

BLENDED INSTRUCTION FOR ACADEMIC ACHIEVEMENT AND RETENTION OF STUDENT LECTURERS IN COLLEGES OF EDUCATION: AN IMPERATIVE FOR TEACHING MATHEMATICS FOR ECONOMICS

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ABSTRACT

This paper discussed blended instruction for academic achievement and retention of student lecturers in colleges of education an imperative for teaching mathematics for economics in selected colleges of education in the northwestern part of Nigeria. The paper established a continuous introduction of mathematics in the study of economics at all levels of higher learning in Nigeria. Literary evidence showed that teacher trainees have been performing poorly in the teaching and learning of the mathematical concepts in economics. Blended learning was employed as alternative to the traditional method of instruction for the experimental group of 50 students in three colleges of education totaling 150 students using and open sourced Learning management System Moodle. Based on the achievement test administered on the two groups, the means score showed that the experimental group performed better in the teacher's structured achievement test. Among the recommendation is that the government should commit more resource to developing a functional learning management LMS that is purposed built for each college of education across Nigeria. Academic staff should be made to undergo in service training to develop their information and communication skill.

Keywords: Mathematics for Economics, Economics, Learning management System.

1. INTRODUCTION

For decades, the increasing use of formal methods of instruction delivery in the social sciences has generated controversy and economics has been the primary focus of criticism. More specifically, most of the debate has centered on the so-called economic theories, and the related bias towards formal methods. Mathematics started to be introduced into economics in the 19th century and got increasingly accepted over the course of the 20th century. This can be seen in the substantial increase in the proportion of articles using algebra in economic journals. In 1915 ten per cent of the articles used algebra, whereas in 1980 this proportion rose to 75 per cent J (Reiss J.) 2000. Stigler et al. show, 1995 stated in 1892 95% of the articles in the four leading journals of economics used neither a geometric representation nor mathematical notation, in 1990 only 5% of the articles used neither of those. (Reiss J.) 2000.

Mathematics which is a science of measurement has continually taken a centre stage in the study of Economics. Economics as defined by Lionel Robbins is the study of human behaviour as a relationship between ends and scarce means that have alternative uses. The definition ordinarily does not appear to require an elaborate use of mathematical and algebraic gymnastics as being done today, however the introduction and the use of mathematical principles has continually being on the rise. This is not far from the fact that mathematics helps to simplify economic terminologies as well to determine the functional relationship between economic variables, aid

rational and concrete economic decisions there helping economists to subject economic problems to serious investigation in order to expose its inadequacies. Mathematics also allows for predictions and forecasting. Mathematics serves as a pathfinder to solving the problems of minimal and maxima (optimization) thereby allowing economists to form meaningful, testable propositions about wide ranging and complex subjects which could be less meaningful or easily expressed informally.

Mathematics also allows economists to make specific and positive claims about controversial or contentious subjects. It allows economists to evaluate existing relationship that exists between economic variables when forming hypothesis.

The above importance accounts for the inclusion of a separate branch of economics as a stand alone course in the study of economics at different level of studying economics including in the universities and colleges of education. The vast knowledge of mathematics and the retention during class room experience usually determines the height which students attain in their final placement examination and evaluation in economics. This because most courses to be covered in the curricular for an award of certificate in economics are embroidered in mathematics with topics ranging from Algebra, Matrices and Calculus.

Nowadays, due to rapid advancement in technology, there are huge gaps in the subject material used in the past and those used at present. Foremost reason for the same is the changing roles of the lecturers and learners within the classrooms settings and schools. Today, the smart board, portable computers, to name few, have replaced chalkboard. This has lead to shift in educational approach from teacher centered to student centered approach where teaching and learning has become learner centered while the teacher only acts as a facilitator Based on the results of various researches in the field of learning, traditional modes of learning are less preferred by most students contemporarily. As a result, educational practices demands transformation of the weaknesses of traditional method to be a boom for educational purposes. Moreover, it has been witnessed from previous results that students prefer novelty in learning. With the progress in ICT, supplementary innovative deliveries and learning solutions have come up to provide significant learning experiences in the classroom settings. To deliver meaningful learning experiences, blended instructions are one of the various methods being used. This is essentially a very basic functional definition of learning in that learning is seen as a function that maps experience onto behavior. In other words, learning is defined as an effect of experience on behavior. Likewise, learning involves new ways of doing things with no limit to adopt the ways and means to attain the goals. It is a continuous, comprehensive process which involves different methods and covers the cognitive, affective and the psycho motor domains of human behavior. More recently, blended learning has recently as a powerful force in the educational institution to improve teaching and learning. Dictionary meaning of blended refers to combination of various aspects, in a way that the one compliments the other. The Sloan consortium defined blended course as, a course that blends face to face and on-line delivery where 150-79% of the content is delivered on-line through systematic use of learning management systems (LMS). Blended learning can also be seen as the combination of pedagogic approaches or the mix of different didactic methods which includes expository presentations, discovery learning, cooperative learning among others.

