International Journal of Teacher Educational Research (IJTER) Vol.6 No.1-9 Jan.-Sept. .2017
ISSN: 2319-4642 www.ijter.com
(Journal approved by University Grants Commission, India)

EFFECTIVENESS OF E-LEARNING STRATEGY ON ACHIEVEMENT OF SLOW LEARNERS IN MATHEMATICS

Mr. R. SIVANNATHAM
Guest Teacher Educator
Department of Mathematics
Government College of Education
Orathanad- 614 625
Thanjavur- District
Tamil Nadu, India
E-mail: med10sivan@gmail.com

ABSTRACT

The present experimental study was undertaken with two objectives in view (i) To apply e-learning strategy in teaching and learning of class X Mathematics subject and (ii) To measure the effectiveness of e-learning strategy with special reference of slow learners. Two matched groups of slow learners were constituted for the purpose of this experiment and a normal group comprising average and above average students was also formed in order to assess how far e-learning strategy enabled the slow learners to cope with normal students. The experiment was conducted for a period of three months at the rate of one hour per day in the evening hours and five units in the Xth standard Mathematics subject were covered. The control group and the normal group were taught through traditional lecture method while the experimental group learnt the subject through e-learning strategy. The obtained results show that the e-learning strategy was more effective than the traditional lecture method in teaching and learning of Mathematics at secondary level and it enabled the slow learners of the experimental group to cope with normal students to a considerable extent.

INTRODUCTION

The problem that every educator invariably encounters in teaching every subject, at every grade level of our educational system is how to teach a lesson to a class that consists of students with different skills, learning rates and learning styles. Accommodating instruction to student differences is one of the most fundamental problems and the foremost task of any teacher. The problem of accommodating instruction to individual differences is so important that many educators have subtly suggested that instruction be completely individualized so that every student can work independently as his or her own rate. (Slavin, 1986). Modern era is an age of globalization and liberalization in which new technologies are helping the teachers and the learners in disseminating information which is normally not possible through any other means. Several trends and forces are pushing towards e-learning. Six major trends or megatrends are affecting education according to Michael T. Moe,

Kathleen Bailey, and Rhoda Lau in the Merrill Lynch report titled, *The Book of Knowledge- Investing in the Growing Educational and Training Industry*. The megatrends are occurring in demographics, technology, globalization, branding, consolidation/privatization, and outsourcing (Merrill Lynch, 1999). Teachers need deliberate and persistent effort to use new technologies for faster development and growth due to global competition in corporate sector in general and the teaching-learning process in particular. The 21st Century is witnessing revolutionary impact of e-learning on the complementary two-way process of teaching-learning in real classroom activities (Rameswari, and Ramar 2014).

Education is not static. It is dynamic. There is no guarantee that what worked well in the past will prove to be so in the present. Similarly, the human resources in the present are not like the human resources in the past. Change is the law of nature. Change is essential for growth. To cope with the changes, we have to introduce innovative strategies to do our job in a better way. It is digital era; digital technology has pervaded every field including education. Megatrends in areas such as demographics, technology, globalization, branding, consolidation/privatization, and outsourcing greatly affect the way we learn. Many giants in the technology world are investing in and providing advanced products for and services tailored to the learning market. These companies, which are expected to make great inroads into e-learning, include AOL, Yahoo, Microsoft, IBM, AT&T, and Sun Microsystems, Oracle, and Harcourt. The children of today have a better exposure to digital technology. To teach well such advanced children, we cannot simply use chalk and talk method alone. It is an era of e-learning, web-learning, m-learning and so on. So there is a greater need to employ digital technology in the teaching-learning process so that optimum human resource development can be ensured (Rameswari and Ramar 2014). The students who are generally unable to cope with the work normally expected of their age group are called slow learners (Tansley and Gulliford, 1962). These students with less than I.Q. 90 are traditionally labelled ‘dull normal’ and they are generally slower to ‘catch on’ to whatever is being taught if it involves symbolic, abstract or conceptual subject matter. But it is really not that they learn so slowly as that they lag behind in developmental readiness to grasp the concepts that are within easy reach of the majority of their peers. Such children will eventually grasp the concepts that are within easy reach of the majority of their peers. Such children will eventually grasp these basic concepts or subjects fairly easily but about a year or two later than their age mates (Jenson, 1980). They lack concentration, retention and abstract thinking. As a result, they find it very difficult to keep up with their age group (Ramar 1996 and 2000).

