EFFECT OF BLENDED LEARNING SYSTEM IN TEACHING AND LEARNING ROBOTICS EDUCATION IN FEDERAL UNIVERSITIES IN ENUGU STATE.

[1]Ehujuo, A. I., [2]Ugwu, E. I., [3]Obichili, O. I. & [4]Ugwoke, C. K.

*[1]Department of Computer Education, University of Nigeria, Nsukka.
[2]&*[3] Department of Home Economics, University of Nigeria, Nsukka.
****[4]Department of Industrial Technical Education, University of Nigeria, Nsukka.
*[1] E-mail: ehujuoanthonyifeanyi@gmail.com

Abstract

The study focused on the effect of blended learning system in teaching and learning robotics education in University of Nigeria, Nsukka, Enugu State. Specifically, this study sought to determine: The effect of blended learning system and lecture method on students" academic achievement in robotics education, the effect of blended learning system and lecture method on students" interest in robotics education, the effect of gender on students" academic achievement in the use of blended learning system to teach robotics education, and the effect of gender on students" interest in the use of blended learning system to teach robotics education. Four research questions and four null hypotheses guided the study. The population for the study was 23 second year students of the Department of Computer and Robotics Education, University of Nigeria, Nsukka. Robotics Education Achievement Test (REAT) and Robotics Education Interest Scale (REIS) was the instrument used for data collection. The REAT consists of 10 multiple choice items while, REIS consists of 10 items interest scale. Data collected were analyzed using mean and standard deviationwhile, ANCOVA was used to test the four null hypotheses at 0.05 level of significance. The findings revealed the following: effect of blended learning system on students" achievement in robotics education is higher than the effect of lecture method, mean scores of blended learning system on students" interest in robotics education is higher than the mean score of lecture method, and among others. Recommendations were made which includes: the technology used for the online learning must shift content and instruction to students" control in at least some way for it to qualify as blended learning from the student"s perspective, rather than just the use of digital tools from the classroom teacher"s perspective and among others.

Key words: *blended learning system, teaching, learning, robotics education*

Introduction

Over the past decade, digital and online learning options have become more popular and more widely used in public schools, although many schools have been slow or reluctant to adopt new technologies for number of complex reasons, ranging from inadequate funding, technologies, and computing networks to general organizational recalcitrance and resistance to change. Given the fact that the internet and most digital learning technologies are still relatively new, instructional alternatives such as blended learning could be seen as de facto reform strategies (Aleix & Martinez, 2012); that is, by incorporating blended learning, schools and teachers are forced to change the ways in which they have historically instructed and interacted with students. For example, if students begin learning both in-person and online, it might lead schools to reexamine their traditional school schedule and rethink how the typical school day is structured. In many cases, blended learning is one

component of a larger reform initiative in a school or district.

Blended learning according to Baker (2011) is an educational program that combines online digital media with traditional classroom methods. It requires the physical presence of both teacher and student, with some element of student control over time, place, path, or pace. Blended learning is a term increasingly used to describe the way e-learning is being combined with conventional classroom methods and independent study to create a new, hybrid teaching methodology (Bergman & Aaron, 2012). It represents, in many cases, a fundamental change in the way teachers and students approach the learning experience. According to Hamdan (2013), there is a general consensus among education innovators that blended learning has three primary components: in-person classroom activities facilitated by a trained educator, online learning materials, often including prerecorded lectures given by that same instructor and structured independent study time guided by the material in the lectures and skills developed during the classroom experience. In a blended learning model, lectures can be videotaped ahead of time so that students can watch at their own time (Heise, 2004).

www.cetvetar.unn.edu.ng
cetvetar.unn@unn.edu.ng

Students can work independently with online lessons, projects, and assignments at home or elsewhere, meeting periodically with teachers to review their learning progress, discuss their work, ask questions, or receive assistance with difficult concepts. Students can work independently and at their own pace online, but still have access to the personal attention of a teacher and all the assistance, knowledge, and resources such an educator provides. At the same time, teachers can structure courses and deliver instruction more flexibly or creatively than in a traditional classroom setting.

