightly higher than the males mean score of 28.59. The mean difference is 0.21. Although the values of the mean scores do not reveal appreciable difference. The result indicates that there is a significant relationship between students' self-esteem and gender ($r = 0.007$, $p < 0.05$). It is depicted from the result that the female students have a little higher self-esteem than their male counterpart.

Research Questions 4: Is there a relationship between students' self-esteem scores and their ages?

Table 4: Relationship between Students' Self-Esteem and Age

Variables	Mean	Std. Dev	No of Students	D.F.	R	P	Remark
Self-Esteem Scores	28.70	3.13	2000	1998	.046	0.05	Significant
Age	1.86	.988					

***Significant at 0.05**

Table 4 shows the relationship between students' self-esteem and their ages. The table indicates that the students' self-esteem score has a mean of 28.70 and standard deviation of 3.13 while the students' Ages have a mean Score 1.86 and standard deviation of 0.988. The mean difference is 26.84. Similarly, the table shows that there is a significant relationship between students' self-esteem and their ages ($r = 0.046$, $p < 0.05$). Thus, the ages of students do determine how high or low their self-esteem could be.

Discussion

The result of the study as evident from the response pattern of students in south western Nigeria, to the Rosenberg self-esteem scale did reveal that students in the sampled states; possesses a high self-esteem as shown from the weighted mean score value. This could in no small measure have a positive and significant effect their self-image and general academic performance.

The result of the study does indicate that there exist a significant correlation between students' self-esteem scores and their academic achievement in mathematics. This means that students who possesses high self-esteem are likely to perform better in their academic endeavours than their counterparts especially in subjects such as mathematics. The finding corroborates with the findings of Mohammad (2010), Rubie *et al* (2004); Walter (2003); Fathi-Ashtiani *et al*. (2007); Bray (2001); Doodman, Zadeh and Changizi (2017), which stated that self-esteem was positively correlated with Performance.

The study has also revealed that here is a significant relationship between students' self-esteem and gender; that females have a little higher self-esteem than their male counterpart. Thus, gender has a role to play in determining the nature and levels of self-esteem student can possess overtime. The finding contrasts with the findings of Arshad, Zaidi and Mahmood (2015), Kearney (1999); McMullin and Cairney (2004) that showed that male students had higher self-esteem than the female students; Patton, Bartrum and Creed (2004) and Mohammad (2010) which revealed that there were no significant differences between males and females on self-esteem.

Another interesting aspect of the study is the fact that there is a significant relationship between students' self-esteem and their ages. Students of higher ages possessed a higher self-esteem that those of lower Ages. The finding of the study agrees with those of Robins et al. (2005); Giarrusso, Mabry and Bengtson (2001) which stated that self-esteem levels are high in childhood, drops during adolescence, rises gradually throughout adulthood, and declines sharply in elderly.

Conclusion

In view of the findings of this study, the researchers conclude that the students in south west Nigeria, possesses a high self-esteem. Students' self-esteem do affect their academic achievement in mathematics. There is a relationship between students' self-esteem and their gender as female students have a higher self-esteem than the males. The ages of students do determine their self-esteem

Recommendations

In view of the foregoing, it is recommended that stakeholders especially parents and teachers, should build up the self-esteem of their wards at home and school by letting them see the virtue and value they possess and set up guidance and counseling unit in schools as this could enhance students' self-esteem and their achievement in mathematics.

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Evaluation of the Undergraduate Chemistry Education Programme in Universities in Rivers State, Nigeria

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Abstract

Decline in the quality of graduate teachers necessitated the adoption of the benchmark minimum academic standard (BMAS) by the National Universities Commission in Nigeria. Extant studies on university programmes have focused on minimum academic standards with little or no attention paid to BMAS especially with respect to undergraduate chemistry education programme (UCEP). The study evaluated the UCEP on the basis of staffing, learning environment, library resources, curriculum activities and employers' feedback along with undergraduate achievement in and attitude to chemistry. Descriptive survey design and programme logic evaluation model were adopted. All the three universities in Rivers State were enumerated. Fifty-nine (59) academic staff and 179 undergraduates constituted the sample. Three instruments: Programme Assessment Pack (α =0.86); Undergraduate Chemistry Knowledge Test (r =0.87) and Undergraduate Chemistry Attitude Rating Scale (α =0.70) were used to collect data that were analysed using descriptive statistics and ANOVA (at p<0.05). Staffing (81.3%); learning environment (71.6%); and library resources (66.7%) were found adequate while employers' feedback (33.3%) was inadequate. There was a significant mean difference between the expected and observed resources and activities in the three universities, UOP (0.92 ± 0.77); RSU (1.20 ± 0.87); UOE (0.76 ±1.45). Mean achievement in and mean attitude towards chemistry was 70.47±14.07 and 62.78 ± 5.15 respectively. There was a significant difference (F (2,176) = 3.28) in undergraduate attitude to chemistry while a non-significant difference existed in undergraduate achievement in chemistry among the three universities. The need to improve on certain aspects of the programme to ensure the production of high quality graduate chemistry teachers was recommended.

Keywords: Universities in Rivers State, Undergraduate chemistry education programme, resources, Achievement in and attitude towards chemistry

Introduction

Chemistry is a natural and physical science subject that has a wide application in almost all spheres of human endeavours. The role of chemistry and chemistry education in human capacity development through education, especially science, technology,

engineering and mathematics (STEM), is a well-established locally and internationally (Olson and Riordan, 2012; Hassan, 2016; Eagan, Stolzenberg, Zimmerman, Aragon, Sayson and Rios-Aguilar, 2017; Hazari et al, 2017; Shamsuddin, Arome, Aminu, Isah and Adamu (2017). For several years, there has been considerable national attention given to increasing the talent pool in STEM to address the growing concerns of sustainability in the global economy, and ensure access to highly-paid, highly-rewarding fields for all students (Olson and Riordan, 2012) in spite of the many challenges confronting the field of chemical technology in the Nigerian economy (Hassan, 2016; Shamsuddin, Arome, Aminu, Isah and Adamu, 2017).

