THE
AFRICAN
JOURNAL
OF BEHAVIOURAL
AND SCALE
DEVELOPMENT
RESEARCH
(AJB-SDR)

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J. O. Adeleke, Editor-in-Chief | **S. O. Ariyo,** Asst. Editor-in-Chief
University of Ibadan, Ibadan, Nigeria.

Frequency: Biannually

Volume 4 No 1, Febuary, 2022

THE AFRICAN JOURNAL OF BEHAVIOURAL
AND SCALE DEVELOPMENT RESEARCH

Editorial Board

Aims

The aims of The African Journal of and Scale Development Research (A*JB-SDR*) Behavioural are to: (i) provide a platform for researchers in behavioural fields to disseminate their research findings in Africa and beyond, (ii) promote the use of modern analytical approaches that will give research work in Africa credibility and global acceptance, (iii) facilitate the publication of quality articles presented by scholars all over the world during annual forum of the Association of the Behavioural Research Analysts and Psychometricians which is held in various regions, (iv) promote professional relationship and exchange of ideas among scholars that are devoted to scale development research and (v) provide a medium for disseminating empirical-based information on modern theories in the field of scale development.

Publication Details

Prioritising Valid Measurement for Credible Behavioural Research

Measurement, which is a process that associates numbers to quantities or phenomena, is central to any research engagement, be it quantitative or qualitative in nature. The usage of the findings of research necessitates that every method adopted during the process must be valid. The realisation of this fact motivated Association of Behavioural Research Analysts and Psychometricians (AB-ReAP) through her journal, The African Journal of Behavioural and Scale Development Research (AJB-SDR) to collate articles for Volume 4, Issue 1. All the authors that subscribed to this edition adopted systematic approaches to construct, as well as validate the instruments they used for measuring the variables in their studies. Beyond common approaches to instrument development, some of the authors adopted advanced methods to validate their instruments and that constituted the main essence of their studies. In the article titled '**Examining Item Biasness in Terminal Unified Mathematics Examination for Primary Schools in Lagos State',** the authors adopted Differential Item Functioning (DIF) method to test the sensitivity of each item in the scale to different groups. The process revealed biased items that could affect measurement negatively. Another study is **'Development, validation and use of principals' leadership behaviours measuring instrument for secondary schools in the South East Nigeria'.** The authors used Normal Varimax Rotation method of factorial analysis to identify the dimensions of the scale before adopting Cronbach reliability method to estimate the coefficients for all the retained subscales. Another set of authors examined **'Psychometric properties of Hausa translated version of Buss- Perry aggressive questionnaire'.** Lawshe (1975) method for content validation was innovatively used to revalidate the aggressive scale translated into Hausa language. **'Investigation of Differential Item Functioning of Basic Education Certificate Examination (BECE) Mathematics Items in AkwaIbom State, Nigeria'** is another article in the current edition where DIF method was also used. Another paper titled '**Assessment of Cognitive Learning Indices and Mathematics Achievement among Junior Secondary III Students in Ondo State'** provides the readers with credible approaches to various assessment practice indices in mathematics classrooms. The current edition of AJB-SDR is available both in print and online to provide guides for the readers on measurement and other research processes. I hereby recommend it for all.

J.O. Adeleke
Editor-in-Chief

The African Journal of Behavioural and Scale Development Research
Publication Guidelines

The African Journal of Behavioural and Scale Development Research (AJB-SDR) will be publishing articles by members and non-members of AB-ReAP whose articles conformed with the standard of AJB-SDR.

- Articles submitted to AJB-SDR must be written in English, following manuscript guidelines (see below) and will be anonymously reviewed by referees. The editors will notify the senior author of the manuscript if it does not meet submission requirements.

- Articles are judged for (a) significance to the field of behavioural research and scale development from a global perspective, (b) comprehensiveness of the literature review, (c) clarity of presentation, and (d) adequacy of evidence for conclusions. Research manuscripts are also evaluated for adequacy of the rationale and appropriateness of the design and analysis. Scholarly relevance is crucial. Be sure to evaluate your information. Articles should move beyond description to present inquiry, critical analysis and must provoke discussions.

- Articles pertaining to a particular country or world area should be authored by scholars that have better understanding of that country or world area.

- All manuscripts accepted for publication will be edited to improve clarity, to conform to style, to correct grammar and to fit available space. Submission of the article is considered permission to edit the article. Editing process begins with text similarity test (Plagiarism test) which a manuscript must satisfy before being forwarded to assessors. The maximum similarity index allowed is 15%. Hence, authors are advised to ensure this before sending the manuscripts.

- Published manuscripts become the property of the Association. Permission to reproduce articles must be requested from the editors. The submission and subsequent acceptance of a manuscript for publication serves as the copyright waiver from the author(s).

- Writing and editorial style shall follow directions in the Publication Manual of the American Psychological Association (7th ed., 2019). References MUST follow the APA style manual. Information on the use of APA style may be obtained at www.apa.org.

Manuscript Guidelines

- Manuscript length, including all references, tables, charts, or figures, should be 3,000 to 5,000 words. Maximum length is 6,000 words. Shorter pieces of 1500-3000 words, such as policy review or critique papers are welcomed.

- All text should be double-spaced, with margin 1 inch (2.5 cm) all round and left and right justified.

- Paragraphs should be indented using the "tab" key on the keyboard. No extra spacing should be between paragraphs.

- Tables, Figures, and Charts should be sized to fit between 5.5 x 8.5 inches or 14 x 20 cm

- Abstract should be limited to 100-200 words.

- Include four or five keywords for database referencing; place immediately after the abstract.

- Cover page shall include the following information: Title of the manuscript; name(s) of author, institution(s), complete mailing address, email address, business and home (mobile) phone

numbers, and fax number. Also on the cover page, please include a brief biographical sketch, background, and areas of specialisation for each author. Please do not exceed 30 words per author.

SUBMISSION REQUIREMENTS
All articles should be submitted directly to Dr. Simeon Ariyo at simeonariyo@yahoo.com and Titilope Oderinwale at titilopeoderinwale@gmail.com for similarity test. Only articles that meet the requirement of maximum of 15% similarity index will be forwarded to the reviewers for assessment.

NOTE
AB-ReAP adapted Journal guidelines of International Society for Teacher Education (ISfTE)

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Examining Item Biasness in Terminal Unified Mathematics Examination for Primary Schools in Lagos State

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Abstract

Item biasness analysis is an important element in assessing examination fairness and validity. The study examined the occurrence of item biasness in Lagos State Terminal Unified Mathematics examination for primary schools pupils. The examination contained 40 items of multiple choice which was developed by the examination unit of Universal Basic Education Board, Lagos State using primary 5 mathematics curriculum. Primary data of scores of 2018 primary 5 Mathematics 2nd Term Unified Examination was used for this research. A sample of 640 pupils selected through multistage sampling technique was used in the study. Two research questions guided this study. Data was analysed using descriptive and inferential statistics. The results displayed closeness of the mean and standard deviation scores for examinee groups, indicating the examinees have similar ability levels. Out of the 40 items, 16 and 17 items function differentially among the examinees based on gender and age respectively while differential item functioning cannot be estimated based on location because it was found to comprise examinees with different ability level because carrying out Differential Item Functioning (DIF) with groups with different ability level will distort the result. The results displayed a high level of DIF. Based on the findings, it can be concluded that the examination has high differentially functioning items and the overall fairness shows biasness in the items. In addition to other psychometric measures, bodies in charge of state or nationwide examinations should ensure items biasness are checked and corrected before being administered for actual assessment.

Keywords: Differential Item Functioning (DIF),Mantel-Haenszel method, Examination bias, Item bias, Unified Terminal Examination, Unified Examination, Mathematics

Introduction

Mathematics has been found to be the science of structure, order, numbers, space and quantity; it is a relationship which revolves around the elementary practice of counting, measuring and describing of shapes and objects (Soyemi, 2002). Maduabum and Odili (2006) defined Mathematics as the science of quantity and space. It has occupied a key position in the Nigerian Educational System. Mathematics is an important foundation which propels advancement of technology in Nigeria. Subsequently, mathematics is a core to enter technologically-based courses either in the university, polytechnic or college of education (Adebule, 2013).

Examination in mathematics is a vital aspect of the teaching and learning technique of mathematics education which allows the mathematics teacher to evaluate mathematics learners during and at the end of mathematics lessons. Examinations are routinely used for diverse purposes, such as selection, placement, recruitment, diagnosis, promotion among others by means of valid and reliable measurement instrument.

As regards how examination scores are used to make inferences about examinees' performance, it is essential to ensure fairness and validity of the items used to obtain those scores. Faleye and Dibu-Ojerinde (2006) and Ajayi and Ighoroje (2000) noted that show of student's interest in courses related to science at the institutions of higher learning is on decline, especially among females. Meanwhile, male students appear to enjoy upper hand beyond their female colleagues in science and mathematics assessments while females have better achievement in verbal aptitude (Adebule, 2004). In line with Barret (2001) and Adebule (2013), objective examination items are found to be biased in favour of males while the females encounter more difficulties with examination items especially those involving mathematical, spatial or high-thinking abilities. In addition, it was detected that high or average examination

scores by certain groups is either due to actual ability differences or bias in examination items or a combination of both (Lee, 1999).

Main goal of measurement and assessment in education is to make right and appropriate decisions for individuals. Since assessment is used to make some predictions about individuals, it is expedient that test should be valid and reliable and do so over time. Determining differential item functioning is a way of strengthening examination validity and reliability.

Item biasness refers to an item that functions differentially among students in different groups with identical abilities. That is, it is found to be exceptionally difficult or easy for members of a particular group. Henceforth, these items will be referred to as DIF items(Levi-Keren, 2016).According to Ojerinde, Popoola, Ojo & Onyeneho (2012), differential item functioning (DIF) is a condition when an item functions differently for respondents from one group to another. In other words, respondents with similar levels on a latent trait(ability/skill) but who belong to different populations, have a different probability of responding to an item. If, for example, in a mathematics examination, boys display higher probability of answering correctly more often than girls of equal ability level because the contents in the examination items are biased against girls, then the items are said to exhibit DIF and should be considered for modification or removal from the test. The DIF analysis is an essential effort in promoting the validity and fairness of the examination. Establishing DIF status of an item has been established to be very crucial in the process of ascertaining validity and reliability of standardized examination items. Differential item functioning can therefore be understood as a conditional dependence between an item response and group examination-taker belongs which depends on variable of concern given that there is same latent ability.

An item cannot be said to show item biasness if individuals from different groups have a different probability to give a specific response; it shows item biasness can only be determined if individuals from different groups with equivalent ability have a unique chance of selecting a specific option (Camilli & Shepard, 1994).

Differential Item Functioning (DIF) is otherwise referred to as examination bias and unfairness. According to Adebule (2009), examination bias is realised due to certain decision, depending, to some extent, on if scores resulting from an examination is unfair or display incongruent effect on a particular group than the other. Gregory, (2006) opined that an examination can be described to be biased if the features of the estimation, the process involved in measurement or the inferences from the results of measurement cause inaccurate generalization concerning the psychomotor, cognitive and other affective aspect of a person or a set of examinees. There is absence of measurement bias in tests if the connection between latent trait and the observed scores which is being measured by the examination are similar across different groups (Stark, et al., 2001). Main differences that could be observed is due to differences among the sub-groups in the construct being measured. Stark et al (2001) asserted that differential item functioning is proven through violations of measurement equivalence. Lee (1999) presents that to examine bias at the level of item, large-scale assessment developers traditionally examine functioning of the items. Differential item functioning is a method of detecting systematic achievement disparities between persons with similar hidden genuine ability from different sub-groups (Camilli & Shepard, 1994; Raju & Ellis, 2002).

Investigating DIF is important, especially in the case of unified terminal examination for primary pupils to ensure cohesion and integration of education curriculum in the Universal Basic Education (UBE). Focus of most statistical procedures for determining DIF is increased validity and reliability of the examinations. In this regard, it seems crucial that studies on DIF should be carried out for the unified terminal exams that have a huge impact on the future of primary school children.

Mathematics plays a vital role in promoting science and technology across the globe and specifically in Nigeria and it is one of the means through which learners and schools are assessed. Even though multiple-choice examination is used as a common form of assessment for measuring pupils' achievement in mathematics in Lagos State Universal Basic Education Board, no evidence exists that the examination items used for the unified exam satisfy the psychometric property of fairness between different groups of examinees. In view of this, the study tends to examine whether Differential Item Functioning (DIF) exists in Terminal Unified Mathematics Examination for primary schools in Lagos State.

Purpose of the Study
Focus point of the study was to examine the occurrence of item biasness in Terminal Unified Mathematics Examination for primary schools in Lagos State. Specifically, the study seeks to determine:
1.   Comparability level of the examinees in the various groups in Lagos State Terminal Unified Mathematics Examination for primary schools.
2.   The occurrence of DIF in Lagos State Terminal Unified Mathematics Examination for primary schools based on Gender, Age and Location of the pupils.

Research Questions
Based on the problem stated above, the study sought to provide answers to the research questions below.
   a.   Will the examinees in the different groups be of similar levels of ability?
   b.   Does DIF exist in Lagos State Terminal Unified Mathematics Examination for primary schools based on Gender, Age and Location of the pupils?

Methodology
Ex-post facto descriptive design was adopted for this study because existing variables were examined in the study. The variables investigated were gender (male and female), age (11 years & below and above 11 years) and location (Lagos city and Lagos less city).
Secondary data was used for this study which comprises scores of primary 5 Mathematics 2nd

Term Unified Examination of Lagos State Universal Basic Examination Board (LSUBEB), March 2018. Existing data for two Local Government Education Authorities each from two different geographical locations of Lagos State which comprised Lagos Less City and Lagos City was retrieved from the examining body. This makes a total of four Local Government Education Authorities for the study.

A simple random sampling was then used to select data from five primary schools from the data retrieved from four selected Local Government Education Authorities. The examination by Primary 5 pupils were used in each of the randomly-selected primary schools to make a total of 640 samples for the study.

The data was retrieved through photocopying of Optical Mark Reader (OMR) sheets for answering the examination. The Lagos State Terminal Unified Mathematics Examination contained 40 multiple choice items. Validation and standardization of the items were already carried out by the examination unit of LSUBEB with established reliability estimate of 0.91. Therefore, the instrument is very good based on instructional objectives and curriculum contents.

STATA package and Excel facility provided by the Microsoft office package was used for analysis purpose. Descriptive statistics was employed to show means and standard deviations of scores for the different groups of examinees in order to indicate whether the examinees are of comparable ability levels and Mantel-Haenszel method was used to check status of DIF in the items and items with 0.05 level of significant was adjudged to have DIF in Terminal Unified Mathematics Examination for primary schools in Lagos State.

Results
Research question one: Are the examinees in the different groups of similar levels of ability?

Table 1: Score distribution of Lagos State Summative Unified Mathematics Examination

Scores	Gender		Age		Location		Total
	M	F	11 years and below	Greater than 11 years	Lagos Less City	Lagos City	
0-19	104	136	180	60	108	132	240
20–30	92	96	116	72	36	152	188
31- 40	80	132	152	60	156	56	212
Total	276	364	448	192	300	340	640
Mean	23.0	24.38	23.60	24.23	25.43	22.34	23.79
StD.	8.94	9.38	9.22	9.20	10.83	7.20	9.21
p-value	0.059		0.427		<0.001		

Table 1 shows closeness in the mean scores of examinees based on gender (t = -1.88, p = 0.059) and age group (t = -0.794, p = 0.427), however, there is a larger gap between the mean scores based on location (t = 4.288, p < 0.001). This indicates that the examinees are of similar ability levels when considering gender and age group but not on location. Hence, differential item functioning can only be performed based on gender and age group and not on location since the ability level is not similar.

Research question 2: Does DIF exist in Terminal Unified Mathematics Examination for primary schools in Lagos State?

Table 2. Chi-square Method for Detecting DIF in Terminal Unified Mathematics Examination for primary schools in Lagos State

	Gender		Age	
Item	**Chi^2**	**Prob.**	**Chi^2**	**Prob.**
1	0.01	0.9311	2.08	0.1496
2	0.19	0.6621	4.17*	0.041
3	8.52*	0.0035	14.40*	0.0001
4	14.65*	0.0001	0.58	0.4466
5	5.37*	0.0205	17.87*	0.00
6	0	0.9481	1.82	0.1775
7	4.02*	0.0451	11.68*	0.0006
8	1.38	0.2406	0.62	0.4326
9	10.08*	0.0015	1.71	0.1912
10	1.83	0.1759	1.09	0.2974
11	26.62*	0.00	20.20*	0.00
12	0.53	0.4655	4.46*	0.0347
13	0	0.9702	5.48*	0.0193
14	13.11*	0.0003	0.01	0.9216
15	3.88*	0.0488	0.01	0.9167
16	0.3	0.5823	10.06*	0.0015
17	2.34	0.1264	0.04	0.834
18	6.34*	0.0118	7.98*	0.0047
19	1.19	0.2751	1.17	0.28
20	8.48*	0.0036	4.31*	0.0379
21	1.3	0.255	4.86*	0.0275
22	0.01	0.9116	1.50	0.2206
23	8.28*	0.004	4.70*	0.0301
24	0.07	0.797	0.00	0.957
25	0.64	0.4224	6.87*	0.0088
26	20.56*	0.00	1.78	0.1827
27	3.52	0.0605	2.40	0.1211
28	0.37	0.5429	4.95*	0.0261
29	3.3	0.0694	0.20	0.6522
30	3.57	0.059	0.04	0.8446
31	18.29*	0.00	33.31*	0.00
32	3.44	0.0636	16.79*	0.00
33	5.71*	0.0169	11.14*	0.0008
34	1.58	0.2089	3.13	0.077
35	0.25	0.62	0.22	0.6388
36	0.13	0.7186	1.40	0.2367
37	1.55	0.2136	0.64	0.4227
38	1.03	0.3101	0.40	0.528
39	5.52*	0.0188	2.66	0.1031
40	9.22*	0.0024	0.00	0.9508

* DIF items (p≤0.05)

Table 2 shows items analysis to detect items with DIF. For item to flag DIF, the Mantel-Haenszel chi-square coefficient significant value must be less than 0.05. When this is applied to Unified Mathematics Multiple-Choice Examination items, the coefficient significant value less than 0.05 flagged under gender were items 3, 4, 5, 7, 9, 11, 14, 15, 18, 20, 23, 26, 31, 33, 39 and 40 while for age items identified to have DIF are 2, 3, 5, 7, 11, 12, 13, 16, 18, 20, 21, 23, 25, 28, 31, 32, and 33 representing 40% and 42.5% respectively of the 40 items displaying DIF.

Conclusion can therefore be made that the Lagos State Terminal Unified Mathematics Examination for primary schools exhibited about average DIF items and the overall fairness should be improved to ensure the results from the items truly shows the knowledge of the examinees without bias based on any criterion used.

Discussion

Unified Terminal Examination is a long-time policy of State Universal Basic Education Board (SUBEB). It is an examination that enables cohesion and integration of education curriculum. It is designed to provide equal level ground of assessment for all learners and to achieve a better academic outcome in placement examination both internally and externally. This grand idea is aimed and directed towards evaluating students' achievement by means of valid and reliable examination items. Meanwhile, items biasness will deny the students opportunity for demonstrating skills, knowledge and attitudes acquired in the teaching and learning process make them have lower score than their actual ability.

It is found through the study that items administered during the Unified Terminal examination in Lagos State especially as it relates with this study to be biased based on gender and age. The result is in resonance with the study of Adebule (2013) who established that the examinees in different groups (gender and age) are of equal levels of ability. The examinees, regardless of their numbers in each sub-group, their scores intervals are similar across different groups which indicate equal levels of ability.

The results displayed 14 items under gender and 17 items under age representing 40% and 42.5% respectively of the 40 items displaying DIF which shows absence of fairness of the examination based on gender which is more of female and age of the pupils which are those below 13 years. Thus, it could be confirmed that Unified Terminal Mathematics Examination in Lagos State is not free from differentially functioning items for the period considered in this study. Hence, the result agrees with Braimah (2011) who reported biased items in the 2005 to 2007 Unified Mathematics Examination of Edo state.

Given the high proportion of items differential functioning in the examination, there is going to be a certain disparity in the final scores obtained by the pupils which will influence their final placement and opportunities and therefore their trajectory in their educational endeavours. The pupils might get discouraged in themselves for their score in the subject and accept their low ability in Mathematics as suggested by scores from the examination.

Conclusions

It can therefore be said that Unified Terminal Mathematics Examination of Lagos State is not free from differentially functioning items and the examination function differentially between the examinees based on sub-groups of gender and age which lead to bias and report of results that are not true representative of the student's ability.

Recommendations

Since examination is used to establish learners' success, it is important that such assessment tool be valid, reliable and free of item bias. Determining differential item functioning is a way of strengthening examination validity, reliability and fairness of the items. Meanwhile, examination test fairness can be checked, it must first be ascertained that the examinees have equivalent ability level. Therefore, examination practitioners in the examination bodies, ministry of education and people concerned with

examination development should endeavour to ascertain items are calibrated appropriately and carry out DIF analysis from a pilot study before administration of examination so that items that exhibit differential functioning for different groups of examination takers can be identified for possible corrections and/or a replacement.

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Modelling Physical Chemistry Achievement using Concept Difficulty, Numerical Ability and Interest

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Abstract

Physical Chemistry concept is a major area students find difficult. The study adopted correlational design. Twenty Public Senior Secondary schools from four local government areas in Education District III of Lagos State were randomly selected with five hundred and seven students (507) samples. Physical Chemistry concept difficulty scale (r = 0.76), student Chemistry interest questionnaire (r = -0.87), Numerical ability test (r = 0.79) and Physical Chemistry Achievement Test (r = 0.83) were used. They were validated using face and content validity, while Ordinal alpha, and Kr-20 were used for reliability. Frequency, Percentage, PPMC and multiple regression at p < 0.05 was used. The results revealed that 61% of the students find the physical concepts difficult. Results also showed a low positive relationship between concept difficulty and achievement in Physical Chemistry and no significant relationship between numerical ability and students. There is a relative significant contribution of concept difficulty (b = 0.108, t (506)= 2.423, p < 0.05) on Physical Chemistry achievement while students' numerical ability (b = 0.023, t (506)= 0.508, p > 0.05)and students' interest (b = - 0.029, t (506)= -0.649, p > 0.05) are not significant in the study. It could be concluded that concept difficulty is a potent predictor of students' Physical Chemistry achievement. Therefore, Chemistry teachers should improve in their method of teaching concept difficult topics in Chemistry.

Keywords: Chemistry, Physical Chemistry, Concept difficulty, Chemistry interest, Chemistry interest and Modelling

Introduction

Chemistry is a required subject in the senior secondary school. It contributes significantly to the advancement and growth of science and technology. Many activities in our daily lives involve chemistry, its application and role in the world cannot be overemphasized. Chemistry plays important role in unifying other science related subjects as a science subject itself. It is taught in secondary schools to prepare students for science-related courses at the university level. Such a course needs to be handled well at the secondary school level to generate a high level of interest from students.

Physical chemistry is a branch of chemistry that focuses on how matter behaves at the molecular and atomic levels and how chemical reactions occur, which results in the development of new theories, such as how complex structures are formed. Physical chemistry is regarded as a challenging subject to teach and learn at both the secondary and tertiary levels. Major learning difficulties could be caused by learners'

perceptions of chemical phenomena and concepts, which appear abstract and difficult to understand, as well as their relationship to everyday life. As a result, misunderstandings occur when students attempt to understand chemical explanations within the context of the instruction provided but are unable to interact with this concept due to difficulty encountered. It could be due to their lack of fundamental scientific knowledge or scientific concepts. If there is no conceptual understanding of concepts and topics, chemistry may not be appealing and this may affect the learner's level of interest and curiosity (Uchegbu, & Anozieh 2015).

Scientific concepts especially chemical concepts requires understanding of chemical phenomena at three interlinked levels namely macroscopic (phenomena that we can see, feel, and hear), symbolic (chemical formulas and equations), and sub-microscopic (individual atoms and molecules), and the relation among the three. However, most of the times, teachers

focus only on one level, usually at the macroscopic and representation parts, microscopic parts are sometimes of forgotten and most explored. This causes students to often have difficulty in understanding and visualizing microscopic concepts such as atom, molecules, or chemical reaction.

Physical chemistry difficulty can be traced back to the nature of science itself, the method by which the subject has been taught and the method by which students learn. Thus, teachers' acquisition of appropriate scientific and technological skills, as well as their ability to impart knowledge to students, will aid in improving performance. Students must actively participate in the learning process by constantly equipping, testing, speculating and building their construct and knowledge. They perceive the subject as abstract if they are not taught or carried along in the teaching. According to the five pillars of effective learning, learning should be active, gender-sensitive, consistent, meaningful, and productive (FME & UNESCO 2007). Thus, for effective learning to occur, the learner must be active in the classroom, both males and females must be carried along equally, the learning must be consistent with the curriculum and the societal goals, the concepts learned must relate to the needs of everyday life and the society and the learners must be able to produce items and products required by the society as needed (Uchegbu, Anozieh, Mbadiugha, Ibe, Njoku 2015)

The study of chemistry at all educational levels necessitates knowledge, a logical thought process and numerical ability. Mathematics is a necessary and integral part of all scientific disciplines. Mathematics, Physics and Chemistry are essential science subjects at the senior secondary school level in Nigeria and serves as the bedrock of many subjects in the secondary school curriculum especially those that are science related. In this scientific age, having a basic understanding of mathematics and numeracy allows students to understand and solve some important chemistry problems in terms of concepts and principles. For example, knowledge gained from learning concepts such as fractions, ratios and proportions, percentages,

the function of integration and differentiation in mathematics could be used to solve numerical problems in chemistry such as solution mixing and dilutions, mole concept, stoichiometry reactions, acid-base reactions and gas laws. Furthermore, the understanding of indices and logarithms in mathematics could be applied to the understanding of the pH scale and rate of reactions in Chemistry. Many researchers and chemistry educators believe that mathematics is one of the issues impeding students' progress in chemistry (Offiah & Samuel, 2008; Akpan & Okoro, 2012; Oyedeji, 2011; Awodun & Ojo, 2013; Allan & Rory, 2014). This demonstrates that learning chemistry necessitates several mathematical concepts and principles for easy comprehension and understanding.

A students' success in any activity is determined by the amount of required information that he has on the activity, his interpretation of it, and, most importantly, the application of his entire knowledge on it. In most cases, acquiring such information is dependent on reading and learning. However, the desire to learn may be influenced, to some extent, by the person's interest in the activity. It is up to the individual to determine why he wishes to study materials on activity and participate in the activity. What one learns may be determined by the degree to which one succeeds in achieving that goal or aim. According to Isangedighi, 1997, there is a strong correlation between high school student's interest in learning, study habits, and academic achievement. He also mentioned that the length of time a child actively engages in learning influences his or her level of learning. Time used for study improves the retention level of materials learnt by the students, which may eventually improve their performance outcomes during tests or examinations. A person does not naturally devote much time to studying materials that do not pique his or her interest and attention. When analyzing students' academic achievement in science, interest and attitudes are two complementary terms that should not be separated. Students' lack of interest may have resulted in a negative attitude and, as a result, continued poor performance. There is a need to establish an empirical position, which has necessitated this study to determine empirically

if there is a relationship between chemistry students' interest and numerical ability and their achievement in the subject. Students' interest is important for high level of achievement in that subject, and it is related to attitude. (Olaboopo, 1999; Odiaka, 2002; Ogunnaike, 2002).

According to Ayanniyi, (2009) learners' interest in the learning process determines the importance students place on the learning process and what they will gain from the learning situation. Following the preceding, it is expected that learners' motivation (interest) in reading a given chemistry text and engaging in learning activities is influenced by their feelings and dispositions toward such activities. This will undoubtedly affect their cognitive development and learning outcomes in Chemistry. In a science subject like chemistry, where students must perform some numeracy skills and calculations, students' phobia for mathematics-related subjects may be a contributing factor to their perception that the chemistry subject is difficult. They now show little or no interest in the subject, which leads to poor achievement performance.