Teachers are likely to yield better results through blended learning system as most students learn

Technologies	Applications
Drop box	An online file sharing program. Files can be uploaded from any personal internetenabled device. The file sharer can then invite users to access the files via email invitation. URL: https://www.dropbox.com
Google hangout	A free feature available as part of the Google + package. Google hangoutenables video calling via any personal device. URL: http://www.google.com/+/learnmore/hangouts
YouTube	A popular video sharing site. Lecturers can create an account and upload videos from any internet-enabled device onto their personal channel. Students can search for these videos by name or subscribe to the lecturer's channel. URL: http://www.youtube.com
Echo Personal Capture	Software that enables lecturers to create videos using a webcam and then upload directly to the learning management system at their institution. URL: http://echo360.com/capture-options
Camtasia Studio	Software that records content on a web camera or digital screen. The recording can then be shared on any internet-enabled device. URL: http://www.techsmith.com/camtasia.html

faster independently. Blended learning system creates more time for teachers to attend to other academic schedules and gives students the opportunity to learn at their own time, pace, place and path. Most students do not understand the teacher in the class but, understand better when learning independently. Some teachers cannot express themselves very well in the class. On the other hand, some learners are shy and reluctant to participate in the class or find it difficult to understand the lecturer during classroom lesson delivery (Wieman, 2011). Rutherfoord & Rutherfoord (2013) in the table below outlines a range of technologies useful for a blended learning approach:

Blended learning may also allow teachers to spend less time giving whole-class lessons, and more time meeting with students individually or in small groups to help them with specific concepts, skills, questions, or learning problems - the basic educational rationale behind —flipped classrooms‖ or —flipped instruction,‖ a form of blended learning (Platt & Treglia, 2000). Blended learning may also allow schools to teach more students more efficiently at a lower cost.

Learning is the acquisition of knowledge or skills; knowledge or skill gained through education; a relatively permanent change in behavior or understanding; acquisition of information or skill; to acquire knowledge of a subject or skill through education or experience; to find out about something or somebody; to gain information about somebody or something; to memorize something such as facts, poem, a piece of music or dance; to teach a topic or skill to somebody (Sharples, 2014).

Teaching is the process or act of impacting knowledge on learners; the process of dishing out instructions to learners; an act of delivering

a lesson; the process of coaching someone or group of persons; the process of training someone or group of persons, either in a formal or informal platform (Walsh, 2014). Robotic education teachers can apply blended learning system in teaching their students by adopting the blended learning system principles as discussed above. It will go a long way in helping students learn faster, at their own pace, path, time, and place. It is pertinent to take into cognizance the effect of blended learning system in teaching robotics education.

Robotics education is the study of robots; it is a broad term that refers to a collection of activities, instructional programs, physical platforms, educational resources and pedagogical philosophy (Roy & Pentland, 2011). There are many schools that are using the robot teacher. The primary objective of educational robotics is to provide a set of experience to facilitate the students' development of knowledge, skills and attitudes for the design, analysis, application and operation of robots. The rigor of the approach can be scaled based on the background of the target audience and may be suitable for students across the entire educational spectrum, from elementary school to graduate programs. The term robot here is used quite broadly and may include articulated robots, mobile robots or autonomous vehicles of any scale.

Robots are machines that can be used to do jobs. Some robots can do work by themselves, while some must always have a person telling them what to do. A robot is a machine programmable by a computer and capable of carrying out a complex series of actions automatically (Salman, 2011). Robots can be guided by an external control device or the control may be embedded within. Robots can be used as scouts to check out new areas to be explored. Scout robots can take photographs and measure the terrain. It helps scientists and engineers make better plans for exploring. Scout robots can be used to look for dangers and to find the best places to drive, walk, or stop. This helps astronauts work more safely and quickly. Having humans and robots work together makes it easier to study other worlds. Robots can be used in many different ways - Robotic arms on spacecraft are used to move very large objects in space (Platt & Treglia, 2000).

Purpose of the Study

The main purpose of this study was to determine the effect of blended learning system in teaching and learning robotics education in Enugu State.