The undergraduate chemistry education programme (UCEP) is central to the implementation of the chemistry education component of STEM and the overall national development agenda (FRN, 2004; NUC, 2007). The National University Commission (NUC) provides regulation in the areas of programme resources through the stipulations of the benchmark minimum academic standard (BMAS) and its implementation through periodic accreditation exercises with a view to ascertaining compliance in programme resources and activities including staffing, learning environment, library resources, curriculum activities and employers' feedback (NUC, 2012).

Like previous versions, the BMAS made stipulations on inputs and activities but differred in the approach to implementation, which is outcome-based. According to Barkman (2000) and Wilder Research Foundation [WRF] (2009), programme outcomes are the end results or benefits participants get from a programme which may be intended or unintended, positive or negative.

The UCEP outcomes against which the minimum standards have been benchmarked are the undergraduate achievement in (UAC) and attitude to chemistry (UAtC) which are the focus of this paper. The outcome-based focus of the BMAS corroborates the views of Horn and Mackey (2011) which give credence to an outcome-based approach that encourages continuous improvement which unlocks a path toward the creation of a high-quality students-centric education as against a content-based approach that locks a system into a way of doing things that inhibit innovation. This notwithstanding, the roles of resources in the overall programme implementation cannot be overlooked and has to be given special consideration in the evaluation of such a programme. Availability of resources, according to NUC (2007) is a sine-qua-non for effective and efficient implementation of programmes. Adequate levels of resources must, therefore, be provided in tandem with the intended outcomes of the programme.

Resources such as staffing and learning environment (physical facilities) are adequately benchmarked for universities. Heneman and Timothy (2005) defined staffing as the process of hiring, positioning and overseeing employees in organizations. . Staffing is a composite consideration of academic staff structure, qualification, competence and student ratio,; programme administration, non- academic staff number and staff development programme. Kim and Ployhart (2014) share the view that, an

organization that is adequately staffed will out-perform its contemporaries. Researchers such as Akinsolu (2010), Betts, Zau and Rice (2008), Brewer and Goldherber (2000) have shown that there is a positive correlation between qualification of staff and students' academic performance. There is a need to equip the programme with human capital resource that has high cognitive ability while also taking cognizance of training of staff to upgrade them with the specific competencies required for the job (Ployhart, Van Iddekinge and MacKenzie, 2011).

Learning environment is defined by the United Nations Educational Scientific and Cultural Organization Institute of Statistics (UNESCO/UIS) as the complete physical, social and pedagogical context in which learning is intended to occur (UNESCO/UIS, 2012). The organisation also asserts that learners in a supportive environment have high levels of self-efficacy and self-motivation and use learning as a primary transformative force (UNESCO, 2016). The Organization of Economic Cooperation and Development (OECD) holds that physical learning environment is an influential element in the complex and highly contextualized nature of learning which is characterized by the interactions between the learner, teacher, content, equipment and technologies (OECD, 2013).

Another important set of programme resources include library facilities. The role of the library is multifold as outlined by ranking of intellectual properties and general information management. (Ugeh, 2007; Wilkin 2015; Glitsch and Helmkamp 2017). This may have underscored why the NUC rates library resources significantly high by stipulating 10% for physical library and 8% for e-library out of other resources in the university (NUC, 2012). The commission also asserts that the ultimate test of the quality of manpower produced from a programme is in meeting the minimum level of training for the given discipline. The commission stipulates a form of feedback mechanism from employers to universities, referred to as employers rating of graduates, for which 3% of the total programme is allotted. This is considered in this study as employers' feedback of the graduate of UCEP.

Attitude is commonly considered a determinant of the altitude one can attain in life and in a chosen career. Undergraduates' attitude to chemistry applies to chemistry theory and laboratory tasks taught in the classrooms Abulade (2016). Undergraduates' achievement, attitudes and skills are measurable by a number of assessment procedures which include continuous assessment tests, examinations, student's group projects, attitude survey and other forms of data generation during a given programme cycle.

Planned curricula activities are also essential for the implementation of UCEP . The UNESCO envisages curricula from different perspectives ranging from the societal expectations of the educational systems presented in official formats known intended or written to all other experiences that are significantly impactful on the educational systems but not official (UNESCO, 2016).

In the face of these requirements for a functional UCEP, observations are rife that universities rarely conduct self-evaluation of programmes in a five-yearly curricular review within some specified framework as recommended by the NUC. The same is also the case with the general decline in the standard of chemistry graduate teachers as observed by employers which necessitated the adoption of the BMAS in place of previous versions. Available records show that sufficient and scholarly attention has not been given to studies under the BMAS. This study therefore, evaluates the UCEP on the basis of staffing, learning environment, library resources, curriculum activities and employers' feedback. It also investigates undergraduate achievement in and attitude to chemistry.

The study is undertaken to achieve the following objectives:

i. to determine the levels of adequacy of UCEP staffing, learning environment, library facilities, curriculum activities and employers' feedback in the universities.
ii. to determine undergraduate's achievement in and attitude to chemistry.

The following research questions were addressed:

1. What is the level of adequacy of the UCEP resources (staffing, learning environment and library) and activities (curriculum and employers' feedback) in the universities in Rivers State, Nigeria?
2. Are there significant differences between expected and observed resources and activities in the universities in Rivers State, Nigeria?
3. What is the undergraduate achievement in and attitude to chemistry in the universities in Rivers State, Nigeria?
4. Are there significant differences in undergraduate achievement in and attitude to chemistry among the universities in Rivers State, Nigeria?

