ACCEPTANCE AND INSTRUCTIONAL COMPETENCE OF BLENDED LEARNING OF TRAINEE TEACHERS IN MATHEMATICS TEACHING IN COLLEGES OF EDUCATION IN VOLTA REGION GHANA

Maxwell Seyram Kumah
Curriculum Studies and Instructional Technology
Ignatius Ajuru University of Education, Port Harcourt, Nigeria
Email: seyramart@gmail.com
https://orcid.org/0000-0002-8256-2829

&

Nchelem Rosemary George, PhD
Department of Mathematics/Statistics
Ignatius Ajuru University of Education, Port Harcourt, Nigeria
Email: george.nchelem@iaue.edu.ng
https://orcid.org/0000-0002-0397-5861

Abstract

This study aimed to investigate the acceptance and instructional competence of blended learning in mathematics teaching with focus on three objectives. The research employed an analytical survey research design, specifically a cross-sectional survey design. The accessible population consisted of 850 trainee teachers from two colleges of education in Volta Region Ghana. The study utilized a multistage sampling technique to obtain 313 participants. Blended Learning Perception and Mathematics Competence Questionnaire was used to collect data. The questionnaire used a four-point Likert scale to rate trainee teachers' responses, with a criterion mean of 2.5. The face and content validity of the instrument were established, and reliability testing using Cronbach's Alpha yielded high coefficient of 0.895. Mean and standard deviation were used to answer the research questions, while the z-test statistic was employed to test the null hypotheses at a 0.05 significant level. The results revealed statistically significant differences between male and female trainee teachers' perceptions regarding acceptance of blended learning in mathematics teaching and tutors' acceptance and instructional competence in using virtual platforms. The findings supported the rejection of the null hypotheses at a 5% significance level, indicating variations in perceptions based on gender. In conclusion, this study shed light on the acceptance and instructional competence of blended learning in mathematics teaching, emphasizing the importance of gender perspectives in understanding trainee teachers' perceptions. The findings contribute to the field of educational research and provide insights for the effective implementation of blended learning strategies in mathematics education.

Keywords: Blended Learning, Acceptance, Instructional Competence, Mathematics, Teaching

Introduction

The education system and its environment are implementing a number of modernizations, that includes the utilization of technology through blended learning. This novel educational approach has been widely adopted, though it is still in its early stages. The introduction of blended learning initiatives, a combination of online/ virtual teaching and learning and physical face-to-face classroom is one of these innovations, but its uptake, particularly in the developing world, faces challenges in order for it to be an effective innovation in teaching and learning. Blended Learning Instructional Strategy (BLIS) is the thoughtful unification of physical face-to-face (PF2F) classroom learning practices with virtual learning skills (Odoi et al., 2019). BLIS was introduced to help bridge the gap of missing physical contact in the classroom in order to have continuous learning without blame on the part of any one. It also serves as a medium by which learning can take place where availability of classroom infrastructure is a problem.

Blended learning efficacy is hampered by a number of underlying influences. One major encounter is ensuring participants' commitment given individual learner characteristics and technology encounters. It is stated that when users encounter difficulties with technology, they may abandon their learning and, as a result, technological applications may fail. An observed situation by (Kintu et al., 2017) shows that 16% of learners had undesirable study attitude toward the use of BLIS, while 26% were concerned that learners would not complete their studies in blended learning. This statement advanced how important learners are in any learning process, and their backgrounds and characteristics influence their ability to continue learning effectively. The observed scenario continues to express that in blended learning, the design tools used may have an impact on their learning effectiveness.

Despite recent significant changes in education, classroom teaching continues to dominate classroom practices. According to research, the disadvantages of such unidirectional learning through in-class teaching include a lack of student concentration and fewer opportunities to develop relevant skills (Halasa et al., 2020). The regular education system in Ghana has essentially been a teacher-centred approach of teaching concepts for almost all disciplines since its commencement, forcing students to learn by heart concepts taught without acquiring any meaningful knowledge. Blended learning instructional strategy by (Adekola et al., 2017)is associated with increased student engagement in the learning process, enhanced critical-thinking development, independent learning and improved learning outcomes. With the introduction of computers, there have been numerous significant changes in education, including the use of ICTs in comprehending and know-how achievement or through computer intervention technique (online learning) a term that has the utilization of the internet as its base (Halasa et al., 2020). Blended learning instructional strategy, which combines virtual or online learning with a physical face-to-face classroom, has thus become common. Blended learning environments, which combine the benefits of technology of different instructional mediums with physical face-to-face learning, can improve student outcomes and accelerate the acquisition of competencies that would not normally be achieved through physical face-to-face alone (Odoi, 2019).

In Ghana, ICT was first integrated into the educational curriculum in 2007. With its incorporation into the conventional classroom teaching, it has become overbearing to totally consider applying blended learning at the tertiary institution in the wake of the new normal; particularly where students have already been introduced to the use of ICTs and were also tested in the WASSCE examinations at the pre - tertiary level, it is critical that they would be able to move on to the next level. Due to the fact that the field of information technology is constantly developing, urbane technologies emerge, making blended learning activities more interesting and welcoming to explore.

Before the Covid-19 pandemic online learning was developing at an estimated rate of 15.4% per annum in higher institutions without any force. Amidst the pandemic it was indicated that over 60% of institutional platforms worldwide also joined the use of blended learning and other forms of e-learning (Pattet al., 2021).According to Lin et al. (2020), blended learning proved to have statistically significant positive effect on students' mathematical attitude, where males and students with high ability learning style were more motivated in adapting to blended learning. Oweis (2018) also proposed that blended learning is the most adequate substitute of e-learning, and which helps to enhance students' learning and also improve competence and is less expensive as compared to other forms of online learning approaches. Again, Johnson et al., (2020) vehemently agreed that blended learning intervention by studies shows positive results in mathematics competence and on-task behaviour of learners including learners with disabilities when a station-rotation format is employed. Blended learning also increased both facilitators and learner's engagement during contact and non-contact.