Specifically, this study determined:

i. The effect of blended learning system and lecture method on students' academic achievement in robotics education.
ii. The effect of blended learning system and lecture method on students' interest in robotics education.
iii. The effect of gender on students' academic achievement in the use of blended learning system to teach robotics education.
iv. The effect of gender on students' interest in the use of blended learning system to teach robotics education.

Research Questions

The following research questions guided the study:

i. What is the effect of blended learning system and lecture method on students' academic achievement in robotics education?
ii. What is the effect of blended learning system and lecture method on students' interest in robotics education?

iii. What is the effect of gender on students' academic achievement in the use of blended learning system to teach robotics education?
iv. What is the effect of gender on students' interest in the use of blended learning system to teach robotics education?

Research Hypotheses

The following null hypotheses will be tested at 0.05 level of probability:

i. **HO_1:** There is no significant difference in the mean achievement scores of students taught robotics education using blended learning system and those taught using lecture method.
ii. **HO_2:** There is no significant difference in the mean interest scores of students' taught robotics education using blended learning system and those taught using lecture method.
iii. **HO_3:** Gender has no significant effect on students' mean achievement score in the use of blended learning system to teach robotics education.
iv. **HO_4:** Gender has no significant effect on students' mean interest score in the use of blended learning system to teach robotics education.

Methodology

The design of the study was quasi-experimental research design. Quasi-experimental design is an experiment where randomization of subject of experimental and control groups is not possible (Nworgu, 2006). The design is considered appropriate for the study because, intact classes were used instead of randomly composed samples. The use of intact classes is to ensure non alteration of lecture time. The design is represented thus:

$E_G = O_1 \times O_2, C_G = O_1 - O_2$, where E_G stands for experimental group, C_G stands for control group, O_1 stands for pre-test observation, O_2 stands for posttest observation, x stands for treatments using blended learning system, - stands for the use of lecture method. This study was carried out in University of Nigeria, Nsukka, Enugu State. This area was chosen because of its proximity to the researcher, it is the only Federal University in Enugu State that teaches robotics education.

The population for the study was 23 students in Computer and Robotics Education Department, University of Nigeria, Nsukka, Enugu State, and this formed the sample size which is made up of 10 males and 13 females of second year students of Computer and Robotics Education Department, University of Nigeria, Nsukka, Enugu State. The experimental group was made up of 6 males and 8 females while the control group was made up of 4 males and 5 females. Total sampling technique was used because the population was manageable.

The instrument for data collection for this study consists of Robotics Education Achievement Test (REAT) and Robotics Education Interest Scale (REIS). The REAT which was used to determine the academic achievement of students was developed based on the test blue print table. The REAT consists of 10 multiple choice items with 4 options. The questions were developed by the researcher based on robotics education curriculum. The REIS was also developed by the researcher, containing 10 items interest scale. This instrument was designed to assess students' interest in the use of blended learning system to teach robotics education. It was based on a four point rating scale of Strongly Agree (SA) = 4, Agree (A) = 3, Disagree (D) = 2, and Strongly Disagree (SD) = 1.

The researcher prepared four (4) sets of lesson plans for the teaching of the module set out for the study. These lesson plans were prepared from the units in the test blue print. Each set contains two (2) lesson plans. Two sets of the lesson plans was prepared based on blended learning system (BLS), while the other two sets was written based on the lecture method (LM) approach of teaching robotics education.

The blended learning system (BLS) lesson plan was used to teach the experimental group, while the control group was taught with lecture method (LM) lesson plan. The Pre-Robotics Education Achievement Test (PRE-REAT) and the Pre-Robotics Education Interest Scale (PRE-REIS) were administered to the students in the two groups before the commencement of the experiment and no feedback on the test was given to the students. Students' scores were recorded and kept aside for use after the treatment by the researcher. At the end of the experiment, a Post-Test of the Robotics Education Achievement Test (POST-REAT) and the Post Robotics Education Interest Scale (POST-REIS) were administered on both groups. The result of the pre-test and post-test were recorded separately.

