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Full Length Research

Mathematics teachers' perceptions and challenges in using blended learning for optimum mathematics delivery in the post COVID - 19 classrooms

Anakpua, Blessing C.[1]*, Nzeakor, Emmanuel C.[2], Emefo Chinyere N.[3] and Okeke Adeline N.[4]

[1]Department of Science Education, Alex Ekwueme Federal University, Ndufu-Alike, Ebonyi State, Nigeria.
[2]Institute of Education, University of Nigeria, Nsukka, Enugu State, Nigeria.
[3]School of Secondary Education (Science), Department of Mathematics, Federal College of Education (Tech.), Bichi, Kano State, Nigeria.
[4]School of General Studies, Anambra State Polytechnic, Mgbakwu Anambra State, Nigeria.

*Corresponding author. Email: blespuah@yahoo.com; Tel: +234 (0)8034226518.

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ABSTRACT: The study examined mathematics teachers' perceptions and challenges in using blended learning for optimum mathematics delivery in the post Covid-19 classrooms in Anambra State, Nigeria. Descriptive survey design was adopted. Two research questions and one hypothesis guided the study. The population for the study was 89 mathematics teachers in Awka Education zone of Anambra State. The population was made up of 54 mathematics teachers in urban areas and 35 mathematics teachers in rural areas. A 20-item "Questionnaire for Mathematics Teachers' Perceptions and Challenges in using Blended Learning for Optimum Mathematics Delivery (QMTPCBLOMD)" was validated by three experts and rated on four Likert scales. Cronbach Alpha was used to establish the reliability co-efficient of the instrument. The Cronbach Alpha reliability co-efficient was estimated at 0.84. Research questions were answered using mean and standard deviation, while the hypothesis was tested using z-test at 0.05 level of significance. The findings of the study showed that both urban and rural mathematics teachers perceived blended learning as the learning process that provides forum for interactive learning, promotes e-learning, fosters collaborative learning experience, incorporates both personalized and group learning, helps to share mathematics information and ideas globally and promotes student-centred learning. Challenges in using blended learning include lack of ICT compliance, low level of interest in mathematics, time factor, low speed connectivity and poor funding of secondary education. There was no significant difference between the mean response of perceptions of urban and rural mathematics teachers in using blended learning for optimum mathematics delivery in the post COVID-19 classrooms. It was recommended among others that both mathematics teachers and students should be ICT compliant and adequate time should be given for teaching of mathematics. Then capacity building workshop on blended learning should be organized for both mathematics teachers and students and government should fund secondary education adequately.

Keywords: Blended learning, COVID-19, mathematics, mathematics delivery.

INTRODUCTION

Mathematics is a language that is full of definitions, vocabularies, symbols and notations that has social, cultural and utilitarian values to ensure all round sustainable development (Ugwuda and Ochuenwike, 2014). Despite the efforts of mathematics teachers in using different methods and strategies in teaching mathe-

matics like problem-solving method, demonstration method and discussion method to achieve mathematics objectives still students' performance in mathematics is not encouraging in both internal and external examinations. Usman (2003) identified inappropriate and ineffective teaching approaches in mathematics among the factors responsible for mass failure in mathematics. Finding by Okebukola (2006) showed that the quality of education is seriously affected by the scarcity of facilities and equipment such as laboratories, libraries and teaching materials due to education budget cuts. Zin *et al.* (2002) posited that most failures and substandard performance in Mathematics are due to insufficient teaching and learning resources. Usaini *et al*. (2015) also stipulated that the geographical location of schools have significant influence on the academic achievement of students.