Aina & Adedo (2013) mentioned one of the causes of low science enrollment to be insufficient trained science personnel in post-primary schools. It is important to mention that schools also lack sufficient instructional resources for teaching, as well as textbooks, which are written in incomprehensive language for students. It is also discovered that chemistry seems to be difficult to understand and problem-solving that requires calculation was a challenge. Teaching that motivates students and piques their interest in learning should make sense to them. Concepts should be presented with appropriate instructional materials to ensure effective learning of the students with step-by-step delivery of contents. When students are unable to connect what they are learning with real-world experiences, they lose interest in the subject, which manifests itself in poor academic performance. When students' interest is boosted, learning becomes a breeze (Aina and Adedo, 2013; Hermitt 2007). Benjamin's (2014) research findings revealed a significant impact on the use of performance

evaluation as a teaching strategy in the science classroom. This increases students' interest in class and improves their academic performance. The recent rise in average student performance in examinations administered by the Senior Secondary Certificate Examination (SSCE) and the National Examination Council (NECO) raises concerns. Poor chemistry performance reveals that students found it difficult to learn and master the subject. As a result, they were unable to perform well in their examination. Many studies have revealed that it is due to a lack of sufficient qualified teachers, teaching materials, motivation, laboratory equipment, etc.

In addition, difficulties experienced by even some chemistry teachers in the delivery of the subject content can lead to the inability of the students to understand chemistry concepts. Teachers face difficulties in teaching chemistry when they lack conceptual understanding of the subject chemistry. Technology can make teaching easier to teach chemistry by using multiple representations such as pictures, drawing, using simulation, videos and audio. Chemistry teachers are currently faced with the challenge of presenting material to students who frequently arrive with negative preconceived notions of the subject being "difficult" or "complicated." Some believe that the subject's abstract nature contributes to the difficult issues. The inability of teachers to use concrete materials and facilities, as well as real-life situations, to teach students makes it less interesting for the students. A lack of understanding of the languages or words used to convey teaching in the subject, as well as a lack of understanding of technical terms, suggests that there is a link between the perception of chemical science as a difficult subject and a lack of student motivation to pursue careers in the fields.

Irrespective of importance of the chemistry's basic knowledge, large proportion of students leave introductory topics without having deep understanding of the subject that is required which has been attributed to complexity of some of the contents in the subject. Some students dislike the subject because of the chemistry

teachers' inability to comprehend and internalize concepts and skills. One of the main challenges that make the subject appear abstract and difficult is students' lack of access to and exposure to practical activities. Students will struggle to integrate what they learn in the classroom and laboratory. According to some researchers, the abstract nature of many chemical concepts, teaching styles used in class, a lack of sufficient teaching aids and the difficulty of the chemistry language are all factors contributing to students' poor understanding and misunderstandings, from primary school to the university. With all of the lingering issues concerning chemistry's difficult and abstract concepts, we should examine some concepts and topics in physical chemistry that appear difficult for the students and compare them to their achievement in physical chemistry.

Methods

The study adopted a non-experimental type of research of a correlational design. Population of the study includes all senior secondary school 2 students of District 3, Lagos State. Five public schools were selected randomly from all the four local governments in district three. The study adopts multi-stage sampling procedures. Lagos State Educational district 3 was stratified into four local governments (Eti-Osa, Epe, Ibeju-Lekki, Lagos Island,). All four local governments were used. In the first stage, simple random sampling was used to select 5 senior secondary schools from each local government. In the second stage, random sampling was also used to select a participant from chemistry intact classes from the five secondary schools from each local government. All the five senior secondary schools two were selected purposively due to their intact classes. A total number of 20 public senior secondary schools were used.

Four instruments were used for data collection activities in the study. Physical chemistry achievement test (PCAT) ($r = 0.83$). Physical Chemistry concept difficulty scale (PCCD, $r = 0.76$), Student Chemistry interest questionnaire (SCIQ, $r = -0.87$) Numerical ability test (NAT, $r = 0.79$),

All instruments were validated by seeking the opinion of experts and the reliability of the items was established using the Kr-20 formula

The quantitative method was used for data analysis. SPSS software was used for the analysis, the researcher made use of descriptive statistics, correlation, and multiple regression to answer the research question at 0.05 significant level. Percentage and frequency were used to answer research question one, Correlation was used to answer research question two. While multiple regression was used to answer research questions three and four. at 0.05 of significant.

RESEARCH QUESTIONS

1. What is the extent to which students find physical chemistry concepts difficult?
2. What is the strength and direction of the relationship among Concept Difficulty, Students' Numerical Ability, Students' Interest and Achievement in Physical Chemistry?
3. What is the composite contribution of Concept Difficulty, Students' Numerical Ability, Students' Interest and Achievement in Physical Chemistry?
4. What is the relative contribution of Concept Difficulty, Students' Numerical Ability, Students' Interest and Achievement in Physical Chemistry?

ANALYSIS
Research Question One
What is the extent to which students find physical chemistry concepts difficult?
Table 1: Descriptive analysis of Concept Difficulty Level

S/N	CONTENTS/INDICATORS	RATING					
		VE	E	SD	D	TD	ED
		Freq (%)	Freq (%)	Freq (%)	Freq (%)	Freq (%)	Freq (%)
1.	What are the chemical formulae? I. Calcium Trioxocarbonate (iv)? II .Iron(ii) Tetraoxosulphate (iv) is?	272 (53.6%)	18 (16.0%)	67 (13.3%)	52 (10.3%)	17 (3.4%)	18 (3.5%)
2.	Calculate is the percentage of water of crystallization in $ZnSO_4. 7H_2O$?.	113 (22.3%)	30 (5.9%)	38 (7.5%)	92 (18.1%)	74 (14.6%)	160 (31.6%)
3	Given that $^{14}_{6}X$ and $^{38}_{19}Y$. Write out the mass number, Number of protons, and neutron.	151 (29.8%)	11 (2.2%)	39 (7.7%)	38 (7.5%)	135 (26.6%)	133 (26.2%)
4	Consider the following reaction $A_2 + 3B \rightleftharpoons 2AB$ Write an expression for the equilibrium constant for the reaction	54 (10.7%)	5 (1.0%)	10 (2.0%)	96 (18.9%)	103 (20.3%)	239 (47.1%)
5.	Determine the oxidation number of phosphorous in HPO_3^{2-}?	119 (23.5%)	17 (3.4%)	37 (7.3%)	68 (13.4%)	110 (21.7%)	156 (30.8%)
6.	The equilibrium constant at 427 °C for the reaction: $N_2(g) + 3H_2(g)$? $2NH_3(g)$ is $K_p = 9.4 x 10^5$. Calculate the value of? G° for the reaction at 427°.	20 (3.9%)	1 (2.0%)	7 (1.4%)	36 (7.1%)	110 (21.9%)	333 (65.7%)
7.	Determine the values of x, y, and z in the following equation $xKClO3(aq)$? $yKCl(aq) + zO_2(g)$	193 (36.1%)	9 (1.8%)	16 (3.2%)	34 (6.7%)	92 (18.1%)	193 (32.1%)
8.	Calculate the amount of sodium chloride in 20.0g of the pure salt (Na = 23, Cl = 35.5)	74 (14.6%)	12 (2.4%)	23 (4.5%)	89 (17.6%)	126 (24.9%)	183 (36.1%)
9.	What is the pH of $0.01moldm^{-3}$ of HNO_3?	34 (6.7%)	0.2 (.9%)	14 (2.8%)	40 (7.9%)	120 (23.7%)	298 (58.8%)
10.	If 2g of zinc granules react with excess dilute HCL in 5minute, what will be the rate of reaction?	29 (5.7%)	1 (0.2%)	8 (1.6%)	26 (5.1%)	96 (18.9%)	347 (18.9%)
11.	Divalent metals such as copper will discharge how many coulombs of electricity?	39 (7.7%)	2 (0.4%)	8 (1.6%)	22 (4.3%)	70 (13.8%)	366 (72.2%)
12.	What quantity of electrons in moles is lost when one mole of iron (ii) ions is oxidized to iron (iii)?	20 (3.9%)	3 (0.6%)	15 (3.0%)	36 (7.1%)	73 (14.4%)	360 (71.0%)
13.	Write the equation for the reaction at the Anode when electrolysis of brine takes place.	13 (2.6%)	5 (1.0%)	16 (3.2%)	59 (11.6%)	77 (15.2%)	96 (18.9%)
14.	What is the quantity of electricity used during electrolysis when a current of 0.21a flows for 2hours?	70 (13.8%)	5 (1.0%)	13 (2.6%)	40 (7.9%)	57 (11.2%)	322 (63.5%)
15.	Balance the ionic reaction $MnO_4^- + H^+ \longrightarrow Mn^{2+} + 4H_2O$	99 (19.5%)	7 (1.4%)	21 (4.1%)	53 (10.5%)	75 (14.8%)	252 (49.7%)
16.	Write the electronic configuration of Mg^{2+}	33 (6.5%)	72 (14.2%)	120 (23.7%)	100 (19.7%)	57 (11.2%)	125 (24.7%)
17.	The heat of combustion of carbon is -393.5kj. calculate the heat of change, when 60g of carbon undergoes complete combustion (c =12)	18 (3.6%)	12 (2.4%)	6 (1.2%)	121 (23.9%)	49 (9.7%)	301 (59.4%)
18.	Calculate the concentration of the solution obtained when $500cm^3$ of $0.10moldm^3$ solution was evaporated to $125cm^3$	35 (6.9%)	4 (0.8%)	42 (8.3%)	45 (8.9%)	47 (9.8%)	334 (65.9%)
19.	$\Delta G = \Delta H - T\Delta S$. State what each letter represents?	42 (8.3%)	15 (3.0%)	45 (8.9%)	74 (14.8%)	78 (15.8%)	253 (49.9%)
20.	What does each symbol represent in the equation? $Zn_s/Zn2^+_{aq}// Cu^{2+}_{aq})/ Cu$.	17 (3.4%)	8 (1.6%)	34 (6.7%)	82 (16.8%)	70 (13.8%)	296 (58.4%)

The results from Table 4.1 show the extent to which the students find physical Chemistry concepts difficult.

Stoichiometry concepts show about 53.6% have no difficulty in writing simple chemical formulae of the compound, 46.6% have difficulty in writing the correct formulae. Also 11. 3% have no difficulty in calculating the percentage of an element in a compound, .71.8% have difficulty in either calculating the relative molecular mass or in calculating the percentage composition required. 14.6% have a good mastery of dilution formulae and use them well. 85.5% have difficulty in recalling the formulae and using the formulae properly.

Quantum Chemistry Concepts, 29.8% of the respondent possess a good mastery of mass numbers, atomic numbers, 72.2.3% of the respondents have a problem in differentiating mass numbers from atomic numbers, proton numbers from neutron numbers. 23.5% of the respondents could write the correct valency of the element given, 10.7% of the respondents could collect like terms properly, while 65.9% of the respondent do not know the valency of hydrogen and oxygen and could not rightly slot the oxidation number of those elements. About 6.5% of the respondents have no difficulty in giving the correct electronic configuration, 93.1% of the respondents have challenges and could not write correct electronic configuration or do not know the right configuration of the element.

In the chemical equilibrium concept, about 10.5% of the respondents have no difficulty in giving the correct expression for the equilibrium constant, while 89.3% have a load of difficulty in giving the expression or could not retain the method for writing the expression. Also, 3.9% of the respondents have no difficulty in equilibrium constant calculation, while 89% find the concept difficult, they cannot remember the formulae nor give the right answer. About 6.7% of the respondents write the correct formula for pH and were able to calculate the pH of the acid, while 93.4% could not write correct formulae and were not able to calculate the pH value.

For concepts involving chemical kinetics, 5.7% of the respondents have no difficulty in calculating the rate of reaction, 94.1% do not comprehend the concept of rate of reaction and have several difficulties. 38.1% of the respondents could balance well the equation with the appropriate number of moles, with no difficulty. 63.4% of the respondents have difficulty balancing the equation. Also, 3.9% of the respondents know when an element is oxidized or not and have difficulty, 96.1% have trouble difficulty in the concept. 19.5% could balance the ionic equation properly, .80.5.0% find the concept difficult.

Thermochemistry concepts show 7.7% of the respondents have no difficulties with the first law of electrolysis, 92.3% have difficulties. 93.3% find the concept difficult. 13.8% of the respondents have no difficulties with the first law of electrolysis, 82.6% have concept difficulty in the topic. 3.4% of the respondents could identify the symbols of the part of electrolysis properly, while 88% could not identify the parameters and difficulty for them.

For thermodynamics, 3.6% of the respondents have a good understanding of the concept, 3.6% of the respondents have also found the concept difficult a little, 87.0% do not understand the concepts very well.

Research Question Two: What is the strength and direction of relationship among Concept Difficulty, Students' Numerical Ability, Students' Interest and Achievement in Chemistry Physical?
Table 4.1b: Correlation Matrix of Concept Difficulty, Students' Numerical Ability, Students' Interest and Achievement in Physical Chemistry

Variables	C.D	SNUAB	Students' Interest	Achievement in Physical Chemistry
Concept Difficulty	1			
Students' Numerical Ability	0.008	1		
Students' Interest	-0.136**	0.065	1	
Achievement in Physical Chemistry	0.112*	0.022	-0.042	1

*Significant at p< .05 level C.D = *Concept Difficulty, SNUAB = Students' Numerical Ability*

From the result above, a significant level was observed at $p<0.05$. The table above shows the intercorrelation matrix showing the correlation coefficients of the independent variables. There was no significance between numerical ability and achievement in physical chemistry ($r = 0.022$, $p =0.629$, $p > 0.05$), It was also found that there was no significant relationship between students' interest and achievement in physical chemistry, ($r = -0.042$, $p = 0.342$, $p > 0.05$). Concept difficulty and achievement in physical chemistry show a significant relationship, ($r = 0.112$, $p < 0.05$) Concept Difficulty, Students' Numerical Ability, Students' Interest, and the criterion variable (Achievement in Physical Chemistry) reveal a small significant relationship between the three independent variables. Hence, it can be concluded that concept difficulty determines students' achievement in Physical chemistry.

Research Question Three: What is the composite contribution of Concept Difficulty, Students' Numerical Ability, Students' Interest and Achievement in Physical Chemistry?

Table 4.1c: Regression Summary and ANOVA of Concept Difficulty, Students' Numerical

Multiple R = 0.118
R Square = 0.014
Adjusted R Square = 0.008
Standard Error = 2.529

Analysis of Variance					
Source of Variance	**Sum of Square**	**Df**	**Mean Square**	**F**	**Sig.**
Regression	45.340	3	15.113	2.362	.071
Residual	3218.376	503	6.398		
Total	3263.716	506			

Ability, Students' Interest and Achievement in Physical Chemistry

Significant at p< .05 level

Table 4.1c shows that the multiple regression correlation coefficients indicating the relationship between the predictor variables (concept difficulty, students' numerical ability and students' interest) and Achievement in Physical Chemistry indicators are 0.118. The adjusted R squared is 0.008. This means that the predictor variables accounted for 0.8% achievement of students in Chemistry. Also, it has been further ascertained using multiple regression ANOVA, $F_{(3,506)}= 2.362$; $p>0.05$. This indicated that there is no significant linear relationship between the predictor variables and Achievement in Physical Chemistry indicators.

Research Question Four: What is the relative contribution of Concept Difficulty, Students' Numerical Ability, Students' Interest and Achievement in Physical Chemistry?

Table 4.1d: Relative contribution of Concept Difficulty, Students' Numerical Ability, Students' Interest and Achievement in Physical Chemistry

Variables	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	**Std. Error**	**Beta**		
(Constant)	8.235	1.215		6.776	0.000
Concept Difficulty	0.026	0.011	0.108	2.423	0.016
Students' Numerical Ability	0.025	0.049	0.023	0.508	0.611
Students' Interest	-0.011	0.018	-0.029	-0.649	0.517

Table 4.1d shows that among the predictor variables, only concept difficulty (b=0.108, $t(506)$=2.423, $p<0.05$) was found to have a significant relative contribution towards students' achievement in Physical chemistry. However, students' numerical ability (b=0.023, $t(506)$=0.508, $p>0.05$) and students' interest (b=-0.029, $t(506)$=-0.649, $p>0.05$) did not contribute significantly to the prediction of students' achievement in physical chemistry. Hence, it can be concluded that concept difficulty is the only potent predictor of students' achievement in Physical chemistry.

Discussion

The findings in this study show the general trend of senior secondary school concept difficulty in physical chemistry. Results indicate the generality of secondary school students has difficulty in physical chemistry concepts. Concepts like thermodynamics, electrochemistry, chemical equilibrium, findings from this study revealed 61 % of the students have concept difficulty in physical chemistry concepts. This result of this research revealed that there was a significant relationship between concept difficulty and students' physical achievement in chemistry. It was revealed that the majority of the students do not have in-depth knowledge of symbols, notation and formulas in concepts such as electrolysis. The results of the finding show that there was no significant relationship between numerical ability and achievement of students in Physical Chemistry. The results show there is no significant relationship between students' interest and achievement in physical chemistry of this study support the assertion of some authors and researchers.

Cecilia Obi Nja et al (2019) in their study reported there is a significant relationship between academic achievement and the interest of students in chemistry. It revealed a level of dependence of student's achievement in Chemistry on students' interest in Chemistry. Hence, for students to do well in Chemistry, it is important that such students have high level of interest in it given that there are difficult topics that only a student who has developed interest can be determined to learn them.

Conclusion and Recommendation

From the findings of this study, it is concluded that Concept difficulty, Numerical ability, Student's interest is not statistically and significantly related to students' achievement in Physical chemistry. Among the predictor variables, only Concept difficulty shows a significant relationship to physical chemistry achievement. It shows that if they have a good mastery of Physical Chemistry Concepts, they will perform high in their Physical Chemistry Achievement.

Also, students should be encouraged to develop good study habit. Students should work more on their numerical and mathematical skills because it's key to proficiency in science subjects. There should be re-orientation of student's interest and idea to the science subject. Chemistry teachers should improve in their method of teaching difficult concepts in chemistry. They should use real-life examples plus technology-driven computer simulation concepts that could enhance easy understanding…Chemistry curriculum planners and textbook writers should make chemistry textbooks more interesting. There should be an easy method of identification of concepts; concepts should be explained based

on socio-cultural contexts. In addition, chemistry text vocabulary and terminology should be more precise and direct. Generally, students need to study hard in their studies to do well in their internal and external exams.

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The Influence of Child Feeding on the Occurrence of Under-nutrition among Children Between 0 and 2 Years in Ado-Ekiti, Ekiti State, Nigeria

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Abstract

The purpose of this research was to determine the influence of child feeding on the occurrence of under-nutrition among children between 0 and 2 years in Ado-Ekiti, Ekiti State. Descriptive research design was adopted. One hundred and eighty five children ≤2 years constituted the samples for this study. These were selected through purposive sampling technique from two government hospitals in Ado-Ekiti. Self-developed questionnaire was used for collecting data and analysis was carried out using frequency counts, percentages, and multiple linear regressions. All inferences were made at P<0.05. The most commonly consumed foods among children include: breast milk (Mean=3.91), infant formula (Mean=1.84), and ready-made instant cereal (Mean=1.83). The least commonly consumed food was solid foods (Mean=1.68). It was revealed that complementary foods were introduced into the diet of majority of the children after 6 months. Majority of the children, 66.5%, 78.4% and 51.9% had normal weight- for- height/length, normal weight- for -age and normal height- for- age respectively. Period of initiation of solid foods (beta=-.367, t = -3.273, P < 0.05) and period of initiation of cereals (beta=.309, t=2.637, P < 0.05) all had significant influence on weight- for- height/length of children. Period of initiation of solid foods (beta=.371, t= 3.27, P<0.05) and period of initiation of cereals (beta=-.332, t =-2.793, P<0.05) also had significant influence on height/length- for- age of children. Nutrition education for better children feeding is required among nursing mothers.

Keywords: Children, Child feeding, Complementary feeding, Under-nutrition

Introduction

Over the years, malnutrition has continued to contribute to the occurrence of morbidity and mortality among children in the developing countries. World Health Organisation (WHO), (2021) reported that in the developing countries, an appreciable percentage of death among children that are less than five years of age are associated with malnutrition. Also, millions of children in Nigeria suffer from severe malnutrition but only very few of the affected children have received treatment (WHO, 2021). Malnutrition is referred to as the deficiencies or excesses in nutrient intake or imbalance in a child's energy and/or nutrients or impaired nutrient utilization (WHO, 2022). One of the types of malnutrition that is common among children between 0 and two years is under-nutrition. This is a type of malnutrition where a child does not obtain enough nutrients in his or her daily diet and could occur either as wasting, stunting, under-weight, or micronutrient deficiencies (WHO, 2022). Any of the four forms of under-nutrition increases the severity and frequency of infections, delays the recovery from such infections and increases the risk of death among the children (United Nations Children's Emergency Fund (UNICEF, 2021).

Wasting (low weight-for-height), a form of under-nutrition, indicates recent, and severe weight loss as a result of inadequate quality and quantity of food and/or infection (WHO, 2022). It is referred to as acute malnutrition and defined as weight-for-height Z score that is below 2 standard deviation (SD) of the standard median score for children that are less than five years. According to WHO (2022), wasting, if not treated properly, puts children at a higher risk of mortality.

Stunting (low height-for-age), another form of under-nutrition, is defined as height-for-age z score that is below-2 SD of the standard median score for children less than five years. Stunting occurs when a child does not obtain adequate quantity and quality of food for a long time. This is associated with poor socio-economic status, frequent sickness, inappropriate feeding and

inadequate care (WHO, 2020). According to UNICEF (2022), the occurrence of stunting among children in Nigeria is high and this is a risk factor for childhood mortality, poor cognitive development, poor academic performance and low productivity in adulthood.

Underweight (low weight- for- age) is another form of under-nutrition. It is a combination of both acute and chronic under-nutrition and it is defined as weight-for- age z score that is less than -2 SD of the standard median score for children that are less than five years and can occur in addition to the other two forms of under-nutrition in a single child (WHO, 2022).

One way by which under-nutrition can be prevented among children is to ensure appropriate feeding practices. These include: Initiating breastfeeding within one hour after delivery, breastfeeding babies exclusively for the first 6 months of life (WHO, 2020), not introducing water, infant formula, tea, juices or semisolids to the baby's diet until after 6months (UNICEF, 2020). Other recommendations include initiating nutrient dense solid foods in the child's diet after 6months and breastfeeding the child frequently and on-demand till after two years of age (WHO, 2020). The above listed feeding practices furnishes the children with the necessary nutrients, boost children's immunity against childhood diseases and reduce their susceptibility to morbidity and mortality (Kalanda, Vehoeff, & Brabin 2006; WHO, 2008).

The childhood period is a very crucial one. It is a period of vulnerability due to immature immune system, at the same time, it is a period for laying the foundations for a healthy, lifelong growth and cognitive development, (UNICEF, 2022). The childhood period also provides the opportunity of preventing under-nutrition and its consequences among children (UNICEF, 2022). Hence all efforts must be made to ensure appropriate feeding of these children so as to lay a good foundation for a healthy growth.

Based on the submission of nutrition experts (Arimond & Ruel, 2004), that improper feeding practices have a direct link with the occurrence of infection and childhood under-nutrition, and the report of the UNICEF (2022), that feeding practices of children have not improved significantly in Nigeria, it is important to constantly assess the feeding practices adopted by the mothers of these children so as to determine any lapses in practices which may warrant nutrition-related intervention.

This study was, therefore, conducted to assess the child's feeding practices adopted by mothers having children between the age of 0 and 2 years in Ado-Ekiti, Ekiti State, Nigeria with the aim of determining how these feeding practices influence the occurrence of under-nutrition among the children.

Purpose of the Study
1. To determine the percentage occurrence of under-nutrition (in the form of wasting, underweight and stunting) among children.
2. To determine the percentage of children having good nutritional status
3. To investigate the commonly consumed foods among children
4. To find out the percentage of mothers that introduced complementary feeding after 6 months
5. To determine the child feeding frequency commonly adopted by nursing mothers.
6. To determine the influence of child feeding on the occurrence of under-nutrition using weight-for-height, weight-for-age and height-for-age measures of the children.

Research Questions
1. What is the percentage occurrence of wasting, underweight and stunting among children?
2. What is the percentage of children with good nutritional status?
3. What are the commonly consumed foods among children?
4. What percentage of mothers introduced complementary feeding after 6 months?
5. What is the child feeding frequency commonly adopted by nursing mothers?

Hypotheses

1. There is no significant influence of child feeding on the weight-for-height measurement of children between 0 and 2 years
2. There is no significant influence of child feeding on the weight-for-age measurement of children between 0 and 2 years
3. There is no significant influence of child feeding on the height-for-age measurement of children between 0 and 2 years

Methodology

Research design

Descriptive research design was adopted in this study.

Sample and sampling technique

One hundred and eighty five (185) nursing mothers having children between the ages of 0 and 2 years constituted the samples for this study. These were selected from two health facilities (one tertiary and one primary) in Ado-Ekiti Nigeria using purposive sampling technique. Prior to commencement of the study, ethical approval was sought from the Ethical Review Board of the Ekiti State University Teaching Hospital, Ado-Ekiti. However, only the nursing mothers who agreed to participate in the study constituted the sample for this study.

Data collection

The instrument for data collection was a self-developed questionnaire consisting of three sections. The first section of the questionnaire was used to obtain information on the weight, height/length and other demographic attributes of the respondents. Section B consists of 7 items having a 4-point rating scale of "Never, "sometimes", "often" "always", to assess the frequency of commonly adopted feeding practices among children. Section C of the instrument consists of 4 items to assess the period of initiation of complementary feeding. Section D of the instrument consists of 5 items having a 6-point rating scale of 'Never', 'Occasionally', 'once in a day',' two times a day', 'three times a day' and 'above three times in a day', to measure the child's feeding practices adopted by mothers of under five children. The feeding practices assessed in this study include: the period of initiation of complementary feeding and frequency of feeding the child with breast milk, home-made cereals (e.g. pap), artificial cereals (e.g. cerelac), solid foods and general feeding. The questionnaire was administered to the mothers by one research assistant and the nursing staff in the two selected health facilities. On-the-spot collection of instrument was adopted.

Statistical analysis

Data analysis was done using SPSS version 23.0 and WHO Anthro 3.2 software. Descriptive statistics of frequency counts and percentages were used to analyze the feeding practices and demographic attributes of the children. The anthropometric data of the children were analysed using the anthropometric calculator in the WHO Anthro 3.2 software. Based on the calculation, children were categorized as either wasted (having weight-for-height <-2SD), underweight (having weight-for-age <-2SD) or stunted (having height-for-age <-2SD). Multiple Linear Regression was used to determine the influence of child's feeding practices on the occurrence of under-nutrition among children. Statistical significance was set at $P < 0.05$.

Results

Table 1: Demographic Characteristics of Children (n=185)

Variable		Freq	%
Sex	Male	85	45.9
	Female	100	54.1
Age	< 1 month	16	8.6
1-6 months		90	48.7
>6months		79	42.7

Table 1 shows that majority (48.7%) of the children assessed in this study were between one and 6 months old

Research Question 1: What is the percentage occurrence of wasting, underweight and stunting among children 0-2 years?

Table 2: Percentage Occurrence of Wasting, Underweight and Stunting among Children 0-2 years (n=185)

Variable	Frequency	%
Wasting (weight-for-height <-2SD)	21	11.4
Underweight (weight-for-age <-2SD)	34	18.4
Stunting (height-for-age <-2SD)	66	35.7

The percentage occurrence of wasting, underweight and stunting as revealed in Table 2 is 11.4%, 18.4% and 35.7% respectively.
Research Question2: What percentage of children has good nutritional status?

Table 3: Classification of Children's Nutritional Status Based on the Combined Assessment of Weight for Height, Weight for Age and Height for Age (n=185)

Category	Freq	%	Category	Freq	%	Category	Freq	%
LWH,LWA,LHA	5	2.7	NWH,NWA,NHA	66	35.7	HWH,HWA,HHA	1	0.5
LWH,LWA,NHA	5	2.7	NWH,HWA,HHA	2	1.1	HWH,HWA,LHA	1	0.5
LWH,NWA,HHA	7	3.8	NWH,LWA,LHA	19	10.3	HWH,HWA,NHA	3	1.6
LWH,NWA,NHA	8	4.3	NWH,LWA,NHA	3	1.6	HWH,LWA,LHA	3	1.6
			NWH,NWA,HHA	12	6.5	HWH,NWA,LHA	21	11.4
			NWH,NWA,LHA	17	9.2	HWH,NWA,NHA	12	6.5

Note: LWH=low weight for height/length, LWA= low weight for age, LHA= low height/length for age, NWH=normal weight for height/length, NWA = normal weight for age, NHA= Normal Height/length for age HWH= high weight for height/length, HWA=high weight for age, HHA=high height/length for age

Table 3 shows that only 35.7% of the children assessed had good nutritional status based on the combined assessment of weight for height, weight for age, and height for age.
Research Question 3: What are the commonly consumed foods among children?