Methodology

Descriptive research type and Simple programme logic model were adopted for this study. The variables of this study are resource (staffing, learning environment, library, curriculum activities and employers' feedback); and learning outcomes (undergraduates' achievement in chemistry and attitude to chemistry). The sample size for the study was 179 intact undergraduates. Programme assessment pack (PAP) α=0.86, undergraduate chemistry knowledge test (UCKT) α=0.87 and undergraduate chemistry attitude rating scale (UCARS) α=0.70 were used for data collection. Data collection involved collation of programme records relating to the NUC resource criteria in the universities in Rivers State and rating same according to the NUC manual of accreditation procedure using the PAP. Undergraduates were administered the UCKT and UCARS in order to elicit achievement and attitude data. Data collected were analysed with mean, standard deviation, t-test and ANOVA.

Results

Data analysis was organised and interpreted according to the research questions posed for this study.

Research Question One

What is the level of adequacy of UCEP resources (staffing, learning environment and library) and activities (curriculum and employers' feedback) in the universities in Rivers State, Nigeria?

Table 1: Mean programme resources adequacy in the three universities

NUC criteria	NUC	UOP	RSU	IAUE	Mean	Decision
Staffing	32	28	25	25	26.00(81.25)	Adequate
Learning environment	27	23	18	23	21.33(79.01)	Adequate
Department library	18	10	13	13	12.00(66.67)	Adequate
Curriculum activities	18	16	14	16	15.34(85.22)	Adequate
Employers' feedback	3	1	1	1	1.00(33.33)	Not adequate
Total	98	78	71	78	75.66(77.21)	Adequate

UOP=University of Port Harcourt, RSU=Rivers State University, IAUE=Ignatius Ajuru University of Education

The assumption that any criterion rated below 50% of the NUC rating is considered not adequate was adopted as shown in Table 1. The table presents five categories of criteria with ratings of the programme resources and activities of the three universities in Rivers State vis-à-vis the NUC standards for Nigerian universities. The results show that all the three universities do not meet the minimum stipulations for programme requirements. However, all have ratings sufficient to continue running the UCEP on full clearance mark but may still be on clear standing on interim basis (NUC, 2012). For the purpose of this study and in accordance with the assumption for results interpretation, the three universities, individually and collectively, meet the resource and activities adequacy criteria. The result further shows that employers' feedback was the only criterion rated 33%, below 50% of the standard rating, hence it was declared inadequate as depicted in Figure 1. This shows that the employers feedback activity has not been fully deployed as a veritable indicator of programme performance in the eye of the programme product consumer, the employer. This finding gives credence to the outcome-based approach of the 2007 BMAS where consumer opinion and satisfaction are provided for.

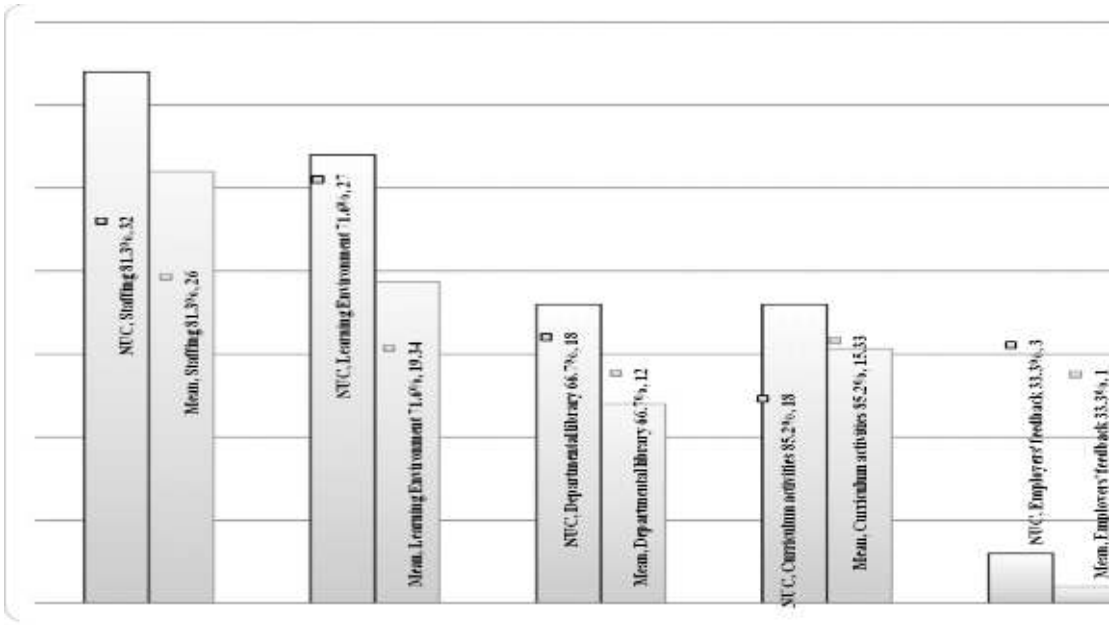


Figure 1: Level of resource adequacy of the universities in Rivers State

Research Question Two

Are there significant differences between the expected and observed resources and activities in the universities in Rivers State, Nigeria?