In blended learning students are not just relying on that material provided by the teacher, but can search the material in various ways, among others, searching the library, asking friends or

classmates online, opening websites, searching for learning materials through search engine, portal, or blog, or it could be with media in the form of learning software and also tutorial learning meaning that Blended learning incorporates both e-learning and face-to-face teaching in lesson delivery.

Interestingly, it has been observed that students having positive attitude and higher motivational levels towards learning showed more positive attitude with regards to e-learning in blended courses. This in turn impacts the learning ability of the students in terms of achievement. Since, it enables the individuals to learn at all times and in all places and at their convenience, has made learning more purposeful and also tend to retain and make use of what they learn better and longer. Similarly, Allen, J. Seaman J. and Garrett R.(2007), defines blended learning strategy as "a combination of instruction from two historically separate models of teaching and learning: traditional face to face learning systems and computer mediated learning". Welker J and Berardino L. (2005), defined it as, the integration of e-learning tools such as virtual learning environment with face to face learning. MacDodnalds (2008), defines blended learning as, a mixture of synchronous technology (video, audio) and asynchronous media (like emails, blogs) of information and communication delivery. MacDodnalds (2008), identified four diverse conducts through which blended learning can be defined as blend of Modes of online technology; Pedagogical approaches; Technology with face to face teaching; Technology with actual classroom work. The ultimate aim of employing different methods is to witness its influence on academic performance.

Statement of problem

Economics as field of study is constantly evolving. If economics student lecturers are well equipped with a good learning approach it can positively improve them in life-long learning process which is a better way of knowledge construction in this Era of Globalization. Proper knowledge of Mathematics for Economics and the application of its principles will help Economics students greatly while studying Economics at different tertiary level of education where Economics is being studying and even at graduation to perform economics analysis in anywhere they find themselves. However, Economics students appear to be performing poorly in Mathematics for Economics course. Despite efforts of lecturers to make classroom instruction interactive and engaging, students' retention and academic achievement in this skill course have been low. Students' poor performance in Mathematics for Economics could lead to frustration and increase in drop-out levels which may lead to increased unemployment among youths in the society. Also, students' poor performance in Mathematics for Economics could result in their inability to perform economists' duties in the public or private institutions where they are employed after graduation. The resultant effect of this could be loss of jobs and loss of confidence in the graduates of Economics by employers of labour. The problem of students' poor performance in Mathematics for Economics at colleges of education and other tertiary institution level may be as a result of teaching approach and learning environment, among other factors. Teaching many students, sitting in a class that is most times overcrowded, as the case is with Economics departments in Colleges of education and Universities, may lead to lack of comprehension of what is taught. The problem of poor performance and its ripple effect on society calls for the need to try new approaches in the teaching of Mathematics for Economics. This 21st Century is characterized by technological innovations that are applicable in education. One of such innovation is e-learning. Therefore, if e-learning is applied in its blended form to

the teaching of Mathematics for Economics, what effect would it have on the Economics students' academic achievement and retention? This is the problem this study sought to address.

Purpose of the study

The purpose of the study is to ascertain the effects of blended learning approach on students' academic achievement and retention in mathematics for economics in Colleges of Education in the North Central Geo-Political zones of Nigeria. Specifically, the study sought to determine:

1. The difference in mean academic achievement scores of Mathematics for Economics students taught mathematics for economics using blended learning approach and those taught using conventional classroom approach.
2. The difference in mean retention scores of Mathematics for Economics students taught Mathematics for economics using blended learning approach and those taught using conventional classroom approach.
3. to understand the best approach that students find more pleasant to them to learn mathematics for economics in colleges of education.

Research Questions

The following research questions guided the study:

1. What is the difference in academic achievement scores of Mathematics for Economics students taught mathematics for economics using blended learning approach and those taught using conventional classroom approach?
2. What is the difference in retention scores of Mathematics for Economics students taught Mathematics for economics using blended learning approach and those taught using conventional classroom approach?
3. What is best approach that students find more pleasant to them to learn mathematics for economics in colleges of education.

Research Hypotheses

The following null hypotheses are tested at 0.05 level of significance:

H₀₁: There is no significant difference between the academic achievement scores of students taught Mathematics for Economics using blended learning approach and those taught using conventional classroom approach.

Significance of the Study

Mathematics for Economics is one course in economics which the students are often scared of. Some of its concepts and theories are technical to understand. So, an attempt could be made to approach it with a versatile strategy like blended learning that focuses on convenient learning in and outside the class.

