Effects of Blended Learning and Individualized Instructional Strategies on the Cognitive Learning Outcomes in Basic Technology

Dr. M. A. Omiola
Agricultural and Rural Management Training Institute, Ilorin, Nigeria

Mr. M. R. Enuwa
Sapati International School, Ilorin, Nigeria

Mr. S. O Awoyemi
Agricultural and Rural Management Training Institute, Ilorin, Nigeria

Dr. (Mrs.) R.F. Adebayo
Landmark University,Omu-Aran, Kwara State, Nigeria

Abstract

This study assessed the effectiveness of blended learning and individualized instructional strategy on the cognitive learning outcomes in Basic Technology. The sample used for this quasi-experimental study consisted of 364 Junior Secondary School students drawn from Secondary Schools in Ilorin Metropolis. Two hypotheses were postulated and tested using Analysis of variance (ANOVA) and Turkey/Kramer post hoc test and mean. The results of the study revealed that, there was significant difference in the students' cognitive achievement and interest in Basic Technology which were mostly enhanced by the blended learning strategy, followed by individualized instructional strategy and minimally by the conventional strategy. Recommendations were made that the blended learning strategy should be given more emphasis during teaching and learning of Basic Technology and be integrated into other related subjects in secondary schools.

Keywords: Blended Learning, Individualized Instruction, Basic Technology, and Cognitive Learning Outcome.

1.Introduction

Blended learning refers to mixing of different learning environments which combine traditional face-to-face classroom methods with more modern computer-mediated activities. Singh (2003) described it as a much richer set of learning strategies or dimension that can be blended in ways such as: offline with online, self-paced with live, collaborative structured with instructed custom content with off-the shelf and so on. There are many approaches to blended learning depending on the teachers and learners involved. As of now, there is no consensus on a single agreed upon definition for blended learning. The terms 'blended', 'hybrid', 'integrative learning' and 'mixed-mode' are all used interchangeably in current research literature (Node, 2004). Blended learning approach can combine face-to face facilitation with computer-mediated instruction and/or discovery learning opportunities. It also applies Science or Information Technology activities with the assistance of educational technologies using computer, cellular or smart-phones, satellite television channel, videoconferencing and other emerging electronic media. Learners and teachers work together to improve the quality of learning and teaching, and the ultimate aim of blended learning being to provide realistic practical opportunities for learners and teachers to make learning independent, useful, sustainable and growing (Graham, 2004).

Blended learning increases the options for greater quality and quantity of human interaction in a learning environment. It offers learners the opportunity to be both together and apart. A community of learners can interact at anytime and anywhere because of the benefits that computer-mediated educational tools provide. It also provides a good mix of technologies and interactions, resulting in a socially supported, and constructive learning experience; this is especially significant given the profound effect that it could have on distance learning. While it is easier for most people to picture a blended learning environment in a traditional classroom environment with a sprinkle of computers thrown in, there are other ways to create blended learning environments. Graham (2004) suggested that there are at least three environments that are effective blended learning environments: (1) on-line and face-to face learning activities (2) on-line and face-to face students and (3) on-line and face-to face instructors.

In another development, no child will be left behind if the individual learning needs of the child are met. This is to emphasise that each child is unique and individualized programmes can increase student success. Children have diverse learning styles, learn at different rates, have varying soci-economic backgrounds, and have diverse intellectual strength (Hamby, 1989). The two major facets recognise and build on the uniqueness of each child. According to Stainback and Stainback (1992) dropout statistics show that numerous so-called normal students are not succeeding because they are not treated as individuals. Also, by not recognising the unique learning needs of students, these therefore hindered them from achieving their potential because they do not learn like everyone else (Pugach and Warger, 1996).