Statement of the Problem

Blended Learning (BL) is becoming more popular in higher education around the world, and it entails combining two unique learning models to enhance student learning results by combining classroom and online learning activities in an appropriate way. BL attempts to address major institutional concerns by combining offline and online modes to ensure that course resources are used efficiently to meet teaching and learning goals. In view of this, institutions are already implementing policies that facilitate blended learning adoption by pledging to improve student learning, provide access to learning materials, offer flexible learning modes, and provide cost-effective e-learning platforms (Aldowah et al., 2020). Despite the benefits of BLIS, many institutions have failed to properly implement it for teaching and learning due to difficulties like as rising technological costs, poor decision-making strategies, insufficient support, and a lack of a clear plan. In addition, Alshehri (2017) stated that it is required of management of institutions to provide the needed support for both teachers and students in blended learning regarding their pedagogical design and resources. Moreso, the adoption of blended learning in tertiary institutions can be effective when management is supportive and

dedicated to improving the system quality and quality information of students and teachers that is cost-effective. Even though designing and implementing blended learning can be of serious challenge, the readiness to accept and join the moving trend of dynamic education globally and ability to change would encourage institutions to accept blended learning without failing. This study was therefore embarked upon to investigate the acceptance and instructional competence of blended learning of trainee teachers in mathematics teaching in colleges of education in Volta Region Ghana.

Aim and Objectives of the Study

The aim of this study was to investigate the perspectives of trainee teachers on the competence of student and tutors in mathematics teaching on the use of blended learning to carry out instruction in the new normal. Specifically, the objectives of the study were to:

1. Find out the perception of the male and female trainee teachers on students' acceptance of learning mathematics via blended learning strategy.
2. Determine the perception of the male and female trainee teachers on tutors' acceptance of teaching mathematics via blended learning strategy.
3. Ascertain the perception of the male and female trainee teachers on the instructional competence of tutors in the use of virtual platforms to teach mathematics.

Research Questions

This study was guided by the following three research questions.

1. What is the perception of the male and female trainee teachers on students' acceptance of learning mathematics via blended learning strategy?
2. What is the perception of the male and female trainee teachers on tutors' acceptance of teaching mathematics via blended learning strategy?
3. How do the male and female trainee teachers perceive the instructional competence of tutors in the use of virtual platforms to teach mathematics?

Hypotheses

The following three null hypotheses were tested at 0.05 significance level.

H_{O1}: There is no significant difference between the perception of the male and female trainee teachers on students' acceptance of learning mathematics via blended learning strategy

H_{O2}: There is no significant difference between the perception of the male and female trainee teachers on tutors' acceptance of teaching mathematics via blended learning strategy.

H_{O3}: No significant difference exists on how the male and female trainee teachers perceive the instructional competence of tutors in the use of virtual platforms to teach mathematics**.**

Review of Related Literature

The use of Technology in the Teaching and Learning of Mathematics

Digital Literacy is one of the learning competencies emphasized in the 2019 standard-based curriculum for pre-tertiary schooling in Ghana. It is to help young learners to have the skills of finding out things on their own or acquire knowledge and communicate through ICT to make them global citizens and use digital media responsibly, (Ministry of Education in Ghana, 2019). In spite of the cutting-edge curriculum reform in Ghana, it is evident from the implementation in September that teachers at their training sections expressed few frustrations. Out of the few worries, lack of ICTs models and computers is one of the particularly ranked challenges (about 90%) to the teachers choose for a successful implementation to the task of the curriculum. Meanwhile, Aliyu, et al. (2019) caution that significant expense of infrastructural advancement has caused low

data transfer capacity accessibility subsequently making it hard to successfully have access to the smart digital devices by students for their use. They also maintain that deficient ICT preparation in the school to prepare students to utilize its instruments and absence of experience by certain instructors and students with ICT devices have likewise upset unsuccessful usage of ICT in instructing and learning.

Pima (2019) argued that the utilization of ICT in teaching and learning is an exceptionally normal research territory for analysts, however much investigation has not been done to identify the ranking challenges of ICT integration into education policy in Ghana. Digital transition in its normal state over the years comes with significant encounters not just to individuals, but also to institutions as well as organizations, and particularly to institutions of higher learning (Kamar et al., 2020). Higher education institutions gave the impression to be ideally suited to meet this encounter because they are primarily learning institutions, at least much more than pre – tertiary institutions. This is so in higher education institutions; they are obligated by their work to do research alongside teaching and learning. Because of this dual mandate, they observe and explain current social transitions to blended education as means of reducing stressors, and in doing so, they create the information that allows communities to respond appropriately to these transitions. A study on lecturers' activities with technology in higher institutions reviewed several studies and realized that in the past, influence of digital teaching and learning in higher education has taken into account a variety of contextual variables and has frequently concentrated on the frequency of teachers' technology usage as the primary competence principle of blended learning.

Meanwhile, Sailer et al. (2021) emphasized in the Cь-model that student learning outcomes as the ultimate purpose of using digital technologies in teaching and learning. The learning practices and relational facilitators presented in the Cь-model shows proximal and distal variables relevant to student learning outcomes. The model focuses on factors relevant to emerging technology that can be affected by higher institution stakeholders. Besides, in order to incorporate learning processes into their model, they stressed on learning practices. Nonetheless, variables like guidance and scaffolding with digital technology are less apparent in the Cь-model than oriented learning experiences with technology and contextual facilitators. However, they try to highlight the importance of helping, scaffolding, and directing students while they are learning through technology.

The role of digital gadgets in blended learning has become sensitive for interaction between teachers and learners. This is to say that digital gadgets are probably one of the most essential factors in blended learning currently. Literature suggests the importance of digital gadgets in e – learning. These include the concern for quality of the gadget used by learners particularly during e – learning, and others are of the view of how the gadgets are being upgraded very often, disabling the functioning of existing ones. Another finding stated that passive activities in e – learning are rated below active, constructive and interactive activities. This to recommend that effective learning activities like engaging active learning constructive and interactive activities in blended learning contribute sufficiently to learning outcomes of learners., It was also noted that most teachers and students have basic skills and attitude in handling digital gadgets for teaching and learning but without knowledge about handling virtual teaching and learning and effective use learning platforms. Lack of institutional commitment for providing digital gadgets for effective e – learnings was noted to be one of the problems facing the change (Sailer, et al., 2021).