The instrument was subjected to face-validity by three experts, one from the Department of Industrial Technical Education, one from Business Education Department, and one from Measurement and

Evaluation Department, University of Nigeria, Nsukka, Enugu State. The test blue print was face validated and the achievement was subjected to face and content validation by same experts mentioned above. The REIS was subjected to face validation by the same validates. The validation exercise was conducted in the following manner: copies of the title of the study, purpose of the study, research questions, hypotheses, the test-blue print, and the achievement test were sent to the above experts. They were requested to read through the instrument, vet the items for clarity, relevance, proper coverage and also to identify and correct wrongly spelt words, ambiguous statement and make suggestions of missing items. The suggestions were utilized to produce the final version of the questionnaire for the study.

The trial test for determining the coefficient of stability of the —REAT‖ was carried out using estimate or temporal stability (Test Re-Test). The instrument was administered by the researcher on equivalent sample of second year students of Computer Science Department, University of Calabar, Calabar, Cross River State. The objectives answer sheets were marked by the researcher and scores kept. After two weeks, the REAT was re-administered to the same sample. The objective questions were also marked by the researcher and scores obtained from the first and second test administered were correlated. The reliability coefficient of the REAT was found to be 0.86 using pearson product moment correlation coefficient, since the test items (REAT) were of multiple choice type. Cronbach Alpha was used to determine the internal consistency of —REIS‖ items. The interest scale was administered on equivalent sample of second year students in University of Calabar, Calabar, Cross River State. The reliability coefficient of REIS was found to be 0.83**.** The REAT was scored out of 20 marks (2 marks each) while REIS was rated based on a 4-point scale.

Experimental Procedure: Training of teachers for the conduct of the study.

The regular robotics education lecturers of the selected schools that teach robotics education

were given one week training. The lecturers were given detail explanation on the use of blended learning system. The training was organized for both the experimental and control group.

The training exercise was based on the purpose of the study, the topics to be taught and the general conduct of the study.

Treatment Procedure: The conduct of the study took place during the normal school periods. The normal time table of the schools used for the study was followed. The regular robotics education lecturers were used. The group that was given treatment, that is the blended learning system served as experimental group while, the group that was taught with conventional method served as the control group.

On the first day, before the commencement of the lesson, the two instruments REAT and REIS were administered as pre-test to both the experimental and control groups after which proper teaching started by using the prepared lesson plan. The blended learning lesson plans incorporated some instructional strategies (organizing and transforming, rehearsing and memorizing, keeping record, seeking social assistance, seeking information, self-evaluation) that enabled the students actively construct knowledge about a situation in order to develop strategies to proceed within the situation, and able to use previous understanding of any issue and the newly acquired knowledge in order to respond to an issue, develop skills, conduct, analyze and communicate findings.

At the end of the treatment, a post-test was administered on both groups with the REAT and REIS. The scores obtained from the groups were compared to determine if there was any significant difference in the performance of the two groups. The data collected was used for further analysis; the scores were collected and kept under the care of the researcher.

Control of Extraneous Variables In order to control some extraneous variables that may distort results and lead to false findings and wrong conclusion, the researcher adopted the following steps:

In order to ensure that errors coming from teacher variables will not interfere with the findings of the study, the researcher organized a one week training exercise for the regular robotics education lecturers of the groups that were selected for the study. The training helped in establishing a common instructional standard among the robotics education lecturers. The topics for the study were treated in details during coordination. A regular supervision was made by the researcher during the period of the experiment to ensure that the lecturers did not deviate from the agreed pattern of instruction.

The use of intact classes removed the possibility of the students knowing whether they are in experimental or control group.

The data collected were used to analyze research questions on Pre and Post REAT. Other research questions on REIS were answered based on the response options of: Strongly Agree (SA) = 4, Agree (A) = 3, Disagree (D) = 2, and Strongly Disagree (SD) = 1.

The hypotheses were tested at 0.05 level of significance using analysis of covariance (ANCOVA). Analysis of covariance (ANCOVA) was also used to take care of equivalence in the

group, since intact classes were used for the study.