Individualised instruction provides the opportunity for students to learn at their own pace, in their own way and be successful. At-risk students who would probably dropout of school, stay and graduate. There are different approach to individualised instruction but they all seek to manipulate the three following fundamental variables: (1) pace: which is the amount of time given to a student to learn the content. (2) method: which is the way that the instruction is structured and managed and (3) content: which is the materials to be learned.

There are examples of instructional approaches that have modified some or all of these three components. In all of these examples, the goal was to improve the instructional experience for the individual learner. In this study, the personalised system of instruction which is known as Keller Plan that was introduced by Fred Keller in the year 1964 was adopted. Personalised system of instruction was based on ten accepted educational principles which include: (1) active responding (2) positive conditions (3) specification of objectives (4) organisation of materials (5) mastery before advancement (6) evaluation/objective congruence (7) frequent evaluation (8) immediate feedback (9) self-pacing and (10) personalisation (Mc Gaw, 2008). None of these ten principles should be considered unique, as they can be easily found in other more traditional educational settings. Rather , it is the components of the Keller Plan based on these ten principles that makes the Keller Plan somewhat different; self-pacing; unit mastery; student tutors; optional motivation lectures; and learning from within material. It is the first component, self-pacing, that is the most obvious attempt at individualising the instruction. The proponents of Keller Plan cited many benefits which include better retention and increased motivation for further learning.

Basic Technology is a subject that introduces students to the basic rudiments of technology. It is also a subject that deals with the fundamentals of engineering and technology. This subject was introduced into the curriculum in Nigeria in order to reduce ignorance about technology and to help lay a solid foundation for true national development. Basic Technology subject is to be offered in the Junior Secondary Schools as one of key subjects on the same level as Mathematics and Science. The three main objectives of teaching Basic Technology in Nigeria are: (1) to provide pre-vocational orientation for further training in technology (2) to provide basic technology literacy for everyday living and (3) to stimulate creativity (FME, 1995).

2. Statement of the Problem

One of the major problems confronting educational system in Nigeria is poor students' performance. National Examination Council (NECO) results for Junior Secondary School in the year 2011 indicated that majority of Basic Technology students recorded ordinary pass. Some of the factors considered to be responsible for the candidate weak performances include: poor method of teaching, shortage of specialist teachers, poor funding and overcrowded classrooms. In this study therefore, an attempt was made using blended learning and individualised instructional strategies in teaching and learning of Basic Technology especially in the areas of engineering materials so that the problem of poor method of teaching can be reduced.

2.1 Purpose of the Study

The main purpose of this study is to provide empirical support on the effects of blended learning and individualised instructional strategies on the performance of students in Basic Technology.

2.2 Research Questions

The following research question were raised to guide the conduct of this study:

(1) Is there any significant difference in the mean achievement scores of Junior Secondary School two (JSS II) students taught Basic Technology with blended learning, individualised instructional strategy and conventional instructional method?

(2) Is there any significant difference in the mean achievement scores of Junior Secondary School two (JSS II) students as measured by the Basic Technology Achievement Test (BTAT) ?

2.3 Research Hypotheses

The following hypotheses were tested at 0.05 Alpha level in order to make pertinent decision in the study:

(1) There is no significant difference in the mean achievement scores of Junior Secondary School two (JSS II) students taught Basic Technology with blended learning strategy, individualised instructional strategy and conventional instructional strategy.

(2) The mean scores of JSS II students in Basic Technology as measured by the Basic Technology Assessment Test (BTAT) do not differ significantly due to the effects of blended learning strategy, individualised instructional strategy and conventional instructional strategy.

3. Research Methodology

3.1 Research Design

The study was a quasi-experimental design. Three hundred and sixty four Junior Secondary two students were subjects of the study. They comprised 239 (65.6%) and 125 (34.4%) males and females respectively, who were offering Basic Technology drawn from secondary schools in Ilorin Metropolis comprising of three Local Government Areas. The students in the two sub-groups had comparable background and the age range of 13-15 years.

