EFFECTIVENESS OF MATHEMATICS TEACHING AND LEARNING EXPERIENCES THROUGH WIRELESS TECHNOLOGY AS RECENT STYLE TO ENHANCE B.Ed. TRAINEES

By

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ABSTRACT

The objective of the study was to find out the effect of learning through Wireless technologies and the traditional method in teaching and learning Mathematics. The investigator adopted experimental research to find the effectiveness of implementing Wireless technologies in the population of B.Ed. trainees. The investigator selected 32 B.Ed. Mathematics Trainees from a College of Education in Tamil Nadu. Tools used were Mathematics learning package developed by the investigator and Achievement test in Mathematics developed by the investigator. In the experimental group, B.Ed. trainees were learning the Mathematics by Wireless technologies in their convenient place and time. The control group B.Ed. trainees were taught using traditional method. Findings of the study showed that there was significant difference between pre-test and post-test scores for the experimental group in learning Mathematics. That is experimental group B.Ed. trainees have achieved high in post- test than the Pre-test. And also there was significant difference in the Post-test Scores of the experimental and control group. That is experimental group B.Ed. trainees have achieved high in post- test than the control group B.Ed. trainees. The investigator concludes that the experimental group is more effective than the control group. Thus the Trainees using Wireless technology for their learning is more successful than the traditional method.

Keyword: Wireless Communication, Wireless Technologies, Mathematics, Teaching and Learning, Effectiveness, B.Ed. Trainees.

INTRODUCTION

Wireless communication is also an Educational technology to improve education. Also, it is the transfer of information between two or more points that are not connected by an electrical conductor. The most common wireless technologies use electromagnetic wireless telecommunications, such as radio. It encompasses various types of fixed, mobile, and portable applications, including two-way radios, cellular telephones, personal digital assistants, and wireless networking. Teaching and Learning provides improvement in all curriculum areas with high quality instruction of the learning that ensures Trainees achieve at high levels.

Definition of Key Terms

Mathematics

According to Richard Courant (1941) Mathematics is an expression of the human mind which reflects the active will, the contemplative reason, and the desire for aesthetic perfection. Its basic elements are logic and intuition, analysis and construction, generality and individuality. Though different traditions may emphasize different aspects, it is only the interplay of these antithetic forces and the struggle for their synthesis that constitute the life, usefulness, and supreme value of mathematical science.

Wireless Technology

Wireless communication is the transfer of information between two or more points that are not connected by an electrical conductor. The common methods of achieving wireless communications include the use of light, sound, magnetic, or electric fields.

Teaching and Learning

Teaching and Learning provides leadership, service, and

support in the development, implementation, and dissemination of learning standards in all curriculum areas. The researchers support school districts and their educators in delivering high quality instruction of the learning that ensures Trainees achieve at high levels.

B.Ed. Trainees

B.Ed. trainees refer to the student teachers who are studying in B.Ed. colleges.

Objectives of the study

1. To find out the difference between the control group and the experimental group in their pre-test scores in learning Mathematics.
2. To find out the difference between the control group and the experimental group in their post-test scores in learning Mathematics.
3. To find out the difference between pre-test and post-test scores for the control group in learning Mathematics.
4. To find out the difference between pre-test and post-test scores for the experimental group in learning Mathematics.

Hypothesis

1. There exist significant difference between the pre-test scores of the control group and experimental group.
2. There exist significant difference between the post-test scores of the control group and experimental group in learning Mathematics.
3. There exist significant difference between the pre test and post-test scores of the control group in learning Mathematics.
4. There exist significant difference between the pre-test and post-test scores of the experimental group in learning Mathematics.

Plan and Procedure

The aim of the study is to find the effect of Mathematics learning through wireless technologies among B.Ed. trainees. The investigator selects a College of Education from the population of B.Ed. trainees in Tamilnadu, and the investigator selected 32 B.Ed. Trainees for the experimental research from the selected College of Education. From the sample the investigator selected 16 Trainees for experimental group and the other 16 Trainees for the control group with respect to the pre-test score. For this research, the investigator used mobile phone and computers along with Internet and Bluetooth technology. Mathematics problems and definitions were sent to the trainees through email or SMS for reference and learning purpose. In the experimental group, B.Ed. trainees were taught the subject Mathematics by using wireless technologies. In the control group, B.Ed. trainees were taught using traditional method. Before and after this treatment, pre-tests and post-tests were conducted for both the groups and marks were entered and tabulated. Using 't' test the investigator found out the mean score differences separately for the control and experimental group.