The rationale of this study is to focus on the practical implementation of blended learning strategy in the classroom and target learners with different level of motivation.

Furthermore, students are indifferent towards mathematics for economics, not because of lack of teaching, but because of inappropriateness of the strategy followed during teaching learning process in schools. This study will bring forth the import of an appropriate learning strategy that

will motivate students to really embrace mathematics for economic as a panacea for study modern economics.

The findings of this study would be beneficial to those in charge of Economics education and Economics education students. The findings of the study, when published, are of benefit to Economics lecturers who are faced with the challenge of handling large classes. As such Economics lecturers can consider the option of adopting blended learning approaches in teaching. Also, lecturers can see the effect of the flipped classroom model of blended learning on students' achievement and retention.

The findings of the study would be of immense benefit to management of universities in Colleges of education who have been trying to adopt e-learning solutions in their educational process.

The findings of the study will also show how the usage of a learning management system (with the blended learning approach) affected students' achievement and retention in mathematical economics. This could influence their adoption of learning management systems in their institutions.

Curriculum developers, policy makers and professional bodies that are saddled with the responsibility of regulating Economics and Economics education, would benefit from the findings of the study. They could consider the adoption of blended learning approaches as a standard for teaching students in tertiary institutions based on the findings of this study. This is possible as the findings of the study showed the effect of blended learning approach on students' academic achievement and retention in mathematical economics.

Economics students, both at undergraduate and post-graduate levels, would benefit from the finding of this study. The findings when published, will show how male and female students differ in their academic achievement and retention in mathematical Economics when blended learning approach is used.

Also, the results of this study would open up new areas of research about Learning Management Systems onto which students, teacher and educational practitioners may intend to carry out their own research in future. It will also be an additional referral to future research studies in teaching and learning pedagogy

Scope of the Study

In this study, the blended learning model used is the flipped-classroom model. This model ensued that the learning resources were made available to the students via a Learning Management System (LMS) which they could access while at home and then in class time were used for class activities and solving problems. The LMS used in this study is in Moodle because it is more robust and it is also an open source management system. The content of the course, Introduction to Mathematical Economics are used in the study

2. LITERATURE REVIEW

There are several literatures on blending learning the beauty of this literatures is that they usually focus on the effectiveness of blended learning along two dimensions: student performance and student perception.

López-Pérez et al. (2011) find that use of blended learning significantly lowers the dropout rate of student and improves their examination performance. They further find that this change is closely related with their perception on blended learning. Pierce and Fox (2012) posited that flipped classroom not only improve student performance but also change the student perception to be more

favorable on the “new” teaching approach. Blended learning is an educational approach that combines face-to-face instruction with online learning activities, creating a blended or integrated learning experience. It involves a thoughtful integration of technology and traditional classroom methods to optimize the learning process. Blended learning is an educational approach that combines traditional face-to-face instruction with online learning activities. It offers several advantages over traditional classroom-only or fully online learning models. It entails; incorporation of traditional face-to-face instruction as a foundational component. Lecturers interact with students in the physical classroom, delivering content, facilitating discussions, and providing guidance. This component allows for direct interaction, immediate feedback, and in-person collaboration among students.

Blended learning incorporates online learning activities and resources into the instructional design. These online components complement and enhance the face-to-face instruction. They can include: i) Online Content Delivery where lecturers can provide digital resources such as video lectures, interactive presentations, e-books, or websites to supplement or reinforce classroom instruction. ii). Online Discussions and Collaboration this involves virtual discussion boards, chat rooms, or collaborative platforms enable students to engage in online discussions, share ideas, and collaborate with peers and instructors. iii) Online Assessments and Feedback which entails online quizzes, assignments, and assessments allow students to demonstrate their understanding and receive immediate feedback. This feedback can be automated or provided by instructors, helping students monitor their progress. iv). Online Resources and Multimedia: Blended learning often utilizes multimedia elements, such as educational videos, simulations, interactive games, and virtual labs, to engage students and provide additional learning opportunities beyond traditional classroom resources.

Learning Management System (LMS)

An LMS is typically used to manage and organize the online components of blended learning. It serves as a central platform for accessing course materials, submitting assignments, engaging in discussions, and tracking progress. Examples of popular LMS platforms include Moodle, Canvas, and Blackboard.