In testing the hypotheses of significant difference, any item whose P-value is greater than 0.05 was regarded as not significant while, any item whose Pvalue is less than 0.05 was regarded as significant.

Findings: The following findings were made:

Research Question 1: What is the effect of blended learning system and lecture method on students' academic achievement in robotics education?

Table 1: Mean and standard deviation of pretest and post test scores of the effect of blended learning system and lecture method on students' academic achievement in robotics education.

Variable Methods of Teaching	N	Pretest Mean	SD	Posttest Mean	SD	Mean gain
Blended Learning System	14	7.79	1.88	16.43	1.45	8.64
Lecture Method	9	5.89	1.96	12.22	1.48	6.33

Results in table 1 show that the gr education using blended learni pretest mean score of 7.79 with a of 1.88 and a posttest mean sco standard deviation of 1.45. The the pretest and posttest mean wa taught robotics education using le pretest mean score of 5.89 with a of 1.96, and a posttest mean sco standard deviation of 1.48. The the pretest and posttest mean was each of the groups, the posttest

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Variable Methods of Teaching	N	Pretest Mean	SD	Posttest Mean	SD	Mean gain
Blended Learning System	14	25.86	2.11	31.14	1.35	5.28
Lecture Method	9	17.44	1.67	21.11	1.76	3.67

Results in table 2 show that the group taught robotics education using blended learning system had a pretest mean interest score of 25.86 with a standard deviation of 2.11 and a posttest mean interest score of 31.14 with a standard deviation of 1.35. The difference between the pretest and posttest mean was 5.28. The group taught robotics education using lecture method had a pretest mean interest score of 17.44 with a standard deviation of 1.67 and a posttest mean interest score of 21.11 with a standard deviation of 1.76. The difference between the pretest and posttest mean was 3.67. However, for each of the groups, the posttest mean was greater than the pretest mean with the group taught using blended learning system having a higher mean gain. This is an indication that blended learning system has more effect on students' interest in robotics education than the lecture method. The effect is that students performed better when they were taught with blended learning system.

Research Question 3: What is the effect of gender on students' academic achievement in the use of blended learning system to teach robotics education?

Table 3: Mean and standard deviation of pretest and post test scores of the effect of gender on students' mean achievement score in the use of blended learning system to teach robotics education.

Variable Gender	N	Pretest		Posttest		
		Mean	SD	Mean	SD	Mean gain
Male	10	12.00	2.00	15.20	2.82	3.20
Female	13	8.77	1.30	11.38	2.72	2.61

Results in table 3 show the effect of gender on Results showed that the male students had a pretest students' mean achievement score in the use of mean of 12.00 with a standard deviation of 2.00 and blended learning system to teach robotics education. a posttest mean of 15.20 with a standard deviation of

2.82. The difference between the pretest and posttest mean for the male students was 3.20. The female students taught robotics education using blended learning system had a pretest mean of 8.77 with a standard deviation of 1.30 and a posttest mean of 11.38 with a standard deviation of 2.72. The difference between the pretest and posttest mean for the female students was 2.61. However, for each of the groups, the posttest mean was greater than the pretest mean with the male students having a higher mean score. This is an indication that gender has effect on students' academic achievement in the use of blended learning system to teach robotics education.

Research Question 4: What is the effect of gender on students' interest in the use of blended learning system to teach robotics education?

Results in table 4 show the effect of gender on

Table 4: Mean and standard deviation of pretest and posttest scores of the effect of gender on students' mean interest score in the use of blended learning system to teach robotics education.

Variable Gender	N	Pretest Mean		Posttest Mean		
		SD		SD		Mean gain
Male	10	25.60	2.01	31.00	1.49	5.40
Female	13	20.62	2.06	24.38	1.50	3.76

students' mean interest score in the use of blended learning system to teach robotics education. Results showed that the male students had a pretest mean interest score of 25.60 with a standard deviation of 2.01 and a posttest mean interest score of 31.00 with a standard deviation of 1.49. The difference between the pretest and posttest mean score for the male students was 5.40. The female students taught robotics education using blended learning system had a pretest mean interest score of 20.62 with a standard deviation of 2.06 and a posttest mean interest score of 24.38 with a standard deviation of 1.50. The difference between the pretest and posttest mean score for the female students was 3.76. However, for each of the groups, the posttest mean was greater than the pretest mean with the male students having a higher mean interest score. This is an indication that gender has effect on students' interest in the use of blended learning system to teach robotics education.