Table 4: Commonly Consumed Foods among Children (n=185)

S/N	How often do you feed your children with the following?	Never (%)	Sometimes (%)	Often (%)	Always (%)	Mean
1	Breast milk	-	7 (3.8)	3 (1.6)	175 (94.6)	3.91
2	Infant formula	119 (64.3)	11 (5.9)	21 (11.4)	34 (18.4)	1.84
3	Home- made cereals	122 (65.9)	20 (10.8)	12 (6.5)	31 (16.8)	1.74
4	Ready-made instant cereals	118 (63.8)	16 (8.6)	15 (8.1)	36 (19.5)	1.83
5	Solid foods	121 (65.4)	22 (11.9)	24 (13.0)	18 (9.7)	1.68
6	Animal protein foods	115 (62.1)	9 (4.9)	27 (14.6)	34 (18.4)	1.89
7	Plant protein foods	118 (63.8)	18 (9.7)	24 (13.0)	25 (13.5)	1.76

Table 4 shows that breast milk (Mean=3.91) is the most commonly consumed foods followed by infant formula (Mean=1.84) and ready-made instant cereal (Mean= 1.83). The least commonly consumed food is solid (staple) foods (Mean= 1.68)

Research Question 4: What percentage of mothers initiated complementary feeding after 6 months?

Table 5: Period of Initiation of Complementary Food Items

Food items	N	Before 6 months		After 6 months	
		Freq	%	Freq	%
Water	92	43	46.7	49	53.3
Infant formula	63	24	34.9	41	65.1
Cereals	71	19	26.8	52	73.2
Solid foods	67	6	9.0	61	91.0

The data presented in Table 5 shows that 53.3%, 65.1%, 73.2% and 91% of the mothers introduced water, infant formula, cereals and solid foods respectively into their babies' diet after 6 months.

Research Question 5: What are the commonly adopted child feeding frequencies by mothers of children between 0 and 2 years?

Table 6: Child Feeding frequency (n=185)

How often do you do the following in a day?	Never (%)	Occasionally (%)	Once (%)	2^{ce}daily (%)	3^{ce} daily (%)	$>3^{ce}$ daily (%)
General child feeding	-	-	-	-	16 (8.6)	169 (91.4)
Feeding the baby with breast-milk	-		4 (2.2)	3 (1.6)	1 (0.5)	177 (95.7)
Feeding the baby with home-made cereals	49 (26.5)	2 (1.1)	21 (11.1)	8 (4.3)	5 (2.7)	100 (54.1)
Feeding the baby with solid foods	49 (26.5)	6 (3.2)	23 (12.4)	15 (8.1)	9 (4.9)	83 (44.9)
Feeding the baby with artificial cereals (e.g cerelac)	51 (27.6)	2 (1.1)	16 (18.6)	6 (3.2)	9 (4.9)	101 (54.6)

The data displayed in Table 6 above shows that many of the mothers feed their babies frequently (more than three times a day) with the various food items assessed.

Hypothesis 1: There is no significant influence of child feeding on the weight-for -height status of children

Table 7: Multiple Linear Regression Analysis of the Influence of Child Feeding on the Weight- for-Height/Length Status of Children

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	-2.250	2.045		-1.100	.273
Initiation of cereals into baby's diet	.800	.304	.309	2.637	.009
Initiation of solid foods into baby's diet	-.903	.276	-.367	-3.273	.001
Frequency of child feeding	.612	.580	.075	1.055	.293
Frequency of breast feeding	.269	.233	.083	1.157	.249
Frequency of feeding with home-made cereals	.079	.075	.103	1.051	.295
Frequency of solid food intake	-.075	.076	-.094	-.985	.326
Frequency of feeding with artificial cereals	-2.250	2.045	- 2.255	-1.100	.273

$R=.351$, $R^2=.123$, Adjusted $R^2=.089$, F=3.550, P=.001, SEE=2.200

Table 7 shows that child feeding has a significant influence (F=3.550, P<0.05) on the weight-for-height status of children. Therefore, hypothesis 1 is rejected. Periods of initiation of cereals (Beta=-.309, P<.05) and the period of initiation of solid foods (Beta= -.367, P<.05) both have significant contribution to the weight-for-height status of children. The period of initiation of solid foods had the highest influence.

Hypothesis 2: There is no significant influence of Child feeding on the weight-for- age status of children

Table 8: Multiple Linear Regression Analysis of the Influence of Child Feeding on the Weight- for- Age Status of Children

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	-1.679	1.889		-.889	.375
Initiation of cereals into baby's diet	.032	.280	.014	.114	.910
Initiation of solid foods into baby's diet	-.082	.255	-.038	-.321	.749
Frequency of child feeding	.557	.536	.077	1.039	.300
Frequency of breast feeding	.020	.215	.007	.092	.927
Frequency of feeding with home-made cereals	.171	.069	.251	2.465	.015
Frequency of solid food intake	-.109	.070	-.155	-1.551	.123
Frequency of feeding with artificial cereals	-.087	.066	-.129	-1.326	.186

$R=.215$, $R^2=.048$, Adjusted $R^2=.008$, F=1.224, P=.292, SEE=2.032

Table 8 shows that child feeding practices do not have a significant influence (F=.927, P>0.05) on the weight-for-age status of children. Therefore, hypothesis 2 is not rejected.

Hypothesis 3: There is no significant influence of child feeding on the height- for-age status of children

Table 9: Multiple Linear Regression Analysis of the Influence of Child Feeding on the Height/Length-for- Age Status of Children

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	-1.658	2.840		-.584	.560
Initiation of cereals into baby's diet	-1.178	.422	-.332	-2.793	.006
Initiation of solid foods into baby's diet	1.248	.383	.371	3.257	.001
Frequency of child feeding	.084	.806	.008	.105	.917
Frequency of breast feeding	-.045	.323	-.010	-.139	.890
Frequency of feeding with home-made cereals	.179	.104	.171	1.718	.088
Frequency of solid food intake	-.012	.106	-.011	-.116	.908
Frequency of feeding with artificial cereals	.053	.099	.051	.535	.593

R=.311, R^2=.097, Adjusted R^2=.081, F=2.709, P=.01, SEE=3.056

Table 9 shows that child feeding have a significant influence (F=2.709, P<0.05) on the height-for-age status of children. Therefore, hypothesis 3 is rejected. The period of initiation of cereals into the baby's diet (Beta=-.332, P< 0.05) and the period of initiation of solid foods (Beta= .371, P<.05) had significant contribution on the height/length- for- age status of children.

Discussion of findings
This study determined the influence of child feeding on the occurrence of under-nutrition among children between 0 and 2 years. The findings of this study on the percentage occurrence of the three forms of under-nutrition: wasting, stunting, and underweight, seem to indicate a reduction in the occurrence of under-nutrition among the children which is an indication of improved nutritional health. When compared with the report of UNICEF (2022b), there seems to be a reduction in the prevalence of wasting (18% vs. 11.4%), stunting (37% vs 35.7%) and underweight 29% vs 18.4%). The reasons for this improvement might be as a result of improved child feeding practices.

The findings presented in this study also showed that less than 40% of the children had a combination of adequate weight-for-height, adequate height-for-age and adequate weight-for-age which is one of the parameters that indicate a very good state of nutritional health. Many of the children assessed in this study had one form of under-nutrition or the other. This is similar to the findings of Kinyoki, Kandala, Manda et al (2016) who reported that 29% of the children in their study had a combination of stunting, wasting and underweight experience. Only few of the children assessed in this study had completely good nutritional status and it is just an indication that more still needs to be done to improve the nutritional status of the children and to boost the immunity of the children against childhood diseases.

With regard to the feeding practices adopted by mothers, this study revealed that breast milk is the most common food given to babies, many of the mothers introduced complementary foods after 6 months. This is likely to be the reason behind the reduction in the prevalence of under-nutrition observed in this study. According to Kalanda et al (2006) & WHO (2008), appropriate child feeding practices is associated with reduced morbidity and mortality in children under five years.

The findings of this study further revealed that child feeding has significant influence on the wasting and stunting experience of the children. This is somewhat similar to the findings of Roche, Gyorkos, Blovin, Marquis, et al (2017) who also reported that child feeding practices significantly influenced the stunting experience of children. Stunting, a form of chronic malnutrition which occurs as a result of a long term deprivation of nutrients often characterizes the experience of children who are not well nourished.

Conclusion
The conclusion that can be drawn from the

findings of this study is that child feeding has significant influence on the occurrence of under-nutrition among children.

Recommendations

1. Nursing mothers should be given nutrition education from time to time to keep them updated with the knowledge of proper child feeding practices

2. Nursing mothers should be encouraged to practice exclusive breastfeeding for 6 months and continue to breastfeed until the baby is 2 years

3. Nursing mothers should be encouraged to give less of instant cereals (e.g. cerelac) but more of homemade cereals so as to reduce the occurrence of under-nutrition among their children

4. Children less than 2years should be introduced to solid foods not later than 6 months of birth

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Spirituality, Cultural Factors, Student's Achievement In Social Studies As Predictors Of Morality Among Secondary School Students In Benue State, Nigeria

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Abstract

The concept of morality is mostly seen as a brainchild of people's religion as well as their cultural formation. This study was necessitated as a result of the rising cases of immorality among youths in our today's generation; hence, attempts to identify the root causes of such behaviours have been an endless debate among scholars. The study adopted correlational research design, and Multi-stage sampling technique was used to select three hundred and fifteen (315) students from two senatorial districts (Zone A, and Zone C) in Benue State. Four instruments were used for the study; Religiosity and Spirituality scale, Cultural factors questionnaire, social studies achievement test and Moral Identity Questionnaire. Findings from the study revealed that all the variables jointly predicted morality among junior secondary school students in Benue State significantly. Furthermore, results showed that components of independent variables considered; Spirituality (Beta=0.044, t =0.659, p>0.05), Cultural factors (Beta = -0.092, t = -1.633, p > 0.05), and social studies (0.076, t=1.337, p>0.05) do not significantly predict morality among secondary school students. It was concluded that parents/guardians should take special interest in curbing moral decadence among the youths. When the thought of the youth is modified or transformed, their actions will definitely be transformed.

Introduction

Morality is a concept that has been discussed widely by moral philosophers and has received much attention over the years. This is because moral deterioration has continued to be a major hindrance to the healthy development of youngsters all over the world and Nigeria in particular. One of the problems Nigeria has been facing and is still facing recently is moral decadence among the youths who constitute tomorrow's leaders and are often seen and described as the wealth and pride of the nation. It appears as if the level at which immorality is committed in our society today doesn't seem to be evil.

Morality as a concept varies from culture to culture or from one tradition to another, notwithstanding, it can collectively be referred to as the principles of right and wrong behaviours either religiously, socially or otherwise. According to Krebs (2008), morality facilitates group functioning, and makes people live together in unity by regulating their behaviours. Looking at the definition of morality, Ogbodo (2018) looked at morality as beliefs of the kind of behaviours that are either good or bad. This includes certain factors like ethics, rightness and nobility together with

certain virtues which can be compared to certain standards that are right and good. He further asserted that morality refers to character or conduct that are interpreted as good or bad, right or wrong. In most cases, moral may refer to relationship or concern with character or conduct that are distinguished from reflective or natural perspectives. Thus implying that, any deviation from moral standards may lead to immorality.

Immorality is the violation of some moral laws, norms or standards. For the purpose of this study, immorality can be seen as a socially unacceptable behaviour that contradicts the agreed written or verbal standards and values of a particular group or organization which are to be followed by members of that group or organization. In some cases, moral can mean goodness, probity, virtue, honour, rectitude, honesty, perfection, or excellence depending on the observer's belief which could be subjective or objective.

Attempts to deconstruct how morality is formed among youths, especially secondary school students have been an endless debate as to whether the task rests with religious beliefs (spirituality), cultural factors, or social studies

education. Some researchers are of the opinion that living a moral life is synonymous with spirituality, hence, spirituality has everything to do with religion which offers certain standards that make easy the spiritual journey of a person. Scholars from this school of thought believe that morality is synonymous with spirituality and anyone that is moral is expected to live honestly anywhere he or she finds himself.

Although spirituality has traditionally been rooted in religion, the link between the two is passionately debated. Hence, being religious does not translate to being spiritual. Therefore, any hasty conclusion on this definition will not be ideal because the concept of spirituality is still under study (McCormick, 2012). This is because spirituality varies ranging from feminist writings to New Age practices and other programs. On one side, some other forms of spirituality can augment some ethical institutions that have achieved mental rigour at the cost of abandoning the needed motivation required to live morally. Similarly, other considerations required for spirituality can generate debates in ecclesiastic and academic circles. (McCormick, 2012).

On the other side, some aspects of spirituality seem repellent to any kind of prescriptive expression, regardless of whether it is theological or religious. This may be because some person's intuition and experiences give them room for the acceptance of certain behaviors. That is why most times you hear people say, they are not religious, but spiritual. This could be that they have been exposed to certain resources and experiences that are backed up by some doctrines and other religious dogmas.

Therefore, it is unavoidable to say that the challenge of spirituality can be traced to the history of any society. This is because a man's spirituality is determined by his/her religion as well as his secular system, thereby making the concept of spirituality more cumbersome to address and define. Principles such as honesty, openness, freedom, and equality create an environment for the spiritual growth of an individual. Since the mid-twentieth century, scholars have studied the concept of spirituality

and came to an understanding that spirituality is the ability of an individual to create his world by setting values of his life which reflect in his quality and standard of living. (McCormick, 2012).

Nevertheless, in an attempt to give a concise definition of spirituality, the Cambridge dictionary looks at spirituality as, "those standards that involve a feeling and belief in a supernatural being, instead of the physical things of the world." Similarly, the researcher defines spirituality as the act of arousing from an ordinary consciousness and rising above the desires of the flesh to a wider understanding. It also means expounding the mind above limitations, imaginations and limited thoughts about life and the world in general. Spirituality in Christian sense, which is the researcher's focus, is the general belief in the almighty God, as well as a person's relationship with God and the transformation that is possible through the grace to follow the footsteps of Jesus (Marsh, 2014).

Therefore, the moral aspect of spirituality is grounded on freedom of will as well as the choices a man makes, and his ability to take responsibility for his actions. Therefore, morality is socially-tailored, which makes it impossible for a person to be moral with himself. For instance, someone in a desert all by himself is responsible for his actions and can decide to lie down, sit, or die without making any other effort for progress, or he can decide to move on and fight for his life, which is his total freedom. This means that an individual who has deprived himself of personal selfish interest and is free from self is considered spiritual.

Regarding whether or not morality requires spirituality, Socrates, a great philosopher cited in Plato's work titled "Euthyphro" asked whether goodness is cherished by the gods just because it is good or whether it is cherished because it is loved by the gods. Although he favoured the former argument, other researchers have debated that morality is impossible without God, and the belief in God in most cases leads to spirituality (Kelechi, 2018). Dostoevsky (1990) for example, stated clearly that without God,

everything is good." This notion that spirituality is synonymous with morality has been promoted by researchers like Laura Schlesinger who stated that "morality cannot be attained without belief in God". Similarly, Zuckerman has claimed that "the current decline in moral standards is as a result of the rise in secularism of organized religion which has been bestowed with the responsibility of inculcating moral standards among its members. This assumption has been disputed by so many contemporary researchers with facts that many, if not all religious doctrines and standards including spirituality have not passed the test of morality, therefore concluding that spirituality is not sufficient for morality (Pierre Bayle).

Some researchers have argued that the typical African man is very inseparable from his culture and that culture influences peoples' cosmology and perception of things around them. Therefore, a child's culture should also be held responsible for his/her immoral behaviours. Lahey (2004) defines culture as certain behaviours, beliefs, traditions and values of a community, nation, or any social group. Such beliefs include languages and other moral beliefs that are acquired from other people we live with. These patterns of behaviours, beliefs, traditions, language and values are generally referred to as cultural factors, hence they contribute in shaping the personality of an individual. This may be why Kennedy (2000) stated that one cannot fully understand an individual without understanding his cultural and ethical formation. According to him, childhood is the period through which the characterization of children is built and their personalities formed, thereby concluding that culture forms the personality of an individual.

Benue State is inhabited with mainly three (3) cultural groups comprising the Tiv, Idoma and Igede. These cultural groups have various cultural practices and teachings which are supposed to inculcate discipline, moral uprightness, hard work, courage and also to teach their youths how they can stand against vices such as theft, rudeness, hatred, wickedness, premarital sex and dishonesty. For instance, the Tiv has ethics which are expressed in norms, which regulate relationships between individuals and social groups. There are sanctions or condemnation attached to deviants of the norms. It has been observed that illness or sickness is attributed to misfortunes which arise as a result of personal relationship between human kind and the laws controlling the land. In other words, sickness and misfortunes emanate from broken norms regulating the action of members of Tiv society. Tiv ethics is seen to be more spiritual than societal in nature. This is the reason why certain actions are outlawed because their violation tends to disrupt the spiritual or supernatural order established by *Aondo* (God).The violation of moral laws of *akombo* which permeates virtually all that the Tiv do is said to disrupt the equilibrium in nature, letting loose calamities, sickness and death. The elders who are the custodians of morality have a spiritual power in them called *Tsav*, which enables them to outlaw certain behaviours that go contrary to the functioning of the spiritual universe. In this regards, Tiv's moral life which is embedded in their traditional ethics is deeply religious and one cannot separate one from the other.

The Idoma cultural beliefs are mostly expressed through their festivals, Agila cultural carnival, cultural dances, performance and traditional marriages. For instance, traditional marriage is an arrangement between two families not just the individuals. It is considered as a lifelong state of union, although in Idoma land, divorce is allowed on the account of infidelity.

The Igede also have their culture as well, for instance, the young ones can greet an elder by mere hand shake without necessarily prostrating which is more western, but contradict other cultures. The culture allows for wives to kneel while serving their husbands. The Igede culture does not allow for a house wife to cheat, a husband's brother cannot tie the rapper of his brother's wife. The Igedes are also rich in traditional tales and varied cultural elements. Like other societies, they display their traditions, customs, beliefs, and lifestyle by some distinctive behaviours, dressing and communication.

On the other hand, considering the fact that the traditional approaches to problem solving have been inadequate in our time and the desire to come up with other ways of providing solutions to challenges in our society, Social Studies, which has been a compulsory subject at the junior secondary school level in Nigeria was introduced to help Nigerian youths from the strings of Western education which introduced foreign values and acquaint them with their cultural norms and values. With respect to this, it is generally believed that social studies, as a subject, was brought into Nigerian schools as part of the solutions to social vices and a tool for societal development. It equally provides individuals with the attitudes and values necessary to attain individual excellence in life. Its study deals with patriotism, loyalty, self-sacrifice, sympathy for others, sense of harmony, judicious use of public utility. This is why Ogundare (2009) stated that social studies is basically a tool for attitude formation among youths. Adaralegbe (1980) also stated that social studies programmes are basically introduced when a society feels a need to inculcate some basic skills, understanding, and actions regarding human relationship among its members.

Therefore, it is expected that students who are exposed to social studies education would have a remarkable change in their nature and personalities meaning that any study on morality among secondary school students will not be complete without looking at whether or not the subject has played a significant impact in the life of the learners.

It is disheartening to state that despite the strong emphasis placed on the development of good citizenship through Social Studies education, the subject has not realized this goal (Falade, 1997). The researcher pointed out that there are cases where final year Social-Studies students are disciplined for examination malpractice while others are alleged on one social misconduct or the other i.e. cultism, thuggery, violence, stealing, etc.

Similarly, Akanji and Dada (2012), stated that there are numerous social ills among youths worldwide, Nigeria not excluded. Youths are faced with similar social problems like drug abuse, abortion, bullying, alcohol problems and others. Some of these predominant social ills include rape, cultism, drug abuse, vandalism and other behaviours that are dangerous to their health, home, schools and the society at large. Some of these problems can lead to others. For instance, smoking sometimes can lead to drug abuse and heroin. Youths who take alcohol and tobacco have the risk of using other drugs. These behaviors can possibly lead to sexual activities, which may result in unwanted pregnancies and abortions.

Therefore, if social studies was basically introduced to promote citizenship and value education, and considering the fact that majority of the students offer social studies in schools, then as a matter of urgency, its effect needs to be looked into since such problems are still persisting despite its introduction into the school curriculum.

From the above background, it is very clear that religious beliefs (spirituality), culture and social studies have significant influences on students' morality. It is disheartening and worrisome since high level of immorality is being exhibited in schools on daily basis despite all these efforts. At different times, Nigerian Governments have made conscious attempts to resolve the problems of immorality in schools. This study explored religious beliefs (spirituality), cultural factors as well as social studies as a subject on morality among secondary school students in Benue State and their relative and composite contributions to morality among secondary school students.

Statement of the Problem
Immorality in our society especially among secondary school students has increased tremendously sending perilous signals on the future of youths in our society and national development at large. Unacceptable behaviours like students' radicalism; dishonesty, lies telling, etc are skyrocketing by the day. Unfortunately, religious organizations and schools which are supposed to enhance the moral behaviour of students by providing a common sense of belonging to groups that are responsive to their needs have done their best, yet cases of

immorality are still on the increase. Attempt to trace the sources of these immoral behaviours among secondary school students has been an endless debate among scholars. Hence, some say it is rooted in religious beliefs (spirituality), cultural factors as well as social studies education. Studies have examined spirituality, cultural factors and social studies but little has been done to examine the combined influence they have on moral vices in secondary schools especially in Benue State. There is insufficient empirical evidence regarding which of the factors that has more influence on secondary school students' morality especially in Benue State. Therefore, this study looked into the relationship between spirituality, cultural factors and social studies on morality among Secondary School students in Benue State, Nigeria.

Research Questions
1. What is the composite contribution of spirituality, cultural factors and social studies on morality among junior secondary school students in Benue State?
2. What is the relative contribution of spirituality, cultural factors and social studies on morality among junior secondary school students in Benue State?

Methodology
Correlational research design was adopted in this quantitative study. Correlational survey studies typically employ questionnaire, interview and observation to elicit information from a large population and to determine the options, preferences, interest and perceptions of people about issues for the purpose of drawing inferences. The design is conceived best for this kind of study hence the researcher is interested in obtaining in-depth information on students' perception on immorality.

Multistage sampling technique was also adopted for this study. At the first stage; purposive sampling technique was employed to select two senatorial districts (Benue Zone A, and Benue Zone C) to ensure that all the major cultural groups in Benue State were included in the study. The two Senatorial Districts are already clustered into six Zonal Education Areas comprising Education Zone A, Education Zone B, Education Zone C in Benue North East, and Education Zone A, Education Zone B, Education Zone C in Benue Zone C. At the second stage; from the Zonal Education Areas, schools were stratified into urban, semi-urban and rural schools. Simple random technique was used to select three schools each from urban, semi-urban and rural areas at stage three. At the fourth stage; intact classes of JSS III students from the sampled schools were used which gave a total of 315 students.

The instruments used for data collection were Religious and Spirituality Scale (RaSSY); Cultural factors scale; social studies achievement test, and Moral Identity Questionnaire.

$R = 0.23$
$R^2 = 0.052$
R^2 Adjusted $= 0.034$

	Sum of Squares	Df	Mean Square	F	Sig.
Regression	1606.243	6	267.707	2.831	. 011
Residual	29125.643	308	94.564		
Total	30731.886	314			

Table 4.1 shows the regression analysis of the composite contribution of spirituality, cultural factors, and social studies on morality among junior secondary school students in Benue State. The table revealed that spirituality, cultural factors, and social studies jointly predicted morality among secondary school students in Benue State significantly ($F_{(6, 308)} = 2.831$, $p < 0.05$). The R-value (0.23) is the relationship between the observed and the predicted values of spirituality, cultural factors and social studies on dependent variable (morality). Furthermore, the combination of spirituality, cultural factors and social studies jointly accounted for about 3.4% of the variance observed in students' morality (R^2 Adjusted = 0.034). The result showed that the combination of spirituality, cultural factors and social studies significantly determine students' morality in Benue State. The implication of the result is that secondary school students 'morality in Benue State is predicted by spirituality, cultural factors and social studies.

Research Question 2: What is the relative contribution of spirituality, cultural factors and social studies on morality among junior secondary school students in Benue State, Nigeria?

Table 4. 2: Relative contribution of spirituality, cultural factors and social studies on morality among junior secondary school students in Benue State, Nigeria

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	54.598	6.524		8.369	.000
Spirituality	.000	.032	.001	.014	.989
Cultural factors	-.167	.102	-.092	-1.633	.104
Social studies	.148	.110	.076	1.337	.182

Table 2 showed the table of Coefficient of Regression analysis for the relative contribution of spirituality, cultural factors and social studies on morality of junior secondary school students in Benue State. The result shows a non-significant beta value of ($\beta=0.044$, $t =0.659$, $p>0.05$) spirituality. From the result, it is very clear that spirituality does not necessarily predict students' morality, holding all other variables constant. The implication of this is that it does not necessarily require someone to be spiritual for him or her to be morally upright hence being spiritual does not necessarily mean you are morally upright. Similarly, the result showed that cultural factors do not significantly predict secondary school students' morality in Benue State ($\beta = -0.092$, $t = -1.633$, $p > 0.05$). The result showed that cultural factors are not a good predictor of students' morality, holding all other variables constant. This implies that it does not necessarily matter the kind of culture a student is coming from for him or her to be morally upright, hence cultural factors are not a good predictor of students' morality in Benue State. Similarly, the result showed a non-significant beta value of ($\beta=0.076$, $t=1.337$, $p>0.05$) in social studies. The result showed that social studies does not predict secondary school students' morality in Benue State, holding all other variables constant. The implication of this is that an increase in the study of social studies or social norms and values does not necessarily mean students will be morally upright, hence social studies does not and is not a good predictor of secondary school students morality in Benue State after holding all other variables constant.

Recommendations

From the findings of the research, it was therefore recommended that;

1. The furtherance of immoral programmes and films by the media should be discouraged by the government since the students are often the first victims of such.

2. More programmes and films which portray the riches of societal values like sexual restraint, the veneration of virginity and frowning at immoral behaviours should be encouraged. Through this, the students will grow to appreciate the dignity of self-discipline and not seek to imitate things that run contrary to decency.

3. There should be cooperation between the Ministry of Education and religious groups in reinforcing the moral development of youths. Non-Governmental Organizations (NGOs) should also be involved in emphasizing the importance of instilling moral virtues in the youths.

4. Students from Secondary schools should understand why they are sent to school by their parents and be ready to take instructions from their teachers. The teachers should also be diligent in carrying out their responsibilities.

5. Secondary school students should be enlightened about the attendant effects of immorality.

Conclusions

From the outcome of the findings, the general conclusion of the study is that the development of moral behaviour follows a gradual and deliberate process. It is in the light of this that this research work suggests that religious organizations and schools should take special interest in curbing moral decadence among the youths. When the thought of the youth is modified or transformed their actions will definitely be transformed.

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Development, Validation and use of Principals' Leadership Behaviours Measuring Instrument for Secondary Schools in the South East Nigeria

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Abstract

T*he study developed, validated and used the instrument for measuring principals' leadership behaviours in the South East Nigeria. Instrumentation research design was used in the study. The study used 474 head principals and secondary schools from 14 education zones in the 5 states of South East selected through proportionate stratified random sampling technique. Two research questions and one null hypothesis were raised in the study. The instrument used for the study was Principals' Leadership Behaviours Measuring Instrument (PLBMI). The PLBMI is a 102-item instrument that emerged after face validation by Measurement and Evaluation and Educational Management and Planning experts; from Michael Okpara University of Agriculture, Umudike. The face validated items were trial tested and the responses were subjected to factor analysis to determine the construct validity in research question one. The instrument reliability was determined by the method of internal consistency using Cronbach Alpha having index of 0.897. Data were analyzed using Normal Varimax Rotation method of factorial analysis, mean, standard deviation and t-test. Mean and S. D. were used for research question 2, t-test statistics employed for the hypothesis at P=0.05 significant level. Findings showed fifty (50) items out of the one hundred and two (102) items met the requirements for acceptance as valid and included in the instrument and fifty two (52) items that were factorially invalid were discarded. The findings also showed effective mean at all the clusters of PLBMI. This is to state that the gender of the principals influenced their mean scores on the PLBMI. The result of the null hypothesis showed no significant difference in the mean scores of the principals based on gender. It was thus recommended among others that since the instrument is proved valid, it should be adopted by Post Primary Schools Management Board and Ministries of Education in the assessment of principals before assigning them to lead schools. This will avert the influence of subjectivity in the selection of principals and also help to ensure that only principals with some degree of leadership behaviours are positioned as leaders.*

Key words: Principal, Leadership Behaviours, Measurement and Instrument

Introduction

Leadership is the sinew on which the body of every organisation rests. A good leadership makes an organisation thrive well, thereby influencing both human and material development of the organisation, leading to the attainment of goals and objectives. Adeyemi and Bolarinwa (2013), expressed leadership as "the art or process of influencing people so that they will strive willingly towards the achievement of objectives" (p.187). Mosadeghrad and Yarmohammadian (2006), defined leadership as a series of attitudes, characteristics and skills used by leaders in different situations in accordance with individual and organisational goals. According to Armstrong (2004), leadership is influence, power and the legitimate authority acquired by a leader to be able to effectively transform the organisation through the direction of the human resources that are the most important organisational assets, leading to the achievement of desired purpose. Leadership is a path of succession of states through which a system passes to influence the activities of an organised group for achievement of goals as enshrined in the organisation's objectives.