Blended learning allows for personalized and differentiated instruction. Lecturers can leverage online tools and resources to adapt the content, pace, and activities to meet individual student needs, preferences, and learning styles. This customization supports student engagement and achievement. It creates rooms for flexibility and time-shifting. Blended learning provides flexibility in terms of time and location. Students can access online materials and complete assignments at their own pace and convenience. This flexibility accommodates diverse learning styles, schedules, and personal commitments. So also, blended learning enables continuous monitoring and assessment of student progress. Lecturers can track student performance through online assessments, gather data on learning outcomes, and adjust instruction accordingly. This data-driven approach supports data-informed decision-making and personalized interventions. When critically viewed, blended learning allows for the combination of the best aspects of both face-to-face instruction and online learning, leveraging the benefits of each to enhance the learning experience. It promotes student engagement, flexibility, personalized learning, and the integration of technology in a way that complements and supports traditional classroom instruction.

Advantages of Blended Learning are numerous as blended learning when combines traditional face-to-face instruction with online learning, offers several advantages. Blended learning provides

flexibility in terms of time and location, allowing learners to access course materials and participate in activities at their own pace and convenience. It enables learners to review content multiple times, which can enhance understanding and retention (Garrison & Vaughan, 2008). It also allows for personalized learning experiences by leveraging online resources and technologies. Learners can engage with various multimedia materials, interactive modules, and adaptive learning platforms, tailoring their learning experience to their individual needs and preferences. (Staker & Horn, 2012). Blended learning incorporates online activities, such as discussion forums, multimedia presentations, and gamified elements, blended learning can enhance learner engagement and motivation. These interactive components can make learning more enjoyable and foster active participation. (Kim & Frick, 2011). Bernard et al., (2014) accentuated that in the area of, individualized pace and progression, blended learning enables learners to progress at their own pace, allowing them to spend more time on challenging concepts or move quickly through familiar topics. This flexibility accommodates different learning styles and ensures that learners are not held back or rushed, fostering a more personalized learning experience. (Vaughan, 2007) in his paper further explained that blended learning facilitates collaboration and communication among learners and instructors through various online tools, such as discussion boards, video conferencing, and collaborative documents. These platforms provide opportunities for peer interaction, group projects, and instructor feedback, fostering a sense of community and promoting social learning.

Hew & Cheung (2013) expressed that based on cost effectiveness, blended learning can be a cost-effective solution compared to purely face-to-face instruction. By leveraging online resources and reducing the need for physical classroom space, it can help institutions optimize their resources and reach a larger number of learners. Finally, Picciano (2009), was of the opinion that blended learning allows for real-time assessment and feedback mechanisms, such as online quizzes, simulations, and instant grading. This immediate feedback can guide learners' progress, address misconceptions, and provide personalized recommendations for further improvement.

Enhanced Flexibility: Blended learning provides students with the flexibility to learn at their own pace and on their own schedule, allowing them to balance their academic pursuits with other commitments. A study by Means et al. (2013) found that blended learning increased student control over time, place, path, and/or pace of learning, resulting in improved engagement and satisfaction.

Personalized Learning: Blended learning allows for personalized instruction tailored to individual student needs. Lecturers can use online tools to assess students' strengths and weaknesses and deliver targeted interventions. A meta-analysis by U.S. Department of Education (2010) concluded that blended learning can have a positive impact on student achievement, particularly when personalized instruction is included.

Improved Engagement

Blended learning often incorporates interactive and multimedia elements that can increase student engagement. Online discussions, multimedia resources, and gamified learning activities can make the learning process more interactive and enjoyable for students. A study by Tucker (2015) indicated that blended learning increased student engagement and motivation compared to traditional instruction.

Blended learning integrates digital resources into the learning experience, providing access to a wide range of educational materials beyond the traditional classroom setting. Students can access

online textbooks, educational videos, interactive simulations, and other multimedia resources that enhance understanding and reinforce learning. The International Association for K-12 Online Learning (iNACOL) (2011) highlighted the potential of blended learning to leverage digital content for personalized learning experiences.

Blended learning encourages collaborative learning and communication among students through online platforms. Virtual discussions, group projects, and collaborative problem-solving activities foster interaction and cooperation among learners, regardless of their physical location. A study by Hew and Cheung (2013) reported that blended learning positively influenced student collaboration and communication skills.

Blended learning can be a cost-effective educational model, as it reduces the need for physical infrastructure and resources. By leveraging online platforms and digital resources, institutions can optimize their resources while still providing high-quality education. The Clayton Christensen Institute (2013) highlighted cost savings associated with blended learning implementations.

These advantages demonstrate the potential of blended learning to enhance education by leveraging the benefits of both face-to-face instruction and online learning. However, it's important to note that the effectiveness of blended learning can vary depending on various factors, including the design and implementation of the program, the suitability of technology, and the support provided to students and lecturers.

Blended learning and conventional teaching methods differ in their instructional approaches and the integration of technology. Blended learning combines face-to-face instruction with online learning activities, creating a more flexible and personalized learning experience. It emphasizes student-centered and active learning approaches, such as collaborative projects, discussions, and hands-on activities. As noted by Garrison and Vaughan (2008), blended learning integrates the best aspects of both face-to-face and online instruction. Whereas the conventional teaching refers to the traditional classroom-based instruction, where lecturers deliver content primarily through lectures, textbooks, and worksheets. It typically follows a teacher-centered approach, with limited opportunities for individualized or active learning experiences.