CONCEPT OF E-LEARNING

E-learning covers a wide set of applications and processes such as web-based learning computer-based learning, virtual classrooms, and digital collaboration. It includes the delivery of content via Internet, intranet extranet, audio and videotape, satellite, and CD-ROM. (Pulichino, 2005). However, many organizations only consider it as a network-enabled transfer of skills and knowledge (Brodsky, 2003). E-learning can be defined as learning opportunities delivered and facilitated by electronic gadgets. It differs from age-old traditional system only in the way the contents are delivered. E-Learning is considered a more effective way of teaching to a large group of students, thereby providing consistency in educational quality. E-learning is the convergence of learning and the Internet (Banc of America Securities, 1999). E-learning is the use of network technology to design, deliver, select, administer, and extend learning – (Elliott Masie, 1999). According to Robert Peterson and Piper Jaffrey (1999) e-learning refers to the use of various Internet and web technologies to create, enable, deliver, and/or facilitate lifelong learning. The opportunities made available through e-learning are both significant and numerous. However, when it is conferred with mobility, it allows the learner to have access to learning and information anytime and anywhere. Hambrecht (2000) identifies the differences between e-learning and online learning. E-learning represents the whole category of technology – based learning, while online learning is synonymous with web-based learning. In this case, online learning is actually a subset of e-learning. The term e-learning covers a wide set of applications, and processes, including computer-based learning, web-based learning, virtual classrooms, and digital collaboration. It is technology-based learning. Online learning constitutes just one part of technology-based learning and describes learning via Internet, intranet, and extranet. It is web-based learning.

TYPES OF E-LEARNING

The following are a few of the most common types of e-learning.

- Technology-based learning
- Web-based learning
- Computer-based learning
- Synchronous e-learning
- Asynchronous e-learning

TECHNOLOGY-BASED LEARNING

Technology-based learning includes development of methods that use recent technological developments such as computer-medicated communication, videoconferencing, multimedia, and groupware, video on demand, desktop publishing, intelligent tutoring system, and virtual reality just to name to few.

WEB-BASED LEARNING

Generally web-based learning uses streaming media, text, and graphics to develop existing learning environment that is deployed right on the user via the Internet. It is great way to e-learning for the large group of people scattered across the globe, but it can present the same deployment challenge that the audience encounters in dial-up connecting.

COMPUTER-BASED LEARNING

This is a great alternative to web based learning for graphic or audio rich e-learning, computer e-learning, deployed via CD-ROM, which eliminates the streaming issues that can be associated with web based learning.

SYNCHRONOUS E-LEARNING

With synchronous e-learning, learning and teaching takes place at the same time while the trainer and learners are physically separated from each other.

Examples synchronous e-learning are as follows:

- Internet telephony,
- Web conferencing,
- Online lectures,
- Distance learning via-interactive satellite,
- Audio/videoconferencing

ASYNCHRONOUS E-LEARNING

It means that the user can take the training independent of any schedule. It refers to learning "wherever they are, whenever they need it". Asynchronous e-learning does not need a facilitator or instructor, and is one of the most popular e-learning deployment methods.

Examples of asynchronous e-learning are as follows:

- Self-paced courses via Internet on CD-ROM
- Stored Audio/Video level presentation or seminars

NEED FOR THE STUDY

Effective teaching in any subject depends largely upon the introduction of newer methods of instruction. There is a growing need for trying out newer methods of instruction and establishing their effectiveness in teaching and learning. Nowadays a teacher cannot depend on any single method of teaching. The teacher has to try out several innovative methods. The students are able to understand the concept, principles and content in an effective manner when the innovative newer methods are incorporated in the teaching-learning process.

The immense knowledge explosion taking place in the world warrants newer methods of teaching and learning. Students need unique experience in presentation of the content which is inherent in the e-learning strategy selected for the study. Destiny of a nation is being shaped in her classrooms. The growing number of underachievers and low achievers at all levels of our educational system warrants such a study, as this proposed one, to be undertaken for the enrichment of our teaching-learning process. Moreover, students as well as the teachers have to keep themselves constantly updating so that they can keep abreast of the latest advancement and developments in the field of education.