Therefore, to lead is to engage in an act that initiates a structure- in – interaction as part of the process of solving a mutual problem (Babalola & Ayeni, 2009). Nwangwu (2011), opined that one given the task of directing and coordinating

task-relevant group activities is a leader. The central theme in leadership is getting things accomplished through people. It is influencing people's behaviour so that they will work towards given objectives. Bennie (2012) in defining leadership identifies four aspects of leadership, which are; its substance – what leaders have to do, its process – how they accomplish it, its purpose- the whys, the reasons for leadership and what leaders will have to do.

Apparently, in relation to school, leadership is second to teaching in its impact on student's achievement (Leithwood et al., 2004), and plays main role in initiating internal changes in schools, giving direction and support (Public Impact, 2016). Principals as leaders are unparalleled in school organizations. The principal is a flagpole on the hill of school organisation. This statement was strengthened by Amoloye (2004) who saw them as school managers. The principals' job of managing according to Babalola & Ayeni, (2009), involves among other things, providing leadership for individuals, coordinating both human and material resources to ensure the attainment of organizational goals. The fundamental goal of the school is to enhance the teaching and learning process. Therefore, leader of the school should endeavour to influence behaviours of both teachers and students to achieve the goals of the school.

Imperatively, an effective leader should understand the characteristics of subordinates in collaboration with the environmental situation, thereby match behaviour accordingly. The principal through leadership behaviour supports both teachers and students in areas of personal interest to them that will help in the achievement of school goals, but at the same time will not conflict with schools' interest. Babalola and Ayeni, (2009), asserted that the ways and manners in which the principal carries out these leadership functions reflect his leadership behaviours.

Therefore, behaviour implies the manner in which the principal as a leader of a school acts towards other members in the working environment consisting mainly of the teachers

and students. Marie and Neal (2011), defined leadership behaviour as a pattern of behaviours leaders prefer to use. Principals adopt different situations with different individuals to motivate them to perform at their utmost potential. A principal may adapt leadership behaviours he deemed fit to different situations. Babalola and Ayeni (2009) opined that these principal leadership behaviours are combination of managerial functions and managerial styles.

Obviously, the organisation performance is either hindered or facilitated by the type of leadership behaviours engaged by the principal which determines and set the school environment. This implies that the actions of the principal result to reactions from the subordinates, and conversely, actions of subordinates trigger reactions from the principal. In this research, for the purpose of description, classification, and experimentation, behaviour is essentially treated by identifying and measuring specific acts or responses which are called behavioural events. This research work focuses on principal's leadership behavioural events defined by four core components and four key processes known to influence student learning and achievement.

These principal behavioural events are key processes classified under four headings: planning, implementing, supporting and monitoring to reflect perception, learning, memory and emotional expressions. These behavioural events are showcased under four core components of high standards for student learning, rigorous curriculum, and quality instruction and performance accountability. The core components refer to characteristics of schools that support students learning and enhance the ability of teachers to teach, while the key processes refer to how principals create and manage those core components.

Effective Learning-centred Leadership is at the intersection of the two dimensions; core components created through key processes (Vanderbilt, 2008). These classes of events represent some aspects of environmental forces. These behavioural events are complexly

determined by the interplay of forces from both intrinsic and extrinsic forces. Behavioural events also bring about intrinsic changes in the principal, which, taking together represent experiences (Nwaigwe, 2011). That is, behaviour comprises all those aspects of human activity which people can observe. In effect, it represents the outward life of the principals.

Therefore, to carry out their responsibilities, the principal employs some types of leadership behaviour. A principal who uses direct leadership behaviour expresses the essential nature of the task and responsibility of his group members, set performance and reward norms, classify the rules and regulations as applicable, provide guidance, advice and give instructions as necessary and monitor outcome. On the other hand, a principal in possession of supportive leadership behaviour establishes warm-interpersonal relationships with the individuals, showing understanding and shares their aspirations and feelings, shows concern for their welfare and promotes group cohesiveness.

More so, a principal with participative leadership behaviour keeps the students and teachers intimated on important tasks, goals and situations and carry them along in decision making and seek their ideas always. Achievement-oriented principals develop and utilize the skills and talent of the staff and students. A principal with achievement-oriented behaviour sets challenging goals for the teachers and students, helps them to have understanding about the goals to be achieved, and free hand to participate in their jobs.

Emphatically, in secondary school system, the principal's behaviour is made manifest in four core components and four key processes through which the principal carries out his functions. It is expected that in the discharge of his responsibilities, the principal has to plan, implement, support and monitor human and non – human resources in the organisation which are leadership functions (Wallace Foundations, 2009). These leadership functions as highlighted by Onifade (2004)) are planning which implies making future decisions on activities to be performed, personnel and material involvement. It also involves decisions

on when and how actions are to be taken. In school, the principal plans about the future and makes preparations needed for carrying out his responsibilities. The purpose of this planning is to take rational decisions so that scarce resources will be judiciously used to achieve maximum benefits and educational objectives effectively.

Babalola and Ayeni (2009), opined that the decisions of the principal has to assist in tailoring workers' personal objectives towards those of the educational organisation. The principal uses an effective channel of communication to guide, motivate and direct the workers to realise the educational goals. More so, the principal as a leader should have the behaviour of monitoring educational activities to ensure expected outcome. Through regulating, curbing and checking the excesses of teachers and students, the principal ensures that things are done in accordance with established rules. Therefore, for a principal to lead effectively, s (he) has to create a working environment whereby teachers and students collaborate and identify with the schools' mission and goals to make the school effective.

Effective schools have been defined as those with effective leaders. According to Williams (2008), they are those schools which obtain significant increases in student performance for targeted populations. This author listed strong leadership behaviour from the principal as a characteristic of successful schools. According to this author, these factors impact on schools' teaching and learning process and student achievements. According to Otiato (2009), an effective secondary school is one with safe and positive learning environment, where students are able to achieve their personal goals and develop the skills to make contributions to the society in the future. There is need for exhibition of sound and effective leadership behaviours by the principals at the secondary level of education in order to achieve these stated objectives which is the main objective of the National policy on secondary education.

Obviously, there is no hyperbolical representation in saying that secondary education is unique in the educational

development of a child, as it links the primary and tertiary education. Specifically, the aims of secondary education cited in National Policy on Education are to prepare a child for useful living within the society and for higher education (Federal Republic of Nigeria, 2014). The purpose of secondary education is to ensure that a child is better developed than at the primary level, more so, primary education is insufficient for children to acquire literacy, numeracy, and communication skills (Ige, 2011; Yusuf, 2009). It is a prerequisite for a child to obtain a minimum of five credits including English Language and Mathematics to be able to proceed to the university education in the country. This makes it very imperative that principal leadership of secondary school should be taken very serious.

There abounds evidences regarding poor leadership behaviours of principals at the secondary school level, evident in constant misunderstandings between the principals' behaviours towards the teachers, students, parents and even supervisors. Other evidences also abound in the principals' behaviour of misappropriation of resources in their custody. These evidences are supported by the researcher's observation as a secondary school teacher for many years. Poor leadership behaviour has resulted in a failure to actualize the purpose of secondary school education. In the light of the foregoing, the federal government of Nigeria committed itself to salvaging these situations by ensuring that these issues are given proper attention.

Hence, the Federal Government identified the principal as a leader and importance of leadership in education, it recognized that no educational system surpasses the quality of its teachers (Federal Ministry of Education, 2014). It put some measures in place to improve the welfare of the principals. These efforts of the government to salvage the education sector have not shown much fruition. This is one of the motivations of the researcher to carry out this research work to find out what has constituted a cog in the wheel of secondary education. However, the crux of the matter is on how education authorities will identify principals with good leadership behaviours that will enable them to carry out the organisational

functions effectively and achieve the educational goals, before positioning them to lead schools. The positioning of principals as leaders in schools without first identifying those who have these behaviours may not augur well for the effective leadership of the school. This selection should not be based on mass promotion or year of certification in order to bring about effective leadership.

More so, measurement of these leadership behaviours cannot be measured directly like other objects that can be seen and which involve the use of well stipulated instruments that measure directly these qualities because of their stability. Measuring behaviours also involves the use of instruments that do not have rules to guide its use and ideas and that gives different results on repeated assessments because by nature, they are more changeable. Therefore, a better way of solving these problems is to develop a good valid and reliable instrument for measurement of principals' leadership behaviours to determine the degree at which one possesses these behaviours before being positioned as a leader.

Development is a set of procedures used to produce or create a new thing. Instrument development therefore, is a procedure used to produce or create a new tool for the discovery of new knowledge. Instrument development is one of the essential processes of educational measurement and evaluation. According to Abonyi (2003), instrument is a tool or device used for a scientific work. It is used to measure the present value under observation. This assertion by Abonyi of the same year implies that without a suitable instrument, the value of the quality under investigation cannot be adequately assessed. This also means that without the developed instrument, the principal leadership behaviours may not be properly identified.

In the process of developing instrument, Gall, Gall and Borg (2009), identified various criteria that can be used to judge whether an instrument is of sufficient quality to use in educational research. These include validity, reliability, objectivity, usability and fairness. A valid measure according to Singh, Shama, and Upadhya (2008), is one that measures what it intends to measure. A validated instrument of

this nature should pass through the process of factorial validation. This factorial machine crushes all the factors fed into it, analyses all, and sieves off the irrelevant and ambiguous ones, thus leaving as a filtrate, a set of competent and valid keys of managerial ability (Ajayi, 2000). Reliability of instrument concerns the consistency of measurement, expressed as a correlation coefficient (Ajayi, 2000). As a result, the researcher has subjected the items of this instrument to both validity and reliability testing and the correlation coefficient obtained shows the extent of the reliability of the instrument.

Howbeit, one cannot talk about instrument development without emphasizing on measurement. Measurement is the act of judging or forming an opinion about the nature or quality of an issue. In education, a number of instruments are used to measure behaviour. They include: achievement tests, personality tests, aptitude tests, interest inventories, intelligence tests, attitude inventories, behavioural procedures and neuropsychological tests (Gruijter and Kamp, 2002). The practical relevance of these instruments depends on the level of reliability and validity they possess.

Moreover, developing research instrument in relation to principal behaviour shows differential performance by many factors. One of these factors includes gender. Therefore, to explain why principals act the way they do, one of the goals or focus of this research work is to assess the underlined disposition and establish the relationship or interplay to principals' behaviour. This controversial independent variable in this study, such as the gender of the principals needs to be examined in order to determine how it influences the leadership behaviours of principals in schools. Since Eneremadu, (2004), posited that increasing number of females assumes leadership roles as principals, it becomes imperative to determine whether the gender of a principal influences the leadership behaviours. Okeke (2004), in her study found out that gender does not affect Administrative Communication Skills of Principals in Anambra State. This differential performance effect on principals' behaviours

can be measured through the development of valid and reliable instrument to determine the existence and degree at which this variable is present. However, the researcher sought to resolve this issue and delve into developing and validating principals' leadership behaviours measuring instrument [PLBMI] in measuring secondary school principals' leadership behaviours in the South East Nigeria.

Statement of the Problem

Based on the forgoing, the objective of the study is to develop, validate and use Principals' Leadership Behaviours Measuring Instrument taking into consideration the gender of the principals. Two research questions and one hypothesis were used.

Research questions

1. What is the factor structure of the Principals' Leadership Behaviours Measuring Instrument Scale?
2. How does gender influence leadership behaviour of the principals?

Hypothesis

H_{01}: There is no significant difference between the mean scores of principals' gender in leadership behaviours as measured by Principals' Leadership Behaviours Measuring Instrument (PLBMI).

Methodology

Instrumentation research design method was used. The study was carried out in the South East Nigeria. The population of the study consisted of 1156 head principals and schools in 20 education zones in 5 states of South East. Proportionate stratified random sampling technique was adopted in selecting (2/3) 14 zones, through which 474 head principals and schools were selected. The instrument used for data collection was Principals' Leadership Behaviours Measuring Instrument (PLBMI) developed by the researcher. The instrument validation was done by two Measurement and Evaluation, and one Educational Management and Planning experts from Michael Okpara University of Agriculture, Umudike. PLBMI is 102 – item instrument that emerged after face validation. The PLBMI items were factorially

analysed using Normal Varimax Rotation Method to determine the construct validity in research question 1. The reliability coefficient of the PLBMI was established using Cronbach alpha statistic. The reliability coefficient yielded 0.90. Mean and standard deviation were used in answering research question 2. T-test statistics was used in testing hypothesis at P=0.05 level of significant.

Results
Research Question 1: The research question one was answered using Table 1 below
Table 1: Factor Structure of Principals' Leadership Behaviours Measuring Instrument

Factor	Cluster	Items	Extraction
Planning	1		
planning intensive expansion in learning for all students		1	.716
aims at school performance that actualizes improvement in student learning		2	.861
plans the integration of school's objectives and targeted goals into school programs		3	.939
plans the use of assessment data for instructional services for students with special needs		6	.857
plans time table that enables quality instruction		7	.923
plans activities and programs that promote disci pline and order		8	.935
plans for enabling environment where student learning is the central focus		9	.852
develops a plan for school / community relations that centres around the academic attainment		10	.885
jointly develop both short and long t erm plans to improve on students' performance		15	.948
Involve school staff members to participate in planning and budgeting		16	.808
stipulates and sets high expectations for students and staff		17	.737
Establishes a safe, positive and supportive schoo environment	l	18	.840
plans every school activity to centre on student learning		22	.589
plans rules and regulations that encourage serenity		23	.664
Implementing	2		
creates the enabling environment for required actions to promote high standards of learning		25	.877
synchronize efforts to improve instructions in classes		28	.849
select and implement effective improvement strategies		31	.932
protects instructional time by limiting transactions that can influence time available		32	.929

focuses school resources on teaching	33	.947
applies equity and consistency in dealing with students and staff	34	.929
builds a culture that honours academic achievement	36	.888
anticipates problems and adjust behaviours to avoid conflict	41	.902
motivates students and staff to higher level of performance	42	.850
adheres to all applicable rules, regulations, policies and laws	43	.890
consistently implement rigorous evaluation of school staff members	45	.878
holds teachers responsible for performan ce goal for all students	46	.901
ensures teachers uses best teaching methods	50	.902
creates more difficult sequences of learning experiences to challenge the student's ability	51	.912
motivates students by recognizing academic achievement	52	.940
Supporting	3	
supports teachers achieving school goals	55	.900
secures teaching materials needed for a rigorous curriculum	56	.823
supports teachers to teach stipulated curriculum by state and national content standards	57	.770
supports and gives teachers opportunities to improve their instructional practices	59	.865
obtains additional resources through partnering with PTA to enhance teaching and learning	62	.932
maps out time to evaluate student learning	64	.715
maps time to evaluate depart ments performance for student learning	65	.817
provides needs based professional development	67	.809
supports teachers efforts to engage in data -bases decision making	68	.801
gives staff opportunities to assume leadership roles in the school	71	.777
supports and encourages teachers to improve their instructional practices by in-service training	76	.857
Monitoring	4	

Normal Varimax Rotation of factor analysis
Table 1 shows that the responses of principals on the one hundred and two (102) items were scored and subjected to data reduction procedure using, Normal Varimax Rotation Method of factor analysis. There was extraction of fifty (50) items considered to be factorially pure, while the remaining fifty-two (52) items were unacceptable. The unacceptable fifty two items discarded include: 4, 5, 11, 12, 13, 14, 19, 20, 21, 24, 26, 27, 29, 30, 35, 37, 38, 39, 40, 44, 47, 48, 49, 53, 54, 58, 60, 61, 63, 66, 70, 72, 73, 74, 75, 78, 79, 80, 82, 83, 84, 85, 86, 88, 90, 91, 92, 94, 96, 98, 102. This groups of items are referred to as factorially impure and complex items (FI and FC) respectively.

Research Question 2: The research question was answered using Table 2 below.
Table 2:Mean (X) and Standard Deviation (S.D.) Scores of Clusters of Principals' Leadership Behaviours Measuring Instrument (PLBMI) by Gender

Factor	Gender	Mean	Std	Decision
		2.88	.510	
	Male			Effective
Planning	Female	2.91	.431	Effective
	Male	2.75	.829	Effective
Implementing	Female	2.76	.780	Effective
	Male	2.74	.862	Effective
Supporting	Female	2.60	.838	Effective
	Male	2.75	.914	Effective
		2.73	.992	Effective
Monitoring	Female			

Key: Scale   0.50-2.49   2.50-4.00

Interpretation: Ineffective   Effective

Table 2 shows that the male principals representing 36.4% of the sample recorded effective mean (x) of 2.88, 2.75, 2.74 and 2.75 with S.D. of 0.510, 0.829, 0.862 and 0.914 scores respectively. While their female counterparts representing 63.6% of the sample size also obtained effective mean (x) of 2.91, 2.76, 2.60 and 2.73 with S. D. of 0.431, 0.780, 0.838 and 0.992 respectively in all the clusters of PLBMI. The result shows that both gender of principals obtained effective mean (x) above 2.50 criterion point indicating a moderately high level of gender influence.

Research Hypothesis 1: The research hypothesis one was answered using Table 3 below:
Table 3: Independent t-test for Equality of Means (X) Scores of Clusters of PLBMI by

Factor	t-test					
	t-calculated	Df	t-critical	Mean Difference	Std. Error Difference	Decision
Planning	Male.967	455	.334	.044	.045	Not Sign.
	Female .947	326.885	.344	.044	.046	
Implementing	Male .021	455	.983	.002	.078	Not Sign.
	Female .021	339.192	.984	.002	.079	
Supporting	Male 1.166	455	.244	.096	.083	Not Sign.
	Female 1.174	356.677	.241	.096	.082	
Monitoring	Male -.154	455	.878	-.014	.093	Not Sign.
	Female -.155	357.547	.877	-.014	.092	

Key: .05 level of significance= Significant, .05 level of significance=Not significant, df 455.

Table 3 shows that male principals t- calculated values of 0.967, 0.021, 1.166, -0.154 are less than the t-critical values of 0.334, 0.983, 0.244 and 0.878 when tested at 0.05 significant level, with 455 degree of freedom. The result shows female principals't- calculated values of 0.947, 0.021, 1.174 and -0.155 are less than t- critical values of 0.344, 0.984, 0.241 and 0.877 tested at 0.05 significant level with 455 degree of freedom. The null hypothesis that there is no significant difference between the mean scores of male and female principals as measured by PLBMI is upheld.

Findings

Based on the analysis of data in the study, the major findings were:

1. The study shows that out of one hundred and two (102) items of PLBMI subjected to factor validity exercise, that 50 items of the instrument were valid. Factor validation was determined on the 50 items after fieldwork, and all the items were found to be factorially pure. Fifty two (52) impure and complex items were discarded. The 50 items formed the items of PLBMI.
2. The result shows mean (x) and standard deviation scores of clusters of PLBMI by gender with effective mean (x) between 2.60 and 2.91 in all the clusters for both sexes of principals. This implies that the instrument is stable with respect to gender.
3. The study revealed no significant difference between the mean scores of male and female principals' leadership behaviours as measured by PLBMI.

Discussion

Based on the findings, it was obvious PLBMI is a valid instrument for measuring principals' leadership behaviours. It was revealed that the 102 items of PLBMI that were subjected to factorial validation exercise using the rotated component matrix had 50 items that were found to be properly loaded. The 50 pure items were sampled on the actual subjects at the fieldwork. A total of 52 items (4, 5, 11, 12, 13, 14, 19, 20, 21, 24, 26, 27, 29, 30, 35, 37, 38, 39, 40, 44, 47, 48, 49, 53, 54, 58, 60, 61, 63, 66, 70, 72, 73, 74,

75, 78, 79, 80, 82, 83, 84, 85, 86, 88, 90, 91, 92, 94, 96, 98, 102) were dropped for being invalid. The result revealed that cluster 1 (planning) of PLBMI had 14 items representing 28% of the 50 items that survived the factorial validation process. While cluster 2 (implementing) had 15 items representing 30% of the 50 items that survived the factorial procedure. The result further showed that cluster 3 (supporting) and 4 (monitoring) had 22% and 20% representing 11 and 10 items respectively of the 50 items that made up PLBMI.

The finding of this study is in consonance with the recommendation made by Meredith as cited in Madu (2012), that a loading of 0.35 should be the minimum for accepting any item. The reduction of items from One hundred and two (102) to fifty (50), agrees with the opinion of Edikpa (2004), that the most distinctive characteristic of factor analysis is its data reduction capability and condensation of many items into a few underlying constructs. The factor analysis pulled the like items of PLBMI closer. The findings of this study also relates to Nwangwu (2011) study, where 30 items were found to be valid and included in the instrument while 15 invalid items were dropped.

However, findings in this study revealed that in the respective four clusters of the instrument, 168 male principals representing 36.4% of the sampled principals obtained effective mean responses of 2.88, 2.75, 2.74 and 2.75, while 294 female principals representing 63.6% obtained effective mean responses of 2.91, 2.76, 2.60 and 2.73. This indicated that principals' mean responses to the items of the instrument in the various clusters did not differ in terms of their sex.

The results of the corresponding hypothesis indicated that male principals t- calculated values of 0.967, 0.021, 1.166, -0.154 were less than the t-critical values of 0.334, 0.983, 0.244 and 0.878, when tested at 0.05 significant level with 455 degree of freedom. The result revealed female principals't- calculated values of 0.947, 0.021, 1.174 and -0.155 are less than t- critical values of 0.344, 0.984, 0.241 and 0.877 when tested at 0.05 significant level at 455 degree of freedom.

This finding contradicts Nwangwu (2006), who posited that in schools headed by female head-teachers, students perform better in external examinations than those headed by male head-teachers. The findings, on the other hand, disagrees with the findings of Eneremadu (2004), who opined that gender of the principal affects the Usefulness of Punishment in secondary schools in Imo State.

Conclusion

The findings of this study have clearly shown that the 50 items that survived factor analysis exercises formed the items of PLBMI; therefore this confirmed the validity of the instrument. This implies that PLBMI can be used by interested institutions and individuals to assess the leadership behaviour capabilities possessed by principals before assigning them schools to lead.

The male and female principals obtained effective mean in all the clusters of the instrument, based on acceptance criterion mean of 2.50.

The hypothesis was accepted or rather given the interpretation of "not significant because t-critical and Significance of F calculated at 455, 3, and 2 degrees of freedom are $P > 0.05$ level of significant. Thus, indicating acceptance of the null hypothesis. By implication, gender of the principals does not exert significant influence on principals' mean (x) scores on the PLBMI. Therefore, the instrument could be used for all principals irrespective of their sex.

Recommendations

The following recommendations were made:
1. Ministries of Education, Teaching Service Board and any other educational institution that might wish to determine the leadership skills of heads of their institutions should adopt PLBMI.
2. This instrument could be used during conferences, seminars and workshops in training of principals by the higher authorities.
3. Principals could use it as self-evaluation tool because PLBMI has the capability of helping the principals identify and improve their leadership behaviours.
4. This instrument should be used for all categories of principals, not minding their gender.

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Psychometric Properties of Hausa Translated Version of Buss- Perry Aggressive Questionnaire

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Abstract
The Buss-Perry Aggressive Questionnaire (AQ) has been widely used for the measurement of aggression in children and adolescents. Although developed in the English language, the versatility of the AQ had made it to be used across cultures and it has been translated and validated into a couple of international languages. However, despite its wide usage among educational and counselling psychologists in Nigeria, a Nigerian translated version of the instrument does not exist. This paper thus describes the qualitative and quantitative procedures of the translation of the AQ for use in a Hausa-speaking community of Almajiris. The approach involved the use of the principles of Brislin's translation model involving forward and back translation cycles by bilinguals and harmonised translation by a committee of translators. To determine the content validity of the translated scale, the quantitative measurement procedure by Lawshe (1975) was used. The translated scale was then administered on 324 Almajiri children randomly selected from 5,961 in five Almajiri integrated schools in Gombe metropolis. Exploratory factor analysis was used to assess its factorial structure. The results of the reliability and validity analyses showed that the scale is highly reliable and valid for screening aggression in Almajiri children of Gombe metropolis.

KEY WORDS: *Translation, Aggression, Almajiri and Psychometric Properties*

Psycometric Properties of Hausa Translated Version of Buss- Perry Aggressive Questionnaire

Introduction
Among the abnormal behaviours in the society, aggression appears to be the most rampant and perturbing because it is displayed everywhere in the society. It starts from home in the form of physical and verbal aggression among the couples, siblings, or parents using it as a corrective measure towards the children while children and adolescents with conduct disorder tend to attribute hostility to others and underestimate their aggression in any conflict, they value aggression as effective in problem-solving and enhancing their self-esteem (Dauda, 2021). Aggression is a personality trait that is related to anti social behaviour and it is associated with situational and environmental factors (Rayna et al, 2011). One of the instrument used for measuring aggression is Buss-Perry Aggressive Questionnaire (AQ) which is a tool developed by Buss and Perry (1992) to evaluate symptoms of aggressive behaviours. The instrument contains 29 Items

that can be used to measure four components of aggressive behaviours; these are physical aggression (9 items), verbal aggression (5 items), anger (7 items) and hostility (8 items) (Bukhari et al., 2017). This questionnaire is most commonly used method for measurement of aggression. It can also be used as a self-assessment of aggression and can be applied on adults and children. The method of scoring is on 5-point Likert scale and the rating is done for each items according to the given scales (1=extremely unlike me, 2= somewhat unlike me, 3= neither like me nor unlike me, 4= somewhat like me, 5= extremely like me). The first two factors represent a motor or instrumental component; anger, which implies psychological activation and preparation for aggression, is the affective or emotional component; and hostility represents the cognitive component. The internal consistency coefficients of the original AQ were as follows: Physical Aggression, $\alpha = 0.85$; Verbal Aggression, $\alpha = 0.72$; Anger, $\alpha = 0.83$ and Hostility, $\alpha = 0.77$, with the internal consistency being $\alpha = 0.89$. This instrument was developed in

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English-speaking country and had been translated and validated in different countries in several languages such as Arabic, Chinese, Dutch, Japanese, Swedish, Spanish, German, Greek, Italian, Malay, Turkish, Urdu and Tamil Languages to avert cultural influence (Iftikhar and Malik, 2014; Kaur, 2018, Dinakaran, 2019).For researchers working with populations in non-English speaking countries or cultural groups that differ greatly from the population used to develop the instrument, translating and adapting established English language measure is an efficient solution for the lack of available instruments.

As an example, a research on Translation and Validation of Aggressive Questionnaire in a Pakistani Children Cohort had been conducted by Iftikhar and Malik, (2014), the tenant of their research was to translate and validate the Buss and Perry 29 items AQ and to scrutinize its measurement model with originally postulated factorial composition given by Buss and Perry (1992). The AQ was translated from English to Urdu using standardized forward and back translation process. To establish the measurement model of the translated AQ, the information gathered was subjected to assenting factor analysis to evaluate its factorial structure on Pakistani children. Construct validity of the AQ was examined using convergent and discriminates analysis. Furthermore, the study examined the internal consistency and gender differences. The outcome of the measurement model recommended using confirmatory factor analysis exposed four factor solution of AQ initially recommended by Buss and Perry AQ. The outcome of the validity and reliability analyses indicated that the translated AQ is enormously consistent and suitable for viewing aggression among Pakistani population.

