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# Challenges of Blended E-Learning Tools in Mathematics: Students' Perspectives University of Uyo

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**Abstract**

An in-depth knowledge of pedagogical approaches can help improve the formulation of effective and efficient pedagogy, tools and technology to support and enhance the teaching and learning of Mathematics in higher institutions. This study investigated students' perceptions of the challenges of blended e-learning tools in the teaching and learning of mathematics. The study is a descriptive survey design conducted with thirty undergraduate students of the University of Uyo, Nigeria. A research questionnaire of students' perceptions on the challenges of blended e-learning tools in mathematics was used to elicit responses. The questionnaire has three sections of the perceived challenges of blended e-learning tools in mathematics; availability, accessibility and students' ICT skills towards utilization of blended e-learning tools. Data were analyzed using SPSS at the 0.05 level of significance. The results revealed non-availability, non-accessibility and inadequate students' ICT skills towards the utilization of blende e-learning tools for the teaching and learning mathematics. The overall results revealed that there is significant difference on students' perceptions towards the challenges of blended e-learning tools. Based on the research findings, the institution and instructors need to identify the perceived challenges and opportunities of blended e-learning and provide practical support such as provision of Virtual Learning Environment (VLE) to diversified students learning of mathematics. The study could be used as proactive response towards the institutions' preparedness on the development of blended e-learning approaches in terms of content design models and pedagogical approach for the teaching and learning of mathematics.

**Keywords:** accessibility, availability, blended e-learning, challenges, ICT skills, perceptions

## 1. Introduction

### *1.1 Overview*

The rapid development of information and communication technology (ICT) and the move towards a robust knowledge-intensive and globalized society have created new challenges on the instructional design model and pedagogy in the tertiary institutions (UNESCO, 2002). The recant development and awareness of the Nigerian government on ICT have opened various opportunities to adopt e-learning tools towards delivery of Distance Education for its populace, a typical case of the National Open University of Nigeria (Adu, Eze, Salako, & Nyangechi, 2013). Tertiary institutions in Nigeria have begun to develop blended e-learning approaches on their conventional programme of studies to link-up with the current trends of globalization in the Education system (Awodele, Kuyoro, Adejumobi, Awe, & Makanju, 2011). This is ideally seen in the perspective of open and distance learning, as various tertiary institutions in Nigeria collaborates with other contemporary universities to develop and harness the product of Information and Communication Technology (Ajadi, Salawu & Adeoye, 2008). These perceptions are reinforced through reforms on ICT with initiates such as National Policy on Computer Education, National Policy on Information Technology, National Information Technology Development Agency (NITDA), National Space Research and Development Agency (NASRDA), National Communication Commission (NCC), and private telecommunication companies/firm such as MTN, Zain and Etisalat.

### *1.2 Rationale of Blended E-learning and Its Impacts in Mathematics Education*

The term open and distance learning is used to describe the interaction in any course that is delivered to students who are not physically present in the same room within themselves or between students and instructor. Sale

(2002) defined e-learning as the use of electronic technology to deliver Education and training applications, monitor learners' performance and report learners progress. Hedge and Hayward (2004) as cited in Ayandu, Eludiora, Amassoma and Ashiru (2011) opted that, it is an innovative approach for delivering electronically mediated, well-designed, learner-centered and interactive learning environment to anyone, anytime by utilizing the internet and digital technologies in concern with instructional design principles. Broadly speaking, e-learning is a network technology-based mode of education that uses a mix of computer and other ICTs, across time, and place constraints to deliver instruction and provide access to information resources (Organization for Economics Corporation and Development [OECD], 2005). Thus, the use of e-learning technologies gives lecturers the diversity of their lectures, displaying more information and enhancing students learning. Therefore, blended e-learning involves a combination of the conventional face-to-face and online technology-bases learning (Wang, 2011). According to Singh (2003) as cited in Yushu (2006), blended e-learning mixes various event-based activities, including face-to-face classroom, live e-learning and self-paced learning. This often is a mix of conventional instruction-led training, synchronous online conference, training, or asynchronous self-pace study.