Use of Technology:

Blended Learning: Blended learning integrates technology into the learning process, providing access to online resources, interactive tools, and learning management systems. Technology is used to supplement and enhance face-to-face instruction, enabling activities like online discussions, multimedia presentations, and virtual simulations. The International Society for Technology in Education (ISTE) (2019) emphasizes the role of technology in blended learning environments.

While conventional teaching relies on traditional instructional materials, such as textbooks, chalkboards, and physical manipulatives. While technology may be used to a limited extent (e.g., projectors or PowerPoint presentations), it is not an integral part of the instructional approach.

Blended learning offers greater flexibility in terms of time, place, path, and pace of learning. Students can access online materials and complete assignments at their own pace, allowing for individualized learning paths. This flexibility accommodates diverse student needs and preferences. A study by Graham (2006) highlighted the personalized nature of blended learning, offering learners greater control over their learning experiences. The conventional teaching typically follows a fixed schedule and pace set by the teacher. There is less opportunity for individualization and customization to meet the unique needs and learning styles of students.

Blended learning promotes increased student engagement and interaction through various online collaboration tools and activities. It encourages active participation, discussion, and collaboration among students, fostering a sense of community. A study by Gaskell and Mills (2014) found that blended learning facilitated greater student engagement and interaction compared to conventional teaching methods. But conventional teaching may involve limited student interaction, with the teacher playing a central role in delivering information. Student engagement may be more passive, relying on listening and note-taking.

These differences illustrate how blended learning and conventional teaching methods vary in terms of instructional approach, technology integration, flexibility, and student engagement. It's important to consider the context, learning objectives, and student characteristics when deciding which method to adopt. Additionally, both methods can be combined or adapted to suit specific educational goals and contexts.

Blended learning is an educational approach that combines traditional face-to-face instruction with online learning activities. It offers several advantages over traditional classroom-only or fully online learning models. Blended learning provides students with the flexibility to learn at their own pace and on their own schedule, allowing them to balance their academic pursuits with other commitments. A study by Means et al. (2013) found that blended learning increased student control over time, place, path, and/or pace of learning, resulting in improved engagement and satisfaction.

Blended learning allows for personalized instruction tailored to individual student needs. Lecturers can use online tools to assess students' strengths and weaknesses and deliver targeted interventions. A meta-analysis by U.S. Department of Education (2010) concluded that blended learning can have a positive impact on student achievement, particularly when personalized instruction is included.

Blended learning often incorporates interactive and multimedia elements that can increase student engagement. Online discussions, multimedia resources, and gamified learning activities can make the learning process more interactive and enjoyable for students. A study by Tucker (2015) indicated that blended learning increased student engagement and motivation compared to traditional instruction. Blended learning integrates digital resources into the learning experience, providing access to a wide range of educational materials beyond the traditional classroom setting. Students can access online textbooks, educational videos, interactive simulations, and other multimedia resources that enhance understanding and reinforce learning. The International Association for K-12 Online Learning (iNACOL) (2011) highlighted the potential of blended learning to leverage digital content for personalized learning experiences. Blended learning encourages collaborative learning and communication among students through online platforms. Virtual discussions, group projects, and collaborative problem-solving activities foster interaction and cooperation among learners, regardless of their physical location. A study by Hew and Cheung (2013) reported that blended learning positively influenced student collaboration and communication skills. Blended learning can be a cost-effective educational model, as it reduces the need for physical infrastructure and resources. By leveraging online platforms and digital resources, institutions can optimize their resources while still providing high-quality education. The Clayton Christensen Institute (2013) highlighted cost savings associated with blended learning implementations.

These advantages demonstrate the potential of blended learning to enhance education by leveraging the benefits of both face-to-face instruction and online learning. However, it's important

to note that the effectiveness of blended learning can vary depending on various factors, including the design and implementation of the program, the suitability of technology, and the support provided to students and lecturers.

There are much difference between blended and conventional teaching methods. Blended learning and conventional teaching methods differ in their instructional approaches and the integration of technology. In the aspect of instructional Approach, blended learning combines face-to-face instruction with online learning activities, creating a more flexible and personalized learning experience. It emphasizes student-centered and active learning approaches, such as collaborative projects, discussions, and hands-on activities. As noted by Garrison and Vaughan (2008), blended learning integrates the best aspects of both face-to-face and online instruction. While conventional teaching refers to the traditional classroom-based instruction, where lecturers deliver content primarily through lectures, textbooks, and worksheets. It typically follows a teacher-centered approach, with limited opportunities for individualized or active learning experiences.