Hypothesis 1: There is no significant difference in the mean achievement scores of students taught robotics education using blended learning system and those taught using lecture method.

achievement in robotics education than the

Table 5: Analysis of Covariance (ANCOVA) of the significant difference in the mean achievement scores of students taught robotics education using blended learning system and those taught using lecture method.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	228.793[a]	3	76.264	18.355	.000
Intercept	157.125	1	157.125	37.816	.000
Pretestscore	5.760	1	5.760	1.386	.254
Groups	33.632	1	33.632	8.094	.010
Gender	17.987	1	17.987	4.329	.051
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Error	78.946	19	4.155		
Total	3914.000	23			
Corrected Total	307.739	22			

The result in table 5 shows that there was a learning system and those taught using lecture significant difference in the mean achievement scores method. Result shows that with respect to the group of students taught robotics education using blended taught robotics education using blended learning

system and those taught using lecture method, an Fratio of 8.094 was obtained with associated probability value of 0.01. Since the associated probability value of 0.01 was less than 0.05 set as level of significance, the null hypothesis (H_{o1}) which stated that there is no significant difference in the mean achievement scores of students taught robotics education using blended learning system and those taught using lecture method was rejected. Thus, inference drawn therefore was that, there is a significant difference in the mean achievement scores of students taught robotics education using blended learning system and those taught using lecture method; with those taught using blended learning system having a higher mean gain. This shows that blended learning system has more effect on students' academic

lecture method.

Hypothesis 2: There is no significant difference in the mean interest scores of students taught robotics education using blended learning system and those taught using lecture method.

Table 6: Analysis of Covariance (ANCOVA) of the significant difference in the mean interest scores of students taught robotics education using blended learning system and those taught using lecture method.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	728.328[a]	3	242.776	61.410	.000
Intercept	198.340	1	198.340	50.170	.000
Pretestintscore	51.736	1	51.736	13.086	.001
Groups	76.169	1	76.169	19.267	.000
Gender	14.694	1	14.694	3.717	.061
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Error	166.042	42	3.953		
Total	35025.000	46			
Corrected Total	894.370	45			

The result in table 6 shows that there was a significant difference in the mean interest scores of students taught robotics education using blended learning system and those taught using lecture method. Result shows that with respect to the group taught robotics education using blended learning system and those taught using lecture method, an Fratio of 19.27 was obtained with associated probability value of 0.00. Since the associated probability value of 0.00 was less than 0.05 set as level of significance, the null hypothesis (H_{02}) which stated that there is no significant difference in the mean interest scores of students taught robotics education using blended learning system and those taught using lecture method was rejected. Thus, inference drawn therefore was that there is a significant difference in the mean interest scores of students taught robotics education using blended learning system and those taught using lecture method with those taught using blended learning system having higher interest mean gain. This shows that blended learning system increases students' interest in robotics education than the lecture method.

Hypothesis 3: Gender has no significant effect on students' mean achievement score in the use of blended learning system to teach robotics education. The result in table 5 shows that with respect to students' gender, an F-ratio of 4.33 was obtained with associated probability value of 0.051. Since the associated probability value of 0.051 was greater than 0.05 set as level of significance, the null hypothesis (H_{03}) which stated that gender has no significant effect on students' mean achievement scores in the use of blended learning system to teach robotics education was accepted. Thus, inference drawn therefore was that, there is no significant difference in the mean achievement scores of male and female students taught robotics education using blended learning system. This result shows that gender was not a significant factor in determining students' academic achievement in the use of blended learning system to teach robotics education.

Hypothesis 4: Gender has no significant effect on students' mean interest score in the use of blended learning system to teach robotics education.