However, in spite of e-learning potentials to increasing institutional reputations, it improves the quality of teaching and learning of mathematics, and provides more flexibility in students learning. In addition, the blended approaches help lecturers to save time and allow more attention to be given to the content of the course. Blended e-learning contains best practices of e-learning and face-to-face learning which could overcome the challenges in conventional teaching and learning of mathematics. Elesionye and Okolo (2011) maintain that, e-learning application ensures that teaching and learning are information and communication technology based, and it has the following benefits:

1) Enable students to have equal opportunities with their contemporaries in other part of the world.

2) Could be used to introduce an interesting variety of the inventory of instructional materials.

3) Exposes students and teachers to basic skills in Computer Education for the purpose of accessing the internet and sourcing of information for effective learning.

4) Helps teachers and students to be comfortably entrenched in the global village.

5) Exposes the teachers and learners to instructional best practices in information technology.

6) Facilitate teaching, knowledge creation and dissemination of information in the tertiary institution.

*1.3 Perspectives of Blended E-Learning Tools in the Teaching and Learning of Mathematics*

Mathematics is a worldwide and comprehensive discipline for the undergraduate level, and the teaching and learning of Mathematics is sin-qua-non for the development of the nation (Misfeldt & Sanne, 2012; Ukpala & Nancy, 2012). The teaching and learning of Mathematics using e-learning tools evolved from basic online instructional tools such as; the use of print media, private radio and TV station for transmitting information to the learners, e-mails (alert in response to problem), and various computer-assisted instruction (i.e., lecture presentation using power-point slides, CD-ROM, Video on Demand (VOD), animated video-audio delivering system, simulation graphics, video-conferencing, e-book and e-journals) (Ayandu, Eludiora, Amassoma, & Ashiru, 2011).

Others are sophisticated web-based or virtual learning environment such as Modular Object Oriented Dynamic Learning environment (MOODLE), Blackboard Learning Management Systems, i-converges pedagogical model, WEBCT, MUMIE, WebALT, MEI online resources, Mathwiki, Home Work System (HWS), open courseware, and other peripherals in the mathematics/computer laboratory(Albano, 2012; Awodele et al, 2010). According to Stuart (2004) cited in Wang (2011) access to these resources means that students can do coursework at their convenience, so learning can happen synchronously or asynchronously. In a broad sense Mathematics e-learning refers to the use of hardware, software and/or the internet to deliver and facilitate Mathematics instruction (Juan, Huertas, Trenholm, Steegmann & 2011). These blended e-learning approaches are leverages to facilitate the growth in e-learning pedagogy and design models in the teaching and learning of Mathematics. It is therefore highly imperative to align Mathematics pedagogy and its instructional design models to this contemporary advancement in technologies.

*1.4 Learning Theory Perspectives on Blended E-Learning Tools in Mathematics Education*

The learning theory that has direct connotation on blended e-learning tools in the present digital age is term as connectivism. Siemens (2008) suggested that modern day learning occurs through network connection as individuals share their interest, knowledge, perspectives, expertise, and opinion in online or virtual environment. According to Siemens as cited in Dunaway (2011), Connectivism is a learning theory comprised of different

series of nodes to connect hundreds of network and facilitate synchronous and asynchronous learning. It is a new learning theory that encompasses new development in digital technology, suitable for other aspect of learning such as learning in the conventional environment or classroom, distance learning and e-learning (Kop & Hill, 2008). From this concept, Downes describes "Connectivism is the thesis that knowledge is distributed across a network of connection (connective knowledge), and therefore that learning consist of the ability to construct and traverse those network" (Hung, 2014; Duke, Harper & Johnston, 2013). In connectivism, the starting point for learning occurs when knowledge is actuated through the process of a learner connecting to and feeding information into a learning community (networks or nodes). Therefore knowledge does not only reside in the mind of an individual, but resides in distributed manner across a network (distributive) and learning is the act of recognizing patterns shaped by this complex networks (Siemens, 2004; Downes, 2010).This could be as a result of exponential growth and complexity of information available on the internet; new possibilities for learners and educators to communicate on global networks, and their ability to aggregate different information streams.