If viewed from the use of technology, blended learning integrates technology into the learning process, providing access to online resources, interactive tools, and learning management systems. Technology is used to supplement and enhance face-to-face instruction, enabling activities like online discussions, multimedia presentations, and virtual simulations. The International Society for Technology in Education (ISTE) (2019) emphasizes the role of technology in blended learning environments. Conventional teaching on the other hand relies on traditional instructional materials, such as textbooks, chalkboards, and physical manipulatives. While technology may be used to a limited extent (e.g., projectors or PowerPoint presentations), it is not an integral part of the instructional approach.

Blended learning offers greater flexibility in terms of time, place, path, and pace of learning. Students can access online materials and complete assignments at their own pace, allowing for individualized learning paths. This flexibility accommodates diverse student needs and preferences. A study by Graham (2006) highlighted the personalized nature of blended learning, offering learners greater control over their learning experiences. But conventional teaching typically follows a fixed schedule and pace set by the teacher. There is less opportunity for individualization and customization to meet the unique needs and learning styles of students.

In terms of student engagement and interaction, blended learning promotes increased student engagement and interaction through various online collaboration tools and activities. It encourages active participation, discussion, and collaboration among students, fostering a sense of community. A study by Gaskell and Mills (2014) found that blended learning facilitated greater student engagement and interaction compared to conventional teaching methods. While conventional teaching may involve limited student interaction, with the teacher playing a central role in delivering information. Student engagement may be more passive, relying on listening and note-taking.

These differences illustrate how blended learning and conventional teaching methods vary in terms of instructional approach, technology integration, flexibility, and student engagement. It's important to consider the context, learning objectives, and student characteristics when deciding which method to adopt.

3. METHODOLOGY

Research Design

The study is an experimental design using control and experimental groups with pre-test and post-test. A research design is a way to obtain answers to the research questions and to control the variants. Based on two traditions of research, the present study is a combination of qualitative and quantitative research. This is because it is based on observations in natural settings where the researcher has direct contact with the subjects (qualitative) and it emphasizes measurement and figures (quantitative). Experimental research makes use of experimental designs. The researcher is able to draw causal inferences through observation.

Sample and Sampling Technique

The target population of this study is all 100 levels NCE economics student in the department of economics in colleges of education in the North Central Geopolitical Zone of Nigeria. A total of 50 students from each of the three colleges of education in the North Central Geopolitical Zone of Nigeria are selected for the study using purposive sampling technique. 50 students from each of the three colleges of education in the North Central Geopolitical Zone of Nigeria are in control group and another 50 are in experimental group per college. This implies that, a total of 150 student lecturers will take part in control and another 150 students in experimental groups.

Method of data collection

Three measures are used to assess these two learning outcomes: test score, course and teaching evaluation, and two-stage surveys. Test score is widely used as a mean to measure the change in student performance. Instead of comparing the difference in the score between pre-test and post-test, this study focuses on analyzing the examination score between blended classes and traditional classes which is useful in investigating the impact from blended classes.

Validation of Research Instrument

Since the instrument is adapted, two chief lecturers from the department of Measurement and Evaluation and Curriculum Studies from the School of Education of researcher's domiciled college, Senior Researchers at Nigeria Educational Research and Development Centre, Abuja (NERDC) instrument.

Data Analysis Techniques

The analysis and interpretation of data obtained through the course and teaching evaluation are done using descriptive and inferential statistics. The descriptive analyses to be used are mean scores and standard deviation. The frequencies would be converted to means and percentages to answer the research questions. The inferential statistics that are used for the study are Pearson's Moment Correlation Coefficient and t-test analysis are used to test the null hypotheses for significant relationship.

4. DATA ANALYSIS AND FINDINGS

Research Question 1. What is the mean difference in academic achievement scores of Mathematics for Economics students taught mathematics for economics using blended learning approach and those taught using conventional classroom approach?

Table 2: distribution of respondent in relation to Instructional Approach.

Question 3. Please indicate the instructional approach you experienced in your Mathematics for Economics class.

a. Blended Learning Approach
b. Conventional Classroom Approach

items	Frequency	percentage	remarks
a. Blended Learning Approach	150	100	Accepted
b. Conventional Classroom Approach	150	100	Accepted

Source: *Field Research, 2023.*

From the table, it can be shown that all respondents (100%) experienced both the Blended Learning Approach and the Conventional Classroom Approach in their Mathematics for Economics class. The "Accepted" remarks suggest that both instructional approaches were present and acknowledged by the respondents.