Table 2: Mean difference between expected and observed universities resources

Dependent variable		N	Mean	SD	df	T	Sig.
Pair 1	NUC	24	3.96	2.39	24	3.40	.002*
	UOP	24	3.04	1.72			
Pair 2	NUC	24	3.96	2.39	24	4.43	.000*
	RSU	24	2.76	1.42			
Pair 3	NUC	24	3.96	2.39	24	3.61	.001*
	IAUE	24	3.20	1.94			

UOP=University of Port Harcourt, RSU=Rivers State University, IAUE=Ignatius Ajuru University of Education

Table 2 shows the mean difference between expected and observed resources and activities in the three universities as depicted in Figure 2. Mean differences exist between the expected and the observed in the universities as follows: UOP (0.92±0.77), RSU (1.20±0.87), UOE (0.76±1.45). These differences were found to be statistically significant at p ⊠ 0.05 as follows: RSU (t_{24} =4.43; p=0.00), UOE (t_{24} =3.61; p=0.00) and UOP (t_{24} =3.40; p=0.00).

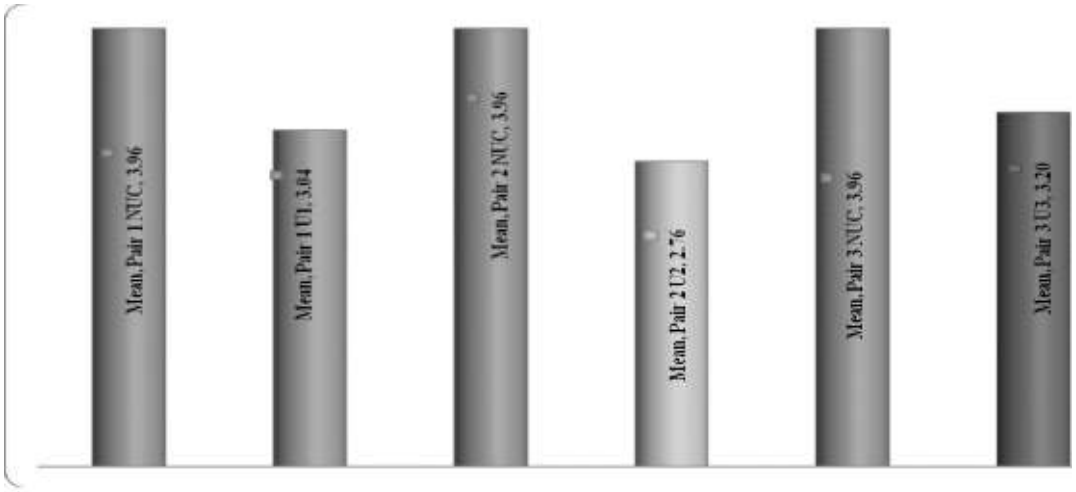


Figure 2: Difference between expected and observed resources and activities

Research Question Three

What is the undergraduate achievement in and attitude to chemistry in the universities in Rivers State, Nigeria?

Table 3: ANOVA of undergraduate's chemistry education p rogramme outcomes

Dependent variable	Universities	N	Mean	SD	Lower	Upper	Min	Max
Undergraduates' achievement in chemistry (UAC)	UOP	40	71.30	15.00	66.50	76.10	50.00	98.00
	RSU	21	65.00	11.90	59.68	70.51	42.00	93.00
	IAUE	118	70.81	14.02	68.25	73.36	44.00	95.00
	Total	179	70.47	14.07	68.17	72.32	42.00	98.00
Undergraduates' attitude to chemistry (UAtC)	UOP	40	61.65	4.94	60.07	63.23	54.00	72.00
	RSU	21	61.05	4.39	59.05	63.05	52.00	70.00
	IAUE	118	63.47	5.24	62.51	64.42	52.00	78.00
	Total	179	62.78	5.15	62.02	63.54	52.00	78.00

UOP=University of Port Harcourt, RSU=Rivers State University, IAUE=Ignatius Ajuru University of Education

Table 3 shows the mean performance of the undergraduates of the programme across the universities in Rivers State and the mean differences of their performances. The table shows that mean undergraduates' achievement in chemistry was 70.47 ± 14.07 with highest score in UOP (mean = 71.56 ± 15.00) and lowest in RSU (mean =65.00 ±11.90). The mean of attitude to chemistry was 62.78±5.15 with the highest in IAUE (mean = 63.47 ± 5.24 and the lowest in RSU (mean = 61.05 ± 4.39).

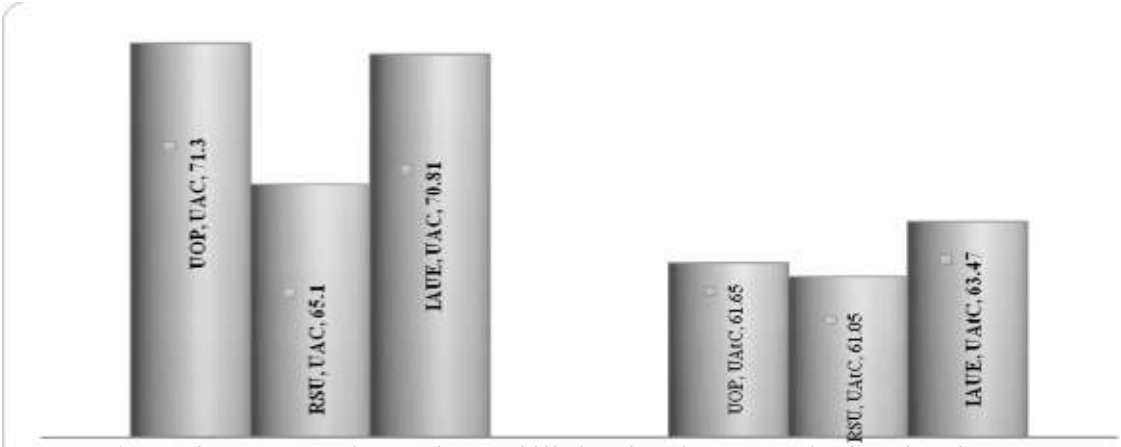


Figure 3: Mean undergraduate skills in chemistry practical and pedagogy

Research Question Four

Are there significant differences in undergraduate achievement in and attitude to chemistry among the universities in Rivers State, Nigeria?