Meanwhile, finding of Reimers (2020) showed that across the globe, the spread of COVID-19 has led to profound changes in social interaction and interrupted learning. It has also affected teaching and learning. Mohan (2020) stated that COVID-19 is a large family of zoonotic virus that causes illness such as dry cough, fever, shortness of breath, breathing difficulties, pneumonia, severe acute respiratory syndrome, kidney failure and death. The closure of schools due to the outbreak of these diseases caused by COVID-19 has transformed the method of teaching and learning of mathematics from traditional teaching method to the use of technology so as to avoid contacting COVID-19 diseases and also to cover the school curriculum. This affirmed the assertion made by Weeden and Cornwell (2020) that teaching and learning had rapidly transited from face-to-face classes to online learning systems with the use of social media. Chen and Lai (2005) concluded that the end result on traditional method of teaching is student frustration, incomplete homework and assignments, poor performances on assessments, low academic self-efficacy, loss of interest and effort. Due to interruption in the school system as a result of school closure because of danger of contacting or being infected with COVID-19 virus, there is need to complement traditional method of teaching and learning mathematics with the use of technology.

Mathematics teachers in the secondary schools have been teaching the students through face-to-face but the use of technology is new to some teachers. Technology is the set of knowledge, skills, experience and techniques through which humans change, transform and use the environment in order to create tools, machines, products and services to meet their needs and desires. Maskus (2004) defined technology as the information necessary to achieve a certain production outcome from a particular means of combining or processing selected inputs which include production processes, intra-firm organizational structures and management techniques. Lin (2003) urged that technology is also embodied in people, materials, cognitive and physical processes, facilities, machines and technological tools (radio, computers, tablets, smart phones, televisions and calculators). Geiger *et al*. (2008) posited that technology conceptualize mathematical models which brought out student–student and student–teacher interactions. Finding by Jahnke (2012) showed that students increasingly depend on technology for updates on major global events. This study also agreed with the findings of Lin *et al*. (2013) which showed that technology helps to elicit instant feedback from school subjects, enhances social presence in online classes, provides timely updates to course information, and motivate students through the use of new technologies. Although mathematics teachers and students can benefit from the use of technology, but can as well face with many challenges during and after use. These challenges can be found in the result of Uitz (2012) which showed that lack of access to technology and good internet connectivity were obstacles encountered in using technology especially among the students from disadvantaged families. Study by Panthi and Belbase (2017) showed that the major issues in teaching and learning mathematics with technology are lack of knowledge of technology and constraints in teaching with technology particularly in the area of mathematics. Also finding by Garegae (2015) admitted that there are shortage of technological tools and lack of support for staff to make use of ICT facilities. Combining face-to-face teaching and learning with the use of technology will become an innovation in the teaching of mathematics. The idea of embracing the reform of teaching and learning of mathematics with both traditional method and the use of technology is generally known as blended learning.

Blended learning is defined by Bersin (2003) as a strategy which employs technology and the selection of appropriate teaching methods in solving the problems related to class management and the learning-directed activities. It is an approach in education that combines online educational materials and opportunities with traditional classroom method. Blended learning requires the physical presence of both teacher and student, with some elements of student control over time, place, path, or pace (Friesen, 2012). The application of blended learning in the mathematics classroom gives room for mathematics teacher to combine face-to-face instruction with the use of technology. The intention is to allow students to get help from the mathematics experts, appeal to a variety of learning styles and gives room for effective use of instructions irrespective of locations and time.

Numerous studies on blended learning showed positive impact of its use in the classroom. For instance, Bani-Doumi and Al-Zoubi (2012) conducted a study which aimed to investigate the impact of blended learning on the achievement of fourth graders in mathematics and their motivation towards learning. Results showed significant differences between the means of the participants of the experimental and control groups in the achievement