The data indicates that respondents in the Mathematics for Economics class experienced both the Blended Learning Approach and the Conventional Classroom Approach. The "Accepted" remarks imply that respondents acknowledged and accepted the presence of both instructional approaches, suggesting that there might have been a combination or integration of these methods in the teaching approach for the course. Thus we can conclude that all respondents attended classes based on the two approaches to teaching.

Research Question 2. What is the mean difference in retention scores of Mathematics for Economics students taught Mathematics for economics using blended learning approach and those taught using conventional classroom approach?

Table 2: Distribution of respondent in relation to Retention Scores:

Question 3. Please indicate the instructional approach you experienced in your Mathematics for Economics class.

items	Rate	Frequency	percentage
a. Blended Learning Approach	Very Low	20	13.3
	Moderate	42	23
	Very High	88	56.7
b. Conventional Classroom Approach	Very Low	77	51.3
	Moderate	51	34
	Very High	12	08

Source: *Field Research, 2023.*

The data you provided is a summary of responses to a question asking respondents to indicate the instructional approach they experienced in their Mathematics for Economics class. The responses are categorized by items (Blended Learning Approach and Conventional Classroom Approach) and further broken down by the ratings (Very Low, Moderate, Very High). In term of blended Learning Approach, a majority of respondents (56.7%) reported a "Very High" experience with the Blended Learning Approach. A significant portion (23%) reported a "Moderate" experience, while smaller fraction (13.3%) reported a "Very Low" experience. For Conventional Classroom Approach, majority of respondents (51.3%) reported a "Very Low" experience with the

Conventional Classroom Approach. A substantial portion (34%) reported a "Moderate" experience, while a relatively small percentage (8%) reported a "Very High" experience. Based on the above, the Blended Learning Approach received a high percentage of "Very High" ratings, indicating a positive experience for a significant number of respondents. The Conventional Classroom Approach, on the other hand, had a larger percentage of respondents reporting a "Very Low" experience, suggesting that a considerable portion found it to be less effective. Based on the responses, it can be concluded that the Blended Learning Approach seems to have been more positively received in the context of Mathematics for Economics compared to the Conventional Classroom Approach.

Research Question 3. What is best approach that students find more effective to them to learn mathematics for economics in colleges of education.

Table 3: Distribution of respondent in relation to effective approach to learn mathematics for economics in colleges of education.

Question 3. Compare the blended learning approach and conventional classroom approach based on your experience in Mathematics for Economics, which approach did you find more effective? (Blended Learning/Conventional Classroom) b. Explain the reasons for your choice.			
items	Frequency	percentage	remarks
a. Blended Learning Approach	121	80.7	Accepted
b. Conventional Classroom Approach	29	19.3	rejected

Source: Field Research, 2023.

The majority of respondents (80.7%) favored the Blended Learning Approach for Mathematics for Economics, as indicated by the "accepted" remarks. On the other hand, a smaller percentage (19.3%) preferred the Conventional Classroom Approach, as evident from the "rejected" remarks. From the above, based on the experiences of the respondents, the blended learning approach appears to be more effective in the context of Mathematics for Economics compared to the conventional classroom approach.

The respondents gave reasons for the choice of preferring blended learning to the conventional classroom learning system as;

1. Blended learning allows students to access learning materials and resources online, providing flexibility in terms of time and location.
2. Blended learning often incorporates technology to offer personalized learning experiences.
3. Blended learning integrates multimedia elements such as videos, simulations, and interactive content.
4. Blended learning encourages self-directed learning as students take on a more active role in their education.
5. Blended learning often incorporates real-world applications and collaborative activities, bridging the gap between theoretical knowledge and practical skills.

Hypothesis testing

Pretest Results

In the colleges understudy, 50 NCE economics students were split into 2 equal groups and both the groups were taught using the traditional learning method till the mid-term exams. Students

were taught using lectures with the help of PowerPoint presentations that were followed by task sheets and gaming techniques. Their mid-term exam scores were used as a pretest. Their scores were compared using mean value and significant difference.

Table 4: Mean Scores (Pre-Test) for Controlled and Treatment Groups

	Mean	N	Standard Deviation
Controlled Group	20.467	150	2.3154
Treatment Group	9.900	150	2.3976

Table 5. T-test Statistics for Pre-test

	Std. Mean	Std. Deviation	Paired Differences		t	df	Sig (2-tailed)	
			95% confidence interval of the Difference					
			Error Mean	Lower Upper				
Controlled Group	.5667	3.3185	.6059	-.6725	1.8058	.935	29	.357
Treatment Group								

The mean scores 20.46 & 19.90 with significant value of 0.375 for the pretest indicates that there is no significant difference between the results of each group. This validates the identical nature of the participants that will go through the investigation. As the test is statistically insignificant at 95% confidence interval, it indicates that on average there is no significant mean difference between the two groups.