Similarly, in India, Kaur, (2018) translated the Buss and Perry Aggression Questionnaire into Hindi language using forward backward translation procedure. The AQ administered on 500 subjects to check its validity and reliability. The result shows that the AQ was valid and reliable for screening aggression in children of India. In the same vein, Dinakaran, (2019) developed the Tamil language edition of the Buss Perry Aggression Questionnaire for the

Chennai people in eastern India and evaluated its psychometric properties. The translation process entailed both forward and backward translations with the help and guidance of two professors who were well versed in both English and Tamil. The Tamil editions of the AQ were given to a sample of general population to assess its validity and reliability. The subjects were asked to complete the questionnaire using to the 5 point level. The Tamil edition of the AQ has been found to be consistent and applicable for screening of Aggression for use in clinical research and practice.

Other researches in embrace of the full scale of AQ and in terms of internal reliability and construct validity were conducted in Spain by Santisteban (2007); in Egypt by Abd-El-Fattah, (2007). A Turkish Version of the AQ had been translated by Psik and Madran (2013); they determined the reliability of the scale through test re-test, split-half method and the criterion validity. Their findings supported the four factors structure and appropriate for assessing aggression among the Turkish population. Another study conducted by von Collani, & Werner, (2005) in Germany agree with the initially established four-factor solution and accomplished highly acceptable psychometric properties of Aggression Questionnaire as internally reliable and validated through construct and concurrent validity.

On the other hand, Nakano (2001) and Sierra & Gutiérrez, (2007) cited in Rayna et al (2011) conducted a research on Japanese and Spanish participants respectively and recommended the elimination of two items from the original scale for better fit of the model AQ. Another study conducted by Meesters, Muris, Bosma, Schouten, and Beuving (1996) also cited in Rayna et al also recommended the discarding of three items of the AQ; one from verbal aggression and two from hostility aggression on a sample of Dutch participants for better fit of the original model.

As in many parts of the world, the AQ is widely used especially for research purposes. However, despite its wide usage among educational and counselling psychologists in Nigeria, a Nigerian translated version of the instrument does not

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exist. This gap prompted the researchers to translate the Buss and Perry AQ into Hausa language, and ascertain its psychometric properties among the sample of Almajiri school pupils who possibly lack the knowledge of western education. The choice of the Almajiris was borne out of the obvious high incidents of aggression among them which affects their daily functioning (Dauda, 2021).

Statement of the Problem
Based on this contextual background, this study sought to translate the Buss-Perry aggressive questionnaire into the Hausa language and evaluate its psychometric properties on a sample of Almajiri pupils in Gombe metropolis.

Objectives of the Study
1. To develop standardized Hausa Version of Buss-Perry Aggressive Questionnaire (HVBPAQ) in Hausa population.
2. To test the reliability of Hausa Version of Buss-Perry Aggressive Questionnaire (HVBPAQ) in Hausa population.

METHOD
Participants
The sample consisted of 324 Almajiri children aged 12 to 20 randomly selected from 5,961 *Almajiris* in five Almajiri integrated schools in Gombe metropolis of Gombe State.

Procedure for the Translation of the Buss-Perry Aggressive Questionnaire into Hausa
In line with the approaches to cross-cultural scale translation (Siddiqui, Abu-Riash & Al-Suliman, 2017; van den Berg, Bekker, Seedat & Stein 2006), three steps were involved in translating the AQ into the Hausa version. Smith,
Figure 1 gives the conceptual procedure of the translation.

Firstly, the AQ was translated from the English language to the Hausa language by two Hausa individuals who are bilingual in both Hausa and English languages (this procedure is called the initial translation).

In the second step, the translation of the Hausa Version was then translated back to the English language by two bilingual English individuals without the use of the original scale (this

procedure is called the back translation).
In the third step, the items produced by the two back-translators were thoroughly evaluated by a committee of seven individuals. The committee comprised the individuals who participated in the initial and back translation procedures and one lecturer of Guidance and Counselling who is conversant with the AQ and the researchers.

The committee selected the items in the back (English) translation and compared with the original version of AQ to see the extent to which it conveys the same idea. The committee rated the two initial translated Hausa versions in comparison with the original English version using the scale of 0-5, where: 0= not related at all, 1= partially related, 2 = moderately related, 3 = approximately related, 4 = Related and 5 = accurately related.

All the items that were rated between 0 and 2 were regarded as poor translations and those that were rated from 3-5 were regarded as good translations. The items with the highest average ratings were selected from each of the two Hausa translations as recommended by van Widenfelt, Treffers, de Beurs, Siebelink and Koudijs (2005).

Based on this rating, 15 items that is items 2,3,4,5,6,7,8,9,10,14,17,22,26, 27 & 28 were selected from the first initial Hausa translator and 5 items i.e. items 15,16,18,19 & 20 from the second initial Hausa translator, while 9 items i.e. items 1,11,12,13,21,23,24,25 & 29 were amended respectively. These form the final version of the Hausa translation.

Table 1 gives the summary of the Final Hausa Version of Buss-Perry Aggressive Questionnaire
Ka'idan umurni:
Yi amfani da wadannan matakai guda 5 da suke kasa, ka bayyana yanayi ko tsarinka ko akasin haka ta lura da kowanne daya daga cikin wadannan bayanai domin ka bayyana kanka ko yanayin ka. Tilas ka dubi wanda ya dace da yanayin ko tsarin wajen abin da ya dace da kai.
1. Kwata-kwata bai yi kama da ni ba.
2. Ya so ya yi kama da ni.
3. Ya dan yi kama da ni
4. Ya yi Kama da ni
5. Ya yi Kama da ni sosai.

Table 1: Final Hausa Version of Buss-Perry Aggressive Questionnaire

S/N	ITEMS	MEAN
1.	Wani lokaci bana iya hana kai na dukan wani.	3.67
2.	Ba ni haushi na iya sani na kai duka.	4.00
3.	Duk wanda ya buge ni zan rama.	3.67
4.	Na kan yi saurin fada in aka taba ni fiye da wanda sai an kure shi.	4.00
5.	Tilas zan jajirce wajen fada domin in kare 'Yanci na	4.00
6.	Wasu mutane sukan kai ni makura (bango) kafin in mayar musu da martini.	4.67
7.	Ba na tsayawa dogon tunani in an bata min rai, nan take nake ramawa.	4.00
8.	Mutanen da na sani ma, ina tsoratasu.	3.67
9.	In aka taba ni, ina komawa kamar mahaukaci.	4.00
10.	Idan ban amince da abu ba, kai tsaye na ke sanarwa abokaina.	4.00
11.	Ni akasari ina jayayya da mutane.	3.67
12.	Nakan bayyana matsayin mutane a wurina, matukar suka bata mini rai.	4.33
13.	In mutane sun ki amincewa da ni, nakanyi ja yayya dasu.	4.33
14.	Abokaina kan ce mini ina da yawan musu.	4.33
15.	Ina fushi da wuri amma nakan sauka ba da bata lokaci ba.	4.67
16.	Na kan bayyana bacin raina a fili.	4.67
17.	Wani lokaci na kan ji kamar na fashe in aka cika ni.	4.00
18.	Bana barin ko ta kwana.	4.33
19.	Wasu abokaina sun dauke ni mai saurin fushi.	4.33
20.	Awasu lokuta nakan jawo rikici ba tare da wani dalili ba.	4.67
21.	Bana boye (kame) fushi na.	4.00
22.	Wani lokaci kishi kan mamaye (cinye) ni.	4.00
23.	Nakan ga kaina marar rabo a rayuwa.	3.67
24.	Alama sauran mutane sune masu rabo.	4.00
25.	Na kan yi mamaki, shin me ya sa na kan yi fushi sosai game da wasu abubuwa	4.33
26.	Na san abokaina na magana na in ba na wajen (bayana).	4.67
27.	Bana samun nitsuwa da kulla abota da wanda bansan halinsaba.	4.67
28.	Na fahimci (gane) wasu mutane na dariya na a bayan Ido na.	4.00
29	Bansan dalilin da ya sa mutane suke kyauta ta min ba.	3.67

Table 2: Reliability of Hausa version and Original AQ

subscale	No of Items	A	α(Buss & Perry)
Physical Aggression	9	.83	.85
Verbal Aggression	5	.69	.72
Anger	7	.78	.83
Hostility	8	.85	.77
Total AQ	**29**	**.89**	**.80**

The researchers also conducted Exploratory Factor Analysis on a sample of 30 subjects that were not part of the study as suggested by Tsang, Royse and Terkawi (2017). A correlation matrix was used in checking item-by-item correlation of the Buss-Perry Aggression Scale. It was found that all the items are correlated.

With regard to the reliability of the translated Hausa version of the AQ, the internal consistency was determined using Cronbach's alpha (α) statistics. The internal consistency estimate obtained using Cronbach alpha was .81. The coefficient of stability obtained using Pearson's Product Moment Correlation was .89 are considered good reliability estimates. This signified that the Hausa model of AQ indicated high indices for the full scale. While for the sub-scales, the internal consistency coefficients were as follows: Physical Aggression, α = 0.83; Verbal Aggression, α= 0.69; Anger, α= 0.85 and Hostility, α= 0.78, with the internal consistency being α= 0.89.

Psychometric characteristics of the Hausa translated version of the AQ

To ascertain the face and content validity of the translated Hausa version of the AQ, the final translated instrument was forwarded to nine independent bilingual individuals who were not aware of the anticipated concept of what the questionnaire expected or designed to measure for rating. The content validity mean values were computed for each item using the quantitative measurement procedure by Lawshe (1975) cited in Effendi, Matore & Khairani, (2015) which is the Content Validity Ratio (CVR). The Content Validity Ratio proposed by Lawshe is a linear transformation of a relational level of agreement on number of "expert" within the panel rate an item "essential" calculating using the following formular:

$$CVR = \frac{ne - N\frac{1}{2}}{N\frac{1}{2}}$$

Where **CVR** = Content Validity Ratio. **ne** = number of experts rated the item as essential. **N** = number of experts.

According to Ayre and Scally (2014), Lawshe recommended the transformation (from proportion to CVR) was significance as it could readily be seen whether the level of agreement among the panel members was greater than 50%. CVR values range between -1 (perfect disagreement) and +1 (perfect agreement) with CVR values above zero signifying that over half of the panel members agree on an item essential. The score of the entire instrument is called the Content Validity Index (CVI). It is simply the mean score of those retained items, calculated according to the following formula by Lawshe 1975 (Varmazyar, Mortazavi, Arghami & Hajizadeh, 2014).

$$CVI = \frac{-\ CVR for all retained items}{retained items numbers}$$

Table 3 gives the summary of the content validity ratio of the items:

Table 3: Content Validity Ratio of the Items and Content Validity Index of the subscales

S/N	FACTOR/ITEMS	CVR	CVI
	Physical Aggression		
1.	Wani lokaci bana iya hana kai na dukan wani.	.56	
2.	Ba ni haushi na iya sani na kai duka.	.78	
3.	Duk wanda ya buge ni zan rama.	.56	
4.	Na kan yi saurin fada in aka taba ni fiye da wanda sai an kure shi.	.78	
5.	Tilas zan jajirce wajen fada domin in kare 'Yanci na	.78	0.73
6.	Wasu mutane sukan kai ni makura (bango) kafin in mayar musu da martini.	.99	
7.	Ba na tsayawa dogon tunani in an bata min rai, nan take nake ramawa.	.78	
8.	Mutanen da na sani ma, ina tsoratasu.	.56	
9.	In aka taba ni, ina komawa kamar mahaukaci.	.78	
	Verbal Aggression		
10.	Idan ban amince da abu ba, kai tsaye na ke sanarwa abokaina.	.78	0.86
11.	Ni akasari ina jayayya da mutane.	.56	
12.	Nakan bayyana matsayin mutane a wurina, matukar suka bata mini rai.	.99	
13.	In mutane sun ki amincewa da ni, nakanyi ja yayya dasu.	.99	
14.	Abokaina kan ce mini ina da yawan musu.	.99	
	Anger		
15.	Ina fushi da wuri amma nakan sauka ba da bata lokaci ba.	.99	
16.	Na kan bayyana bacin raina a fili.	.99	
17.	Wani lokaci na kan ji kamar na fashe in aka cika ni.	.78	
18.	Bana barin ko ta kwana.	.99	0.93
19.	Wasu abokaina sun dauke ni mai saurin fushi.	.99	
20.	Awasu lokuta nakan jawo rikici ba tare da wani dalili ba.	.99	
21.	Bana boye (kame) fushi na.	.78	
22.	Wani lokaci kishi kan mamaye (cinye) ni.	.78	
	Hostility		
23.	Nakan ga kaina marar rabo a rayuwa.	.56	
24.	Alama sauran mutane sune masu rabo.	.78	
25.	Na kan yi mamaki, shin me ya sa na kan yi fushi sosai game da wasu abubuwa	.99	0.80
26.	Na san abokaina na magana na in ba na wajen (bayana).	.99	
27.	Bana samun nitsuwa da kulla abota da wanda bansan halinsaba.	.99	
28.	**Na fahimci (gane) wasu mutane na dariya na a bayan Ido na.**	.78	
29	Bansan dalilin da ya sa mutane suke kyauta ta min ba.	.56	

Base on the Table 2, the Content Validity Index was calculated thus:

$$CVI = \frac{-\; CVR for all retained items}{retained items numbers}$$

For physical aggression = $\frac{6.57}{9}$ = 0.73, For verbal aggression = $\frac{4.31}{5}$ = 0.86,

For anger = $\frac{6.57}{7}$ = 0.93, For hostility = $\frac{6.43}{8}$ = 0.80

For the whole Scale = $\frac{23.39}{29}$ = 0.81

Table 3 shows that Lawshes's content validity ratios of the items are adequately fit of the full model and the content validity index of .73, .86, .93, .80 for the physical aggression, verbal aggression, anger and hostility respectively for the subscales and .81 for the total scale.

Discussion

The study aimed at determining the measurement model of Aggressive Questionnaire (AQ) by Buss and Perry (1992) on Nigerian *Almajiri* children. The main intent of the study were to translated the Buss-Perry aggressive questionnaire into the Hausa language and evaluate its psychometric properties of on a sample of Almajiri pupils in Gombe metropolis.

The outcomes of inter item correlation of the translated scale were significant. The internal consistency of the total scale and subscales was in consistent with the original reliability for the total scale and subscales proposed by Buss and Perry (1992). The results in the Table 2 show that "Physical Aggression" and "Anger" are highly reliable with the Cronbach's alpha of .83 and .85 respectively, Verbal Aggression and Anger subscales are moderately reliable with .68 and .78 respectively. Table 3 shows the standardized factor loading on CVR of 4 factor solution of AQ. The factor loadings were in the range of .56 and .99, which were significant. The results of the factor loadings were consistent with the CVR loading.

The reliability of the translated Hausa version was consistent with the reliability of the original scale proposed by Buss and Perry (1992). The face and content validity of the scale was evaluated using the quantitative measurement procedure by Lawshe (1975). The outcomes of the translated Hausa version of the AQ analyses indicated that the scale is highly reliable and valid for screening aggressive behaviour among Almajiri children of Gombe metropolis.

The results also indicated that the existence of four structure using exploratory factor analysis and Lawshes's content validity ratio is an adequate fit of the model. The results are in agreement with the previous studies where AQ simulated the four factors structure in different countries like China (Dinakaran, 2019), India (Kaur, 2018), Argentina (Reyna et al, 2011), Germany (von Collani & Werner, 2005), Spain (Santisteban, 2007), Egypt (Abd-El-Fattah, 2007), Turkey (Psik, & Madran, 2013), Pakistani (Iftikhar and Malik, 2014).

CONCLUSION
The findings of the present study indicate that the translated version is a reliable and valid instrument for screening aggression in the Nigerian *Almajiri's* population. It is imperative to note that when the instrument was translated into another language, one cannot merely presume that the translated instrument or items are valid. This is due to the fact that validity is precise and it cannot be translated in a literal manner. In addition, the cultural context of the second language, such as the terms used, is different from the original one. Hence, all translated instruments should be subjected to additional psychometric property assessment (Zavala-Rojas, 2014).

Recommendation

This study provides groundwork for further research, in using Buss-Perry Aggressive Questionnaire in various cultures and languages in Nigeria, since Nigeria, being a multi-lingual country. Self rating BPAQ can also be examined in the psychological population. Further studies should seek to obtain probabilistic and more heterogonous samples to facilitate generalization; hence the sample of this study might not be representative of Nigerian Hausa speaking people population.

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Investigation of Differential Item Functioning of Basic Education Certificate Examination (BECE) Mathematics Items in Akwa Ibom State, Nigeria

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Abstract

Differential Item Functioning (DIF) of multiple-choice test is a potential bias source in measurement, which can be misleading in any evaluation process. Therefore, it is pertinent to identify the possibilities of DIF in multiple-choice items. The descriptive survey design was adopted to study the differential item functioning of 2020 Basic Education Certificate Examination (BECE) Mathematics multiple-choice items. The study population consisted of 19,560 Junior Secondary three (JSS3) students, who registered and sat for the 2019/2020 BECE in Akwa Ibom State. From the population of 1,956 students were selected from 530 secondary schools using stratified, proportionate and sample random sampling techniques. Three research questions were raised and subjected to item differential functioning analysis. The result showed that fourteen items out of 50 items functioned differentially with respect to gender. The result also revealed that sixteen items out of 50 items functioned differently with respect to school location, while 22 items functioned differently with respect to school ownership. It was recommended that, DIF analysis should be incorporated into educational assessment to obtain valid psychometric properties of test and valid educational assessment. Also, examination bodies and test developers should promote analysis of test items bias for every fixed response test.

Keywords: DIF, IRT, Item Effectiveness, BECE, Difficulty Index

Introduction

Test is a process of determining examinees' ability to complete certain task or demonstrate mastery of skill or knowledge of contents. Therefore, test is often conducted to measure examinees' knowledge, skill, aptitude, physical fitness, classification, social development, emotional maturity and mastery of some concepts or achievements in a specific area (Asim, Ekuri & Eni, 2013). Test can be administered verbally, on paper, on a computer, or in a confined area that requires the examinees to physically perform a set of skills. Test produces qualitative or quantitative information which can be used to adjudge students' achievement. It can further be used in providing incentives and goals for the students. In addition, it can be used to certify attainment as well as provide information for decision-making (Rutayuga & Amiri, 2005; Evans, 2016). McAllister and Guidice (2012) and AERA *et al.* (2014) sees test as an item or set of items presented to an individual or set of individuals to which they are expected to respond under specific a condition, with the intent to determine the extent to which traits are present or absent in the respondents.

In Nigeria, multiple-choice tests are frequently deployed by most external examination bodies as well as subject teachers to examine students' mastery of a subject, including mathematics. The reason is that multiple-choice test items can be structured to cover a wide area of a curriculum; it can measure most educational outcomes such as knowledge, understanding, judgment and problem solving (Asim, Evans & Idaka, 2020). Of course, it can always be used to test a large number of students at a time. In addition, multiple-choice item allows for computer-based testing, hence, marking and collation of results processes can be automated. It also aids broad contents coverage, rapid scoring and provision of quick feedback to students (McAllister & Guidice, 2012; Bassey, Joshua & Asim, 2014). Therefore, multiple-choice item can be considered as a panacea to the problem of large class size, which has always been an issue challenging test credibility and

civility in the Nigerian educational system.

Measurement of educational constructs in schools is made possible through the use of test items. The cognitive construct of students, like mathematics cognitive ability, can be measured with mathematics achievement test. Items on a test instrument ought to measure the intended ability irrespective of the parameter of subgroup of the students. A test item provides more advantages for one group over another to the extent that their comparative interpretation using measurement theory becomes biased (Zumbo, 2015). Measurement theory commonly refers to as psychometric theory provides the foundation for evaluating tests, their uses and interpretations. Measurement theory espouses validity and reliability properties of test items to define the quality of a test. Validity is the extent to which evidence and theory occur with interpretations driven by the test result as captured in test usage proposal. It is also the degree to which a test actually measures the variables it purports to measure (Nitko, 1996; Cronbach, 1988; Kpolovie, 2002; Joshua, 2005).

The truthfulness of a measured item is its validity (Shaughnessy & Zechmeister 2003; Adebalaziz, 2010). Together, the validity and reliability of a test provide the basis for rating the technical credibility and appropriateness of the use as well as interpretations of test results. Test validity is most important when evaluating the uses of test and the inferences made from test results. However, other considerations such as fairness and comparability of test results for different test takers or from one occasion to another are also important. In most tests, fairness and comparability of test are readily subsumed under more fundamental subjects of validity and reliability. Hence a test that is meant for different sub population but which give each sub-population different approaches in responding to the test result is not merely biased, but unfair to all the population of students. Such a test lacks validity and objectivity because the test will need different interpretations for each sub-population of the students (Umobong & Tommy, 2019).

Theoretical Foundations of Testing

Test objectivity is measured by two conditions namely the calibration of test instrument and measurement of examinees' ability. The calibration of measuring instrument must definitely be independent of people that are used for the calibration. Secondly, the measurement of examinees' ability must be independent of the instrument used for measuring (Nenty, 2004; Umobong, 2004; Joshua, 2008). The objectivity property is not found in psychological or behavioural measurement. It is lack of the objectivity property in behavioural measurement based on classical measurement model that makes the resulting data basically uninterpretable and only meaningful in extremely limited situations. For a long time, the classical test theory (CTT) has dominated the development of measuring instrument in Nigeria and other part of Africa (Turkcebilgi, 2010). Fortunately the solution is gradually changing with the introduction of the item response theory (IRT).

In CTT, students' scores have been based on the summation of the scores obtained by the examinees on the test items of a given test. Using the summed up or total score of all the items as the basis to determine the performance of students in a given subject tends to hide the characteristic of both the testees and the item that constitute the test (Obinne, 2011). Certainly, the situation does not ensure objective and adequate or accurate decision about the testees and the items. Therefore, it is necessary to use the modern test theory to check those hidden psychometric properties of both the testees and the items as a way of improving test development. In view of above, item response theory (IRT) became the paradigm for the design, analysis and scoring of test, questionnaires. Similar instrument can be used for measuring ability, attitude or other parameters (Fox, 2010). Item response theory as set of mathematical models designed to describe the fundamental relationship between examinees' abilities and performance on an item (Cohen & Walls, 2001). By item response theory (IRT) standards, test items should not depend on the characteristics of the sample. With the use of

IRT framework, the analysis of test items, Psychometricians have established that some items in a test may function differently from what the test is meant for. It means that such items have interaction with the characteristics of the examinees taking a test. Therefore, the items are described as having differential function. IRT assumes there is Mathematical function that relates the probability of correct respond on an item to an examinee's ability (Sa'ad, Adamu & Sadiq, 2014).Differential item functioning is a difference in proportion of correct responses between equal-ability respondent in two groups. A test that exhibits differential item functioning (DIF) is one that is unfair to a subgroup population in which it is being used. DIF occurs when two groups, the reference and focal groups, possess relevant knowledge and skill but performed differently in a given test (Umoinyang, 2011). DIF is said to exist when people from different groups but with the same ability systematically responding differently to specific test items. It is a threat to test validity and invalidates interpretation of a test result (Pido, 2012; Omorogiuwa & Iro-Aghedo, 2016). It occurs when examinees of the same ability do not have equal probability of getting an item correctly (Roever, 2005). Linacre, 2007 noted that despite the existence of statistically significant difference, the impact of one item could have too small an influence on the meaning of test result. Consequently, it is important to study statistically significant and the logit difference of at least 0.5 in order to address test item bias. Irrespective of the amount of DIF detected, with a satisfactory fit model, the DIF can be negligible. Trivial impact is the difference in the person estimate from the two analyses of less than 0.5 logits (Wright & Panchapakesan, 1969). In differential item functioning analyses, abilities of various samples are evaluated based on the test items linked with demographical features like male and female in similar performance grade or school ownership and school location of the examinees (Greer, 2004; Perrone,2006; Pedraijita, 2009; Gomez-benito, 2017).

Abeddalaziz (2010) investigated gender-related differential item functioning of Mathematics test items. The researcher determined the DIF of mathematics items and concluded that the percentage of agreement among the three approaches in detecting DIF was relatively low. Omorogiuwa and Iro-Aghedo (2016) investigated DIF by gender in National Business and Technical Examination Board (NBTEB) using 2015 Mathematical multiple-choice test items (Dichotomous). The results of the study indicate that male and female students functioned differently in 17 items (representing 34%) while there was no difference in 33 items (representing 66%). Adedoyin (2010), studied gender biased items in Mathematics examination found that out of 16 test items that fitted the three parameters logistis (3PL) item response theory statistical analysis, 5 items were gender biased. Lyons-Thomas et al. (2014), examined gender differential items function (DIF) across four jurisdictions that took part in a large-scale international assessment in Canada, Shangai, Findland and Turkey. They observed that some items performed differently among the examinees from the different countries. Six items representing 12% had DIF effect, while the other 44 items representing 88% had no DIF effect.

Research reports indicate that test items could function differentially for subgroup defined by location. For instance, Uruema and Adams (2013) conducted a study on differential item functioning method as an item bias indicator as an item bias indicator using logistic regression on NECO Economics examination items. They detected items that have DIF against subgroup of students in urban and rural schools. The study further revealed that from the 60 multiple-choice items in NECO Economics examination, 18 items showed DIF. Their findings implies that items used in assessing students' ability have element of bias that place the rural school examinees at disadvantage and the urban schools' examinees were favoured. However, the study by Lee and Mclntire (2001) reveals that there is no significant difference between performance of rural and urban students.

Research studies have been done on differential item functioning of items due to school type. Amuche and Fan (2017) using logistic regression statistics detected item that have DIF against subgroups such as public and private

schools' examinees. The result shows that out of 60 items in NECO Biology examination of 2012, 10 items were identified to display DIF of which, six items favoured private school students, while the public school students were at disadvantage because only four items actually favoured public schools. Adeosun (2020) investigated item biasness of early reading literacy for pre-school children in Oyo State. He uses DIF analysis system software version 5.0 to conduct in order to establish items that function differentially between private (reference group) and public (focal group).The result was presented in line graph of items and it indicated DIF in favour of private and public school children. The result shows that out of 226 items, only 70(42%) items were biased with respect to school type. Ogbebor and Onuka (2013) investigated DIF method as item bias indicator. They used logistic regression statistics to identify test items that have DIF against sub-groups such as public and private schools; urban and rural schools. It was discovered that 11 items favoured public; another set of eleven items favoured private schools.

In the world over, concerted efforts have been made towards improving students' achievement in Mathematics for effective scientific and technological development. In Akwa Ibom State, Nigeria, the State Government usually conduct qualifying examination for all Junior Secondary three (JSS3) students, to assess their ability to write Basic Education Certificate Examination (BECE**).** In addition, priority is given to Mathematics teachers during employment to ensure their availability in public schools to promote teaching-learning of Mathematics. This is due to the importance of Mathematics in science and technological (Eduwem & Umoinyang, 2014). Going by the importance of Mathematics in senior secondary education, evidence by the special attention paid to mathematics by stakeholders in the educational section and the subsequent grouping of students into classes based on BECE results. In spite of these, the achievement of students in the subject has not improved, evidenced by the rate of students' achievement in mathematics from 2011- 2015 stated as: 45.4% in the year 2011, 48.4% in the year 2012,

45.8% in the year 2013, 37.0% in the year 2014 and 47.2% in the year 2015. But attention has not been given to the objectivity of the test items from whose results are used for decision making (Asim, Evans & Idaka, 2020).

In attempting to solve the problems of students' poor achievement in mathematics, Asim *et al.* (2013); Eduwem and Umoinyang (2014) noted some factors capable of influencing students' poor achievement in mathematics to include; motivation, class attendance, class size, subject matter, study time, teaching methods, external activities, test formats and school location. Tata, (2013), attributed students' poor achievement in mathematics to the decline in students' interest in mathematics, fear and poorly distribution of library materials in schools. Researchers such as Sa'ad, Adamu & Sadiq (2014); Eduwem & Umoinyang, (2014); Thawabieh, (2016) have traced the downward trend in students' achievement in mathematics to the inability of the students to understand the test items. Asim, Evans and Idaka (2020) emphasized on the type of multiple-choice test items dominating a testing material, and the problem of biasness of the test formats.