examination on behalf of the experimental group. A significant difference was found between the performance of the participants of the two groups in the motivation scale, and on behalf of the experimental group. The study of Dauod and Mahmoud (2013) examined the impact of blended teaching on the achievement of fifth graders in chemistry, and their attitudes towards blended learning in Mosul. Results of the study showed statistically significant differences between the means of the achievement of the participants of the experimental group, and the means of the participants of the control group; and statistically significant differences between the means of the scores of the participants of the control and experimental groups in the attitudes scale, on behalf of the experimental group. The study of Bani-Hamad (2011) aimed to explore the impact of blended learning on achievement and motivation in learning Arabic among third grade students, in comparison to traditional methods. Results of ANCOVA analysis showed statistically significant differences in achievement due to the teaching variable strategy, and on behalf of the experimental group. Results showed also statistically significant differences in motivation towards learning Arabic, and on behalf of the experimental group as well. The study of Al-Awadh and Al-Younes (2011) investigated the impact of blended learning on the achievement of eighth graders in solving equations' unit as well as their attitudes towards learning mathematics among two pilot schools in Amman third educational directorate. Results showed the lack of a significant impact of the achievement level on the attitudes of the students towards mathematics, as well as the lack of an impact on the achievement of the students in functions and equations solving, and attitudes due to the teaching method and the achievement levels of the students. Singh and Reed (2001) posited that effective learning can be undoubtedly achieved because blended learning enables effective instruction to come into play as learners are not only presented with real-world problems to solve but also provided with how to solve the problems. The result of these studies favoured the experimental group. Meanwhile, research on the application of digital learning platforms and learning achievements have not shown consistent results. For instance, finding by Chen (2007) on correlation between the gender variable and academic achievement on the use of Moodle Online Instruction and effectiveness showed that females perform better than males while study the same study conducted by Lin and Chen (2007) showed that males perform better than females. This means, there is need for further studies on the use of blended learning in teaching and learning of school subjects.

Tthis study is in support of Dewey (1916) who advocated that learning is a practical social experience in which learners learn by doing, collaborating and reflecting with others. Dewey's work is very much evidenced in a good deal of present-day social constructivist instructional design where the use of reflective practice by both learner and teacher is a pedagogical cornerstone for interactive discussions. Thomas and Palmer (2014) believed that the application of this theory in the classroom practice can be determined by how teachers value technology, the nature of mathematical knowledge and confidence the teacher has.

Studies conducted by Bani-Doumi and Al-Zoubi (2012), Dauod and Mahmoud (2013), Bani-Hamad (2011) and Al-Awadh and Al-Younes (2011) have shown the significance difference between the use of blended learning on the experimental group and control group as it affects students' attitudes and motivations in mathematics, chemistry, Arabic and in solving equations. Considering these studies, no existing literature has considered reviewing the perceptions of the mathematics teachers in using blended learning for optimum mathematics delivery in the post COVID-19 classrooms. Challenges associated with the use of blended learning for optimum mathematics delivery in the post COVID-19 classrooms have not been examined. Therefore, this study examined mathematics teachers' perceptions and challenges in using blended learning for optimum mathematics delivery in the post Covid-19 classroom.

Statement of the problem

There are challenges facing teaching and learning of mathematics that brought about lack of curriculum coverage, poor service delivery in mathematics classrooms, poor performances in mathematics, loss of efforts and loss of interest in mathematics activities by the students. The worrisome situation is that some mathematics teachers experience difficulty in achieving mathematics objectives in the classroom due to teaching methods and types of teaching tools used in the mathematics classroom. In this twenty first, the need to integrate face-to-face learning with the use of technology is necessary. Therefore, there is need to examine mathematics teachers' perceptions and challenges in using blended learning for optimum mathematics delivery in the post Covid-19 classroom.

Purpose of the study

The purpose of the study is to examine mathematics teachers' perceptions and challenges in using blended learning for optimum mathematics delivery in the post Covid-19 classrooms. Specifically, the study examines:

1. The perceptions of urban and rural mathematics teachers in using blended learning for optimum mathematics delivery in the post Covid-19 classrooms.
2. The challenges associated with using blended

learning for optimum mathematics delivery in the post Covid-19 classrooms.

Research questions

1. What are the perceptions of urban and rural mathematics teachers in using blended learning for optimum mathematics delivery in the post Covid-19 classrooms?
2. What are the challenges associated with using blended learning for optimum mathematics delivery in the post Covid-19 classrooms?