Post test Result

After the mid-term exams, the control group was taught using the traditional learning method, whereas the treatment group was taught using the blended learning method which focused on simulation of various mathematics for economics topics. Students were engaged in tasks that required them to use communication skills taught in real life like; interviewing, meetings, problem solving and professional socializing. The final exam scores were used as the posttest results.

Table 6. Mean Score (Post-test) for controlled and Treated Groups

	Mean	N	Standard Deviation	Std. Error
Controlled Group	20.467	150	2.3154	.1887
Treatment Group	9.900	150	2.3976	.1923

Table 7: T-Test Statistics for Post-Test

	Mean	Std. Deviation	Std. Error Mean	Paired Differences		t	df	Sig (2-tailed)
				95% confidence interval Lower	95% confidence interval Upper			
Controlled Group	-2.5667	4.0995	.7485	-4.0974	-1.0359	-3.429	29	.002
Treatment Group								

The mean scores 27.80 and 30.367 with a significant value of .002 of the posttest of both the groups indicate that there is a significant difference between the results of each group. This validates that the treatment group has a different identity in scores in comparison to the controlled group; while mean scores have clearly indicated a positive difference in the scores of the group taught using blended learning method. On an average, the mean scores of the control group are less than 2.5 units than the group taught using blended learning method; therefore, the results are highly statistically significant as indicated by p-value, which is less than .05 at 95% confidence interval.

5.DISCUSSION

The study aimed to find out if the blended learning method or the traditional learning method is more effective for the teaching of mathematics for Economics to the NCE Economics students in the selected Colleges. Qazi and Simon (2012) emphasized that students in Pakistani classrooms do not get enough experience of the practical application of mathematics for Economics skills because many lecturers choose to teach students using readily available power point presentations and materials, which restricts students learning to the theoretical realm only. Such lecturers still teach through traditional learning method and they do not make an active effort to incorporate modern methods of teaching to their teaching styles. Similarly, Wurdinger (2005) asserts that blended learning method constructs multidisciplinary learning experience that replicates real world learning. Jarošova, Bakić-Tomić and Šikić (2007) and Coulmont and Sandu (2016) also assert that blended learning inspires students with the help of activities that are based on role-playing or simulations and it inbuilt among them key Economics skills like decision making, problem solving and teambuilding.

The data analysis of the study reflects that both groups were identical since their mean scores were 20.46 and 19.90 with significant value of 0.375 until both were taught using the traditional method. However, the group of students (control group), who were taught using the traditional learning method scored less in the posttest which indicates that these students learnt less and showed inconsistent performance than the group of students (treatment group), who were taught using blended learning style. Findings are congruent with On the other hand, data analysis of the treatment group reflects more output and consistent performance. The results show difference of impact of the two teaching methodologies adopted for teaching Economics. It also shows that students who were taught using the blended learning method demonstrated better knowledge and understanding of the theoretical framework. The findings coincide with other research studies (Chang, Lee, Ng & Moon, 2003; Scalzo & Turner, 2014). Although both the groups were tested using the same assessment in the final exam (posttest), the change in the teaching methodology became a contributing factor in students’ understanding. McHann and Frost (2010) assert that

Economics schools must incorporate more blended learning into Economics courses. They explain that the true and core purpose of Economics school education is to prepare graduates for the profession of leading and managing real world organizations. Nauman and Hussain (2017), also verified that written communication ensures the smooth running of day to day Economics of any organization.

According to the researchers, modern teaching tools such as use of ICT, facilitates students to increase their participation and encourage them to practice what they have learnt in simulated environment (Dauletova, 2016). Whereas, the traditional methods are largely theoretical and do not engage the students personally or professionally in learning by doing. Therefore, avoiding blended learning method is simply not an option.

6. CONCLUSION AND RECOMMENDATIONS

This study was conducted to explore whether blended learning method or traditional learning method is more effective for the teaching of mathematics for Economics courses to the NCE Economics students of Economics. The data analysis and findings clearly prove that blended learning method improves NCE Economics students' communication skills better. Literature was also reviewed to find and fill the gaps in the existing literature, which further validated the study. After critical analysis, it was found out that the blended learning approaches proved to be a more effective strategy. It can be concluded that blended learning strategy is a more effective learning strategy as compared to the traditional learning strategy.

To this end it is recommended that; lecturers and school administration should try to encourage the use of blended learning in the classrooms. Proper planning must be put in place to implement the blended learning strategy at the institutions level in the north central region. The teachers and students must be given enough training to implement blended learning in the classroom. The teachers and students must be provided with high-speed internet facility to implement the blended learning strategy in our colleges. Finally, colleges of Education and higher institutions in the Nigeria, particularly must change their culture of traditional learning strategy.

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