*1.5 Statement of the Problem*

In the teaching and learning of mathematics we encounter problems that are difficult to solve in a face-to-face teaching framework for the beginners. They could lack the motivation and interest, some are not intended to specialize in it, and thus, they pay little or no attention to understanding basic mathematical concepts (Abramovitz, Berezina, Berman & Shvaetsman, 2012). The state of-the-art of communication technology is a persistent issue that described the current challenges of blended e-learning in Mathematics. Blended e-learning approaches supposedly to be an initiative toward linking the conventional teaching and programmes in Mathematics Education to virtual learning system, so as to benefit from the technology-based learning, but it is hinged on the challenges of e-learning tools. The challenges of e-learning in Mathematics Education involve technological divides and limitations such as; lack of computers with high speed internet or intranet connections, lack of computer peripherals, lack of functioning computer/mathematics laboratory, content management software malfunctioning(i.e., internet insecurity) and/or other related ICT incompetence amongst students/educators(Jarvis, 2012; Misfeldt & Sanne,2012).

It could be an imperative to opine that, challenges also abound on the instructional design models of blended e-learning tools to represent the conventional Mathematics classroom settings.They could be difficulties in typing mathematical formulas/notations in designed e-learning models, which in turn hinder mathematical communication. It therefore prompts students to describe mathematics in words rather than in the established mathematical notations. Therefore Bellas, Romero, Marona and Becerra (2010) emphasized that, content design models in e-learning platform could be carried out following these main features:

1) Adequately meeting the needs, and capabilities of the students.
2) Clarity and quality of the information presented.
3) An adapted structure for its correct understanding and assimilation.
4) Interactivity with the students.

*1.6 Purpose of the Study*

The purpose of the study was to examine the perceptions of undergraduate students in University of Uyo on the challenges militating blended e-learning tools in Mathematics. The specific objectives of the study were:

1) To determine the perceptions of undergraduate students on the availability of blended e-learning tools in Mathematics.
2) To determine the perceptions of undergraduate students on the accessibility of blended e-learning tools in Mathematics.
3) To determine the perception of undergraduate students' ICT proficiency towards utilization of blended e-learning tools in Mathematics.

*1.7 Research Questions*

1) What is the extent of availability of blended e-learning tools for the teaching and learning of mathematics?
2) What is the extent of students' accessibility of blended e-learning tools for the teaching and learning of mathematics?
3) What is the extent of students' ICT skills towards the utilization of blended e-learning tools in the teaching and learning of mathematics?

*1.8 Research Hypotheses*

$H_0$:There is no significant difference in the mean responses between students' perceptions and challenges of blended e-learning tools in Mathematics.

$H_0$: There is no significant interaction effect in the mean responses between students' perceptions and challenges on blended e-learning tools for the teaching and learning of mathematics.

$H_0$: There is no significant difference in the mean responses between students' perceptions on the challenges of blended e-learning tools for the teaching and learning of mathematics.

$H_0$: There is no significant difference in the mean responses between the challenges (items) of blended e-learning tools for the teaching and learning of mathematics.

## 2. Research Method

*2.1 Sample*

The accessible population were undergraduate students in the University of Uyo Nigeria. A stratified random sampling technique was adopted to select thirty undergraduate students from the two strata (i.e., Students of the Department of Mathematics/Statistics, and Department of Science Education) all from the University of Uyo Nigeria.

*2.2 Instruments*

A research questionnaire of Students' Perceptions on the Challenges of Blended E-learning Tools (SPCBET) in Mathematics was used to collect data from the respondents. The questionnaire was a four-point likert scale (i.e., 4-strongly agree, 3-agree, 2-disagree, and 1- strongly disagree) with twenty items, and divided into the three (3) factor levels of the perceived challenges on blended e-learning tools (i.e., items on availability of blended e-learning tools, items on accessibility of blended e-learning tools, and items on students ICT skills towards the utilization of blended e-learning tools). The questionnaire was face-content validated by two experts in Department of measurement and Evaluation, together with an ICT administrator in the University of Uyo. The pre-questionnaire was administered to a sample of homogenous group, and a reliability coefficient of 0.71 was determined using cronbach's alpha technique. This ensures internal consistency in the items. Mean response of 2.5 and above were considered agreed and positive perceptions, and mean response of 2.49 and below were considered disagreed and negative perceptions towards the challenges of blended e-learning tools in the teaching and learning of Mathematics.

*2.3 Research Procedure*

The research was a quantitative survey design. The perceived challenges on blended e-learning tools (i.e., availability, accessibility and ICT skills) were the independent variables, and third year undergraduate students from the two respective departments were the dependent group variables. Descriptive statistics was use to answer the research questions, and a two-way analysis of variance (ANOVA) was used to test the null hypotheses at 0.05 level of significant.