Table 4a: ANOVA of UAC and UAtC among the universities

Dependent variable	Source of variance	Sum of squares	df	Mean squares	F	Sig.
Undergraduates' achievement in chemistry(UAC)	Between	218.14	2	109.07	0.79	0.46
	Within	4284.33	176	138.20		
	Total	4502.47	178			
Undergraduates' attitude to chemistry(UAtC)	Between	169.65	2	84.82	3.28	0.04
	Within	4545.42	176	25.83		
	Total	4715.06	178			

Table 4a shows the ANOVA of UAC and UAtC among the universities. The table shows that non-significant differences existed in UAC ($F_{2, 176}$=0.79, p=0.46), while there were significant differences UAtC ($F_{2, 176}$=3.28, p=0.04) among the universities.

Table 4b: Multiple comparisons

Dependent variable	I	J	MD I-J	SE	Sig.	95% CI interval Lower	Upper
Undergraduates' attitude to chemistry(UAtC)	UOP	RSU	0.60	1.37	0.91	-2.7785	3.98
		IAUE	-1.82	0.93	0.15	-4.1115	.48
	RSU	UOP	-0.60	1.37	0.91	-3.9833	2.78
		IAUE	-2.42	1.20	0.14	-5.3899	.55
	IAUE	UOP	1.82	0.93	0.15	-.4793	4.11
		RSU	2.42	1.20	0.14	-.5529	5.39

UOP=University of Port Harcourt, RSU=Rivers State University, IAUE=Ignatius Ajuru University of Education

Table 4b shows the post-hoc analysis of the ANOVA of UAtC which revealed significant differences among the universities. The table revealed that the highest mean difference is between IAUE and RSU (MD=2.42) and lowest between UOP and RSU (MD=0.60). The table also shows that these differences are not statistically significant.

Discussion

Staffing, learning environment, library resources and curriculum activities were found adequate. The findings of significant mean difference between NUC standard and observed resource profile of the universities, collectively and individually reported, corroborate the findings of Ochu (2007) in which about 50% of the resource requirements were found to be either unavailable or not adequate in an evaluation of the undergraduate chemistry education programme in universities in North-Central Nigeria. The findings also support those of Oni et al (2014) who reported shortfalls in the observed requirements in an evaluation of undergraduate estate management programme in Nigerian universities. Emendu and Okoye (2015) while identifying the problems of studying chemistry in Anambra State spotted infrastructure, curriculum, funding, textbooks, teachers, and students as challenges. Knaub et al (2016), while investigating facilities available for science, technology, engineering and mathematics education, reported situations of unhelpful flexible classroom while Zhu and Engels (2013) reported that students' perception of infrastructure and facilities are factors affecting the smooth implementation of the respective programmes evaluated. This may not be unconnected with weak enforcement of compliance by the regulatory agency who still allows below minimum standard profile for universities to continue running programmes where 'minimum' may have been misunderstood for standard. That understanding needs to be re-echoed and made stringent.

The mean of achievement (UAC) and attitude (UAtC) in chemistry indicate the extent of learning that have taken place amongst undergraduates in the three universities as mean achievement and attitude within the grade levels were considered to be commendable. However, the mean differences found to be statistically non-significant across the universities in Rivers State during the period, 2007-2015, may be due to the fact that no competitive atmosphere existed among the universities to engender such performance differences. Adeyemo, Ogunleye, Oke and Adenle (2010) commented on the falling standards in universities arising from the difference between expected and observed activities in the institutions. The researchers reported that many employers rated certain key skills as particularly worrisome. The findings confirm that universities are still emphasizing "too much theory and too little practical training" which is the reasons why many graduates cannot solve problems or think analytically and are not practically equipped when faced with job situations.

Conclusion and Recommendations

This study was conducted to evaluate the undergraduate chemistry education programme (UCEP) in terms of level of adequacy of resources and activities in compliance with the National Universities Commission's (NUC) subsisting standards and the corresponding outcomes of undergraduate achievement in and attitude to chemistry using four research questions as guides. The study reveals that the UCEP in universities in Rivers State, Nigeria are yet to comply fully with the NUC standard. The study further reveals that, just as the universities still grapple with non-compliance with NUC minimum standards, they do not show significant performance variation in UCEP outcomes. This is not a healthy productive atmosphere for a university community. The study reveals that despite the resources invested in the undergraduate chemistry education programme, the effects of the programme in the universities in Rivers State are significantly low. It is not certain if the programme is able to transmit the needed quantity and quality of manpower to the labour market, since the employers' feedback is reported low in this study. It is therefore recommended that universities should develop a culture of annual *all* graduates' survey which is not a common practice in Nigeria. This will help universities to develop and grow a database of their products and how they are faring after graduation from their respective programmes.

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Estimating Generalizability and Dependability Studies of Students' Scores in Teaching Practice Assessment in a Nigerian College of Education

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Abstract

Teaching practice is a mandatory requirement for graduation from colleges of education in Nigeria. The objectives of the study was to find out the variance components for persons, occasions and persons crossed with raters and residual, generalizability coefficient and the dependability index (indices). Two facets crossed with ratters design were used. 1,393 students participated in the study. The data used were the scores of students' in 2016/2017 teaching practice course. The data were analysed using variance components (VARCOMP), relative error variance, absolute error variance and indices statistics. The findings revealed that in 2016/2017 session, the following scores were obtained in 2016/2017 teaching practice course; persons (o^2p) = 0.02 occasions, (0^2_0) = 0.03 interaction of persons with occasions, (0^2_{p0}) = 0.05 and residual (0^2_{prqe}) = 0.15, generalizability coefficient of 0.84 and a dependability index of 0.74 respectively. The study concluded that the indices of students' scores in 2016/2017 teaching practice were high or acceptable. This implies that the quality of students' scores in teaching practice course is standard. The study recommended that the sixteen weeks slated for teaching practice should be maintained.