Blended Learning Instruction in Mathematics Education

Mathematics and science are observed as critical aspects of society, increasing productivity, improving economics and pleasing to the eye of worldwide industrial rivalry. This awakening has led to the calls for improvement of mathematics and science in schools in Ghana. However, studies have so far remarked on the decrease in general mathematics courses in colleges. The decreased trend competence in mathematics can be traced back to pre – tertiary education where mathematics is a core subject, and also as a result of insufficient enrolment of teachers as well as challenges of teachers teaching and learning materials (Kennedy, et al., 2014).

Blended learning instructional strategy consists of e-learning and f2f classroom andrology, and has proved to be significant to students' attitude and competence in secondary schools and also paved the way for collaborative learning among students. This method of teaching strategy also improves student active participation in class. The effectiveness of blended learning shows that there is a relationship between one-on-one coaching and teaching, scaffolding, differentiating and good facilitation. It was also stated that the use of computers alone in recent times does not promote blended learning effectively. However, it is surprising that students still spent important time writing notes in mathematics class instead of activity-oriented lessons. Same study indicates that student engagement in mathematics class makes students confident, independent learners

and team players (Martinsen, 2017). These therefore, support the effective utilization of blended and hybrid learning where teachers close the gap between online and traditional learning environments. Different models have been designed to teach students online in senior schools and middle schools in the western world but much has not been seen in Africa, particularly Ghana. Examples of instructional designs include the 4D's and 4S (designing, developing, delving and distribution) and (shared goal, sharable e – learning activities, salvage knowledge and scaffolding) respectively. This was proposed by (Abdelaziz, 2012). It was suggested that the 4D and 4S strategy is well established for adaptive learning. However, Dovros and Makrakis (2012) disagree by utilizing constructivist based instructional strategy which also has four step operations which is well positioned for blended learning. Another model known as Science Learning Activity Model (SLAM) was designed by Bidara and Rusman (2017). The SLAM is used for blended learning where facilitation of science related courses can be done in individual, collaborative, synchronous and asynchronous learning modes.

Mathematics education and digital learning has gone through several transformations till to today despite the challenges of e – learning. According to Borba et al. (2016) the use of mathematical software and open course learning platforms like Khan, MOOCs and Coursera have made e – learning accessible to learning easy for students. These platforms and other online learning modes are often used during blended learning. The study conceived that experienced gain online earning enables students to often revisit the learning platforms to extend their ideas and concepts on things learnt in the Pf2f classrooms. Based on the above observation, it was also opined that the online learning component of the BL increases students' self – directed learning, pace, sequence of learning, time on task and competence while reducing distraction that mostly occur in the Pf2f classroom. However, it was maintained that as students are accepting the use of technology in learning mathematics, some teachers on other hand who have low digital literacy find it challenging to teach students online. For this reason, it is recommended that there is a need for professional development for teachers on digital teaching and learning while implementing BL in schools.

Another supportive study argued that BL is a good way to get around time constraints when it comes to Pf2f learning. It enables teachers to extend and supplement Pf2f learning with online learning, and it allows students to learn whenever and wherever they choose without sacrificing Pf2f connection with teachers in the classroom. Because of the time constraints, teachers did not have to worry about meeting the learning objectives, BL allows students to discuss their learning challenges with other students or teachers, in addition to the Pf2f learning environment. The online learning component allowed students to communicate with other students and teachers. In addition, students could also learn and practice at their own speed via blended learning. The pace of the teachers had been recognized as being too fast for the slow learners. This suggests that students may learn and practice at their own pace with blended learning. As a result, it has the potential to maximize the growth of students' thinking abilities. Based on the preceding statement, blended learning may be defined as a modern learning approach that combines physical face-to-face learning with online learning methods, including media-rich technology that is utilized as a complement to physical face-to-face learning to develop students' thinking abilities (Sukma & Priatna, 2021). The study revealed that students were able to master several topics using the blended learning environment. In conclusion, it was recommended that students' critical thinking skills may be strengthened if they were encouraged to think critically on a daily basis. It was also suggested that the BL environment should be supplemented with some critical thinking exercises and conversations about which solution is best. This implies that the most significant factor to address in order to develop students' critical thinking skills was how they assessed their responses and the techniques they used to obtain the answers in a BL environment.

Readiness in Adoption of Blended Learning in High Institutions

The adoption of e-learning in general has been a problem for developing nations, particularly in Africa. The problem of facilities and infrastructure as well as human forces are identified to be the major resistance to the success of effective e – learning among institutions. Mulyanengsih and Wibowo (2021) in their study revealed that teachers and students change in behaviour to accept e-learning was welcome and effective by all parties in online learning. They indicate that all forms of learning when combined help facilitate effective change for student learning because they meet the needs of all students in such a setting. They are also of the view that ICTs utilization in the 21st century is encouraged in education since it is meant to improve quality education globally. The study therefore recommends the effective use of all forms of contemporary ways of learning in higher institutions.

The issue of technical readiness for both students and teachers in adoption of any form of e – learning is a perpetual concern to many groups and individuals in higher institutions. Some technical applications discovered are software and hardware assistance, connectivity, lesson organization, flexibility of system for users and

technical support system when in need (Al-araibi et al., 2018). The sustainability of e – learning depends on the total readiness in areas of human development and provision of infrastructure, otherwise the system is likely to fail. We witnessed the recent demand on online learning when schools were closed due to the pandemic and many institutions were found wanting due to problems outlined earlier. The transition from traditional learning into blended learning is having a positive influence on teaching and learning strategies in higher institutions. To successfully implement the effective utilization of blended learning requires preparedness and consciously involves all stakeholders considering why, what, how and who. It is shown that participation of all groups (teachers, students and institutional management) is important for an effective implementation and transition of traditional learning into blended learning instructional strategy (Adekola et al., 2017). The study delves into physical infrastructure, learning technology support, pedagogy, institutional management and culture as supports needed for good practice in blended learning. Again, it was revealed that teacher's competence and teacher – student's commitment, communication and collaboration effectively contribute to the success of blended learning in higher institutions.