## 3. Results

*3.1 Research Question1: What is the Extent of Availability of Blended E-Learning Tools for the Teaching and Learning of Mathematics?*

Table 1. Students' perceptions on the availability of blended e-learning tools for the teaching and learning of mathematics

| | Items on availabiltity of blended e-learning tools in the teaching and learning of maths | N | X | SD | Decision |
|---|---|---|---|---|---|
| 1 | Virtual learning networking environments (MOODLE, blackboard, WebCT, e-converge, WEB2.0) supports blended e-learning approaches in the institution. | 30 | 1.70 | 0.65 | Disagree |
| 2 | We have ICT Centre with internet or intranet connection in the institution. | 30 | 1.70 | 0.74 | Disagree |
| 3 | The institutions' library has e-library section connected to affiliated institutional online libraries. | 30 | 1.93 | 0.90 | Disagree |

| | | | | | |
|---|---|---|---|---|---|
| 4 | We have mathematics/computer laboratory with internet facilities for timely interactive lectures. | 30 | 2.03 | 0.85 | Disagree |
| 5 | The institution provide online course management system(i.e., e-registration, online result checking, e-transcript, and other relevant management information for students and staff) | 30 | 2.80 | 0.96 | Agree |
| 6 | Fostering international universities affiliations/consortium for aiding projects towards developing blended e-learning platform in the university. | 30 | 2.96 | 0.92 | Agree |
| 7 | The institution has design a model blended e-learning platform for mathematics programmes | 30 | 1.76 | 0.67 | Disagree |
| | Sub-grand mean | | 2.12 | | Disagree |

Table 1 shows the students mean responses on availability of blended e-learning tools in the teaching and learning of mathematics. This result has shown that students have agreed on their institutions' e-readiness towards blended e-learning approaches; provision of online course management system, fostering international affiliation/consortium aiding projects for developing blended e-learning platform in the university. On the other hand, the students' disagree on the availability of virtual learning network environment, ICT/internet centre, e-library, math/computer laboratory, and blended e-learning platform for mathematics programmes in the institution. Meanwhile, the sub-grand mean of 2.12reveals non-availability of blended e-learning tools for the teaching and learning of mathematics.

*3.2 Research Question 2: What is the Extent of Students' Accessibility of Blended e-Learning Tools for the Teaching and Learning of Mathematics?*

Table 2. Students perceptions on the accessibility of blended e-learning tools for the teaching and learning of Mathematics

| S/N | Items on accessibility of blended e-learning tools for the teaching and learning of maths | N | X | SD | Decision |
|---|---|---|---|---|---|
| 8 | We utilize Computer-Assisted Instruction (CAI) such as power point slides and instructional mathematics software (MATLAB, MINITAB, graphical utility software, SPSS and so on) in conventional classroom. | 30 | 3.33 | 0.66 | Agree |
| 9 | Lecturers synchronously utilize interactive whiteboard/projectors presentation in conventional classroom. | 30 | 2.00 | 1.05 | Disagree |
| 10 | There is robust electricity supply for computer-based infrastructures in the institution. | 30 | 1.86 | 0.77 | Disagree |
| 11 | Lecturers provide links, blogs, and websites for courses e-materials and downloadable (e-book, e-journals, lecture notes, and lecture videos) to facilitate conventional lectures in the classroom. | 30 | 2.86 | 0.97 | Agree |
| 12 | Computer viruses (spyware and malware) hinder the use of computer peripherals (scanners, photocopiers and desktop computers) at the institutions' resource centres. | 30 | 1.60 | 0.67 | Disagree |
| 13 | Conventional lectures are facilitated on internet networking (i.e., e-mails, e-assessment, e-assignment, and e-project) amongst students and lecturers. | 30 | 3.16 | 0.79 | Agree |
| | Sub-grand mean | | 2.46 | | Disagree |

Table 2 shows students mean responses in the perceived challenges on accessibility of blended e-learning tools for the teaching and learning of Mathematics. The responses revealed that, students might have utilized

asynchronous blended e-learning approach including the use of computer-assisted instruction to complement conventional classroom delivery; hindrances were: poor electricity supply, and lack of internet accessibility within the university.