Review of Related Literature

Gan, & Balakrishnan (2014) have conducted a study on "Determinants of Mobile Wireless Technology for Promoting Interactivity in Lecture Sessions: An Empirical Analysis"

The aim of this paper is to identify adoption factors of mobile wireless technology and to increase interactivity between lecturers and students during lectures. A theoretical framework to ascertain lecturers' intentions to use mobile wireless technology during lectures (dependent variable) is proposed with seven independent variables. The independent variables were ease of use and usefulness from Technology Acceptance Model; trust from Wireless Internet via Mobile Devices model and Mobile Services Acceptance Model; self-efficacy from Social Cognitive Theory; enjoyment from Motivational Model; social influence from Unified Theory of Acceptance and Use of Technology; and uncertainty avoidance from Geert Hofstede's cultural dimensions (Hofstede et al. in "Cultures and organizations: software of the mind," 3rd edn. McGraw-Hill, New York, 2010). Four lecture observations were conducted and interaction barriers were identified. Interviews with 22 selected lecturers were conducted to elicit perceptions of mobile wireless technology use during lectures and to validate the framework's variables. Interview results from thematic analysis strongly validated mobile wireless technology's usefulness as a supporting, collaboration and real-time interaction tool, especially

among introvert students. Ease of use, self-efficacy and enjoyment are supported through familiarity with mobile wireless technology. Majority of the respondents are apprehensive that mobile wireless technology might cause disruptions during lectures, with concerns of redundancy, dependency and misuses amongst students (attributes of uncertainty avoidance). None of the respondents are currently using mobile wireless technology for interaction during lectures, thus lending credence to social influence. Very few respondents agree that use of mobile wireless technology can reduce students' boredom and make lectures more enjoyable, and few perceive intermittent wireless connection will affect user trust. Knowledge of significant mobile wireless technology adoption factors and concerns may be important and applicable to Tertiary Education in Malaysia.

Sanguino, Lopez, & Hernandez (2013) have conducted a study on "WiFiSiM: An Educational Tool for the Study and Design of Wireless Networks"

A new Educational simulation tool designed for the generic study of wireless networks, the Wireless Fidelity Simulator (WiFiSim), is presented in this paper. The goal of this work was to create and implement a didactic tool to improve the teaching and learning of computer networks by means of two complementary strategies: simulating the behavior and performance of communication protocols based on the IEEE 802.11 standard widely studied in networking courses, and providing with improved scope and realism for students engaged in wireless network design and modeling. The Educational interest of this tool lies in the realism of the simulation, which provides a high level of interactivity and visual information through a highly configurable graphic user interface, as well as highly intuitive and easy-to-interpret graphic results. This educational tool was tested by computer networking teachers, students, and professionals. The experience demonstrated the effectiveness of the software and resulted in a significant improvement in the students' practical work, leading to enhanced learning and consolidation of theoretical concepts.

Timur Mirzoev, Joel Stacey White (2012) have conducted a study on "The Role of Client Isolation in Protecting Wi-Fi Users from ARP Spoofing Attacks

This study investigates the role of client isolation technology Public Secure Packet Forwarding (PSPF) in defending 802.11 wireless (Wi-Fi) clients, connected to a public wireless access point, from Address Resolution Protocol (ARP) cache poisoning attacks, or ARP spoofing. Exploitation of wireless attack vectors such as these have been on the rise and some have made National and International news. Although client isolation technologies are common place in most wireless access points, they are rarely enabled by default. Since an average user generally has a limited understanding of IP networking concepts, it is rarely enabled during access point configurations. Isolating wireless clients from one another on unencrypted wireless networks is a simple and potentially effective way of protection. The purpose of this research is to determine if a commonly available and easily implementable wireless client isolation security technology, such as PSPF, is an effective method for defending wireless clients against attacks

Echeverria, Alejandro; Nussbaum, Miguel; Calderon, Juan Felipe; Bravo, Claudio; Infante, Cristian; Vasquez, Andrea (2011) have conducted a study on "Face-to-Face Collaborative Learning Supported by Mobile Phones"