According to Alqahtani and Rajkhan, (2020) the presence of covid19 pressured the educational sector to move away from F2F traditional learning into a blended learning environment where technology management, support from administration, increased in online learning and demand for digital devices and internet utilization. Of five e – learning strategies studied; it was argued that blended learning instructional strategy was the most suitable learning strategy to practice and adopt. Similarly, Anthony et al., (2020) investigated on blended learning and implementation in tertiary institutions. The study involved students, lectures and administration by employing meta-analysis of 94 researches on blended learning adaptation. It was found that 'face-to-face, activities, information, resources, assessment, and feedback for students and technology, pedagogy, content, and knowledge for lecturers' influence all participants' adoption and implementation of blended learning. Again, it was revealed that "technology acceptance model, information system success model, the unified theory of acceptance and use of technology, and lastly diffusion of innovations theories" are used to explore blended learning adoption. The findings therefore suggest that in order to adopt blended learning and implementation in higher institutions, stakeholders such as students, lecturers and administrators need to work teaching strategies and resources that would help improve the implementation and adoption of blended learning.

Tutor/student acceptance of teaching/learning mathematics via blended learning strategy

Due to the limitations of e-learning and the inflexibility of Physical Classroom Learning Environment (PCLE), the blended learning approach was initiated to reduce the shortcomings of both e-learning or physical classroom learning environment, by employing different learning strategies and converge between physical face-to-face and e-learning (asynchronous and/or synchronous approach). As a result, blended learning, as a student-centered educational strategy, maximizes the benefits of face-to-face learning in both physical classrooms and e-learning contexts. This strategy encourages students to take greater ownership of their learning and develops a shared responsibility for both instructors and students in the learning process, resulting in greater challenges for students. Students must determine their requirements and preferences, define learning goals, use effective learning strategies, utilize accessible learning resources, and employ time and Blended Learning System (BLS) management in order to attain satisfactory learning outcomes. These obstacles, as well as other considerations, make it difficult for students to continue utilizing blended learning instructional strategy (Sabah, 2020). Sharma et al. (2017) focused mostly on whether or not students were able to accept or use technology. Extrinsic factors that influence users' decision-making and predict perceptions of technology usage were the focus of these models, but intrinsic motivation that influenced user outcomes were not. Their studies also attempted to fill in the vacuum by incorporating both extrinsic and intrinsic motivation into a single acceptance/adoption model, but without capturing the linkages between the motivations. BLS built on the Moodle platform, on the other hand, have been the subject of relatively less research in comparison to that conducted on the continuous use of online learning systems.

The advent of e-learning alternatives has opened up the prospect of using technology to bridge the gap between students – students and students – teacher interaction, through virtual interaction and resource sharing. However, the physical face-to-face interaction is still an acceptable medium, necessitating the addition of an online component. As a result, the blended learning mode of learning has risen to prominence, perfecting the qualities of both the fully online and fully physical face -to – face modes (Momani, 2020). They further established that even though the degree of what characterizes blended learning is indeed arguable, the basic principle behind BL is that it encourages the combination of both physical face-to-face and online components of the teaching and learning process. Because of this efficiency, most institutions have adopted this style of lesson delivery, particularly in tertiary education. Nevertheless, at the heart of blended learning is the LMS, a system that allows for online interaction and sharing of online resources, which is at the heart of the blended mode. Despite the

high adoption rates, there is a paucity of use by teachers, which raises concerns about the learning management system competence. This is because the most advantage from a learning management system deployment is obtained when utilization levels are high enough to achieve implementation objectives. Despite the fact that learning management system acquisition is on the rise, online presence and usage are still minimal. As a result, several causes for the lack of use of learning management system have been proposed, but one crucial signal is the learning management system anxiety factor. technology anxiety. Megahed and Hassan (2021) posited that there is an unpleasant instinctive attachment, such as worry or discomfort, that people have when they think about or use technology. Anxiety is a stimulus-response (SR) phenomena that affects both personality and behaviour. Fear of a specific object or scenario is a direct result of a specific influencing factor or stimulus. Stimulus response theory is a psychological concept that states that behaviour is the outcome of the interaction between stimulus and response. This paradigm implies that anxiety does not live in a bubble or in independence, but is activated or induced by particular antecedents. This behavioural effect could be the result of both technology and social trends. To better understand the origins of technology anxiety, an initial examination into the causative circumstances that trigger it is required. Whereas other researchers believe that the causes of technology anxiety are a lack of technology experience and poor self-efficacy levels, Bervell and Umar, (2020) opined that the anxiety element is more than just a lack of self-belief in technology and exposure to technology. In addition, they indicated that the development of this fearful emotional response could be a result of a mix of elements involving the usage of the technology as well as influence from other comparable persons, such as co-workers in the same setting or location.