Other works still attempting to offer solutions to the problem of item biasness include; Ojerinde, Popoola, Ojo and Onyeneho (2012); Ogbebor and Onuka (2013); Bulus (2018). They observed the presence of some irrelevant elements in the test items significantly responsible for differential performance of testees with the same ability but of different demographic setting. This is because differential item functioning may occur without the judgment of unfairness producing weak performance. From the above, little or no efforts have been made to investigate items characteristics of Mathematics test in BECE in order to determine the influence of differential item functioning on the fluctuating performance of students in Mathematics in the BECE, which is the focus of this study. This was achieved through the following objectives:

1. to investigate the number of Mathematics multiple-choice items in 2020 BECE that functioned differently among students in Akwa Ibom State based on gender,
2. to determine the extent that the 2020 BECE test items in Mathematics function differently

due to school location,
3. to examine the extent to which the 2020 BECE test items in mathematics function differently based on school proprietorship.

Research questions
The following questions were raised to guide the study:
1. What is the number of Mathematics multiple-choice items in 2020 BECE that functioned differently among students in Akwa Ibom State based on gender?
2. To what extent do the 2020 BECE test items in mathematics function differently due to school location?
3. To what extent do the 2020 BECE test items in mathematics function differently due to school proprietorship?

Research Methodology
The research methodology applied to find solutions to the research questions raised to guide the study are covered in the subsections below.

Research Design
The research design adopted for this study is the descriptive survey design. Therefore, quantitative method using some set of predetermined questions, which include written and oral was deployed to investigate a group of JSS3 students of Batch 2020. The entire JSS3 students in Akwa Ibom State were assumed to be of homogenous characteristics ((Shaughessy et al., 2003; Rover, 2005; Fowler, 2009, Anikweze, 2009; Isangedighi, 2012). Besides, survey research design can be applied to large and small population by selecting and studying a sample of the population from which inference are made to discover relative incidence, contributions and interrelations of sociological and psychological variables. Survey design provides a quantitative description of trends, aptitudes, opinions, feelings, perception or achievement of a population by studying a sample of that population at a particular time.

Research Area
The research was carried out in Akwa Ibom State, Nigeria. The State is among those classified as educationally advantaged States in the country, as many of her citizens are exposed to all levels of education with literacy rate of 78.84% (National Bureau of Statistics, 2017).

Population
The population for the study comprises 19,560 JSS3 students from public and private secondary schools in Akwa Ibom State who wrote the 2020 BECE.

Sample/Sampling Technique
A sample of 1,956 students (10%) of the students' population consisting of 1027 males and 929 females was selected for study using multistage sampling procedure.

Instrument
The 2020 BECE Mathematics examination items were adopted and used to obtain secondary data. The examination consists of two sections; objective and essay sections, however, the study used only the objective section whose items were structured in the multiple-choice formats. The objective section consists of 50 items marked dichotomously as correct (1) and incorrect as (0). Every item has four options indicated as A to D, of which one of the options is correct, while the other three options functioned as distractors. The items were deemed valid and reliable because they had been validated by examination bodies. Mathematics question paper and optical mark recognition (OMR) marked scripts were obtained from Akwa Ibom State Ministry of Education by the researchers for data analysis.

Analysis of Data
Data were analysed using Phase 2 module of BILOG MG. Item with a difference greater than ± 0.5 indicates the presence of significant DIF.

Results
Research Question 1: What is the number of mathematics multiple-choice items in 2020 BECE that functioned differently among students in Akwa Ibom State based on gender? Phase 2 module of BILOG MG was used to establish the number of items in Mathematics Multiple-choice paper in 2020 BECE function differently among students in Akwa Ibom State based on gender (Table 1).

Table 1: IRT Analysis of DIF with respect to gender on selected 50 items from 2020 BECE Mathematics

S/N	Gender		DIF Difference	Decision	Remark
	Male	Female			
1	-0.478	-0.782	0.304	N0 DIF	
2	0.222	-0.091	0.313	No DIF	
3	0.552	0.324	0.228	No DIF	
4	0.116	0.246	-0.130	No DIF	
5	-2.537	-2.476	-0.041	No DIF	
6	10.075	5.358	4.7I7	DIF	Favoured Male
7	-0.629	-0.351	-0.278	No DIF	
8	15.872	10.983	4.889	DIF	Favoured Male
9	-1.913	-2.118	0.205	No DIF	
10	0.294	-0247	0.541	DIF	Favoured Male
11	11.237	11.490	-0.253	No DIF	
12	-1.214	-1.300	0.086	No DIF	
13	-0.851	-0.717	-0.134	No DIF	
14	17.577	21.179	-3.602	DIF	Favoured Female
15	0.234	-0.180	0.414	No DIF	
16	-1.86	-1.947	0.087	No DIF	
17	-3.169	-3.498	0.329	No DIF	
18	-0.134	-0.604	-0.13	No DIF	
19	-1.085	-1.922	0.837	DIF	Favoured Male
20	0.331	0.646	-0.315	No DIF	
21	-12.441	7.798	-20.239	DIF	Favoured Female
22	0.581	0.452	0.129	No DIF	
23	-2.495	-1.078	-1.417	No DIF	
24	12.056	-0.427	12.483	DIF	Favoured Male
25	-1.908	-1.805	-0.103	No DIF	
26	0.042	0.325	-0.283	No DIF	
27	0.20	-0.205	0.405	No DIF	
28	7.79	9.126	-1.216	DIF	Favoured Female
29	-0.399	-0.394	-0.005	No DIF	
30	-0.058	-0.017	-0.041	No DIF	
31	19.11	18.048	1.062	DIF	Favoured Male
32	7.39	2.951	4.392	DIF	Favoured Male
33	-0.419	-0.642	0.228	No DIF	
34	5.329	1.417	3.912	DIF	Favoured Male
35	3.920	4.300	-0.380	No DIF	
36	-1.240	-1.092	-0,148	No DIF	
37	-0.562	-0.368	-0.194	No DIF	
38	-0.601	-0.537	-0.064	No DIF	
39	0.166	2.246	-0.080	No DIF	
40	-1.360	-1.464	0.140	No DIF	
41	0.162	0.299	-0.067	No DIF	
42	-1.044	-0.968	-0.076	No DIF	
43	0.744	-0.582	-0.162	No DIF	
44	0.423	1.122	-0.699	DIF	Favoured Female
45	-0.065	-0.074	0.009	No DIF	

46	-0.59	-0.748	0.158	No DIF	
47	0.937	-0.7	-0.237	No DIF	
48	-10.188	-4.594	-5.594	DIF	Favoured Female
49	-1.134	-1.018	-0.116	No DIF	
50	0.812	0.252	0.560	DIF	Favoured Male

Table 1 is the IRT DIF statistics on examined items, performance with respect to respondents' gender. The result shows that 14 (representing 28%) items out of 50 items were gender bias and have group difficulty difference of +0.5. From these 14 items, 9 items (representing 18%) favoured male while 5 (10%) favoured the female. The decision column shows items with DIF and the ones with no DIF with regards to the respondents' gender.

Research Question 2: To what extent do the 2020 BECE test items in mathematics function differently due to school location?

Table 2: IRT Analysis of DIF on 50 multiple choice item of 2019/2020 BECE Mathematics with respect to school location

S/N	School Location		DIF Difference	Decision	Remark
	Urban	Rural			
1	0.436	0.303	0.133	No DIF	
2	-0.43	-0.564	0.134	No DIF	
3	-3.254	-3.806	0.552	DIF	Favoured Urban
4	0.074	0.377	-0.303	No DIF	
5	-0.292	-0.233	-0.059	No DIF	
6	-0.348	-0.246	-0.102	No DIF	
7	0.812	0.252	0.56	DIF	Favoured Urban
8	0.154	-.003	0.157	No DIF	
9	-0.417	-0 .448	0.031	No DIF	
10	0.554	-0.966	0.412	No DIF	
11	0.443	-0.791	1.234	DIF	Favoured Urban
12	-0.566	-0.476	-0.090	No DIF	
13	-19.938	-2.590	-17.346	DIF	Favoured Rural
14	-0.28	-0.337	0.057	No DIF	
15	-1.037	1.351	0.314	No DIF	
16	11.027	15.905	-4.876	DIF	Favoured Rural
17	-0.656	-1.019	0.363	DIF	
18	0.084	0.869	0.953	DIF	Favoured Urban

19	-0.554	-0.966	0.412	No DIF	
20	-0.417	-0.448	0.031	No DIF	
21	-0.422	- 0.76	0.338	No DIF	
22	-0.019	-0.333	0.314	No DIF	
23	-0.986	-1.256	0.270	No DIF	
24	-1.66	-2.882	1.215	DIF	Favoured Urban
25	-0.504	-0.820	0.316	No DIF	
26	-5.464	4.700	-10.164	DIF	Favoured Rural
27	-4.336	-0.865	-3.471	DIF	Favoured Rural
28	-0.119	-0.484	0.365	No DIF	
29	-5.665	-1.044	-4.621	DIF	Favoured Rural
30	-0.1.199	-1.514	0.315	No DIF	
31	-0.824	-1.165	0.341	No DIF	
32	-0.504	-0.820	0.316	No DIF	
33	-1.108	-1.436	0.328	No DIF	
34	-0.211	-0.672	0.451	No DIF	
35	-0.623	0.673	0.050	No DIF	
36	-0.422	-0.760	0.338	No DIF	
37	-1.534	-2.802	1.268	DIF	Favoured Urban
38	-0.534	-0.704	0.170	No DIF	
39	-1.199	-1.514	0.315	No DIF	
40	-1.667	-2.882	1.215	DIF	Favoured Urban
41	-0.027	-0.431	0.404	No DIF	
42	-0.702	-0.950	0.248	DIF	
43	-0.119	-0.484	0.365	No DIF	
44	-1.461	-1.787	0.321	No DIF	
45	-0.478	-0.782	0.304	No DIF	
46	7.445	10.587	-3.142	DIF	Favoured Rural
47	0.056	-1.204	1.260	DIF	Favoured Urban
48	6.312	-1.653	7.965	DIF	Favoured Urban
49	0.785	-1.142	0.357	No DIF	
50	-0.657	-0.299	0.648	DIF	Favoured Urban

Table 2 is the IRT analysis of DIF statistics on 2020 BECE multiple-choice items in mathematics performance with respect to respondents' location. The result showed that sixteen (16) item out of 50 have group difficulty difference of +0.5. Out of the 50 items, 16 items exhibited DIF, which 10 items (20% of the items) favoured urban schools, while 6(12%) favoured rural schools.

Research Question 3: To what extent do the 2020 BECE test items in mathematics function differently due to school proprietorship?

Table 3: IRT analysis of DIF with respect to school type on 50 multiple choice item of 2019/2020 BECE Mathematics

S/N	School Proprietorship		DIF Difference	Decision	Remark
	Private	Public			
1	0.093	-1.434	1.527	DIF	Favoured Private
2	-19.938	-2.592	-17.346	DIF	Favoured Public
3	-0.422	-0.76	0.338	No DIF	
4	-0.566	-0.476	-0.09	No DIF	
5	0.443	-0.791	1.234	DIF	Favoured Private
6	-0.555	-0.926	0.371	No DIF	
7	-14.096	-3.397	-10.699	DIF	Favoured Public
8	-0.419	-0.647	0.228	No DIF	
9	0.20	-0.205	0.406	No DIF	
10	0.552	0.324	0.228	No DIF	
11	-3.169	-3.498	0.329	No DIF	
12	6.3.12	1.653	7.965	DIF	Favoured Private
13	-7.838	-0.902	-6.936	DIF	Favoured Public
14	-0.196	0-.094	-0.102	No DIF	
15	-0.042	0.325	-0.284	No DIF	
16	-0.986	-1.256	0.27	No DIF	
17	-10.188	-4.594	-5.594	DIF	Favoured Public
18	-0.554	-0.966	0.412	No DIF	
19	0.2	-0.205	0.405	No DIF	
20	-0.566	-0.476	-0.09	No DIF	
21	-2.495	-1.078	-1.417	DIF	Favoured Public
22	11.234	11.49	-0.253	No DIF	

23	0.285	-0.877	1.162	DIF	Favoured Private
24	-2.765	-1.47	-1.295	DIF	Favoured Public
25	-0.59	-0.748	0.158	No DIF	
26	-1.24	-1.092	-0.148	No DIF	
27	0.116	0.246	-0.13	No DIF	
28	-12.441	7.798	-20.239	DIF	Favoured Public
29	-1.652	-1.959	0.307	No DIF	
30	17.577	21.179	-3.602	DIF	Favoured Public
31	-4.336	-0.865	-3.471	DIF	Favoured Public
32	-0.28.	-0.0337	0.057	No DIF	
33	-0.601	-0.537	0.064	No DIF	
34	0.423	1.122	-0.699	DIF	Favoured Public
35	-0.504	-0.082	0.316	No DIF	
36	-0.027	-0.431	0.404	No DIF	
37	-0.785	-1.142	0.357	No DIF	
38	-1.204	0.056	1.26	DIF	Favoured Public
39	-0.019	-0.333	0.314	No DIF	
40	-0.988	-2.188	1.2	DIF	Favoured Private
41	-1.037	-1.351	0.314	No DIF	
42	-0.445	-1.681	1.26	DIF	Favoured Private
43	-7.712	-2.371	-5.341	DIF	Favoured Public
44	--0.555	-0.926	0.371	No DIF	
45	0.162	0.229	-0.067	No DIF	
46	0.294	-0.247	0.541	DIF	Favoured Private
47	7.445	10.587	-3.142	DIF	Favoured Public
48	-0.702	-0.95	0.243	No DIF	
49	0.166	0.246	-0.08	No DIF	
50	7.91	9.126	-1.216	DIF	Favoured Public

Table 3 is the IRT analysis of DIF statistics on examined item performance with respect to respondents' school Proprietorship. The result reveals that out of the fifty (50) items, twenty two (22) indicate group difficulty difference of +0.5. From the twenty (22) items, seven (14%) favoured private school while 15(30%) favoured public schools.

Discussions

Differential item function being used to identify the degree of effectiveness of the 2020 BECE items in measuring different examinees' abilities for the numbers of the sub-groups for purpose of eliminating bias items.

The result indicates that, the items of the multiple-choice section function differently for gender, with fourteen (14) items out of the fifty (50) items been gender biased. The study further revealed that, from the 14 biased items, 9 of the items which is 18% favoured male, while five 5 (10%) favoured the female. The items measured construct having something to do with gender of the students other than their ability in mathematics. The findings are in agreement with Bulus (2018) who had earlier made such observation. The study also agrees with Omorogiuwu and Iro-Aghedo (2016) that items of the National Business and Technical Examination Board of 2015 function differently based on gender.

The study also revealed significance differential item functioning in the 2020 BECE multiple-choice Mathematics due to school location. 16 of the 50 items show no significance DIF, while 34 items function differently among students of urban and rural schools having the same ability in Mathematics. 10 of the items favoured rural schools, while 6 items favoured urban schools. This implies that the performance of the examinees on the items do not only depend on the ability in Mathematics, but also on the school location. The finding agrees with that of Uruema and Adams (2013), which show that, there exist differential item functioning between Urban and Rural students. The findings also agreed with Lyons-Thomas et al (2014), they observed that some items performed differently among the testees from the different countries.

Lastly, the result revealed that, out of the 50 items in 2020 multiple-choice Mathematics, 22 were biased with respect to school type. 7 items favoured students of private schools, whereas, 15 items favoured students of public schools. It means that, the performance of the examinees on the items do not only depend on their ability in Mathematics, but also on the school type. This findings is congruence with Ogbebor and Onuka (2013). They used logistic regression statics to identify items that have DIF against sub-group such as public and private schools and urban and rural areas and discovered that 11 items favoured public schools, while 11 items also favoured private schools.

Conclusion

The study reveals DIF in the 2020 BECE multiple-choice examination in Mathematics. The 2020 BECE multiple-choice Mathematics items show differential item functioning with reference to gender, school location and school type. Based on the study, the performance of students in the multiple-choice Mathematics items of 2020 BECE did not only depend on the ability, but also on their gender, school location and school type.

Recommendations

Based on the results obtained from the study, the following recommendations were made.

1. DIF analysis should be incorporated into educational assessment so as to obtain valid psychometric properties of test and valid educational assessment.
2. Examination bodies and test developers should step up to include item bias during item analysis.
3. Measurement or test experts should acquaint themselves the opportunity of obtaining knowledge and skills involved in DIF.

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Effects of Flipped Learning and Peer Tutoring on Learning Outcome in Biology in Ibadan

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Abstract
The academic achievement of learners in Biology based on previous observations has not been encouraging over the years. This could be as a result of inactive participation of learners during teaching and learning process in a conventional/traditional classroom where teachers frequently employ the traditional method. In other to avoid persistent poor academic achievement of learners, every effort must be made to fully engage the learners in teaching/learning process. Therefore, a flipped learning and peer tutoring pedagogical approaches were used. A pretest-posttest-control approach was used in a quasi-experimental design. Out of the four educational zones in Ibadan, one was chosen by random sampling for this study and purposive sampling was used in selecting three schools and from each school, an arm of SS2 science intact class was used totalling114 learners. Five instruments were used: Achievement test in Biology (ATB) (r = .81), flipped learning guide, peer tutoring guide, flipped learning – peer tutoring and lecture method guide. At p = 0.05, two hypotheses were evaluated. The method of data analysis used was Analysis of Co -variance. The result revealed that there was a significant effect of treatments (flipped learning, peer tutoring and flipped learning – peer tutoring) on learners' academic achievement [F $_{(3, 105)}$ = 126.497, p=.000]. Additionally, it was shown that there was no discernible connection between treatment and learners' gender and academic achievement [F $_{(3, 105)}$ = 0.456, p=.714]. It was recommended that flipped learning, peer tutoring and flipped learning – peer tutoring should be encouraged and adopted during teaching/learning of Biology.

Keywords: Flipped learning group, Peer tutoring, Lecture Method group and Academic Achievement

Introduction
Biology is a science subject that is helpful in explaining the various phenomena both around and within us. The various phenomena of Biology apply to our life such as where we reside, what we consume and what activities we engaged in. Based on its usefulness to life there is need for learners to improve on the academic achievement in other to avoid continuous decline in the academic achievement of learners that had always been recorded in previous years. According to evidence, the percentage of students who passed Biology at the credit level was extremely low when compared to the total number of students who applied. In 2014, 2015, 2016, and 2018, 33.9 percent, 28.6 percent, 33.9 percent, and 28 percent of learners were at the credit level correspondingly (WAEC, 2013 – 2018). Learners' academic achievement was always less than half of the total number of students. As vital as biology knowledge is to humans, it appears that students' academic

achievement in biology is slipping behind that of other science disciplines in high school as revealed by the above stated WAEC result analysis.

The contributory factors which might have been affecting the academic achievement of learners are numerous such as teaching method used by teachers popularly known as the traditional/conventional method, learners' gender among others. In facilitating the transfer of knowledge, teachers should employ the teaching strategies that are most appropriate for the particular objectives and level exit outcomes. This unhealthy development in the disposition of learners towards science has sparked the search for the development of alternative methods of teaching and learning which can stimulate students' interest and guarantee an educational system that offers equal opportunities for all sexes. (Ajaja, 2013). Thus, the field of study of science education is in

dire need of methods to recommend to science teachers that have traits like lesson clarity, self-activity promotion, self-development promotion, stimulation of interest and curiosity, and reliance on the psychological process of teaching and learning. The approaches should promote better science education and learning than what is now practiced (Ajaja, 2013). Learners' gender is also an important factor. Blackwood (2020) reported in her write up stated that male participate actively in subject areas such as sciences, mathematics among others whereas female have lower perceptions of scientific abilities and are aware of gender identity. In testing for the efficacy of flipped learning and peer tutoring, this study focused on flipped learning and peer tutoring and learners' gender if it might improve the academic achievement of learners.

In flipped learning, direct instruction is moved from the group learning environment to the individual learning environment, and the resulting group learning environment is transformed into a dynamic, interactive learning environment where the educator guides learners as they apply concepts and engage creatively in the subject matter. When a teacher uses "flipped learning" in the teaching/learning process, they can give students different learning options based on how they learn best, such as reading a textbook, watching videos, listening to audio files, or using any other kind of material they can find or make that covers a particular topic. In a traditional classroom, the teacher serves as the wise man on stage, but in a flipped classroom, the teacher serves as a guide on the side while students watch lessons at home at their own pace, engage in online discussions with peers and teachers, or read textbooks, and engage with concepts in the classroom with the teacher's assistance. According to Wright (2011) in Edudemic Connecting Education & Technology claims that the flipped classroom is a more evolved version of the student-centred classroom. It all comes down to shifting from passive to active learning.

Flipping the classroom entails fundamentally rethinking how you've been doing things for years. Here are some of the advantages of doing so:

1. Flipped learning keeps learners more engaged: Students' interest is usually maintained through discussion and hands-on activities.

2. The flipped classroom style allows teachers to spend more time working with pupils one-on-one. As a result, they can easily spot when a student is struggling with a concept and work with them one-on-one to help them understand it. Teachers will be able to obtain a better understanding of their students' diverse learning styles as a result of increased engagement in the classroom, allowing them to personalize their instruction to their individual requirements.

3. Learners are able to complete their work at their own leisure. Learners have the option of watching it again if they believe they need it to better understand the idea. They have greater control over how and when they study and learn.

Peer tutoring is a general name for a strategy in which students support other students in the learning process. While the act of initial instruction in any skill or topics should be done by the teacher, students can be successful in providing support, reinforce or modelling for a variety of academic topics. It allows for different types of students' pairings. Some models pair peers of similar abilities while other model pair a higher – performing students with a lower – performing student for a target skill (Calderwood, 2021). AbdulRaheem, Yusuf & Odutayo (2017) revealed that students in peer tutoring group obtained higher Economics Performance Test (EPT) scores than students in the conventional group.

Theoretical Background
This study's two underlying ideas are psychological theories. These theories are cognitive and behaviourist which comprises Cognitive Theory, Dual Coding Theory (DCT), Social constructivism Theory and Generative Theory of Multimedia Instruction The interaction between individuals and groups in the classroom will improve the students'

knowledge of scientific concepts when peer tutoring is appropriately supervised by a teacher.

The Cognitive Theory of Jean Piaget recognized four phases of cognitive development, the last stage which is stage of formal operation (11 years and above) is relevant to this study, the students are more logical, divergent and or convergent in thinking and can make justifiable generalization. The students are as well mentally prepared to exploit the features of human relationship and multimedia instruction which will captivate their attention and affect learning.

Secondly, Dual Coding Theory (DCT) emphasise that students have preferred representation styles. Some students retain knowledge and acquire it more easily when it is presented visually, while others do so when it is spoken to them. Paivio, (1971), in his Dual Coding Theory, proposes that information is encoded and processed in two separate channels, namely verbal system units and visual system units. And that learning experiences that exposes the learner to both verbal and visual units, may likely be more effective than learning experiences that exposes the learner to one of the units. According to Kozma (1994) in Audu (2018), we must evaluate the interaction between the medium's properties and students' cognitive processes in order to grasp the relationship between media and learning.

Thirdly, Vygosky theory of cognitive constructivism called social constructivism places a strong emphasis on the collaborative nature of learning. The thesis holds that knowledge is co-formed and not only constructed. The zone of proximal development, a notion introduced by Vygotsky, serves as the foundation for the social constructivism peer-tutoring learning technique. The zone of proximal development is the space between the level of actual development as determined by independent problem-solving and the level of prospective development as defined by problem-solving under adult supervision or in cooperation with more advanced peers (ZPD).

The learner's present level of development is the moment at which they have advanced to the point where they can solve issues independently. The degree of development that a learner is capable of obtaining with the assistance of teachers or by working with peers is known as the learner's potential development (zone of proximal development). The student is capable of understanding and solving problems at this level that they are unable to do at their current degree of advancement. The amount of learning depends on the level of prospective development. It consists of cognitive structures that are still developing, but they can only do so via collaboration or assistance from others. The zone of proximal development, according to Vygotsky (1978), refers to functions that have not yet fully developed but are in the process of doing so; functions that will fully develop tomorrow but are currently in the embryonic stage.

When a child is engaged in an activity that they could not do on their own but can complete with the assistance of a peer or an adult, according to Vygotsky, they are working within their zone of proximal development.

The idea of Vygotsky (1978) applies to pupils in this study because it can raise students' achievement. Vygotsky believed that peer learning groups led by teachers may help students develop intellectually to their full capacity while also inspiring them to learn more about the subject.

Lastly, Mayer proposed a generative theory of multimedia instruction (1997) in Mayer (2001). The hypothesis assumes that using a multimodal method of delivery (texts, images, audio, video, and animation) has an impact on how much learners use cognitive processes to study. Thus, the learner is placed in the centre of the learning process, acting as a knowledge constructor by choosing and tying together visual and spoken knowledge. According to Mayer (2001), meaningful learning occurs when a person chooses the knowledge that is most significant, organizes it into a logical mental picture, and combines the new information with the preexisting information. Mayer reported that mixed mode of delivery is suggested, according

to the fact that data is encoded in the memory by two independent, non-conflicting channels, one Visual and the other Verbal. In other words, a picture would be encoded by a visual encoding mechanism and a word encoded by a verbal mechanism. However, information that contain images and words is encoded and processed twice in the memory and therefore could be retained more in the cognition.

Hypotheses

1) There is no significant main effect of treatment on learners' academic achievement.
2) There is no significant interaction effect of treatment and gender of the learners and their academic achievement.

Method

Pretest, Posttest, Control Group, Quasi Experimental Design was employed in the study. The schematized layout is shown below;

$O_1 X_1 O_2$ is Experimental group 1
$O_1 X_2 O_2$ is Experimental group 2
$O_1 X_3 O_2$ is Experimental group 3
$O_1 X_4 O_2$ is Control group
O_1 denotes pre-achievement test
O_2 denotes post-achievement test
X_1 = Flipped learning
X_2 = Peer tutoring
X_3 = combination of flipped learning and peer tutoring
X_4 = Lecture method

Participants: The schools in Ibadan were clustered along four educational zones, three local government areas were chosen at random from each zone totalling 12 local government areas. In order to choose the participants, a purposeful sampling strategy was adopted one private school from each of the selected local government area. Private schools were used because of the availability of the materials needed for the study. In each school an arm of SS 2 intact class was used, totalling 114 students (Male 57 and Female 57).

Instrument:

The instrument used for this comprised;
1) Achievement Test on Biology (ATB)
2) Flipped Learning Guide (FLG)
3) Peer – Tutoring Guide (PTG)
4) Flipped Learning - Peer – Tutoring Guide (FLPTG)
5) Lecture Method Guide (LMG)

Achievement Test on Biology (ATB)

Thirty multiple-choice questions with four answer choices made up the test (A, B, C and D). The questions were derived from six themes in the SS 1 and SS 2 Biology curriculum, with a total of 60 items pilot examined. The researcher created the instrument using a table of specifications that included cognitive areas such as remembering, understanding, and applying. The reliability coefficient of the Achievement Test on Biology was determined using the Kuder – Richardson 20 (KR – 20) method. The item difficulty indices were between 0.41 and 0.63 with discriminating indices between 0.33 and 0.47. The 30 items were selected from the pools of items trial tested. The table of specification shows the final selected items for the multiple-choice test. The reliability coefficient was 0.81. Table 1 displays the analysis of the questions.

The multiple-choice test's specification table indicates that forty – percent tested remembering, thirty per cent tested understanding and thirty per cent tested applying. The right answer received a score of 1, while the wrong answer received a value of 0. The maximum mark obtainable for the multiple – choice was 30 marks.

Table 1: Table of Specification for Achievement Test on Biology

Topics/Objectives	Remembering 40%	Understanding 30%	Applying 30%	Total 100%
Meaning of Ecology and Ecological Concepts	2	2	1	5
Population Studies	2	2	1	5
Food chain, Food web and Trophic Level	2	2	1	5
Skeleton, Forms and Components	2	1	2	5
Types of Skeleton	2	1	2	5
Joints – Definition, Types, Location and Examples	2	1	2	5
Total	12	9	9	30

Flipped Learning Guide (FLP)

The instructional guide was prepared by the researcher to show the various steps the teacher followed. The following steps were followed;

1) Step 1 – The teacher uses educational video to teach the content by using a 5 – minute video
2) Step 2 – The teacher makes decision on the video service to use for the students
3) Step 3 – The teacher makes videos by setting some limits. Five minutes is the maximum allowed for video duration, and no more than three movies can be assigned every day or night. Videos should only be seen before school in the morning in case someone forgot or does not have access to technology at home.
4) Step 4 – The teacher gives the students notes quizzes or hiding pictures, words or phrase in the videos (assignment) to check that they did and understood them in order to make them accountable for watching the videos.