3.2 Research Instrument

The instrument used for this study was Basic Technology Achievement Test (BTAT). The BTAT consisted of twenty multiple choice items that covered the areas of engineering materials.

3.3 Validation of Research Instruments

To ensure validity, item construction procedures were followed in developing BTAT. Two experienced Basic Technology teachers and one expert in Educational Measurement and Evaluation vetted BTAT in terms of clarity of words, appropriateness to the class and readability. The BTAT was administered on two categories of sampled students. The test-retest method was used to determined the reliability index of

the instrument which equal to 0.64 using Kuder-Richardson Formular (KR21). The manuscripts that were prepared to be used on the web for self instruction were subjected to face and content validity. These were developed with the assistance of Educational Technology Lecturers of the University of Ilorin. Based on the suggestions made, few amendments were made.

3.4 Procedure for Data Collection

The researchers solicited the help of Basic Technology teachers in the selected schools in administering the research instruments. The blended learning instructional strategy and individualised instructional strategy were used in three different lessons each, once in a week with different groups. In other words, treatment lasted for three weeks. The teaching of the two topics (Wood and Metal) using the conventional method was done simultaneously for three weeks. The students here were not given any special treatment, they were taught with normal instructional strategy utilised by most of the secondary school teachers in Ilorin Metropolis. After the treatment, the researchers supervised the administration of the Basic Technology Achievement Test (BTAT) on the subjects. Pre-test, post-test sensitisation was controlled by renumbering the items of the pre-test in the post-test.

3.5 Data Analysis Technique

The data collected were tested and analysed using Mean, Analysis of Variance and Turkey/Kramer test.

4. Data Analysis and Results

The two hypotheses raised for the study were analysed using Mean, Analysis of Variance (ANOVA) and Turkey/Kramer test.

4.1 Hypothesis One

There is no significant difference in the mean achievement scores of Junior Secondary School two (JSS II) students taught Basic Technology with blended learning strategy, individualised instructional strategy and conventional instructional strategy.

Table 1: indicated that the students mean gain score was highest in blended learning strategy group with 31.52, followed by individualised instructional strategy with 15.03 and students mean gain score of the conventional strategy was the least with 8.35. See the table 1 in the appendix.

Table 3 indicated that the significant difference was found with students taught with blended learning strategy as they achieved significantly higher than their counterparts taught with individualised and conventional strategies. Also, students taught with individualised instructional strategy achieved significantly higher than those taught with conventional strategy. See the table 3 in the appendix.

4.2 Hypothesis Two

The mean scores of JSS II students in Basic Technology as measured by the Basic Technology Assessment Test (BTAT) do not differ significantly due to the effects of blended learning strategy, individualised instructional strategy and conventional instructional strategy.

Table 4 showed that the students mean gain score was highest for blended learning strategy group (23.26), followed by the individualised instructional strategy group (9.95), while the least was conventional group (4.80). See the table 4 in the appendix.

Table 5 revealed that the calculated F value (49.8000) was greater than F at 0.05 (2.36) which is 3.00. The null hypothesis of no difference among mean scores of JSS II students is therefore rejected. See the table 5 in the appendix.

5. Discussion of Findings

The findings from the study showed that subjects in the treatment conditions exhibited more significant mean achievement than those in the control group. The students' achievement in Basic Technology were enhanced mostly by the blended learning strategy and minimally by the conventional strategy. It is

evident that the use of blended learning in teaching Basic Technology provides precise feedback and hence incontrovertible evidence of what happened in the class. These findings corroborated with the view of Navonro and Shoemaker (2000) that students in a principles of macro-economic course content class using bulletin boards, and chartrooms and email performed better than students who did not have access to this material.

5.1 Conclusion

In conclusion therefore, the results of the study revealed that the blended learning strategy enhanced the cognitive achievement in Basic Technology. This is followed by individualised learning strategy and minimally by the conventional instructional strategy.