The use of handheld computers in educational contexts has increased considerably in recent years and their value as a teaching tool has been confirmed by many positive experiences, particularly within collaborative learning systems (Mobile Computer Supported Collaborative Learning [MCSCL]). The cost of the devices has hindered widespread use in schools, however, and cell phones have emerged as an attractive alternative. To test their functionality as a platform for collaborative Educational activities, the authors adapted an existing Personal Digital Assistant (PDA) application for the use on cell phones equipped with Wi-Fi. This article examines the problems of developing applications for this alternative technology and reports on a usability analysis of a collaborative classroom activity for teaching physics. The results confirm the viability of the cell phone platform, taking due account of the device's processing, network and interface limitations. With an appropriate design, users quickly master the

technology, though a certain decline in efficiency relative to PDAs is observed.

Maheridou, Antoniou, Kourtessis and Avgerinos (2011) have conducted a study on "Blogs in Distance Education: An Analysis of Physical Educators' Perceptions of Learning"

The flexibility of open and online learning in meeting different kinds of needs in a variety of ways and the need for planners to make appropriate choices, taking a number of factors into account indicates the need to find out more about the evaluation of teacher training through online distance education. In recent years web 2.0 technologies such as blogs enable sharing and collaboration between geographically remote users and offer the opportunity for new forms of student-centered pedagogic practices. The purpose of this study was to examine the physical educators' perception of learning the three blog courses, carried out during an eight week period, in order to enhance their professional development and their skills in effective teaching. In each blog a different cooperative teaching method was applied (STAND, COOP and ICL). Participants were fifty four (n=54) physical educators who teach in elementary and secondary schools of different Greek regions, with an experience of 1.67 to 21.75 years. Data was collected using an online questionnaire after the education programme was completed. Overall, participants' responses in the perceived learning questions supported the benefits of using asynchronous web 2 tools in distance education programmes. Their perception of learning using blogs appears to be positively increased regarding the regulation of the applied cooperative procedure.

Oriaku, Ngozi (2008) have conducted a study on "The challenges and opportunities of wireless technologies in the classroom: related standards and regulations"

Wireless technologies have revolutionized the ways teaching and learning have become in many colleges and universities. It is therefore interesting to observe the way wireless technologies are used to organize small group meetings. It provides online access to internet resources such as instructor lecture series. It finally helps in problem-solving of real-time interactions with students and instructors without being present at the physical place. Through the use of Journal articles, Textbooks, and research findings from the World Wide Web, this paper addresses some concerns: (1) what is the advantage of using wireless devices in teaching and learning? (2) What challenges will one face using wireless devices in classroom? Is it an effective means of teaching and learning? This study therefore, focused on challenges and opportunities of wireless technologies in the classroom and assessed the availability and readiness of students and administrators.

Method Adopted in this Study

The experimental method was adopted to find the effect of Mathematics learning through wireless technologies over the traditional Method among B.Ed. trainees.

Experimental Design

The experimental design employed in this study was the randomized pre-test post-test design. Teaching strategy is the independent variable which has two levels, viz., Mathematics learning through wireless technologies and Traditional Method of teaching.

In this study the experimental group learns Mathematics using wireless technologies and the control group learns Mathematics by traditional Method. The dependent variable is the Achievement test in Mathematics.

Achievement Test in Mathematics

An achievement test has an unavoidable part in an experimental study. The investigator conducted an achievement test for both experimental group and control group to find the effect of wireless technologies. To prepare the test, weightage tables were prepared on the basis of objectives and difficulty level. The question paper was prepared according to the blue print.

Maximum Marks : 50

Maximum Time : 45 minutes

Design of an Achievement Test

Weightage to Objectives

The researcher decides the marks for various objectives; this is known as distribution of weightage of objectives. The objectives selected for the preparation of the test are knowledge, understanding, application and skill. The details of weightage given to these objectives are given in

the Table 1.

Weightage to Difficulty Level

Discriminating power is the ability to discriminate high achievers, average achiever and low achievers by a good test. Priority was shown with regard to the difficulty level of the questions asked. Items are included for the bright, average and dull. The weightage given to difficulty level of test is shown in the Table 2.

Blue Print

A blue print gives the details of the design to concrete terms. Blue print is prepared as a three dimensional chart showing the weightage given to the objectives, content, form of questions in the achievement test. A blue print was prepared by the investigator for setting the questions as shown in Table 3. This was done to see whether the questions were equally spread to all topics.