Keywords: Generalizability, Dependability, Classical test theory, Students' scores, Teaching practice Assessment

Introduction

In measurement history, the leading theory for explaining latent trait underlying examinees' test performance is the Classical Test Theory (CTT) which describes how errors can influence observed scores. It is a simple model based on the true score theory that introduces three concepts - test scores or observed scores (X), true scores (T), and error scores (E). It recognizes that the characteristics of the testing situation can

contribute to measurement error and evaluates sources of error separately. This is the case of test-retest, alternate forms and internal consistency option of reliability of measures. The combined effect of error from the various threats to the reliability of an estimated score is rarely considered. Each method of reliability in CTT yields valuable information but provides only a slice of a bigger picture. Each piece of the source of error is estimated in isolation and fulfils a single objective. How all the various sources of error operate at one time and fit together to influence the overall reliability of the instrument cannot be estimated (Shavelson & Webb, 1991).

CTT deals with the reliabilities of relative decisions, where an individual's score is compared with a reference group and used to rank order the individuals as in norm-referencing although the measurement error is not considered. Absolute reliability occurs where an individual is compared to a well-defined standard and used to provide the absolute value of an attribute as in criterion-referencing; the measurement error is not considered (Shavelson & Webb 1991). *Generalizability Theory (GT) is a conceptual framework and a methodology that enables an investigator to disentangle multiple sources of errors in a measurement procedure. The roots of generalizability theory can be found in Classical Test Theory and Analysis of Variance (ANOVA).* In psychology and education, measurement issues have been addressed principally using CTT which postulates that observed scores can be decomposed into a "true" score and single undifferentiated random error term, *E* (Brennan, 2000).

Generalizability Theory (GT) is a statistical theory about the reliability of behavioural measurements. Reliability refers to the accuracy of generalizing from the person's observed score on a test or other measures (e.g. behaviour observation, opinion) to the average score that person would have received under all the possible conditions that the test user would be equally willing to accept. Generalizability theory provides an all-at-once way of revealing and comparing the sources of errors in a conjoint metric. It also provides estimates of the variance contributed by source and in addition, presents estimates of the variance associated with interface between the various sources. For instance, if an instrument is administered on two occasions, generalizability theory provides estimates of the variance contributed by persons, items, occasions and each of the four possible interactions (persons by items, persons by occasions, items by occasions and persons by items by occasions). It also provides helpful forecasts of the improvements in measurement. In this theory, reliability can be obtained by altering the number of persons, items, and occasions. This theory enables decision makers to determine how many occasions, test forms and administrators are needed to obtain reliable and valid scores.

Decision study, which is the second study in GT according to Wan, Li, Fan, Yang, & Pan (2014), gives information about which protocols are optional for particular measurement situations by generating generalizability coefficient that could be considered as reliability coefficient for various facets of the study. Decision studies

make use of information provided by generalizability study in arriving at its own reliability coefficient called index of dependability. It is the index of dependability that is used to determine how dependable measurement behaviour is. Dependability is the accuracy of generalizing an individual's average score which he would have received under all the possible conditions that the examiner would be equally willing to accept (Nie, Yeo, & Lau 2007). Therefore, the dependability of a measurement depends on the accuracy of its generalization. Dependability subsumes all other aspects of Generalizability theory. This is because the result obtained from generalizability study is used to access dependability.

GT, as noted by Gerbil (2013), is a powerful tool for estimating consistency in test scores. It also helps test developers to make correct decisions related to test development and administration, effective investigation of the relative contribution of various facets to test precision, provision of information about the impact of increasing or decreasing the number of test tasks, and test validation in order to optimize measurement precision. The importance of teaching practice in teacher education programme and its usefulness for student teachers makes it necessary that such an important programme is validated.

Table 1 shows the sources of variability of the univariate two-facets crossed persons by occasions by raters (p x o x r) design.

Table 1: Sources of Variability in Two -Facet Measurement Error

Source of variability	Type of Variability	Variance Notation
Persons (p)	Universe score	σ^2p
Occasions (o)	Conditions	σ^2o
Raters	Conditions	σ^2r
Persons by Occasions by raters	Residual	pro,e

Source: Shavelson & Webb (1991)

The students' scores during teaching practice exercise has always been used as part of their final grades. The scores as noted earlier, usually differ from one lecturer to the other. This difference is a major part of what GT uses to determine the dependability level of scores. It is therefore necessary to examine the dependability of students' scores in teaching practice programme using GT. This was why this study examined and analysed the dependability of the students' scores in teaching practice courses in Nigeria colleges of education.

Statement of the Problem

Nakpodia (2011) examined teachers and the student practice teaching programme in Nigerian educational system; Jekayinfa et.al' (2012) examined the lecturers' assessment of teaching practice exercise in Nigerian Universities; Fasasi (2013) investigated the

duties of students' teachers and supervisors in teaching practice; and Ekundayo, Alonge, Kolawole and Ekundayo (2014) examined the challenges and the way forward for education students in Nigerian colleges of education in teaching practice. However, none of these researchers examined the dependability of the scores given to students by the supervisors particularly with the use of generalizability theory.