Peer – Tutoring Guide (PTG)

The instructional guide was prepared by the researcher to show the various steps the teacher followed. The following steps were followed;

1. Step 1 – The teacher paired mixed ability students (Ability of students was determined using the previous continuous assessments recorded by the teacher)

2. Step 2 – The teacher defines tutor and tutee roles
3. Step 3 - The tutor fills in the gaps in the tutee's knowledge by explaining and demonstrating how to arrive at a certain solution.
4. Step 4 – The tutor asks tutee guiding and probing questions
5. Step 5 - The tutor asks for positive feedback. This act as encouragement

Flipped Learning - Peer – Tutoring Guide (FLPTG)

The instructional guide is prepared to show teacher's various steps to follow using Flipped Learning and Peer – tutoring

1) Step 1 – The teacher uses educational video to teach the content by using a 5 – minute video
2) Step 2 – The teacher make decision on the educational video service to use for the students
3) Step 3 – The teacher makes videos by setting some limits. Five minutes is the maximum allowed for video duration, and no more than three movies can be assigned every day or night. Videos should only be seen before school in the morning in case someone forgot or does not have access to technology at home.
4) Step 4 – The teacher gives the students notes quizzes or hiding pictures, words or phrase in the videos (assignment) to check that they did and understood them in order to make them accountable for watching the videos.

5) Step 5 – The teacher paired mixed ability students
6) Step 6 – The teacher defines tutor and tutee roles
7) Step 7 - The tutor fills in the gaps in the tutee's knowledge by explaining and demonstrating how to arrive at a certain solution.
8) Step 8 – The tutor asks tutee guiding and probing questions
9) Step 9 - The tutor asks for positive feedback. This act as encouragement

Lecture Method Guide (LMG)

The instructional guide was prepared by the researcher to show the various steps the teacher followed. The following steps were followed;
1. Step 1 – The teacher asks questions on previous topic taught
2. Step 2 – The teacher defines and explain the concepts
3. Step 3 – The teacher asks questions on the topic taught
4. Step 4 – The teacher writes the note on the topic taught on the chalkboard
5. Step 5 – The teacher checks the students' notebook
6. Step 6 – The teacher marks the students' note

Data Collection

The study enlisted the help of six qualified Biology teachers. For one week, the researcher instructed the biology teachers on how to implement the pedagogical approaches. In the first week, a pre-test of achievement was given. The treatments lasted for six weeks, thereafter, biology achievement test was administered on the participants as post – test. There were three different treatment groups. These were flipped learning, peer tutoring and flipped learning and peer tutoring. In flipped learning group, N = 27 learners. The treatment in this group involved teaching the learners for 40 minutes for each contact totalling 10 contacts. In peer tutoring group, N = 31. The treatment in this group involved teaching the learners for 40 minutes for each contacts totalling 10 contacts likewise in flipped learning – peer tutoring group, N = 28 and conventional teaching method group, N = 28.

Data Analysis:

The analysis was carried out using inferential statistics – Analysis of Covariance (ANCOVA) - treatment: four groups.

Results

Table 2 ANCOVA of Learners' Academic Achievement in Biology

Source	Type III Sum of Squares	df	Mean Square	F	Sig
Corrected Model	2193.778[a]	8	274.222	74.755	.000
Intercept	345.521	1	345.521	94.192	.000
Pre-Test	502.099	1	502.099	136.876	.000
Lnrs' Gend	2.533	1	2.533	.690	.408
Trmt	1392.074	3	464.025	126.497	.000
Lnrs'Gend*Trmt	5.017	3	1.672	.456	.714
Error	385.169	105	3.668		
Total	44650.000	114			
Corrected Total	2578.947	113			

a. R Squared = .851 (Adjusted R Squared = .839)* = sig at p < .05

KEY: Trmt – Treatment, **Lnrs' Gend** – Learners' Gender

Table 3: Scheffe Post Hoc Homogenous Test showing the Means in Learners' Academic Achievement in the Treatment Groups

Treatment		Subset for alpha = 0.05	
	N	1	2
Conventional Teaching Method	28	12.5357	
Flipped Learning – Peer – Tutoring	28		20.8929
Peer - Tutoring	31		21.6129
Flipped Learning	27		21.6296
Sig.		1.000	.819

$H_{O1:}$ There is insignificant main effect of treatment on learners' academic achievement. Table 2 indicates that there is significant main effect of treatment on learners' academic achievement [F $_{(3, 105)}$ = 126.497), p = .000] therefore, null hypothesis is rejected.

Table 3 also shows the result of Scheffe Post Hoc Multiple Comparison with differences in mean scores in four treatment groups. Flipped Learning group, Peer – Tutoring group and Flipped Learning - Peer – Tutoring group had the following mean scores 21.6296, 21.6129 and 20.8929 respectively with high mean score but slight differences among the three groups while Lecture Method group had low mean score of 12.5357

H_{O2}: There is no significant interaction effect of treatment and gender of the learners and their academic achievement.

Table 2 displays a summary of result of effect of treatment (flipped learning, peer tutoring, flipped learning with peer tutoring and lecture method) as well as the learners' gender on their academic in biology. It reveals that there is no significant interaction effect of treatment and gender of the learners and their academic achievement [F $_{(3, 105)}$ = 0.456, p =.714] after controlling for covariate. The null hypothesis is therefore accepted.

Discussion
The post hoc analysis indicates that all the students taught with flipped learning, peer tutoring, and flipped learning-peer tutoring outscore lecture method group. Ullah, Rabia and Tabassum (2018) found that mean score of the experimental group was significantly better than that of the control group (Lecture Demonstration Method). Olulowo, Ige & Ugwoke (2020) affirmed that peer – tutoring instructional strategy is more effective in improving students' academic achievement in financial accounting concepts than the conventional method. The study also shows that the experimental strategy was not sensitive gender. Abdulallahi (2017) found that students taught with peer – tutoring strategy performed better than those taught with conventional teaching method and gender has no effect on their mathematics achievement scores. Karadag (2017) found that "Flipped Learning" approach positively affect students' academic achievement in mathematics. Adunola (2011) in Audu (2018) claims that teachers must be familiar with a range of teaching philosophies that reflect the gravity of the subjects they are expected to teach. Ayeni (2011) defines teaching as a process that comprises causing desired changes in learners in order to achieve specific goals. The results imply that adopting instructional strategies improves learners' academic achievement.

In addition, Okeke (2018) on interaction effect of gender and treatment (Teaching Strategy) using Mend Mapping Teaching Strategy (MMTS) and Conventional Teaching Method (CTM) was in tandem with this study while the finding of this study is disagreeing with the result of finding of Papama, Sive & Rose (2022) in mathematics on interaction effects and teaching strategy.

Conclusion
Flipped Learning, Peer – Tutoring and Flipped Learning – Peer -Tutoring positively influenced learners' academic achievement in biology. It could be concluded that when appropriate pedagogical approaches are used, the learners' learning outcome could be improved.

Recommendations
The following are recommended:
(i) Biology teachers should employ learner – centred pedagogical approaches as supplement to the regular conventional method in other to improve learners' learning outcomes.
(ii) The Biology curriculum should be revised to make adequate provisions for the use learner - centred pedagogical approaches.

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Assessment of Cognitive Learning Indices and Mathematics Achievement among Junior Secondary III Students in Ondo State

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Abstract

As important as the knowledge of Mathematics is, some students at secondary school level do not take the topic seriously. Previous researches had been investigating the challenges that students face in the learning of mathematics. Limited research effort has been directed to the way instructional issues correlated with students' mathematics achievement, and the relative contribution of each of the variables to student's achievement in mathematics. A descriptive survey design was adopted. A total of 200 students were selected from 20 schools across the five LGA of Ondo State using a multistage sampling procedure. Mathematics Cognitive Learning Indices and Achievement Records (MCLIAR) (r = 0.62), Junior School Mathematics Achievement Test (r = 0.75) were used for data collection while Descriptive (percentages, mean and standard deviation) and Inferential statistics (Regression analysis) were used for data analyses at α = 0.05 significance level. From the study, the number of exercises and assignments given to students per week is low. Only the number of periods (β = 0.23) and the number of times assignments were given (β = 0.48) were found to have a significant contribution towards student's achievement in mathematics. Thus, it was recommended that Mathematics teachers should endeavour to maximize the number of periods by giving student more exercises and assignments to enhance students' achievement in the subject.

Keywords: Mathematics achievement, Cognitive Learning Indices, Number of Mathematics Assignment

Introduction

Mathematics can be found in every activity people engage in; it is the foundation for everything in their lives, including art, architecture (ancient and modern), mobile devices, engineering, money and even sports. When solving mathematical problems, data is collected, broken down, and relations that keep or systematically yield rational solutions to their parts are observed. When people have a solid comprehension of mathematics and can obtain logical answers, they are better prepared to solve real-life problems. Mathematics fosters analytical thinking - analytical thinking fosters individuals' ability to investigate and discover the truth about the world around them. These are the truths that researchers seek, and they are founded on evidence rather than emotions. It is a way of thinking that allows people to be aware of their own and other people's mistakes, as well as deception and manipulation. This is only possible because mathematics gives people the ability to reason logically and reasonably while taking into account real, verifiable data.

According to Hom (2013), mathematics is the science that is concerned with the logic of numbers, order, shapes and so on. Mathematics also develops individuals' ability to think and solve problems because when trying to solve a problem, it is necessary to consider all possible solutions and processes. Mathematics fosters wisdom by enabling people to express themselves with coherence, clarity, and precision. Learning to use numbers correctly allows people to think critically and creatively daily. The importance of mathematics applies to all career fields, regardless of industry or field: it creates and promotes analytical thinking, helps to understand how to budget and spend money, and also improves thinking.

Mathematics is a major subject in Nigeria's junior and senior secondary school curricula. Such inclusion justifies the recognition of mathematics as essential, even though progress in mathematics has not been encouraging (Iji & Omenka, 2015). A variety of factors, ranging from the learners themselves to the teachers, textbooks, curricula, and the school environment, have been identified as contributing to low student achievement in school mathematics.

According to (Ali, et al., 2010), mathematics ranks as one of the most ineffectively explained,

broadly despised, and poorly comprehended subjects in our schools. This is evident in students' persistent poor performance in some external examinations, such as the Senior Secondary School Certificate Examinations and the Junior Secondary School Certificate Examination (JSCE), which is now renamed as the Basic Education Certificate Examination (BECE). Zalmon & Wonu, (2017) analysis of student achievement in mathematics reveals abysmal performance over the last 26 years, with only 27.31 percent of students obtaining credit and above while 72.69 percent passed and below in the may June West African Examination Council examination.

Brodley (2016) outlined some strategies that students can use to improve success in mathematics and they include: completing all class work and assignments, not missing mathematics classes, finding a friendly study partner, establishing a good relationship with the teacher, analyzing and comprehending every mistake, receiving help on time, asking questions as needed, and so on. It is critical that teachers collaborate with students and that students take their learning seriously by making an effort to learn mathematics.

Cognitive learning is a constructive, long-term and active type of learning. It involves learners in the learning process by making them understand how to utilize their brains very effectively by constantly engaging their minds through regular input and practice of mathematics problems, allowing them to make connections to learning new things (Herrity, 2019). Memory, attention, and reasoning are examples of cognitive functions. In cognitive learning, students are motivated to learn in a participatory manner. It allows students to develop transferable problem-solving skills while also encouraging long-term learning.

Repetition and memorization are not elements of the cognitive learning process. It is all about possessing in-depth understanding and learning how concepts can be learnt. By constantly practicing mathematics problems, students can learn how to learn. Mathematics is best learnt by students when they approach when they have an enthusiastic perspective of the subject. Blind memorization and speed pressure timed testing are significant obstacles to the study of mathematics (Boaler, 2015). Truly, research shows that for students to learn math facts is to utilize them frequently and develop an understanding of numerical relationships. Memorization, speed, and test pressure can all be detrimental.

Requesting students to think through on their experiences, assisting students in discovering new approaches to solving problems, instigating the sharing of ideas on the subject of discussion, assisting students in exploring and understanding how concepts are interconnected, asking students to tender explanations and justifications to their thoughts, recalling and utilizing visualizations for the improvement of the level of understanding are all cognitive learning strategies. It assists students in learning more efficiently and ascertains that concepts learned in class are fully comprehended rather than just memorizing. Cognitive learning can help you improve your ability to reason abstractly, utilize logical thinking, and make meaningful decisions.

The process of learning the skills that will help you learn is referred to as cognitive learning. There is an adage that "practice makes perfect," and the amount of time students devote to a task determines their effectiveness in carrying out that task. Teachers must cultivate the habit of guiding their students through the classroom and avoid rote learning as much as possible. As a result, the cognitive learning indices reflect the number of effort teachers put into their teaching for students to be carried along in the process of learning. It is the degree or extent to which students are permitted to participate in their learning process, as well as the frequency with which teachers allow them to take in by constant practice and assessment.

Mathematics is a subject that necessitates constant and consistent practice, and teachers may never know how much their students have learned if they do not allow them to practice what they have learned. Furthermore, students may believe they know or understand a concept

until they practice it on their own and see how much they can do independently. The most significant impediment to learning mathematics is a lack of practice (TOI, 2015). Due to students' poor performance in BECE mathematics in 2018, Wendy Addy-Lamptey, head of WAEC's National office, suggested that teachers provide adequate exercises in the various topics as students are taught in the classroom.

The cognitive learning indices used in this study are based on the number of periods, exercises, and assignments that students complete in class. Because no skill can be learned and perfected without regular practice, consistent practice of mathematics sum aids learning. Teachers must pay close attention to and take this aspect of students' learning seriously. Class exercises and assignments help to improve memory and thinking skills. It instils in students the ability to think critically and logically, which is critical for academic success. It also instils in students positive habits and study skills, aids in exam preparation, and fosters students' inquisitiveness.

It is imperative that teachers engage in various assessment practices in the classroom because certain assessment practices must be implemented to truly know if students have learned or are learning. For this study, exercises and assignments are considered. This is done to ensure that students are properly learning.

The educational process must be accompanied by school activities that will help to enhance the process of teaching, presenting, and learning both within and outside the walls of the classroom. Students learn by being actively involved in the process of acquiring knowledge by collecting information, processing it through problem-solving, and articulating their discoveries. Each of the activities listed below allow students solidify their learning by the application of concepts and articulation of new knowledge, and most of these activities also supply feedback to the teacher on the progress of the students.

Classroom exercises are those activities students carry out within the classroom with the aim of applying or carrying out the practical portion of the concepts discussed in a lesson after the teacher's instruction. Activities outside of class allow students to expand their knowledge. All classroom exercises aim to improve the level of understanding in students, effectiveness or skill in a specific area by harnessing a variety of learning styles. School activities also help to a sense of fun in learning while also boosting student confidence and critical thinking skills.

Assignments are tasks given to the students by their teachers and tutors to complete within a specified frame of time. They can also be referred to as the work delegated to a set of people as part of the learning process. Assignments can be given out in different formats which could be written, practical, art or fieldwork-based, or even online. The goal of the teacher is to ensure that students have a valid comprehension of the subject being discussed. Assignments are a qualitative method to assess the knowledge and understanding of an individual on a subject. The art of assigning tasks starts in kindergarten in various forms. Little children are required to read and write on the things they had learnt in class.

Mathematics is a very important subject in schools and society at large. Mathematics is a base on which all other science subjects stand and it is a major prerequisite for students' career development especially those in the sciences to gain admission into any of the tertiary institutions in Nigeria. Several studies have been conducted to discover some of the challenges students face in the course of learning mathematics and the reason behind the poor achievement of students in mathematics. A few studies looked at the effect of student's perception of mathematics has on their achievement, others looked at topics that are perceived to be difficult by students and their frequency of practice, some looked at the attitude of students, teachers, parents, and how it affects student's achievement in mathematics.

However, the researcher intends to investigate students' cognitive learning indices (the number of periods per week, quantity of exercises given and practiced per week, number of times exercises and assignments are given per week and the number of exercises and assignments

done correctly per week) and student's achievement in mathematics.

The researcher intends to find out the proportion of the different assessment practices that students are usually engaged with by teachers during the mathematics class. They include exercises, assignments and corrections made by teachers to the exercises and assignments. This study is to find out if teachers are following up with students based on class work and assignments given and correcting their mistakes where necessary. The research is meant to establish the general trend of mathematics learning in junior secondary schools within Ondo State.

Research Questions

1. What are the estimated cognitive learning indices (number of periods per week, number of exercises given per week, number of exercises practiced per week, number of times exercises were given per week, number of assignments given per week, number of assignments practiced per week, number of times assignments were given per week) of students in mathematics?

2. What is the relative contribution of cognitive learning indices (number of periods per week, number of exercises given per week, number of exercises practiced per week, number of times exercises were given per week, number of assignments given per week, number of assignments practiced per week, number of times assignments were given per week) to mathematics achievement?

3. What is the composite contribution of cognitive learning indices to mathematics achievement?

Methodology

The study employed the design of descriptive survey. The population of the study consisted of Junior Secondary School III Students in Ondo State. A multi-Stage sampling procedure was used in the selection of the sample for this study. Ondo State is already grouped into three senatorial districts (Ondo Central, Ondo North, and Ondo South Central respectively). Two out of the three senatorial districts were randomly

selected for the study; five Local Government Areas were then randomly selected from each of the strata. Four secondary schools were randomly selected from each LGA and ten (10) Junior Secondary School III students were also randomly selected from each of the secondary schools. A total number of 20 schools were put into consideration totalling 200 students. Two instruments were used in this study. One of the instruments was constructed by the researcher and one was adapted- Mathematics Cognitive Learning Indices and Achievement Records (MCLIAR) and Junior School Mathematics Achievement Test (JSMAT). The Mathematics Cognitive Learning Indices Records (MCLIR) was adapted from the Students' Frequency Practice of Mathematics Problems Records (SFPMPR) developed by Ayodele Ishola Wakeel in 2018. It was adapted to include the number of periods per week, number of exercises given and practiced per week, number of times exercises and assignments are given per week and the number of exercises and assignment done corrected per week. The instrument was validated through experts' judgment before it was used to collect data on the field. The internal consistency was established using Cronbach Alpha and the reliability coefficient was established to be 0.62. The item consists of a multiple-choice test item with four options. The test was constructed using the junior secondary school curriculum whose items were developed using a test blueprint. To ensure its validity and reliability, it was given to some JSS3 Students for trial testing, to mathematics teachers for scrutiny, and experts in measurement and evaluation. Ninety items were initially constructed for the trial testing before thirty were eventually selected after their difficulty and discrimination index was established. The range of the difficulty and discrimination index of the items selected was established to be between (0.3, 0.8) and (0.3, 0.6) respectively. The reliability coefficient of the achievement test was established to be 0.75 using KR20. The data collection took about 5weeks.

Data analyses were performed to determine the cognitive learning indices of junior secondary school students in mathematics. The reliability of the cognitive learning indices scale was

determined using Cronbach alpha, while KR20 was used to establish the reliability of the junior secondary school mathematics. The cognitive learning indices of students were determined using percentages, mean and standard deviation while regression analysis was used to establish contribution of each index to student's achievement in mathematics.

cognitive learning indices (number of periods per week, number of exercises given per week, number of exercises practiced per week, number of times exercises were given per week, number of assignments given per week, number of assignments practiced per week, number of times assignments were given per week) of students in mathematics?

Findings/ Results

Research Question 1: What are the estimated

Table 1: The Estimated Cognitive Learning Indices Record

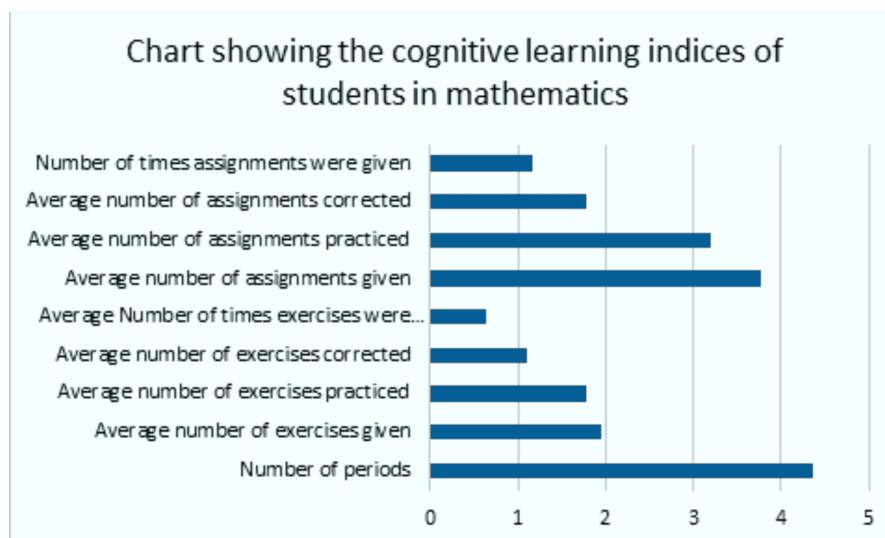|	Minimum	Maximum	Mean	Standard Deviation
Number of periods	3	6	4.35	0.855
Average number of exercises given	0	8	1.94	2.018
Average nu mber of exercises practiced	0	8	1.79	1.864
Average number of exercises corrected	0	7	1.10	1.288
Average Number of times exercises were given	0	2	0.63	0.558
Average number of assignments given	1	9	3.77	2.552
Average number of assignments practiced	0	9	3.20	2.268
Average number of assignments corrected	0	7	1.78	1.629
Number of times assignments were given	0	4	1.17	0.841

Figure 1: A chart showing the mean of the cognitive learning indices of students in mathematics

Table 1 above shows the minimum, maximum, mean and standard deviation of 200 students selected randomly across six local government areas in Ondo State. It shows that in a term, the minimum number of mathematics periods is 3 while the maximum number is 6. This implies that some schools within the state usually have mathematics classes 3 times within a week while some have 6 periods within the week. The average number of periods however is 4.35 approximately 4 times while the standard deviation is 0.85 which implies that the average number of periods is 0.85 away from the mean score.

The minimum number of exercises given in a term is zero while the maximum number of exercises given within a term is 8. This means that students can go through a whole term without teachers giving students exercises in the classroom. The average number of exercises given within a term is 1.94 which is approximately 2. This implies that within a term, students are exposed to as low as 2 exercises which is relatively low. The standard deviation of the average number of exercises given is 2.018 which implies that the average number of exercises given deviates from the mean score by 2.018.

The minimum number of exercises practiced within a week is zero while the maximum number of exercises practiced is 8. This implies that some students can go through a week without practicing any mathematics exercises while others go to the extent of attempting all mathematics exercises given to them by their teachers in the class. The mean score 1.79 which is approximately 2 implies that an average of 2 mathematics exercises is practiced by students within a week. The standard deviation of 1.864 shows that the average number of exercises practiced deviates from the mean score by 1.864.

The minimum number of exercises that students got correctly is zero while the maximum is seven. It then implies that within a week, some students do not get any mathematics exercise correctly while some got about seven correctly out of their mathematics exercises weekly. The mean score of the exercises gotten correctly by students within a week is 1.10 which is approximately 1. This implies that an average of 1 exercise is gotten correctly by students in a week. The standard deviation of 1.288 implies that the number of exercises gotten correctly per week deviates from the mean score by 1.288.

The minimum number of times exercises were given to students is zero while the maximum number is 2. This means that within one week, some students were not given exercises at all while others were given exercise two times. The mean score is 0.63 approximately one, this implies that in a week, students were given exercises just once. The standard deviation of 0.558 implies that the average number of times exercises were given deviates from the mean score by 0.558.

The minimum number of assignments given is 1 while the maximum is 9. It implies that within one week, students were given a minimum of 1 assignment and a maximum of 9 within a week. The mean score of 3.77 approximately 4 implies that students were given an average of 4 assignments within a week. The standard deviation of 2.552 implies that the average number of assignments deviates from the mean score by 2.552.

The minimum number of assignments practiced within a week is zero while the maximum number is 9. This implies that even though some students practiced no mathematics assignment within the week, some practiced all the mathematics assignment they were given during the week. The mean score of 3.20 approximately 3 implies that an average of 3 assignments were practiced by the students within a week is 3. The standard deviation of 2.268 implies that the average number of assignments practiced per week deviates from the mean score by 2.268.

The minimum and the maximum number of assignments gotten correctly within a week are 0 and 7 respectively. The mean score is 1.78 which is approximately 2 and this simply implies that the average number of assignments gotten correctly within a week is 2 out of the average number of 3 that was practiced within the week. The standard deviation of 1.629 implies shows the degree of deviation of the average number of

exercises from the mean score.

The minimum and the maximum number of times assignments were given weekly are 0 and 4 respectively. This implies that assignments are given at most 4 times within the week. Also, the mean score of 1.17 approximately 1 shows that the average number of times assignments were

given is just one. The standard deviation of 0.841 shows that the degree of deviation of the average number of times exercises from the mean score is also one.

Table 2: Table of the Percentage of the exercises and assignments given, practiced and gotten correctly per week

NP	4	NP	4
NE	1.94	NA	3.77
N_{EP}	1.79	N_{AP}	3.20
N_{EC}	1.10	N_{AC}	1.78
N_{TEG}	0.63	N_{TAG}	1.17

% practiced $= \dfrac{N_{EP}}{N_E} \times 100 = 92.27\%$	% practiced $= \dfrac{N_{AP}}{N_A} \times 100 = 84.88\%$
% corrected $= \dfrac{N_{EC}}{N_E} \times 100 = 56.70\%$	% corrected $= \dfrac{N_{AC}}{N_A} \times 100 = 47.21\%$
% corrected $= \dfrac{N_{EC}}{N_E} \times 100 = 14.48\%$	% of time assignment were given $= \dfrac{N_{TAG}}{N_P} \times 100 = 26.90\%$

NP- Number of period, NE- Number of Exercises, NEP- Number of Exercises Practiced NEC- Number of Exercises Corrected, NTEG- Number of Times Exercises were Given
NA- Number of Assignments Given, NAP- Number of Assignments Practiced
NAC- Number of Assignments Corrected, NTAG- Number of Times Assignments were Given

In conclusion, from table 2 above, it can be deduced from the table that the number of assignments that were given, practiced and gotten correctly is more than the number of exercises that were given to the students weekly. This implies that teachers give students more of assignments than class exercises.

Also, if the number of exercises and assignments given are 1.94 and 3.77 respectively and the average number of exercises and assignments practiced weekly is 1.79 and 3.20 respectively, it implies that the percentage of exercises and assignments practiced per week is 92.27% and 84.88%. This shows that the students to a large extent usually practice the exercises and assignments they are given by their teachers.

The average number of exercises gotten correctly per week and the average number of

assignments gotten correctly per week are 1.10 and 1.78 respectively. It implies that the percentage of the average number of exercises gotten correctly per week is 56.70% and 47.21% respectively showing that even though students usually practice the mathematics exercises and assignments given to them by their teachers, they do not often get it correctly.

The result also shows that compared to the number of periods that we have weekly, the number of times exercises and assignments are given weekly is relatively low. If the average number of periods is 4.35, the number of times exercises were given is 0.63 and the number of times assignments were given is 1.17, it implies that teachers give students exercises only 14.48% and assignments 26.90% totalling 41.73% every week.

Research Question 2: What is the relative contribution of cognitive learning indices (number of periods per week, number of exercises given per week, number of exercises practiced per week, number of times exercises were given per week, number of assignments given per week, number of assignments practiced per week, number of times assignments were given per week) to mathematics achievement?

Table 3: Relative Contribution of Cognitive Learning Indices to Mathematics Achievement

Variables	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	T	Sig.
Constant	7.861	1.898		4.141	0.000
Number of periods	1.146	0.497	0.225	2.307	0.022
Average number of exercises given	-0.086	0.828	-0.040	-0.104	0.917
Average number of exercises practiced	-0.166	0.472	-0.087	-0.352	0.725
The average number of exercises gotten correctly	1.207	0.625	0.357	1.933	0.055
Average number of times assignments were given	-0.985	1.753	-0.126	-0.562	0.575
Average number of assignments given	-0.361	0.453	-0.212	-0.796	0.427
Average number of assignments practiced	-0.166	0.472	-0.087	-0.352	0.725
Average number of assignments gotten correctly	-0.501	0.434	-0.188	-1.155	0.250
Average number of times assignments were given	2.493	0.846	0.482	2.948	0.004

Table 3 shows that among the predictor variables, only the number of periods ($\beta = 0.225$, $t(200) = 2.309$, $p<0.05$), and the average number of times assignments were given ($\beta = -0.482$, $t(200) = 2.948$, $p<0.05$) were found to have significant contribution towards student's achievement in mathematics.