Research Method

The analytical survey research design was employed to conduct this study. Analytical survey research also known as cross – sectional survey design is good to implement for research purposes in cases where there is a restricted cost involved, and the need to access details of information easily. The targeted population of this study comprise of all one thousand four hundred and fifty-four (1,454)level 300 mathematics trainee teachers in the five public Colleges of Education in Volta Region of Ghana for the 2020/2021 academic session. However, the accessible population was eight hundred and fifty (850) trainee teachers from two Colleges were used due to proximity and their peculiarities. Multistage sampling technique was used for this study. Krejcie and Morgan (1970) sample size determination table was used to obtain a sample of three hundred and thirteen (313). For representation of each college, we obtained 147 trainee teachers from College A and 166 trainee teachers from College B. Blended Learning Perception and Mathematics Competence Questionnaire" (BLPMCQ) instrument was organized into two main sections namely section A and section B. Section A contained information on the sample bio data. Section B was sub-sectioned into three with respect to the three objectives of the study. The section B in totality contained fifteen items that were used to explore blended learning instruction and trainee teachers' acceptance and instructional competence in mathematics teaching. Items 1 to 5 was used to address objective one, items 6 to 10 were used to address objective two, while items 11 to 15 addressed objective three. The four-point Likert scale was used to rate the sample trainee teachers' responses to sub-section B of BLPMCQ. The levels of the scale responses were Strongly Agree (SA=4), Agree (A=3), Disagree (D=2) and Strongly Disagree (SD=1). The criterion mean for each item in the questionnaire would be 2.5.The instrument, BLPMCQ was validated using face and content validity. The instrument, BLPMCQ was subjected to a reliability test. This was done using the Cronbach Alpha. Twenty copies of BLPMQ were administered once to a group of twenty level 300 mathematics trainee teachers that were not participants in the main study. This is deemed appropriate so that the reliability of the instrument used can be determined. The alpha coefficient for the pilot test was 0.895. Since the alpha coefficient of BLPMCQ was above 0.70 threshold. This indicated that the items of the questionnaire have consistent response from respondent at any time or anywhere the instrument would be administered. Data analysis was presented in two folds, thus descriptive and inferential statistics. Mean and standard deviation were used to answer the research questions while the z-test statistic was used to test the null hypotheses at 0.05 significant level.

Results

RQ1. What is the perception of the male and female trainee teachers on students' acceptance of learning mathematics via blended learning strategy?

Table 1:Mean and Standard deviation of the male and female trainee teachers on students' acceptance of learning mathematics via blended learning strategy

Trainee teachers Acceptance of Learning Mathematics via BLIS	Male N = 162	Female N = 142

S/N		Mean	SD	Mean	SD
1	It is easy to learn and has the skill for using blended learning instructional strategy in mathematics courses	3.33	0.55	2.95	0.54
2	Use of BLIS enables students to connect with friends for mathematics discussion.	3.56	0.57	3.20	0.58
3	The communication between the student and the instructor using blended learning instructional strategy is simple and easy for learning mathematics	3.26	0.65	3.03	0.84
4	Learning by blended learning instructional strategy during mathematics courses provides Interaction, not only between the learners but also between learner(s) and the instructor.	3.56	0.57	3.33	0.75
5	Students have a positive attitude towards the adoption of learning by using blended learning instructional strategy with mathematics courses.	3.37	0.78	2.91	0.76
	Grand Mean	**3.41**	**0.42**	**3.20**	**0.55**

Criterion Mean = 2.5

Table 1 shows the mean responses and standard deviation of the male and female trainee teachers on their acceptance of learning mathematics via blended learning instructional strategy (BLIS). From the result, it can be seen that both male and female trainee teachers agreed to all five items based on the 2.5 criterion mean threshold. However, male trainee teachers in each item expressed higher mean of agreement level compared to their female counterparts. The grand mean in table1 revealed that both male and female trainee teachers agreed that students accepted the learning of mathematics via blended learning strategy.

RQ2. What is the perception of the male and female trainee teachers on tutors' acceptance of teaching mathematics via blended learning strategy?

Table 2: Mean and Standard deviation of the male and female trainee teachers on tutors' acceptance of teaching mathematics via blended learning strategy

S/N	Tutors' Acceptance of Teaching Mathematics via BLIS	Male N = 162 Mean	SD	Female N = 142 Mean	SD
11	It is easy for mathematics tutors to teach and has the skill for using blended learning instructional strategy.	3.19	0.61	2.99	0.76
12	Mathematics tutors are able to use blended learning instructional strategy to connect with students for discussion.	3.41	0.56	3.12	0.52
13	Mathematics tutors are able to communicate with students using blended learning instructional strategy.	3.37	0.56	3.20	0.58
14	Mathematics tutors are able to use multimedia in BLIS to support students in various formats including text, picture, video and animation.	3.19	0.67	3.12	0.52
15	Mathematics tutors have a positive attitude towards the adoption of blended learning instructional strategy for teaching.	3.26	0.52	3.16	0.62
	Grand Mean	**3.28**	**0.37**	**3.12**	**0.46**

Criterion Mean = 2.5

The second research question investigated the perception of trainee teachers on mathematics tutors' acceptance of teaching mathematics through blended learning instructional strategy. This was examined in relation to trainee teachers' sex to indicate if there is different between male and female trainee teachers based on their opinion. There were 162 male trainee teachers and 142 female trainee teachers who expressed their views. Table 2shows that all participants (both male and female trainee teachers) agreed that mathematics tutors accepted the use of the blended learning instructional strategy to teach mathematics in Colleges of Education. The grand mean shows that male (Mean=3.28, SD=0.37) and female (Mean=3.12, SD=0.46), indicated that, based on the criterion mean of 2.5 threshold both male and female trainee teachers agreed that tutors accepted the use of BLIS to teach mathematics.

RQ3. How do the male and female trainee teachers perceive the instructional competence of tutors in the use of virtual platforms to teach mathematics?

Table 3: Mean and Standard deviation of the male and female trainee teachers perceive the instructional competence of tutors in the use of virtual platforms to teach mathematics

S/N	Instructional Competence of Tutors in the use of Virtual Platforms to Teach Mathematics	Male N = 162		Female N = 142	
		Mean	SD	Mean	SD
16	Mathematics tutors are able to present the content of subject matter, tailored to the students' knowledge	3.37	0.56	3.03	0.34
17	Mathematics tutors provides clear information about objectives, tutorials and contents	3.48	0.50	2.92	0.58
18	Mathematics tutors provides me with relevant information that allows me to gain a better and deeper understanding of the subject matter	3.59	0.49	3.03	0.54
19	Mathematics tutors applies the established curriculum with a certain amount of flexibility for a better class dynamic	3.37	0.48	2.96	0.62
20	Mathematics tutors uses material resources that facilitate learning virtually	3.15	0.85	2.87	0.72
	Grand Mean	**3.39**	**0.35**	**2.96**	**0.41**

Criterion Mean = 2.5

The third research question displayed the perception of male and female trainee teachers in relation to mathematics tutors' instructional competence in teaching mathematics using virtual platforms (e.g., WhatsApp and Telegram). Table 3 shows the mean response and standard deviation of the male and female trainee teachers. It can be seen that all five items were respectively agreed on by both male and trainee teachers who took part in the study, based on the 2.5 criterion. It is observed that the grand mean for male is (Mean=3.39, SD=0.35) and that of female is (Mean=2.96, SD=0.41). This indicates that although both male and female trainee teachers agreed that tutors have instructional competence in teaching mathematics through virtual platforms, the male expressed higher mean agreement level than the female trainee teachers.