Hypothesis

H_{01}: There is no significant difference between the mean response of perceptions of urban and rural mathematics teachers in using blended learning for optimum mathematics delivery in the post Covid-19 classrooms.

METHODS AND MATERIALS

The study examines mathematics teachers' perceptions and challenges in using blended learning for optimum mathematics delivery in the post Covid-19 classrooms in Anambra State, Nigeria. Two research questions and one hypothesis guided the study. Descriptive survey research design was employed. According to Akuezuilo and Agu (2003), descriptive research design describes and interprets the conditions, relationships that exist, opinions that are held, processes that are going on and trends that are developing in research study. The population for the study was 89 mathematics teachers in Awka Education of Anambra State. The population was made up of 54 mathematics teachers in urban areas and 35 mathematics teachers in rural areas. There was no sampling of the mathematics teachers due to the manageable size of the population. A 20-item "Questionnaire for Mathematics Teachers' Perceptions and Challenges in using Blended Learning for Optimum Mathematics Delivery (QMTPCBLOMD)" was faced and content validated by three experts in Science Education (Measurement and Evaluation and Mathematics Education) from Nnamdi Azikiwe University, Awka. Modified Likert–type four-point rating scale value was used to score the respondents' responses on Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD) response pattern. Cronbach Alpha was used to establish the reliability co-efficient of the instrument. The Cronbach Alpha reliability co-efficient was estimated at 0.84. The questionnaire was administered to the respondents in their various schools by hand and collected on the spot. The 89 copies of the questionnaires returned were collated and used for data analysis. Research questions were answered using mean and standard deviation while hypothesis was tested with z-test statistic at 0.05 level of significance. A criterion means of 2.50 was used in taking decision on the research questions. Meanwhile items with mean score of 2.50 and above were accepted on otherwise rejected.

RESULTS

The data in Table 1 shows the grand means of 2.81 and 2.92 and standard deviations of 0.94 and 0.93 respectively. The grand means above 2.50 indicated that the respondents agreed that all the items are the perceptions of urban and rural mathematics teachers in using blended learning for optimum mathematics delivery in the post COVID-19 classroom. The major items accepted by the urban mathematics teachers were items 3, 5, 8, and 9 with the means 3.04, 3.10, 3.00 and 3.21. This shows that urban mathematics teachers agreed that blended learning encourages group learning, fosters collaborative learning experience, helps students to develop proficiency with the tools of technology and helps the mathematics teachers share mathematics information and ideas globally. The major items accepted by the rural mathematics teachers were items 4, 6 and 9 with the means 3.14, 3.01 and 3.11. This shows that rural mathematics teachers agreed that blended learning enforces usage of strategies and instructions in the mathematics classroom, encourages personalized learning and helps the mathematics teachers share mathematics information and ideas globally. Both urban and rural mathematics teachers agreed that blended learning promotes e-learning, allows students to work at their own pace and promotes students-centred learning.

The data in Table 2 shows the grand means of 2.80 and 2.82 and standard deviations of 0.97 and 0.98 respectively. This grand means above 2.50 indicated that the respondents agreed that all the items are challenges associated with using blended learning for optimum mathematics delivery In the post COVID-19 classroom. The major items accepted by the urban and rural mathematics teachers were items 4, 7 and 8 with the mean ratings of 3.16, 3.12 and 3.07 for urban mathematics teachers and 3.05, 3.02 and 3.11 for rural mathematics teachers respectively. This shows that both urban and rural mathematics teachers agreed that major challenges associated with using blended learning for optimum mathematics delivery in the post COVID-19 classroom include difficulty in repairing some of the technological tools, poor supply of secondary schools with technological facilities and time-consuming due to combination of face-to-face and use of technology. Other challenges include lack of internet facilities in school and at home, inadequate instructional materials in some of the mathematics topics, lack of internet connectivity due to location and poor