However, the average number of exercises given ($\beta = -0.040$, $t = -0.140$, $p>0.05$), average number of exercises practiced ($\beta = -0.232$, $t = -0. 520$, $p>0.05$), average number of exercises gotten correctly ($\beta = 0.357$, $t = 1.933$, $p>0.05$), average number of times assignment were given ($\beta = -0.126$, $t = -0.526$, $p>0.05$), average number of assignments given ($\beta = -0.212$, $t(200) = -0.796$, $p>0.05$), average number of assignments practiced ($\beta = -0.0087$, $t(200) = -0.352$, $p>0.05$), average number of exercises gotten correctly, ($\beta = -0.188$, $t(200) = -1.155$, $p>0.05$) and the average number of times assignments were given, ($\beta = -0.482$, $t(200) = 2.948$, $p>0.05$) did not contribute significantly to students achievement in mathematics.

Research Question 3: What is the composite contribution of cognitive learning indices to mathematics achievement?

Table 4: Regression summary and ANOVA of Cognitive Learning Indices and Student's Achievement in Mathematics

Multiple R= 0.361
R Square= 0.130
Adjusted R Square= 0.089
Standard Error= 4.154

Analysis of Variance

	Sum of Squares	Df	Mean Square	F	Sig.
Regression	490.619	9	54.513	3.159	.001
Residual	3278.976	190	17.258		
Total	3769.595	199			

Significant at $p<0.05$

The regression ANOVA was produced (F=3.159, P<0.05). It could be deduced from the result that the independent variables considered in this study together contributed significantly to the prediction.

Table 4 above shows that the multiple correlation coefficients (R) of all the combined predictor variables with students' achievement in mathematics is 0.361. This implies that there is the positively low relationship among student's cognitive learning indices (number of periods, number of exercises given, number of exercises practiced, number of exercises gotten correctly, number of assignments given, number of assignments practiced, and number of assignments gotten correctly) and student's mathematics achievement in mathematics. R Square= 0.130, the adjusted R^2 which estimates the variance on the dependent variable that can be accounted for by the combination of the independent variables is 0.089. This implies that all the cognitive learning indices (number of periods, number of exercises given, number of exercises practiced, number of exercises gotten correctly, number of assignments given, number of assignments practiced, and number of assignments gotten correctly) made 8.9% contribution of the variance in student's achievement in mathematics.

Discussions
The study revealed the overall trend of JSS three student cognitive learning indices. However, the results show that these secondary school students' cognitive learning indices are quite low when compared to the mean scores of some of the indices used. Even though mathematics is a compulsory subject in the mathematics curriculum in Nigerian secondary schools, as evidenced by the average number of periods taught in a week in secondary schools, students do not usually practice their mathematics sums regularly. When compared to the number of periods in a week, the cognitive learning indices are relatively low. This is consistent with the findings of Ali, Hukamdad, Akhtem, and Khan (2010), which discovered that mathematics is one of the major subjects being poorly taught in secondary schools.

The study revealed the overall trend of JSS three students' cognitive learning indices. However, the results show that these secondary school students' cognitive learning indices are quite low when compared to the mean scores of some of the indices used. Even though mathematics is a compulsory subject in the mathematics curriculum in Nigerian secondary schools, as evidenced by the average number of periods taught in a week in secondary schools, students do not usually practice their mathematics sums regularly. When compared to the number of periods in a week, the cognitive learning indices are relatively low. This is consistent with the findings of Ali, Hukamdad, Akhtem, and Khan (2010), who discovered that mathematics is one of the most poorly taught subjects in secondary schools.

The study showed that the average number of times assignments were given had a significant contribution to students' achievement in mathematics, but the number of assignments given, practiced, and gotten correctly did not contribute to students' achievement in mathematics, which agreed with the findings of Sasser (1981) in his study, which argues that there is a slight predominance of evidences highlighting that students who are given assignments attain a little bit more improved results academically than those who are not given any assignments. These findings are also consistent with Esan (1996) who found out that a number of studies have found a close relationship that connects the home and the school in terms of academic achievement and the findings of Sasser (1981), and McMulen (1981) Oluwayemi (2010) and Iverson and Walberg (1982) who discovered in their study that student achievement is positively related to the intellectual stimulation and socio-psychological environment at home.

The findings of the study also aligned with that of McMulen (2010) whose study discovered that assignments have tangible effects on students' achievement academically and thus suggested supplementary assignments as it might be effective in closing the achievement gap between high and low achieving students and the study of (Kohn, 2006) who questioned and debated the motion that assignment will upgrade an achieving top-level student. Also,

the findings were in line with that of (Adebule, 2014) who discovered a notable difference between the mean achievements of students who were given assignments and those not given the homework assignments. This implies that assignments have a positive role to play in the achievement of students.

However, it negates that of Friesen (1979), whose findings did not infer an obvious standpoint for either the assignment or non-assignment groups. Also, in line with the findings of (Kohn, 2006), (Friesen, 1979), (Begley, 1998), their study revealed that assignment does not improve achievement at the middle-class level. In his study the effect on mathematics achievement of secondary school students in South-West Nigeria.

Conclusion

From the study and its findings, it is concluded that the cognitive learning indices of students are low. This means that students are not practicing mathematics sum as they ought to especially in relation to the number of periods they have in a week.

Even though the number of periods is relatively high but the number of times exercises and assignments given are relatively low. Also, teachers gave students more assignments than class work.

Recommendation

It can be recommended that teachers should try as much as possible to expose students to more mathematics exercises and assignments to expose them to constantly practice the subject. This can be done by maximizing the number of mathematics periods.

Teachers should ensure that students are given more mathematics sums with correction done to ensure improvement on students' part.

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Faculty's and Student's Perceptions and Adjustments to Online Learning in the Era of COVID-19 in the Universities in the North East, Nigeria

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Abstract
Due to paucity of resources, transitioning to remote learning environment was difficult in Nigeria during Covid-19. This study investigates faculty's and students' perceptions and adjustments to online learning in the period of COVID19 in the universities in the North East Nigeria through a descriptive survey research design. 384 facultys' and 384 students' respectively were the sample selected through a multi-stage sampling from five universities in the North East, Nigeria. FSPAOQ with a reliability coefficient of .89 was used to collect data using Google Forms. Mean and standard deviation and Linear Regression Analysis was used to test the hypothesis at 0.05 level of significance. Based on the analyses, 14.1 % of facultys' and 12.3% of students' adjustment to online learning could be explained by their perception with $R^2 = 0.141$ and $R^2 = 0.123$ respectively. The level of significance of facultys', students' perception and adjustment was significant (with R= .376; F = 62.890; P < 0.05, and R = .350; F = 53.420; P < 0.05 respectively). Hence, Faculty and Students' perceptions have the potential of explaining students' adjustment to online learning in the Universities in era of COVID-19 in the North East, Nigeria. Necessary recommendations were made for planning education and for policy.

Key Words: COVID-19, Online learning, Adjustments, Faculty's, Universities

Introduction

COVID-19 pandemic has become a popular discussion topic in the last three years. COVID-19 virus has been ravaging the world since it was discovered in December 2019 in Wuhan, China. COVID-19 is classified to be in the family of the severe acute respiratory syndrome (SARs) and as a result of its rapid transmission, the World Health Organisation acknowledged it as a major pandemic comparable to the flu pandemic that ravaged the world in 1918, which was primarily caused by an H1N1 influenza viruswith its genes originating from avian species(www.cdc.gov.). COVID-19 symptoms manifest in fever, chills, cough, shortness of breath or difficulty in breathing(UNICEF, 2020). The protocols stated by the government as a means to curb the transmission of COVID-19 includes the usage of facial masks, self-isolation, maintaining sufficient distance between people and the temporary closure of academic institutions (Wiranto and Syakurah, 2022; UN, n.d). As it were, expert's fear was that the COVID-19 pandemic will grow into an endemic situation suggesting that the pandemic will not be terminated by the disappearance of the virus. Although global efforts to provide vaccination against the virus has been hailed with increasing global public health infrastructure and surveillance system put in place, it has nonetheless changed the way we live and do things on various aspects;especially in the educational, socio-cultural, and economic spheres.

In the sphere of education, COVID-19 has caused shock, fearamong students and teachers and cancellation of in-person classroom instructions and then learning was adjusted to be in the format of learning and teaching remotely in March 2020 while attempting to contain a further spread of the virus (DiPietro, Biagi, Costa, Karpinki and Mazza, 2020). The first country to impose school closure was Peoples Republic of China on 16th February, 2020 in some parts of China (Schleicher, 2020).Other countries also started closing up schools, not necessarily bringing a complete stop to teaching and learning activities as the pandemic cases increased.The enforcement of the physical distancing policy spanned across many nations.

The Nigerian government also implemented this policy, leading to the closure of all academic institutions across the nation. Universities were urged to make adjustments appropriately such that the learning process of students can continue, and also sustain the academic progress of students. The methodology of teaching and learning in most countries were immediately re-configured to being a full-time online learning format (Amir etal., 2020).

Online learning spans across a spectrum of technological tools, some of which are the worldwide web, internet, social media chats, new groups and texts, emails, audio and video conferencing delivered through computer networks to create a means for teaching and learning (Dhull and Sakshi, 2017). As an element of distance learning, it usually had concerns for the creation of accessing educational experiences which considerably has flexibility in space and time as that of the campus-based education (Anderson, 2011).Thus, online learning can be seen from different perspectives. Online learning can be synchronous and asynchronous modes. Synchronous technology gives room for live interactive sessions betweenstudents and their instructor through audio/video conferencing and web chats media.The asynchronous technology on the other hand involves a time lag between the release of instruction from the teacher and its receipt from students in forms ofpre-recorded videos, emails, forums and instructions.

In Nigeria, the challenge with online learning however are the need to implement courageous and bold actions to resolvethe many socio-economic challenges which have not yet been attended to, matters including skilled human resource, dependable infrastructures, open government and other essential sequences of building capacity (Federal Republic of Nigeria (FRN, 2001). For the teachers, there is a challengein the expanse of their knowledgewith the usage ofInformation and Communication Technology (ICT) for carrying out educational activities(Honan, 2008), the adjustment to new and different mode of learning, the association of online learning with the use of some technologies which needs teachers and student's adjustment to technological change (Arlinwibowo, Retnawati, Kartowagiran and

Kassymova, 2020), it is likely that students lose on learning while under lockdown (DiPietro, et al., 2020), and the fact that some educational programmes require blending face-face learning with online learning. Some educational programmes make use of laboratory, tutorials, and acquisition of clinical knowledge and learning assessmentsin form of objective clinical examinations and block examinations. For example, medical students are required to acquire not only basic knowledge but practical skills gotten in the laboratory and during clinical involvements (Wiranto and Syakurah, 2022).

Online learning also known as E-learning involves the utilization of the Internet and other notable technological facilities for the creation of materials for academic purposes, educational distribution, and management of programsthrough the internet. Empirical studies such as Almahasees et al., (2021); Mpalanyi, Nalwyiso, and Mubuuke (2020); Nasution, Nasution, Batubara and Munandar (2022) reported that countries exploitedvast sorts of resources to augment the learning process of students while the school closure policies subsist. These resources include instructional materials (printouts, worksheets and textbooks), radio education, educational television and online learning.The pandemic forced the closure of schools and face-to-face lessons had to be shifted to the online space. UNESCO (2020) reported that in Iceland, primary schools were left open on the condition that size of classes were not more than 20 students. Most of the primary and lower secondary schools in Sweden remained open, while the upper secondary schools translated majorly to distance learning. In Uganda, the Makerere University, carried out problem based learning (PBL) online using Zoom and other LMS (Mpalanyi, Nalwyiso, and Mubuuke, 2020). The main lesson learnt from the pandemic has been the strategic improvement in global health and lives generally and in particular, the adjustment to online education during the COVID-19 period and beyond.

Several studies have suggested several online learning in universities using technological developments that could be used in the COVID-19 pandemic era. These technologies are

DingTalk, Zoom, Twitter, Slack, Whatsapp, YouTube and email. Others are applications such as Google classroom, Microsoft Teams, Voxvote and Canvas (Nasution, Nasution, Batubara and Munandar, 2022), and Telemedicine and Tele-teaching (Choudhary and Gupta, 2015) to explore synchronous and asynchronous discussions.The teacher supplies instructional materials and then obtains feedback on the subject of discussion. As optimistic as these are, they cannot replace patient contact directly as in the case of medical education (Wiranto and Syakurah, 2022).

The perceptions of stakeholders on the benefits and otherwise of online learning varies. This is especially so when new technologies, new approaches and new learning environment are involved. What shapes and influences faculty and the perception of the students of online learning and adjustment is their sense of achievement in learning, satisfaction with resources, the aid they receive, technical mastery of the process, intellectual motivation, emotional stimulation, convenience with the process, and consciousness of a learning community (Malau-Aduli, 2021). Their adjustment, which is the way they individual attempts to deal with changes in the mode of learning, tensions and conflicts and meets his or her needs, and maintain harmonious relationship with the environment is very critical to making learning fun, participatory and successful. The four main areas of adjustment, according to Malau-Aduli (2021), are social, academic, personal-emotional, and goal/institutional. The academic adjustment deals with an individual's capacity to cope with educational demands, such as motivation to complete academic requirements, academic effort and performance, and academic satisfaction. The emotional adjustment deals with an individual's behavior in his or her relationships with people inside and outside of the school. Goal and institutional adjustments, meanwhile, pertain to how satisfied a person is with the university as a whole. These modifications are necessary components of how academic staff and students are able to meet the new demands of online learning.

The COVID19 pandemic has had a calamitous effect on the world-wide economy and particularly on education in developing countries. The education system world over was faced with a crises which created uncertainty among critical stakeholders in the education industry and posed a threat to the education system performance and sustainability. Transitioning to remote work and learning environment has remained one of the nagging issues in our education development trajectory in view of cost of data and bandwidths availability. However, efforts are being made to help faculties and students adjust to online learning mode. The challenges posed by the transition from in-class learning to online learning amidst the COVID-19 era are undoubtedly unique and diverse. Bothfaculty's and students are likely to have seriouscomplexities in adjusting to the new virtual environment of learning. The challenge is likely to worsenthe inequalities in the existing educational set-up. This is a major concern. Yet, it has not been uniformly addressed for all universities whether public or private as not all academic institutions were set to execute it due to uneven access. For example,not all schools have the requisite ICT infrastructures, while poor students with poor home environment lack resources to support their learningand the teachers are likely to have less ICT competencies to facilitate learning. Universities differ in their level of educational development. Thus, in Nigeria shift to online learning has not been possible considering that universities in Nigeriaseemed unprepared during this transitional moment, while teachers and students must reposition themselves while attempting to find meaning amidst themanyissuesin relation to the pandemic.The perception of online learning is impacted byone standing perspective and value system. Students' perceptions of online learning are critical to their academic success particularly, since they are the *raison d'etre* of the educational endeavour. Since it appears the COVID-19 is here to stay, the question is: how prepared are faculty's and students to use of online learning in the COVID-19 era? How effective can ICT be used for online learning in the COVID-19 period? Although researches on COVID-19 are emerging, studies on this critical aspect of faculty's and student's perceptions and adjustment to online learning

amidst COVID-19 in Nigerian universities in the context of the North-East Nigeria is still emerging.

Purpose of the Study

The purpose of this study is to research and investigate faculty's and students perceptions and adjustment to online learning in universities in the North East Nigeria. Specifically, the objectives of the study are to investigate:

1. the perception of online learning by facultys' and students'in universities during the COVID-19 era in the North East, Nigeria
2. the relationship between respondents perceptions and adjustment to online learning in universities in the COVID-19 era in the North East, Nigeria?

Research Questions

The following research questions were laid out to guide the study:

1. What is the facultys' perception of online learning in universities in the era of COVID-19 in the North East, Nigeria?
2. What is the students' perception of online learning in universities in the era of COVID-19 in the North East, Nigeria?

Research Hypothesis

Ho1: There is no significant relationship between faculty's perception and adjustment to online learning in universities in the era of COVID-19 in North East, Nigeria.

Ho2: There is no significant relationship between students' perception and adjustment to online learning in universities in the era of COVID-19 in the North East, Nigeria.

Methodology

The research design is descriptive survey. The population for the study was 16, 020 (representing15, 554 students and 446 faculty (lecturers) in the faculties of education in the universities in the North East, Nigeria. The target population include students and faculty's in five out of the 11 public universities in the North East, Nigeria. The sample size was 384 teachers and 384 students respectively. They wereselected through a multi-stage sampling. First, five universities were purposively selected for the study because of availability of ICT resources to enable participation in the study.The universities are: Taraba State University, Jalingo, Adamawa State University, Mubi, Gombe State University, Gombe, Moddibo Adama University, Yola, and Federal University Kashere respectively. Second, snowball sampling was used to select respondents for the study. This is because this technique is most suitable in a situation where it is difficult and expensive to locate a large number of respondents by other means (such as simple random sampling) (Frcker, 2008). Also, this study relies on referrals from initial respondents to generate additional respondents who are willing and have the ICT tools to participate in the study.This is important to explore faculty's and students' perceptions of online learning in this region which according to Apuke (2018) is still witnessing slower technological change with little study conducted to ascertain the level of ICT use in learning.A validated questionnaire titled "FSPAOQ" was used as the instrument for data collection, this was adapted from perception and adjustment questionnaire used in the existing literature (Almahasees etal., 2021; Harefaetal.,2022; Hilburgetal., 2020). The data was collected using Google Forms. The instrument was pilot tested and analysed using CronbachAlpa and yielded a reliability coefficient of .89 which was acceptable. Descriptive and inferential statistics were used in analyzing the data obtained. The descriptive statistics involved mean and standard deviations, and percentages toanswer the research questions. Linear regression was used in the inferential statistics to test the hypotheses at 0.05significance level. The results of the analyses with a mean score above 2.5 were accepted/ high (positive) while the mean score below 2.5 was taken as not accepted and low (negative). The p-value <0.05 was deemed significant.

Results

The results of the study were presented based on the research questions and hypotheses raised to guide the study.

Research Question 1.

What is the faculty perception of online learning in universities in the era of COVID-19 in the North East, Nigeria?

Table 1: Mean rating of faculty perception of online learning in universities in the era of COVID-19 in the North East, Nigeria

S/No.	Items	Mean	Sd	SA	A	D	SD	Dec.
1	I have the IT competency to do online classes	1.768	.9565	30	124	37	193	disagree
2	Conducting online classes requires more efforts in comparism to face-to-face instructions	2.883	.6083	51	237	96	0	agree
3	I have to open the cameras to maximise their live interactions with students	3.380	.8769	221	115	21	27	agree
4	Online platforms have tools to facilitate online classes	3.281	.8514	195	115	61	13	agree
5	Traditional classes are more effective than online classes	2.914	.6220	0	59	233	92	agree
6	Theoretical and practical classes could be taught without real interaction between teachers and students	1.992	1.045	61	25	148	150	disagree
7	Poor quality of instruction due to lack of interaction between students and teachers	3.250	.8791	191	115	61	17	agree
8	Students with face-to-face learning perform better than students on online learning mode	2.943	.6755	73	220	87	4	agree
9	I can assess students fairly and know their individual differences better with face-to-face learning mode than online learning mode	3.339	.9282	217	115	17	35	agree
10	Online teaching is more cost effective than in-class learning	1.547	.8476	26	12	108	238	disagree
	Grand Mean	**2.73**						

Table 1 above shows summary of scores, mean and standard deviation of faculty's rating of their perceptions of online learning in universities in the era of COVID-19 in the North East, Nigeria. Details of the analysis reveal that the respondents agree on items 2,3,4,5,7,8,9. But disagree on items 1, 6, and 10 which are below the criterion mean of 2.5. The grand mean is 2.73 which is higher than criterion mean of 2.5. This implies that faculty's perception of online learning is high (positive) in the North East, Nigeria.

Research Question 2.
What is the studentperception of online learning in universities in the era of COVID-19 in the North East, Nigeria?

Table 2: Mean rating of students' perception of online learning in universities in the era of COVID-19 in the North East, Nigeria

S/No.	Items	Mean	Sd	SA	A	D	SD	Dec.
1	I have sufficient equipment and facilities to participate in online learning (computer, android phones, softwares)	1.768	1.354	13	29	173	169	disagree
2	I have computer knowledge and ICT skills to manage my online learning	2.581	1.1736	124	68	99	93	agree
3	Online tools are easy to use	2.831	1.1380	152	84	79	69	agree
4	Online learning required efficient time management	2.927	.6299	63	230	91	0	agree
5	Using online learning enable one to gain experience of learning in a new environment	3.305	.9074	203	126	24	31	agree
6	Online learning is flexible and adaptable	3.302	.8565	199	119	49	17	agree
7	I am motivated to participate in online learning because of access to learning materials	2.177	1.0168	34	136	78	136	agree
8	I will be satisfied with teacher students interaction in online learning mode	3.370	.8989	221	115	17	31	agree
9	I have problem with bandwidths and internet connectivity from my home environment	2.016	1.0116	53	40	151	140	disagree
10	There are possibility of distractions from family and friends during online learning	2.883	.6812	64	216	99	5	agree
	Grand Mean	**2.72**						

Table 2 above shows the summary of scores, mean and standard deviation of students' rating of their perceptionof online learning in universities in the era of COVID-19 in the North East, Nigeria. Details of the analysis reveal that the respondents agree on items 12, 13, 14, 15, 16, 18 and 20. But disagree on items 11, 17, and 19 which are below the criterion mean of 2.5. The grand mean is 2.72 which is higher than criterion mean of 2.5. This implies that the students'perception of online learning is high (positive)in the North East, Nigeria.

Hypotheses
Ho1: There is no significantrelationship between faculty perception and adjustment to online learning in universities in the era of COVID-19 in North East, Nigeria.

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ISSN: 2714-3449 (Online)

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Table 3: Hypothesis testing the relationship between Facultys' perception and adjustment to online learning in universities in the era of COVID-19 in North East, Nigeria.

Model	Sum of Square	DF	Mean Square	F	Sign
Regression	13.440	1	13.440	62.890	.000[b]
Residual	81.639	382	.214		
Total	95.079	383			
Model Summary					
Model	1				
R	.376[a]				
R Square	.141				
Adjusted Square	.139				
Standard Error of Estimate	.46229				

Table 3 above shows that 14.1 % of faculty's' adjustment to online learning could be explained by their perception (R^2 = 0.141). Furthermore, the level of significance of faculty's' perception was presented in the Regression ANOVA Table; the table shows that R value of .376[a] was significant (F = 62.890; P < 0.05). This implies that, faculty's' perception have a positive relationship with adjustment to online learning in universities. Hence, faculty's' perceptions have the potential of explaining faculty's' adjustment to online learning in the universities in the era of COVID-19 in the North East, Nigeria, to a certain extent.

Ho2: There is no significant relationship between Students perception and adjustment to online learning in the universities in the era of COVID-19 in North East, Nigeria.

Table 4: Hypothesis testing the relationship betweenStudents'perception and adjustment to online learning in universities in the era of COVID-19 in North East, Nigeria.

Model	Sum of Square	DF	Mean Square	F	Sign
Regression	11.665	1	11.665	53.420	.000[b]
Residual	83.414	382	.218		
Total	95.079	383			
Model Summary					
Model	1				
R	.350[a]				
R Square	.123				
Adjusted Square	.120				
Standard Error of Estimate	.46729				

Table 4 above shows that 12.3 % of students' adjustment to online learning could be explained by their perception (R^2 = 0.123). Furthermore, the level of significance of students' perception was presented in the Regression ANOVA Table; the table shows the R value of .350[a] was significant (F = 53.420; P < 0.05). This implies that, students' perception have a positive relationship with adjustment to online learning in universities. Hence, students' perceptions

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ISSN: 2714-2965 (Print)
ISSN: 2714-3449 (Online)

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have the potential of explaining students' adjustment to online learning in universities in the era of COVID-19 in North East, Nigeria to a certain extent.

Discussion

The study investigated whether faculty and students perception relates significantly with their adjustment to online learning during the period of COVID-19 in North East, Nigeria. Results indicated that perception relate significantly to adjustment to online learning from the perspective of bothfaculty's and students.

Findings of this study revealed that faculty (university lecturers) members in universities in the North East, Nigeria have high (positive) perception about online learning and demonstrated that their perceptions relates with level of adjustment to online learning in the North East Nigeria. Ten items of the questionnaire were used to authenticate this position. From the findings, it was clear that lecturers in the universities are positive about online learning. However, there are of the opinion that conducting online classes requires more efforts in comparism to face-to-face instructions and that traditional class is more effective than online classes hence their preference for traditional face-to-face instruction than online. This agrees with Almahasees etal., (2021) and Kamal and Illiyan (2021). The lecturers believe that practical and theoretical classes could be taught without vivid interaction between students and teachers in an online classroom, resulting in poor quality of instruction due to lack of interaction between students and teachers.

The study also revealed high (positive)students perception and this is related to their adjustment to online learning in universities in the era of COVID-19 in the North East, Nigeria. Their perceptions significantly relate to their adjustment to online learning. They maintain that using online learning enable one to gain experience of learning in a new environment. Also, the students agree that theyhave computerliteracy and ICT skills to handletheir online learning. However, they lack adequate equipment and facilities to engage in online learning (computer, android phones, soft wares), coupled with the problem with bandwidths and internet connectivity from their home environment considered online learning to be costly. Students' perceptions of online learning agree with Khan, et al., 2021. In their study the students are confident of their abilities to make use of E-learning platforms. It is expected that students' perception would influence their satisfaction positively through interactive online learning. But in a study by Al-Bala et al., 2020: Gautam, 2020: Almahasees et al., 2021. students satisfaction was seen to be minimal because of technical issues, lack of interaction and training. This is so because during period of transition to online learning, Murphy etal., (2020) reported that negative emotions such as nervousness and anxiety were experienced by students. Similarly, Martin, Xie and Bollinger (2022) maintained that students found themselves experiencing uncertainties and insecurities pertaining to basic needs such as food and housing. Some passed through financial difficulties, the fear of the unknown, an absence of social connection and sense of belonging, and other issues that negatively affected their academic performance and overall well-being. Therefore, they need to be supported by the parents, teachers and the institutions to be motivated to learn in order enhance their academic performance.

The study found a statistically significant relationship between perception and adjustment to online learning in universities for faculty's' and students' (with R= .376; F = 62.890; P < 0.05, and R = .350; F = 53.420; P < 0.05 respectively).Hence, faculty's' perceptions and students' perception have the potential of explaining faculty's' adjustment to online learning in universities in the era of COVID-19 in North East, Nigeria to a certain extent. This agrees with Harefa and Sihombing (2022).Studies have shown impact of online learning have been significantly observed on faculty members and students. Theymaintained that perceptions are critical to level of adjustment to online learning. School system needs to develop implementing procedures for online learning.to make learning fun for teachers and students.

Conclusion

While accepting the generalization that online learning motivates and enriches students learning experiences in a new and creative manner, researches has shown, just like this one, that it is important to consider perception of students and indeed faculty in designing online models that will assist them adjust to online learning environment. This study has shown replete evidencesthat support the contention that the way faculty and students see online learning determine their motivation and participation in online learning. This is because online learning is still new and emerging, therefore, it requires teachers and students to coordinateeducational activities with technologies in such a manner that will guarantee students participation, motivation and satisfaction whether academically, emotionally and socially. This is why their social and psychological adjustment to learning in the school is a desideratum. Therefore, each university need to plan their curriculum well by designing and adopting appropriate media andonline learning modules that are flexible, and make social emotional and academic adjustment easy for students and faculties to make transition to online learning and assessment. This will make learning effective amidst the COVID-19 pandemic and its many variants.

Recommendations

The following recommendations were made for planning.
1. Government should be encouraged to provide internet access at affordable price for institutions. This will make the cost of bandwidths affordable to faculty and students.
2. Teachers should be encouraged to be innovative to provide variation in learning approaches and models to stimulatethe interest of students in online learning.
3. Parents should support the students in order to make online learning to be effective. This is because parents position on online learning and the value for online learning influences students perception and how they adjust academically to learning in the period of COVID19.
4. The university should provide the necessary infrastructural and technical supports as well as the enabling environment to make the shift to online learning enjoyable and stress less for the teacher and students.

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ISSN: 2714-3449 (Online)

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