H_{O1}: There is no significant difference between the perception of the male and female trainee teachers on their acceptance of learning mathematics via blended learning strategy

Table 4: z - test analysis on the perception of the male and female trainee teachers on their acceptance of learning mathematics via blended learning strategy

Students' acceptance of BLIS	N	Mean	SD	df	Sig. level	p-value	Effect size (Cohen's d)	Decision
Male	162	3.41	0.42	302	0.05	0.001	0.69	Significant
Female	142	3.09	0.55					

In table 4, the first hypothesis in line with research question one investigated the significant difference between the perception of male and female trainee teachers on their acceptance of learning mathematics through BLIS. It

was revealed that there was a statistically significant difference between male trainee teachers, $z(302) = 5.97, p = 0.001 < 0.05$with large effect size of (Cohen′s $d = 0.69$).This indicated that male trainee teachers possess marginal acceptance effect of using BLIS in learning mathematics than the female trainee teachers. Therefore, we reject the null hypothesis at 5% significant level.

H_{O2}: There is no significant difference between the perception of the male and female trainee teachers on tutors' acceptance of teaching mathematics via blended learning strategy.

Table 5: z-test analysis on the perception of the male and female trainee teachers on tutors' acceptance of teaching mathematics via BLIS

Tutors' acceptance of BLIS	N	Median	Mann-Whitney (U)	p-value	Effect size (Rank biserial correlation)	Decision
Male	162	3.20	8556	0.001	0.26	*
Female	142	3.00				

*Significant

Table 5 presents the second hypothesis linked to the second research question which investigated the significant difference between the perception of male and female trainee teachers on tutors' acceptance of teaching mathematics through BLIS. The result shows that there is a significant difference between male and female trainee teachers' perception regarding tutors' acceptance of teaching mathematics through blended learning instructional strategy. Due to violation of normality assumption in the data, a non – parametric analysis Mann – Whitney U test was computed to determine the significant difference between male and female students, and so the median was used to compare the difference. It was revealed that male $(\text{Median} = 3.20)$ and female $(\text{Median} = 3.00)$ at $\text{Mann} - \text{Whitney U} = 8556, p = 0.001 < 0.05$ with positive but weak effect size (Rank biserial correlation $= 0.26$) suggest that male trainee teachers perceived more that tutor accept the use of blended learning instructional strategy in teaching mathematics than the female trainee teachers. Therefore, reject the null hypothesis at 5% significant level.

H_{O3}: No significant difference exists on how the male and female student teachers perceive the instructional competencies of tutors in the use of virtual platforms to teach mathematics.

Table 6: test analysis on how the male and female trainee teachers perceive the instructional competence of tutors in the use of virtual platforms to teach mathematics.

Instructional competence of Tutors in BLIS	n	Mean	SD	df	Sig. level	p-value	Effect size (Cohen's d)	Decision
Male	162	3.39	0.35	302	0.05	0.001	1.14	*
Female	142	2.96	0.41					

*Significant

Table 6 shows the result for the third hypothesis which is line with the third research question examine the significant difference that exist between male and female trainee teachers' perception about tutors' instructional competence in using virtual platforms for teaching mathematics in Colleges of Education. The result in table 6, indicate that there is a statistically significant difference between male student teachers $(\text{Mean} = 3.39, \text{SD} = 0.35)$ mean perception over female trainee teachers $(\text{Mean} = 2.96, \text{SD} = 0.41)$ at $t(302) = 9.92, p = .001 < 0.05$ with large effect size at (Cohen′s $d = 1.14$).This implied that male have higher agreement perception that tutors demonstrate instructional competence in teaching mathematics using virtual platforms during BLIS. Therefore, we reject the null hypothesis at 5% significant level.

Discussion of Findings

Perception of the male and female trainee teachers on acceptance of learning mathematics via blended learning strategy.

With respect to student acceptance of blended learning instructional strategy in learning mathematics. It was found that majority 3.60 representing 75th percentile of the student teachers agreed that they accept the implementation of blended learning instructional strategy in learning mathematics in college of education. Further analysis suggests there was statistically significant relationship of trainee teachers' acceptance of

blended learning instructional strategy hence can contribute to their competence in mathematics. However, male trainee teachers expressed higher mean perception than the female trainee teachers. In support of this finding, Lin, et al. (2016) indicate that students gave positive feedback on the use of learning platform in learning mathematics after experiencing blended learning instructional strategy. This suggest that student demonstrate positive acceptance of blended learning instructional strategy in learning mathematics. Similarly, it was showed that all of the participating students generally approved of the blended learning environment created, and that blended learning instructional strategy learning environment may have improved students' acceptance of the blended learning technique, which blends classroom instruction and online learning (Wen et al., 2016; Alsalhi et al., 2021). This explained that student have interest and accept the learning of mathematics through blended learning instructional strategy.

Yilmaz and Malone (2020) also opined students have positive perception towards the utilization of blended learning during a science method course. The result showed also that both the male and the female students exhibited a high acceptance of the use of technology to learn mathematics. Contrary to this study, they found there was no significant difference between the acceptance level of the male and the female students in the use of technology to learn mathematics. This implied that most studies found that students have accepted the use of blended learning instructional strategy for learning by developing positive mindset, giving positive feedback and showed interest.