This might have compelled the students to use cyber-café and subscribed to internet access outside the university.

Consequently, the sub-grand mean of 2.46 have shown non-accessibility of blended e-learning tools for the teaching and learning of mathematics.

*3.3 Research Question 3: What is the Extent of Students' ICT Skills towards the Utilization of Blended e-Learning Tools in the Teaching and Learning of Mathematics?*

Table 3. Students perceptions on ICT skills towards the utilization of blended e-learning tools for the teaching and learning of Mathematics

| | Items on students' ICT skills for blended e-learning in the teaching and learning of mathematics | N | X | SD | Decision |
|---|---|---|---|---|---|
| 14 | Entrepreneurial studies on ICT is ongoing for undergraduates in the institution | 30 | 3.36 | 0.71 | Agree |
| 15 | Experience ICT personnel provides technical supports for staff and students in the institution. | 30 | 3.10 | 0.75 | Agree |
| 16 | I can design instructional software for the teaching and learning of mathematics. | 30 | 1.83 | 0.87 | Disagree |
| 17 | I am currently on ICT training to support my studies in the institution | 30 | 2.76 | 0.89 | Agree |
| 18 | I am a Microsoft certified computer user. | 30 | 3.10 | 0.80 | Agree |
| 19 | I have a PC and computer gadgets that enabled internet access | 30 | 2.83 | 0.98 | Agree |
| 20 | I surf the internet for instructional materials. | 30 | 2.96 | 0.88 | Agree |
| | Sub-grand mean | | 2.84 | | Agree |

Table 3 shows mean responses on the extent of students' ICT skills on the utilization of blended e-learning tools for the teaching and learning of Mathematics. The finding shows that students have the prerequisite knowledge, basic ICT skills and exhibit proficiency on the use of computer-based facilities in the institution. However, students lack the training-facilities that could foster their creativity to design blended e-learning models. The sub-grand mean of 2.84 is above the benchmark, and this envisages that, any blended e-learning initiatives could yield growth towards harnessing the opportunities in ICT/internet as well as connective-knowledge.

Table 4. The results of items descriptive statistic of students' perceptions on challenges of blended e-learning tools for the teaching and learning of mathematics

| | N | X | S.D | Z-score | Positive perceptions (%) | Negative perceptions (%) | p-value (sig)* |
|---|---|---|---|---|---|---|---|
| Items | 20 | 2.48 | 1.03 | 0.02 | 49.24 | 50.76 | 0.9 |

Sig* and normally distributed; benchmark mean = 2.50.

Grand-mean = 2.48

The grand mean of 2.48 for all items selected as the perceived challenges of blended e-learning tools is below the benchmark, and its revealed; non-availability, non-accessibility and lack of students' ICT skills in blended e-learning tools for the teaching and learning of mathematics. Therefore, challenges on blended e-learning tools shown persistency as the percentage of positive perceptions decreases, while that of negatives perceptions increases, invariably leading to variability between responses on the items. Since the mean response scores of a

likert-rating scale often follow a normal or closed normal distribution, its' imperative to conduct an inferential statistic; ANCOVA, to detect the significant difference.

Table 5. ANCOVA results of students perceptions on the challenges of blended e-learning tools for the teaching and learning of mathematics

| Source | SS | DF | MS | F-ratio | Sig. | Partial et$a^2$ | Power |
|---|---|---|---|---|---|---|---|
| Corrected model | 4324.50[a] | 597 | 7.24 | 43.46 | 0.005 | 1.00 | 0.99 |
| Perceptions | 61.87 | 29 | 2.13 | 12.79 | 0.029 | 0.99 | 0.81 |
| Challenges (Items) | 226.6 | 19 | 11.93 | 71.57 | 0.002 | 0.99 | 1.00 |
| Perceptions *Challenges | 348.74 | 548 | 0.64 | 3.81 | 0.14 | 0.99 | 0.36 |
| Error | 0.50 | 3 | 0.16 | | | | |
| Total | 4325.00 | 600 | | | | | |