Table 1. Mean rating response of the perceptions of Urban and Rural Mathematics teachers' in using blended learning for optimum mathematics delivery in the post COVID-19 classroom

S/N	Item description	Urban mathematics teachers (N=54)			Rural mathematics teachers (N=35)		
		$\bar{X}$	SD	Decision	$\bar{X}$	SD	Decision
1	Blended learning provides forum for interactive learning	2.54	1.01	Accepted	2.60	1.09	Accepted
2	Blended learning promotes E – learning	2.68	0.94	Accepted	2.83	0.87	Accepted
3	Blended learning encourages group learning	3.04	0.82	Accepted	2.57	1.11	Accepted
4	Blended learning enforces usage of strategies and instructions in the mathematics classroom	2.57	1.05	Accepted	3.14	0.79	Accepted
5	Blended learning fosters collaborative learning experience	3.10	0.87	Accepted	2.73	1.02	Accepted
6	Blended learning encourages personalized learning	2.63	1.00	Accepted	3.01	0.80	Accepted
7	Blended learning allows students to work at their own pace	2.51	1.01	Accepted	2.63	1.05	Accepted
8	Blended learning helps students to develop proficiency with the tools of technology	3.00	0.90	Accepted	2.81	0.90	Accepted
9	Blended learning helps the mathematics teachers share mathematics information and ideas globally	3.21	0.85	Accepted	3.11	0.78	Accepted
10	Blended learning promotes students-centred learning	2.84	0.91	Accepted	2.87	0.92	Accepted
	Grand mean	2.81	0.94		2.92	0.93	

Table 2. Mean rating response of Urban and Rural Mathematics teachers on the challenges associated with using blended learning for optimum mathematics delivery in the post Covid - 19 classroom.

S/N	Item description	Urban mathematics teachers (N=54)			Rural mathematics teachers (N=35)		
		$\bar{X}$	SD	Decision	$\bar{X}$	SD	Decision
1	Lack of internet facilities in school and at home.	2.84	0.96	Accepted	2.73	1.05	Accepted
2	Inadequate instructional materials in some of the mathematics topics	2.51	1.13	Accepted	2.50	1.15	Accepted
3	Lack of internet connectivity due to location and poor network.	2.65	1.05	Accepted	2.76	1.02	Accepted
4	Difficulty in repairing some of the technological tools	3.16	0.79	Accepted	3.05	0.82	Accepted
5	Lack of ICT compliant by the mathematics teachers and students	2.50	1.13	Accepted	2.87	0.90	Accepted
6	Low interest in mathematics by some students	2.82	0.98	Accepted	2.71	1.09	Accepted
7	Poor supply of technological facilities in secondary schools.	3.12	0.82	Accepted	3.02	0.89	Accepted
8	Use of blended learning can be time-consuming due to combination of face-to-face and use of technology	3.07	0.84	Accepted	3.11	0.79	Accepted
9	Inadequate of power supply	2.63	1.07	Accepted	2.81	0.96	Accepted
10	Low speed connectivityof technological tools.	2.71	1.00	Accepted	2.63	1.11	Accepted
	Grandmean	**2.80**	**0.97**		**2.82**	**0.98**	

network, lack of ICT compliant by the mathematics teachers and students, low interest in mathematics by some students, inadequate of power supply and low speed connectivity.

The result in Table 3 shows that z-crit. value of 1.96 is greater than the z-cal. value of- 0.54 at 0.05 level of significance. In other words, the null hypothesis was upheld. This result has shown that there is no significant difference between the mean response of perceptions of urban and rural mathematics teachers in using blended learning for optimum mathematics delivery in the post COVID-19 classrooms.