Note: Figure outside brackets indicate the number of questions and within brackets indicate marks.

On the basis of the specifications of blue-print, question paper was prepared.

Scoring Procedure

Sl. No	Objectives	Marks	Percentage
1	Knowledge	12	24
2	Application	16	32
3	Understanding	11	22
4	Skill	11	22
	Total	50	100

Table 1. Weightage to objectives

Sl. No	Difficulty level	Marks	Percentage
1	Easy	17	34
2	Average	21	42
3	Difficult	12	24
	Total	50	100

Table 2. Weightage to difficulty level

Objectives	Knowledge	Understanding	Application	Skill	Total
Teaching of Mathematics	3(1)	4(1)	2(1)	2(1)	11
Analytic and Synthetic Methods	3(1)	4(1)	4(1)	3(1)	14
Gifted Children	3(1)	4(1)	2(1)	3(1)	12
Inductive and Deductive Method	3(1)	4(1)	3(1)	3(1)	13
Total	12	16	11	11	50

Table 3. Blue print

The final form of achievement test includes 50 objective type questions. The maximum mark awarded for the final test was 50.

Final Try Out

In order to determine the validity and reliability of final achievement test, the investigator conducted the final try out of the test on sample of 35 B.Ed. trainees. The answer sheets were scored in accordance with the scheme of evaluation of final test.

Validity of the Achievement Test in Mathematics

Validity is the extent to which a test measures what it purports to measure. A test is valid to the extent that inferences made from it are appropriate, meaningful and useful. Here the investigator used the face validity for the achievement test. So the test is valid.

Reliability of Achievement Test in Mathematics

The reliability of Achievement test in mathematics was established by split-half method. Split-half reliability refers to the correlation within a single test of two similar parts of the test.

In the split-half method, the whole items are divided into two sets by considering all the odd numbered items as a set and the even numbered items as a separate set. If the two sets of scores were highly correlated with each other, this can be taken as the evidence of the index's reliability. Thus the test was divided into two equivalent halves and the correlation (r) was found for this half-test using Karl Pearson's formula and the value of 'r' was found to be 0.86.

From the self-correlation of the half-test, the reliability coefficient of the whole test (r') is given by the Spearman-Brown prophecy formula. The value of 'r' was found to be 0.92 which indicates that the tool is highly reliable.

Population

The population for the present study was all the B.Ed. Mathematics Trainees of Kanyakumari District. In Kanyakumari District nearly 740 Trainees are undertaking the B.Ed. Mathematics course.

Sample Selected for the Study

Sample of the study consists of 32 B.Ed. Mathematics Trainees selected from a College of Education in

Kanyakumari District. The group was divided into two. One is the experimental group and the other is the control group. Each group consisted of 16 B.Ed. Mathematics Trainees.

Tools Used

The tools used in the present study were

- Mathematics Learning Package, developed by the Investigator
- Achievement test in Mathematics, developed by the Investigator

Development of Mathematics Learning Package (for Experimental Group)

The Mathematics Learning Package was prepared with 4 chapters. It consists of 40 slides with animations, pictures, video and audio.

Development of Lesson Plan (for Control Group)

Teachers should follow certain specific steps in writing lesson plan based on traditional method.

Statistical Techniques Used

Suitable descriptive and inferential statistical techniques were used in the interpretation of the data such as Arithmetic Mean, Standard Deviation and 't' test.

Analysis of the Data

Hypothesis – 1

There exist significant difference between the pre-test scores of the control group and experimental group.

Table 4 shows that the Mean and Standard Deviation for the control group (N=16) is 46.75 and 9.64 respectively. The Mean and Standard Deviation for the experimental group (N=16) is 45.56 and 9.15 respectively. Here the calculated 't' value (2.36) was found to be less than the table value (2.92) at 0.01 level of significance. The 't' was not significant statistically. Therefore, the Hypothesis-1 that, "There exist significant difference between the pre-test scores of the control group and experimental group" was rejected.

It shows that the B.Ed. Trainees are equal in their pre-test scores because they are split by equal matching technique.

Hypothesis – 2

There exist significant difference between the post-test scores of the control group and experimental group in learning Mathematics.