Perception of the male and female trainee teachers on tutors' acceptance of teaching mathematics via blended learning strategy.

For male and female trainee teacher perception on tutor acceptance of teaching mathematics through blended learning instructional strategy. It was found that majority with grand mean of 3.40 at 75^{th} percentile of the trainee teachers agree that tutor accept blended learning instructional strategy and like to teach mathematics using blended learning instructional strategy. In addition, it was established that there was a significant difference between male and female trainee teacher perception of tutor acceptance of blended learning instructional strategy and hence can influence student competence in mathematics in relation to sex. It was shown that male trainee teachers had higher mean compared to female trainee teachers. Few studies, for example, Azka and Faradillah (2020); Faradillah and Hadi, (2020) and Broadbent, (2017)earlier opined that while teachers themselves perceived that they accept using blended learning instructional strategy, students also confirmed that most teacher during the Covid-19 emergence love to teacher using blended learning instructional strategy. In addition, they expressed that there was no significant difference between teachers and student perception regarding teachers' acceptance of blended learning instructional strategy in teaching mathematics. Their findings are in line with what is found in this study as far as tutors' acceptance of blended learning instructional strategy in teaching mathematics in college of education is concern. However, they found that there was no significant difference in sex opinions but this study established a significantly difference in sex.

Perception of the male and female trainee teachers on the instructional competence of tutors in the use of virtual platforms to teach mathematics.

This objective investigated male and female trainee teacher perception of tutors' instructional competence in teaching mathematics using blended learning instructional strategy. It was found that majority of the participants perceived that tutor had instructional competence in teaching mathematics using virtual platforms. It was also found that there was statistically significant difference between male and female trainee teachers regarding their agreement level of tutor competence in teaching using blended learning instructional strategy. This result was ascertained by Ubah et al. (2020) who indicated that mathematics teachers expressed interest in blended learning instructional strategies based on teacher instructional competencies shown during blended learning. Again, it was shown that blended learning improved students' learning outcome and hence suggested that students are more likely to adapt to the blended teaching strategies during their in-service career as mathematics teachers. Yang et al. (2022) also suggest that teacher instructional competence is based on teacher pedagogy. The study further indicates that due to varied pedagogical exploration made teacher instructional competence significant in blended learning instructional strategy and therefore should be recommended for teaching in higher education.

Conclusion

The study concluded that male and female student teachers descriptively agree that the implementation of blended learning instructional strategy increase their acceptance of blended learning strategy, tutor acceptance of blended learning, tutor competence and assessment in blended learning towards the learning and teaching of mathematics and also improve the mathematics competence of students. In addition, it was significantly maintained that the use of blended learning instructional strategy improves trainee teachers' mathematics competence.

Recommendations

The implementation of blended learning instructional strategy should be restored for learning and teaching among trainee teachers and tutors respectively in colleges of education, while they are on campus. This would curb most of the challenges encountered in the past experiences and also make trainee teachers and tutors to;

1. increase the percentage acceptance of student teachers using blended learning instructional strategy.
2. increase the percentage acceptance of tutors using blended learning instructional strategy.
3. increase the tutors' instructional competence using blended learning instructional strategy due to support system from colleagues.

References

Abdelaziz, H. A. (2012). D4 S4: A four dimensions instructional strategy for web-based and blended learning. *Turkish Online Journal of Distance Education*, *13*(4), 220-235.

Adekola, J., Dale, V. H., & Gardiner, K. (2017). Development of an institutional framework to guide transitions into enhanced blended learning in higher education. *Research in Learning Technology*, 2(5), 1 – 10.

Al-araibi, A. A. M., Mahrin, M. N. R. B., & Yusoff, R. C. M. (2019). Technological aspect factors of E-learning readiness in higher education institutions: Delphi technique. *Education and Information Technologies*, *24*(1), 567-590.

Aldowah, H., Al-Samarraie, H., Alzahrani, A. I., & Alalwan, N. (2020). Factors affecting student dropout in MOOCs: a cause and effect decision-making model. *Journal of Computing in Higher Education*, *32*(2), 429-454.

Aliyu, O., Arasanmi, C. C., & Ekundayo, S. (2019). Do demographic characteristics moderate the acceptance and use of the Moodle learning system among business students? *International Journal of Education and Development using ICT*, *15*(1), 25 – 30.

Alqahtani, A. Y., & Rajkhan, A. A. (2020). E-learning critical success factors during the covid-19 pandemic: A comprehensive analysis of e-learning managerial perspectives. *Education sciences*, *10*(9), 216.

Al-shami, S. A., Aziz, H., & Rashid, N. (2019). The adoption of MOOC students in Universiti Teknikal Malaysia Melaka (Utem) utilization among undergraduate. *J Fundam Appl Sci*, *10*(6S), 2634-2654.

Alshehri, A. F. (2017). Student satisfaction and commitment towards a blended learning finance course: A new evidence from using the investment model. *Research in International Business and Finance*, *41*, 423-433.

Anthony, B., Kamaludin, A., Romli, A., Raffei, A. F. M., Phon, D. N. A., Abdullah, A., & Ming, G. L. (2020). Blended learning adoption and implementation in higher education: A theoretical and systematic review. *Technology, Knowledge and Learning*, 1-48.

Azka, A., & Faradillah, A. (2020). Pre-Service Teachers Perceptions of Blended Learning on Mathematics Learning Based on Gender. *IndoMath: Indonesia Mathematics Education*, *3*(2), 121-129.

Bervell, B., & Umar, I. N. (2020). Blended learning or face-to-face? Does Tutor anxiety prevent the adoption of Learning Management Systems for distance education in Ghana? *Open Learning: The Journal of Open, Distance and e-Learning*, *35*(2), 159-177.

Bidarra, J., & Rusman, E. (2017). Towards a pedagogical model for science education: bridging educational contexts through a blended learning approach. *Open Learning: the journal of open, distance and e-learning*, *32*(1), 6-20.

Borba, M., Askar, P., Engelbrecht, E., Gadanidis, G., Llinares, S., & Aguillar, M. (2016). Distance learning, blended learning, e-learning in mathematics. *The International Journal on Mathematics Education*, *48*(1), 589-610.