$R^2 = 1,\ Adjusted\ R^2 = 0.97.$

Table 4 shows the ANCOVA results of students' perceptions on the challenges of blended e-learning tools for the teaching and learning of Mathematics. The result shown statistical significant differences between the mean responses of students' perceptions and challenges of blended e-learning tools for the teaching and learning of mathematics (F= 43.46; $p = 0.005$), null hypothesis (I) was rejected. Table 4 also reveals that there is no significant interactions in the mean responses between students' perception and challenges of blended e-learning tools for the teaching and learning of mathematics (F =3.81, $p = 0.14$). However, the test statistic did not provide convincing evidence to accept null hypothesis (II), because an observed power of 0.36 could lead to incorrect conclusion. The results also shown significant differences on the two main effects; challenges (items) on blended e-learning tools and students' perceptions (responses) on blended e-learning tools (F = 12.79, p=0.029; F=71.57, p=0.002) and null hypotheses (III & IV)were rejected, all at 0.05 level of significance respectively.

Furthermore, Scheffé's Post-Hoc comparisons was used to determine where there is significant differences in the mean responses on the two main effects; challenges (items) on blended e-learning tools and students' perceptions (responses) on blended learning tools in the study. This however shows that there is significant difference in the mean responses between items selected as challenges of blended e-learning tools. The post hoc test did not give any significant difference in the mean responses between students' perceptions on the challenges of blended e-learning tools.

Table 6. Summary of Scheffé's post hoc comparisons test of mean responses on the challenges of blended e-learning tools for the teaching and learning of mathematics

| Items (I) | Items (J) | Mean difference (I –J) | Std. Error | Sig |
|---|---|---|---|---|
| 1 | 8 | -1.63 | 0.10 | 0.029* |
| | 13 | -1.46 | 0.10 | 0.040* |
| | 14 | -1.66 | 0.10 | 0.028* |
| | 15 | -1.40 | 0.10 | 0.045* |
| | 18 | -1.40 | 0.10 | 0.045* |
| 2 | 8 | -1.63 | 0.10 | 0.029* |
| | 13 | -1.46 | 0.10 | 0.040* |
| | 14 | -1.66 | 0.10 | 0.028* |
| | 15 | -1.40 | 0.10 | 0.045* |
| | 18 | -1.40 | 0.10 | 0.045* |

| | | | | |
|---|---|---|---|---|
| 3 | 8 | -1.40 | 0.10 | 0.045* |
| | 14 | -1.43 | 0.10 | 0.043* |
| 8 | 1 | 1.63 | 0.10 | 0.029* |
| | 2 | 1.63 | 0.10 | 0.029* |
| | 7 | 1.56 | 0.10 | 0.033* |
| | 10 | 1.46 | 0.10 | 0.040* |
| | 12 | 1.73 | 0.10 | 0.025* |
| | 16 | 1.50 | 0.10 | 0.037* |
| 9 | 14 | -1.36 | 0.10 | 0.049* |
| 10 | 8 | -1.46 | 0.10 | 0.040* |
| | 14 | -1.50 | 0.10 | 0.037* |
| 12 | 8 | -1.73 | 0.10 | 0.025* |
| | 13 | -1.56 | 0.10 | 0.033* |
| | 14 | -1.76 | 0.10 | 0.024* |
| | 15 | -1.50 | 0.10 | 0.037* |
| | 18 | -1.50 | 0.10 | 0.037* |
| 13 | 1 | 1.46 | 0.10 | 0.040* |
| | 2 | 1.46 | 0.10 | 0.040* |
| | 7 | 1.40 | 0.10 | 0.045* |
| | 12 | 1.56 | 0.10 | 0.033* |
| 14 | 1 | 1.66 | 0.10 | 0.028* |
| | 2 | 1.66 | 0.10 | 0.028* |
| | 3 | 1.43 | 0.10 | 0.043* |
| | 4 | 1.36 | 0.10 | 0.049* |
| | 7 | 1.60 | 0.10 | 0.031* |
| | 9 | 1.36 | 0.10 | 0.049* |
| | 10 | 1.50 | 0.10 | 0.037* |
| | 12 | 1.76 | 0.10 | 0.024* |
| | 16 | 1.53 | 0.10 | 0.035* |
| 15 | 1 | 1.40 | 0.10 | 0.045* |
| | 2 | 1.40 | 0.10 | 0.045* |
| | 12 | 1.50 | 0.10 | 0.037* |
| 16 | 8 | -1.50 | 0.10 | 0.037* |
| | 14 | -1.53 | 0.10 | 0.035* |
| 18 | 1 | 1.40 | 0.10 | 0.045* |
| | 2 | 1.40 | 0.10 | 0.045* |
| | 12 | 1.50 | 0.10 | 0.037* |
| *significant at 0.05 | level | | | |