Also, researchers such as Shavelon and Webb (1991), Brennan 2000, 2001, 2010), Burns (1998) and Gerbil (2013), have worked on the application of generalizability theory to test the dependability of measurement behaviour (instruments, scores). But GT has not been applied to test the dependability of students' scores in teaching practice courses particularly in Nigerian colleges of education. All these constitute research gaps parts of which this study intends to fill.

The purpose of this study is to investigate the dependability level of the sources of regular Nigerian Certificate of Education students' teaching practice in the 2016/2017 academic session in the sampled universities in Nigeria. Specifically, this study intends to:

i. determine the five variance components for persons, occasions, and persons crossed with raters and residual.
ii. investigate the generalizalibility coefficient of the students' scores in teaching practice.
iii. find out the dependability (phi) coefficient of the students' scores in teaching practice.

Research Questions

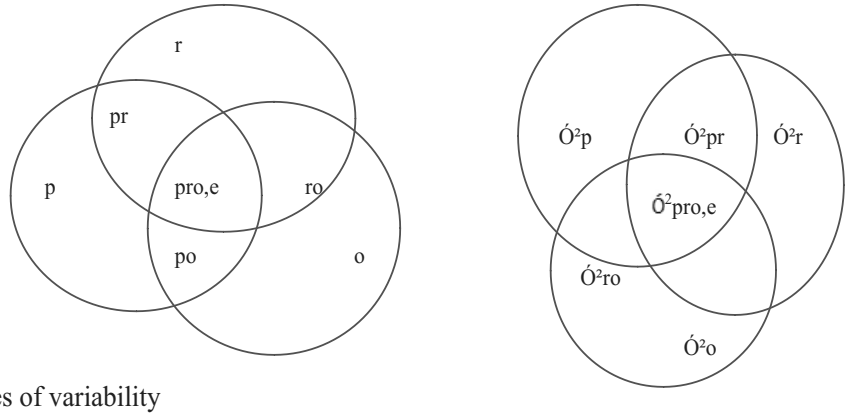
The following research questions were generated to guide the study:

1. What are the variance components for persons, occasions, persons crossed with rater and residual in the undergraduate students' scores in teaching practice course?
2. What is the generalizability coefficient of the students' scores in teaching practice course?
3. What is the dependability (phi) coefficient of the students' scores in teaching practice course?

Methodology

A two-facet random design of persons crossed, occasions and raters was employed in this study. In this design (P x rxo), there was one object of measurement (persons – these were the NCE students that participated in the teaching practice programme for the 2016/2017 academic session) and two facets of observations (raters – the lecturers that assess the students during teaching practice and occasions – the periods of teaching

practice exercise). This is in agreement with Shavelson and Webb's (1991) statement that two facet random design has one object of two other facets of measurement (person) observed by different conditions of two other facets of observations (raters and occasions).



a. Sources of variability

b. Variance components

Figure 1. Venn Diagrams for a Two -Facet, Crossed (p• x r• x o•) Design

The population for this study consists, of 1,393 students of College of Education (Technical), Lafiagi Kwara State. Ninety (90) Lecturers participated in the exercise during the 2016/2017 academic session. Purposive sampling technique was used to carry out the study. A Proforma titled "Scores of Students in 2016/2017 Teaching Practice course" was used to obtain samples scores in Teaching Practice in the 2016/2017 academic session. More than one lecturer usually assess students during teaching practice programme. They graded the students on percentage and the scores of students from the lecturers' were averaged to represent each students' performance. In this study, the raw scores turned in by each lecturer was used. The results of teaching exercise were used for students' grading and certification which means that the results could be said to be valid and reliable. This study was carried out using generalizability theory.

The data collected were analysed using variance (VARCOMP) to answer research question one, while the remaining research questions were answered using the formulas of relative error variance, generalizability coefficient and phi coefficient.

Results

The data used for this study were the sampled scores of students' in the 2016/2017 teaching practice course of a Nigerian college of education. Research question one was answered using VARCOMP while research questions two and three were answered using the relative variance error variance (σ^2rel) absolute variance error (σ^2abs), generalizability co-efficient and phi co-efficient formula

Research Question 1: What are the variance components for persons, occasions, and person crossed raters and residual in the students' scores in teaching practice course?

The raw scores of students from the ten assessors were input into the SPSS (IBM version 21) after which the data were subjected to syntax analysis to obtain the variance components. The results obtained are presented in Table 2.

Table 2: Estimated variance components for students' scores in 2016/2017 Teaching Practice scores

Source of variability	Variance	estimated variance	% of total variance
Student (P)	σ^2p	0.02	8%
Occasion (o)	σ^2o	0.03	12%
Person x occasion (po)	σ^2po	0.15	20%
Residual (pro,e)	σ^2pro,e	0.25	60%
Total			100%

The research question was aimed at showing how much variance component for persons in the observed scores is due to students' differences in their performance during the teaching practice assessment; the difference could be among persons' characteristics. From the above table, it was revealed that the estimated variance component for persons (σ^2p) is 0.02 which accounts for 8% of the total variance in the students' scores during teaching practice. The estimated variance component or persons crossed with occasions (σ^2po) is 0.05 and this accounted for 20% of the total variation in the students' scores. While the estimated variance component for residual (σ^2pro,e) is 0.15, which accounted for 60% of the total variance in the students' scores at the teaching practice. The largest estimated variance component of (0.15) is that of the residual as it accounted for 74% of the total variance in the students' scores.

Research Question 2: What is the generalization co-efficient of the student scores in teaching practice course?

Relative error variance and generalizability coefficient were used to answer this research question. The estimated variance component for persons (σ^2p) and person occasion by ratters residual (σ^2Pr, Pro,e) were used to determine the relative error variance while estimated variance component for person and relative error were also used to obtain generalizability coefficient. The result are presented in Table 3.