Broadbent, J. (2017). Comparing online and blended learner's self-regulated learning strategies and academic competence. *The Internet and Higher Education*, *3(3)*, 24-32.

Dovros, N., & Makrakis, V. (2012). Transforming the classroom into a reflective community: A blended learning instructional approach. *Journal of Teacher Education for Sustainability*, *14*(2), 73-88.

Faradillah, A., & Hadi, W. (2020). Educators' perception Of Blended Learning Models on Mathematics Learning. *Kalamatika: Jurnal Pendidikan Matematika*, *5*(1), 83-92.

Halasa, S., Abusalim, N., Rayyan, M., Constantino, R. E., Nassar, O., Amre, H., Sharab, M., & Qadri, I. (2020). Comparing student achievement in traditional learning with a combination of blended and flipped learning. Nursing Open, 7(4), 1129–1138. https://doi.org/10.1002/nop2.492

Johnson, N., Veletsianos, G., & Seaman, J. (2020). U.S. faculty and administrators' experiences and approaches in the early weeks of the COVID-19 pandemic. Online Learning Journal, 24(2), 6–21. https://doi.org/10.24059/olj.v24i2.2285

Kamar, K., Novitasari, D., Asbari, M., Winanti, W., & Goestjahjanti, F. S. (2020). Enhancing Employee Competence During the Covid-19 Pandemic: The Role of Readiness for Change Mentality. *JDM (Jurnal Dinamika Manajemen)*, *11*(2), 154-166.

Kennedy, J., Lyons, T., & Quinn, F. (2014). The continuing decline of science and mathematics enrolments in Australian high schools. *Teaching Science*, *60*(2), 34-46.

Kintu, M. J., Zhu, C., & Kagambe, E. (2017). Blended learning effectiveness: the relationship between student characteristics, design features and outcomes. *International Journal of Educational Technology in Higher Education*, *14*(1), 1-20.

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and psychological measurement*, *30*(3), 607-610.

Lin, C. Y., Huang, C. K., & Ko, C. J. (2020). The impact of perceived enjoyment on team effectiveness and individual learning in a blended learning business course: The mediating effect of knowledge sharing. Australasian Journal of Educational Technology, 36(1), 126–141. https://doi.org/10.14742/ajet.4446

Martinsen, B. W. (2017). *The Potential and Pitfalls of Blended Learning: an investigation of student and teacher perceptions of blended learning in two Australian secondary science classes* (Doctoral dissertation, James Cook University).

Megahed, N., & Hassan, A. (2021). A blended learning strategy: reimagining the post-Covid-19 architectural education. *Archnet-IJAR: International Journal of Architectural Research*.

Ministry of Education, (2019). Introduction of Blended Learning in Colleges of Education in Ghana.

Momani, A. M. (2020). The unified theory of acceptance and use of technology: A new approach in technology acceptance. *International Journal of Socio-technology and Knowledge Development (IJSKD)*, *12*(3), 79-98.

Mulyanengsih, R., & Wibowo, F. C. (2021, October). E-learning in Sains Learning: A-Review of Literature. In *Journal of Physics: Conference Series* (Vol. 2019, No. 1, p. 012042). IOP Publishing.

Odoi, G., Ussiph, N., & Panford, J. K. (2019). Application of Blended Learning at the SHS Level – Implications on Students' Competence. International Journal of Computer Science and Information Security, 17(7), 1–7.

Oweis, T. I. (2018). Effects of Using a Blended Learning Method on Students' Achievement and Motivation to Learn English in Jordan: A Pilot Case Study. Education Research International, 2018. https://doi.org/10.1155/2018/7425924

Patt, D. A., Wilfong, L., Toth, S., Broussard, S., Kanipe, K., Hammonds, J., Allen, V., Mautner, B., Campbell, N., Dubey, A. K., Wu, N., Neubauer, M., Jones, B. S., & Paulson, R. S. (2021). Telemedicine in Community Cancer Care: How Technology Helps Patients with Cancer Navigate a Pandemic. JCO Oncology Practice, 17(1), e11–e15. https://doi.org/10.1200/op.20.00815

Pima, J. (2019). Factors that motivate teachers to use ICT in teaching: A case of Kaliua District secondary schools in Tanzania. *International Journal of Education and Development using ICT*, *15*(1).

Sabah, N. M. (2020). Motivation factors and barriers to the continuous use of blended learning approach using Moodle: students' perceptions and individual differences. *Behaviour & Information Technology*, *39*(8), 875-898.

Sailer, M., Schultz-Pernice, F., & Fischer, F. (2021). Contextual facilitators for learning activities involving technology in higher education: The C♭-model. *Computers in Human Behavior*, *121*, 106794.

Sharma, P. (2017). Blended learning design and practice. In *Digital Language Learning and Teaching* (pp. 167-178). Routledge.

Sukma, Y., & Priatna, N. (2021). Mathematics Teachers 'response to Online Learning During the Covid-19 Pandemic: Challenges and Opportunities. *Kalamatika: Jurnal Pendidikan Matematika*, *6*(1), 1-14.

Ubah, I. J. A., Spangenberg, E. D., & Ramdhany, V. (2020). Blended Learning Approach to Mathematics Education Modules: An Analysis of Pre-Service Teachers' Perceptions. *International Journal of Learning, Teaching and Educational Research*, *19*(7), 298-319.

Wen, M. (2016). Investigating virtual teams in massive open online courses: Deliberation-based virtual team formation, discussion mining and support. *Pittsburgh (PA): Carnegie Mellon University*.

Yang, H., Cai, J., Yang, H. H., & Wang, X. (2022). Examining key factors of beginner's continuance intention in blended learning in higher education. *Journal of Computing in Higher Education*, 1-18.

Yılmaz, Ö., & Malone, K. L. (2020). Preservice teachers' perceptions about the use of blended learning in a science education methods course. *Smart Learning Environments*, *7*(1), 1-21.