DISCUSSIONS

Blended learning provides forum for interactive learning, promotes e-learning, encourages group learning and

Table 3. z-Test difference of the mean responses of perceptions of Urban and Rural mathematics teachers in using blended learning for optimum mathematics delivery in the post COVID-19 classroo

Mathematics Teachers	N	$\bar{X}$	SD	df	z-crit	z–cal	Decision
Urban	54	2.81	0.94	87	1.96	-0.54	Ho upheld
Rural	35	2.92	0.93				

enables students to access mathematics activities with different modes. Blended learning enforces usage of strategies and instructions, fosters collaborative learning experience, encourages personalized learning, allows students to work at their own pace and develop proficiency with the tools of technology. It also helps mathematics teachers in sharing mathematics information and ideas globally and promotes students-centred learning. The result of this study collaborates with the result of Chen *et al*. (2001) which showed that incorporating scientific technology with education creates interactive discussions between the teachers and students and makes the learning process active, multi-faceted, flexible, enhances learning quality and motivates the students to engage in self-directed learning. This study also supported the result of Lederer (2012) which showed that use of technology foster collaboration and discussion among students, create meaningful dialogue, promote exchange of ideas and boost student interaction. Chiekezie and Ifeakor (2018) emphasized that collaborative learning strategy and grouping learners have been effective in improving students' achievement. This finding agreed with Ya-Wen *et al*. (2017) that blended learning enable teachers to give instruction to individual students who encounter learning difficulties in class. The implication of this finding is that blended learning will helps the students fully understand new mathematics concepts before moving on to the next concept.

The idea of sharing mathematics information and ideas globally with the help of blended learning as perceived by mathematics teachers is consistence with the result of Jahnke (2012) which showed that students increasingly depend on technology for updates on major global events. This study also agreed with the findings of Lin *et al*. (2013) which showed that technology helps to elicit instant feedback from school subjects, enhances social presence in online classes, provides timely updates to course information, and motivate students through the use of new technologies. The implication of this study is that technology can be used to send messages and updates, announce upcoming events, post homework, assignments and share interesting school-related content especially in mathematics as a school subject. Student-centred learning enable students solve problems and explore new ideas in mathematic activities as admitted by the mathematics teachers in this study. This finding is in line with the result of Forman (2003) which stated that involving students in solving mathematics gives the students opportunity to explain ideas clearly, foster reasoning and have deep understanding of the mathematical concepts.

The challenges associated with using blended learning as shown in this study include lack of internet facilities in schools and at homes, inadequate instructional materials in some of the mathematics topics, lack of internet connectivity due to location and poor network. Difficulty in repairing some of the technological tools, lack of ICT compliant by mathematics teachers and students, low interest in mathematics by some students constitute challenge in using blended learning. Also, poor supply of technological facilities in secondary schools, time-consuming due to combination of face-to-face and use of technology, inadequate power supply and low speed connectivity of technological tools are among the challenges associated with using blended learning. Lack of internet connectivity due to location and poor network and low speed connectivity of technological tools as shown in the finding supported the result of Uitz (2012) which showed that lack of access to technology and poor internet connectivity were obstacles encountered in using technology especially among the students from disadvantaged families. Truly this problem of not connecting to the internet and low speed will discourage mathematics teachers and students from using technology which is an aspect of blended learning and makes them resort to only face-to-face means of teaching and learning of mathematics. Lack of internet facilities and inadequate instructional materials have posed a lot of threat to the use of blended learning. This finding is related to the result of Okebukola (2006) which showed that the quality of education is seriously affected by the scarcity of facilities and equipment such as laboratories, libraries and general teaching materials due to education budget cuts. The role of instructional materials in the teaching and learning of mathematics cannot be overemphasized. No wonder findings by Hossain (2000) showed that students learn by touching, seeing, smelling and testing than by just listening. Therefore, making provisions and use of instructional materials in the mathematics classroom will make mathematics activities relevant to the students.