Table 3: Relative Error Variance and Generalizability Coefficient for 2016/2-17 Students' Teaching Practice Scores

Source	Generalizability co efficient
σ^2Rel	0.0053
σ^2P^2	0.8400

Table 3 shows that the estimated relative error of 0.051 and generalizability coefficient of 2016/2017 teaching practice scores is 0.84. Therefore the generalizability obtained is high and acceptable, since the value obtained is not less than the acceptable value of 0.070.

Research Question 3: What is the dependability (phi) co efficient of the student scores in 2016/2017 teaching practice course?

The decision study or dependability index for the 2016/207 teaching practice was obtained using absolute error variance and dependability equations respectively. Table 4 revealed the results obtained.

Table 4: Relative Error Variance and Dependability Index for 2016/2017 of Students' Teaching Practice Scores

Absolute error (σ^2abs)	dependability index (Φ
0.0028	0.7400

Table 4 revealed that the absolute error variance is 0.0028 while, the decision study or dependability index of 2016/2017 teaching practice scores is 0.7400. This shows that dependability index of the 2016/2017 teaching practice scores are acceptable since the obtained value does not fall below the acceptable value of 0.70. From the result of this study, it was revealed that 0.80 generalizability coefficient and 0.74 dependability index were obtained. This shows that there is no need to increase the number of occasions and raters. Forecasting could have been carried out assuming that the coefficient and dependability index are not above the acceptable value of 0.70

Discussion of Findings

It was observed from the result obtained that the variance component due to persons (σ^2p) accounted for 8% of the total variance in the 2016/2017 students' scores in teaching practice course percentage and this indicated that students performed differently in during the assessment. The difference in the performance of the students

could be because students normally try to improve their performance steadily after the first three weeks assessment during teaching practice programme. This is an indication that learning has taken place. The variance components for occasion (σ^2o) accounted for 12% of the total variance in the students' scores in 2016/2017 teaching practice course percentage. This is a little higher than the variance component for persons which suggested that the sixteen weeks of teaching practice led to the difference in the students' scores during the 2016/2017 teaching practice programme.

The finding also revealed that residual (σ^2pro,e) has the largest contribution as it was responsible for 60% of the total variation in the students' scores in the teaching practice course. This variance component represents persons crossed with occasion and raters, the interaction effect between persons, occasions and raters' other systematic and unsystematic sources of variation that were not part of the design. It was also suggested that the combination of students' period of teaching practice and raters' variable contributed seriously to the difference in the students' scores. This interpretation, given to the variance components, is supported by Shavelson and Webs (1991a) assertion that when the estimated variance components are summed together, the results give the total variance components. The variance component which has the larger percentage contributed to the largest proportion of the total variation while the variance component with the least percentage contributed the smallest proportion of the total variation. The finding of the current study is in line with Tunde (2015) who reported that the residual has the major sources of measurement error. The finding was equally corroborated by Shalveson and Webs (1991a); Hintze and Petite' (2001) whose study found that the residual has the largest contribution to measurement error. Findings in this study revealed that the generalizability co efficient of the 2016/2017 of teaching practice scored was 0.8400. This indicated that the estimated relative error variance (σ^2o) which the estimated relative error persons observed deviation scores and their universe scores (Brenman 2002a) obtained through the variance and estimated variance components that were used to obtain the generalizability coefficient of the 2016/2017 teaching practice scores was high or acceptable. Therefore if generalizability coefficient of 0.8 is to be classical test theory it will be regarded as a high reliability.

The result also revealed that the dependability coefficient/index of the 2016/2017 teaching practice scores and that the estimated absolute error variance (σ^2abs) for the design of this study was the difference between person observed score and the variance score (Brennan 2000). Three out of four variance components in this study contributed to the absolute variance error. It was only the variance component for persons that did not contribute to the absolute variance error (σ^2abs). The obtained D study or dependability index was high (0.74) considering the 0.70 level of acceptability value. Therefore, the dependability index of the 2016/2017 teaching practice is high as the dependability index is the parameter used to determine the dependability level of an instrument (Nie et al 2007).

The high dependability index level of the 2016/2017 teaching practice scores may be due to the contributions of the four sources of measurement errors and the difference in the persons' performance evident in the high level of commitment of students during the 2016/2017 teaching practice programme. The interpretation given the variance components were in line with Shalveson and Webs (1991b) who opined that when estimated variance components are added together, the outcome reveals that the total variance components and the variance components that has the largest percentage contributed the largest part of the total variation, while the variance component with the lowest percentage contributed the least part of the total variance. This finding was not in line with that of Turner et al (2010) who studied the effect of ventilation on segmental bio-impedance spectroscopy measures using generalizability theory. They found that the largest source of variation was persons (P) variance component unlike this study which has residual (Pro,e) as the largest source of variation. The findings of this study are not also in line with findings of Turner's (2010) study. This may be due to the fact that the study was not carried out in Nigeria. This could be an indication of location differences in research - 100 participants participated in Turner's study while 1,393 participated in this study. These factors could be responsible for the difference.

Conclusion

It could be concluded from the findings of this study that the value of generalizability and dependability coefficients of the 2016/2017 is high or acceptable. This means that the students were hardworking and adequate supervision took place in the sampled college of education and the participating schools. This could be due to the contribution of the four sources of measurement errors to the difference in the 2016/2017 teaching practice scores used for this study.

Recommendations

Based on the findings and conclusions drawn in this study, it is recommended that:

1. The sixteen weeks for the teaching practice exercise should be maintained.
2. raters should be given adequate orientation before going out for assessment.
3. The schools administrator of every participating school should always assess students' lesson plans on a daily basis.
4. raters should be highly remunerated in order to improve their commitment.

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