Groups Compared	N	Mean	SD	SEM	Calculated 't' value	p-value
Control	16	46.75	9.64	2.41	2.36	0.032
Experimental	16	45.56	9.15	2.29		

Table 4. Data and results of t- test for the comparison of pre-test scores of control and experimental group

Table 5 shows that the Mean and Standard Deviation for the control group (N= 16) is 73.69 and 9.67 respectively. The Mean and Standard Deviation for the experimental group (N=16) is 84.25 and 12.10 respectively. Here the calculated 't' value (4.29) was found to be greater than the table value (2.92) at 0.01 level of significance. The 't' was significant statistically. Therefore, the Hypothesis-2 that, "There exist significant difference between the post-test scores of the control group and experimental group in learning Mathematics" was accepted.

It was interpreted that the B.Ed. Trainees of experimental group performed better than the control group in their post-test.

Hypothesis -3

There exist significant difference between the pretest and post-test scores of the control group in learning Mathematics.

Table 6 shows that the Mean and Standard Deviation for the pre-test of control group is 46.75 and 9.64 respectively. The Mean and Standard Deviation for the Post- test of control group is 73.69 and 9.67 respectively. Here the calculated 't' value (9.95) was found to be greater than the table value (2.92) at 0.01 level of significance. The 't' was significant statistically. Therefore, the Hypothesis-3 that, "There exist significant difference between the pretest and post-test scores of the control group in learning Mathematics" was accepted.

It was interpreted that the B.Ed. Trainees of control group performed better in the post-test than pre-test. Since there also learning takes place.

Groups Compared	N	Mean	SD	SEM	Calculated 't' value	p-value
Control	16	73.69	9.67	2.42	4.29	0.001
Experimental	16	84.25	12.10	3.03		

Table 5. Data and results of t- test for the comparison of post-test scores of control and experimental group

Hypothesis – 4

There exist significant difference between the pre-test and post-test scores of the experimental group in learning Mathematics.

Table 7 shows that the Mean and Standard Deviation for the pre-test of experimental group are 45.56 and 9.15 respectively. The Mean and Standard Deviation for the post- test of experimental group is 84.25 and 12.10 respectively. Here the calculated 't' value (15.29) was found to be greater than the table value (2.92) at 0.01 level of significance. The 't' was significant statistically. Therefore, the Hypothesis-4 that, "There exist significant difference between the pre-test and post-test scores of the experimental group in learning Mathematics" was accepted.

It was interpreted that the B.Ed. Trainees of the experimental group performed more effectively in the post-test than pre-test.

Findings

- According to Table 4 result, there was no significant difference in the Pre-test scores of the experimental and control group Trainees.
- According to Table 5 result, there was significant difference in the Post-test Scores of the experimental and control group.
- According to Table 6 result, there was significant difference between the Pre-test and post-test scores of the control group.
- According to Table 7 result, there was significant difference between the Pre-test and Post-test achievement scores of the experimental group. That is experimental group B.Ed. trainees have achieved high in post- test than the Pre-test.

Groups Compared	N	Mean	SD	SEM	Calculated 't' value	p-value
Pre-test	16	46.75	9.64	2.41	9.95	0.000
Post-test	16	73.69	9.67	2.42		

Table 6. Data and results of t- test for the comparison of pre- test and post-test scores of the control group

Groups Compared	N	Mean	SD	SEM	Calculated 't' value	p-value
Pre-test	16	45.56	9.15	2.29	15.29	0.000
Post–test	16	84.25	12.10	3.03		

Table 7. Data and results of t-test for the comparison of pre-test and post-test scores of the experimental group

Educational Implications of the Study

The results of the study proved that wireless technology is more effective than the traditional method to improve the teaching and learning process. So the teacher educators give the study material as packages through wireless technologies like Bluetooth, Wifi, Internet, and so on.

Conclusion

The researcher spilt the control group and experimental group as two equal groups and applies the packages by traditional and wireless technology method. The finding shows that there are improvements in both methods and it has occured due to the effect of implementing packages by traditional and wireless technology. Thus from the findings of the study the researcher concludes that the Experimental group is more effective than the control group. This occured due to the learning package through wireless technology. Here the learners can learn their lessons in anywhere, any time using any device in an attractive manner. Therefore Mathematics teaching and learning can improve through wireless technology among B.Ed. Trainees.

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