Lack of ICT compliance by the mathematics teachers and students as found by this study will make the use of blended learning a flop. This study agreed with the result of Panthi and Belbase (2017) which showed that the major issues in teaching and learning mathematics with technology are lack of knowledge of technology and constraints in teaching with technology particularly in the

area of mathematics. Also agreed with the finding by Garegae (2015) that there are shortage of technological tools and lack of support for staff to make use of ICT facilities. The implication of this study is that mathematics teachers and students should accept blended learning as an innovative way of teaching and learning mathematics so as to also transform students' learning experience in mathematics especially at this period of post COVID-19. Lack of interest in mathematics by the students is a serious challenge in the mathematics class especially with the use of blended learning. This correlates with the finding of Ukpebor (2005) which showed that lack of interest in solving mathematics problems contributed to poor achievement in mathematics. This is true because when students lack interest in mathematical activities, it will be difficult for them to understand the concept no matter how mathematics teacher tries to bring out originality from the mathematics concept even with the use of blended learning. Poor funding of secondary education as a challenge in using blended learning related to the finding by Ukonu (2010) showed that poor funding of education, lack of transparency of public officers, tribal sentiments, short circulating of funds meant for research, misappropriation and embezzlement of funds contributed to poor achievement in mathematics. The result of this study is associated with the result of Adikwu (2008) which showed that lack of fund stands out as number one problem in teaching and learning of mathematics. The finding that low speed connectivity affected the use of technology is related to the result of Donegan (2002) which showed that the quality of sound and vision deteriorate if the speed of the connection becomes low. This low speed connectivity delay sharing of mathematics information which will bring about wrong interpretation of mathematics concepts resulting to poor performance in mathematics.

The result of the study showed that there was no significant difference between the mean response of urban and rural mathematics teachers' perceptions in using blended learning for optimum mathematics delivery in the post Covid-19 classrooms. This implies that both urban and rural mathematics teachers have the same perception on the use of blended learning as it is a forum for interactive learning, e-learning, collaborative learning experience, personalized learning, sharing mathematics information and promotion of students-centred learning. Comparing this result with the result of Bani-Doumi and Al-Zoubi (2012), Dauod and Mahmoud (2013) and Bani-Hamad (2011), there is statistically significant differences in achievement of students due to the teaching variable strategy, and on behalf of the experimental group. While the result of Al-Awadh and Al-Younes (2011) on the use of blended showed lack of a significant impact of the achievement level on the attitudes of the students towards mathematics, as well as the lack of an impact on the achievement of the students in functions and equations solving, and attitudes due to the teaching method and the achievement levels of the students.

Conclusion

Based on the results of the study, mathematics teachers perceived blended learning as a forum for interactive learning, e-learning, group learning, collaborative learning experience and personalized learning for optimum mathematics delivery in the post COVID-19 classrooms. It helps students to develop proficiency with the tools of technology, share mathematics information and promotes students-centred learning. Mathematics teachers perceived blended learning challenges including lack of internet connectivity due to location and poor network, difficulty in repairing some of the technological tools, lack of ICT compliant by mathematics teachers and students, time-consuming due to combination of face-to-face and use of technology, inadequate power supply and low speed connectivity of technological tools. Finding solutions to these challenges will enable mathematics teachers use blended learning effectively and efficiently for optimum mathematics delivery in the post Covid-19 classrooms.

Recommendations

Based on the findings of the study, the following recommendations are made:

1. Mathematics teachers should be encouraged to use blended learning (use of technology and face-to-fact) while teaching mathematics.
2. School authorities and government should provide technological facilities in schools.
3. Parents should provide internet facilities at home and allow their children to make use of android phone at home for mathematics activities.
4. Mathematics teachers should be provided with computers and android phone that have high internet connectivity.
5. Instructional materials should be made available in schools and mathematics teachers should be encouraged to used them during learning.
6. Mathematics teachers and schools should connect to the functional network to avoid break in connection during blended learning.
7. Schools should liaise with software engineers for repairing of technological tools.
8. Government and schools should always organize seminars and capacity building workshop on the use of blended learning for teachers and students.
9. Enough time should be allotted for mathematics lesson in the school timetable especially whenever technology will be used.
10. Government should ensure there is adequate power

supply in the school premises and alternative power supply should be provided as well.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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