## 4. Discussion

The study examined the extent of students' perceptions on the challenges of blended e-learning tools for the teaching and learning of mathematics in University of Uyo, Nigeria. The results revealed that there are statistical significant differences in the mean responses of students' perceptions on the challenges of blended e-learning

tools. This could be as a result of non-availability of blended e-learning tools such as; lack of virtual learning environment, lack of ICT centres with internet facilities. This invariably could hamper access to e-learning tools and blended e-learning approaches for the teaching and learning of mathematics in the institution. In line with this study Liverpool, Marut, Ndam and Oti (2009) reported that resources are inadequate to meet the existing educational deficits using conventional approaches, and higher educational institutions are ready for blended e-learning as soon as computer and a network are in place.

On the other hand, the sub-grand mean on students' ICT skills revealed a robust increase in mean responses more than other factors levels selected as challenges (i.e., availability and accessibility) of blended e-learning tools. This could be as a result of students' ability of utilizing ICT related infrastructures. In the same vein they could be able to utilize blended e-learning tools, if its integrated to their conventional classroom programme of study. Ahmad and Janier (2008) reported that students' demonstrate positive perceptions towards learning with the help of technology, and blended learning can be used as an alternative approach in teaching and learning mathematics in order to motivate the students. The motivation could have significant effect on their achievement in the subject. Kuhn, Watson and Walters (2014) reported that the use of Web Home-work System (WHS) would improve and correlate well with students' success in mathematics courses. Further support on studies involving BL approach envisaged that the blend serves to introduce students to the diverse environment and experiences comprising of professional practices (Groen & Carmody, 2005). On this notes, Iozzi and Osimo (2004) opted that, using blended learning strategy in teaching undergraduate course shown that there was an improvement in students' performance in mathematics.

All in all, the overall grand mean of the three factors levels selected as challenges of blended e-learning reveals non-availability, non-accessibility and inadequate ICT skills towards the utilization of blended e-learning tools in mathematics. This could be attributed to lack of ICT infrastructures to supports blended e-learning approaches for teaching and learning of mathematics in the institution.

## 5. Conclusion

The emerging ICT infrastructures have diversified pedagogical approaches of tertiary institutions in Nigeria. It is an imperative for University of Uyo to align its instructional approaches of mathematics to computer-based/web-based teaching and learning such as blended e-learning approaches. It's no doubt saying that students' interest and motivation are low on pursuing career in mathematics courses, and the only way to bring a significant new group of learners to the fold is through the use of blended e-learning approaches.

Elaborating the benefits of blended e-learning approaches suggested that it could improve students understanding and comprehension of the courses in Mathematics. Students would independently explore the blended e-learning environment to expand their learning and knowledge of mathematics beyond the limitations of knowledge found in conventional classroom and presented lectures. Blended e-learning could potentially increase institutional reputations, improve quality of teaching and learning, and provides more flexibility in students' life-long learning.

This study has identified students' perceived challenges of blended e-learning tools in the institution. It could contribute to enhancing the institutions' blended e-learning preparedness and proactive prospects of blended e-learning approaches for the teaching and learning of Mathematics in the institution.

## 6. Recommendations/Further Research

1) The institution should provide functional ICT centre and internet facilities with the direct link to the department of Mathematics/Statistics and Science Education.

2) The institution should provide virtual learning environment such as moodle or blackboard to enhancing blended e-learning pedagogy for Mathematics courses; calculus and pre-algebra that are being offered by larger number of students across the faculties of Science, Engineering, and Education.

3) Entrepreneurial training and empowerment of staff and students on the acquisition of ICT skill should be a priority.

4) The institution should foster international collaboration/consortium towards developing Virtual Learning Environment (VLE) platform to suit her conventional classroom curriculum.

5) Further studies could be undertaken to investigate the pedagogical and design models of a given virtual learning platform that could satisfy the university curriculum design as specified by the Nigerian University Commission (NUC).

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