The result in table 6 shows that with respect to students' gender, an F-ratio of 3.72 was obtained with associated probability value of 0.06. Since the associated probability value of 0.06 was greater than 0.05 set as level of significance, the null hypothesis (H_{04}) which stated that gender has no significant effect on students' mean interest score in the use of blended learning system to teach robotics education was accepted. Thus, inference drawn therefore was that, there is no significant difference in the mean interest scores of male and female students taught robotics education using blended learning system. This result shows that gender is not a significant factor in determining students' interest in the use of blended learning system to teach robotics education.

Discussion of the Findings

The study revealed that the main effect of blended learning system on students' achievement in robotics education is higher than the main effect of conventional technique. There was a statistically

significant difference between the main effect of blended learning system on students' achievement in robotics education confirming that the difference between the main effect of blended learning technique and lecture method was statistically significant. The implication of these findings is that blended learning method (recording lectures on video tapes or CDs and post it online through YouTube, WhatsApp and among others) is more effective than conventional or lecture method in enhancing students' achievement in robotics education. The finding that blended learning method has positive effect on students' academic achievement is similar to the findings of (Walsh, 2014) who observed that there was significant difference in students' achievement in the use of blended learning model and conventional method to teach computer hardware and software.

The study also revealed that the mean score of blended learning system on students' interest in robotics education is higher than the mean score of lecture method. Analysis of covariance presented in table 6 confirmed that the difference between the main effects of blended learning system and conventional method in students' interest inventory was significant. The significant difference is attributed to the treatment given to the experimental groups assigned to blended learning system. The findings indicated that blended learning system is more effective in stimulating students' interest in robotics education than the conventional lecture method. Baker (2011) asserted that the degree of understanding by students depended on several interacting variables such as learning materials, students' interest, school environment, and teaching techniques. Therefore, he emphasized that teachers should endeavour to adopt instructional techniques that are capable of stimulating students' interest.

Furthermore, the study revealed that there was no significant difference in the mean achievement scores of the male and female students taught robotics education using blended learning system, which implies that blended learning system is more effective in improving students' achievement in robotics education regardless of the gender. The findings is also in line with the views of Mazur (2010) who discovered that there was no difference in the mean achievement scores of male and female students taught physical geography using flipped learning model and conventional method. Also, the findings of this study corresponds with the opinion of Wieman (2011) who in his study on how emotion is made and measured found out that there was no significant difference in the achievement scores of the experimental and control groups.

The study also revealed that gender has no effect on students' interest in robotics education using blended learning system. There was no significant difference in the mean interest scores of male and female students taught robotics education using blended learning system, which implies that blended learning system is more effective in stimulating students' interest in robotics education regardless of gender. This is contrary to the findings of Richalot (2005) who in his study the importance of setting expectations and priming students for active student-centered learning found out that there was a significant difference in the mean interest scores of male and female students taught geometry using

blended learning model. The findings also disagrees with Bergman & Aaron (2012) who observed that there was significant difference in the mean interest score of male and female students taught algebra with flipped learning model.

Conclusion

In all blended-learning programs, students do some of their learning via the Internet. This does not mean using any digital tool, such as an online graphing calculator or Google Docs. Online learning means a bigger instructional shift from a face-to-face teacher to web-based content and instruction. By understanding blended learning as an instructional delivery model that gives students some element of control over their learning and by leveraging the opportunity of personalization that blended learning can provide at scale, educators can start to address challenges and opportunities in their schools that will enable them to move the practice of blended learning system forward.

Recommendations

Based on the findings, the following recommendations were made:

1. The technology used for the online learning must shift content and instruction to the control of the student in at least some way for it to qualify as blended learning from the student's perspective, rather than just the use of digital tools from the classroom teacher's perspective.
2. To prevent lack of coordination, most blendedlearning programs should use a computer-based data system to track each student's progress and try to match the modality - whether it is online, one-on-one, or small group - to the appropriate level and topic.
3. Government should create a conducive and enabling environment to encourage teachers and students by providing basic infrastructures/facilities that will enable one, irrespective of his/her financial status, acquire and apply computer knowledge and skills.

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