5.2 Recommendations

As a result of this study, it is highly recommended that the blended learning strategy should be given more emphasis during teaching and learning of Basic Technology subject in secondary schools. Efforts should be made towards the integration of this instructional strategy in other related subjects and conducive environment be provided for teachers to exhibit their talents in making teaching-learning process to be more meaningful and interesting.

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Appendix

Table 1: Students Achievement Scores on the Pre- and Post Treatment Test.

Instructional Strategy	Pre-test X SD	Post-test X SD	Mean Gain Score
Blended Learning Strategy	27.35 7.03	59.18 9.51	31.52
Individualised Learning Strategy	26.15 6.87	41.24 9.67	15.03
Conventional Method	27.05 7.15	34.46 8.81	8.35

Table 2: ANOVA on students' Achievement Test due to the instructional strategies in order to find the direction of the difference among the three instructional strategies.

Variation	Sum of Squares	Degree of Freedom	Mean Square	F. N
Between groups	14636.64	2	7318.32	9.7048*
Within groups Total	33054.38 47691.02	360 362	91.8177	

Table 3: Turkey/Kramer post hoc pair-wise comparisons of the students' post-test mean achievement scores.

Instructional Strategy	Mean Scores	Blended Learning	Individualised Strategy	Conventional Strategy
Blended learning	59.18	*26.759	*20.436	
Individualised Learning	41.24			*6.387
Conventional Method	35.42			

Table 4: Students interest scores on pre and post treatment test.

Instructional Strategy	Pre-test X	SD	Post-test X	SD	Mean Gain score
Blended learning strategy	39.85 41.09	10.33 10.63	63.32 51.09	9.7	23.25
Individualised learning strategy	38.91	9.64	10.14 43.75		9.95
Conventional method			11.23		4.8

Table 5: ANOVA on effect of students in Basic Technology as a result of instructional strategy.

Sources of Variation	Sum of Squares	Degree of Freedom	Mean square	F
Between groups	5381.51	2	2688.25	
Within groups				49.800*
Total	19369.6	360	53.98	
		362		

Table 6: Turkey/Kramer post hoc pair-wise comparisons of the students' post-test mean scores.

Instructional Strategy	Mean Scores	Blended Learning	Individualised Learning	Conventional Method
Blended Learning	63.427	*29.182		
Individualised Learning	51.085		*18.202	
Conventional Method	43.658			*11.021

Significant at 0.05

About the Authors

Dr. M.A. Omiola is one of the Senior Trainers and Head of Learning Resources Division in Agricultural and Rural Management Training Institute Ilorin, Kwara State, Nigeria. Also, a part-time Lecturer at the Institute of Education, University of Ilorin, Nigeria. E-mail: tayomayo2001@yahoo.com

Mr. S.O. Awoyemi is a Principal Management Development Official, a Senior Trainer and the Head of Research Division in Agricultural and Rural Management Training Institute Ilorin, Nigeria. E-mail: statisticianbode@yahoo.com

Mr. M.R. Enuwa is a Senior Physics Teacher at the Sapati International School, Ilorin, Nigeria.E-mail: mohammedridwan@yahoo.com

Dr. (Mrs.) R. F. Adebayo is a Senior Management Officer at the Landmark University at Omu-Aran, Kwara State, Nigeria and also a part-time Lecturer at the Institute of Education, University of Ilorin. E-mail: rachfunadebayo@yahoo.co.uk

Learning outcomes are user-friendly statements that tell students what they will be able to do at the end of a period of time. They are measurable and quite often observable. Learning outcomes are usually discussed within the context of program-wide assessment, but they can be valuable components of any class because of the way they sharpen the focus on student learning. Learning outcomesÂ Look for opportunities to refocus students on the outcomes throughout the semester, asking them at regular intervals to reflect on their progress toward these goals. So while you may be introduced to learning outcomes as part of an assessment plan, these tools are most effective within your class when actively used as a way of guiding student learning.