Students seem intrigued when they discover that the material they normally can only find in a book or class lecture is also available to them in an e-learning program they can quickly master. The possibility of going through the program in a non-linear fashion, jumping ahead or repeating sections at their will, gives the students a feeling of empowerment and control over their learning progress. Being able to type in their own answers (in the electronic notebook for short-answer questions) makes the program interactive and lively. Further, e-learning has a variety of inherent motivational features, such as visual effects, hidden pop-up windows, linkages to other material, etc. Even though there are adequate studies on e-learning in the Western countries, only a few studies have been attempted in the Indian context. Hence, this study is attempted to verify the efficacy of e-learning in teaching and learning of Mathematics at secondary level.

OBJECTIVES

- To find out whether there is any significant difference between the pre-test and the post-test Mean scores of the slow learners in the control group taught through traditional lecture method.
- To assess whether there exists any significant difference between the pre-test and post-test Mean scores of the slow learners in the experimental group who learnt through e-learning strategy.
- To find out whether there is any significant difference between the post-test Mean scores of the slow learners in the control group and the slow learners in the experimental group.

- To assess whether there exists any significant difference between the post-test Mean scores of slow learners in the control group and the students in the normal group.
- To find out whether there is any significant difference between the post-test Mean scores of the slow learners in the experimental group and the students in the normal group.

METHODOLOGY

The various steps followed in the methodology of this study are ensuring infrastructural facilities for e-learning, construction of research tool, identifying slow learning students, sampling, design of the study, applying e-learning strategy in teaching and learning of Mathematics, administration of the tool for pre-test and post-test and employing appropriate statistical techniques for arriving at scientific conclusions.

ENSURING INFRASTRUCTURAL FACILITIES FOR E-LEARNING

The required hardware, software and Internet connectivity were ensured beforehand for the use of the experimental group students during the period of experimental treatment.

CONSTRUCTION OF RESEARCH TOOL

An achievement test was constructed on the basis of items analysis to assess the achievement of the students in Mathematics at secondary level. The items validity by item analysis, reliability by spilt-half method and validity by expert opinion were established.

IDENTIFYING SLOW LEARNERS

For the purpose of this investigation the slow learners were identified on the basis of a three-phase process. The phases are:

i) Identifying phase
ii) Scientific confirmatory phase
iii) Countercheck phase

For the first phase, the third measure recommended by Tansley and Gulliford (1962) which incorporates the first, second and fourth measures of ChintamaniKar (1992) was followed. In the second phase, the identified slow learners were subjected to a scientific confirmatory test. For this purpose Standard Progressive Matrices designed by J.C. Raven which is successfully and effectively used by Soundararaja Rao and Rajaguru, 1995, Ramar 1996; Reddy and Ramar 1996 in the Indian setting was administered to them as a scientific confirmatory test. In the confirmatory test, those who got less score (below 15/60 or below 25th percentile point) and took more time, were classified as slow learners. Lastly, these slow learners were counterchecked on the basis of their rate of learning as suggested by Kirk (1972).

SAMPLE DESIGN

For the purpose of this investigation, 50 slow learners of class X from Government Higher Secondary School, Melatur at Thanjavur district, were selected as stated above. Out of the fifty slow learners finally selected for the study, two groups were formed following systematic random sampling technique. They were placed in the order of merit. All the odd number students formed the control group while the even number students constituted the experimental group. To see whether both the groups were matched or not, Mean and Standard Deviation were calculated for their half yearly examination scores and RPM scores. Then t-test was applied. The obtained t-values (0.62) and (0.78) revealed that both the groups were matched before the experiment. The control group was taught through traditional lecture method while the experimental group students learnt through e-learning strategy.

To assess how far this e-learning strategy enabled the slow learners to cope with normal students, a normal group comprising average and above average students was also formed. For this group, out of 150 students every sixth student was selected on the basis of systematic random sampling technique. This normal group was also taught through traditional lecture method only.

IMPLEMENTING THE STRATEGY

The strategy was implemented for a period of three months after covering the syllabus in the normal way. The experimental group students were subjected to e-learning. The proposed e-learning includes digital presentation, net browsing and the use of DVD & CDS to teach/learn the selected units.

SCORING PROCEDURE

The achievement test consisted of 100 objective type questions. These test items were selected on the basis of item analysis. The total score of the test was 100. For each correct answer, the score was one and for each wrong answer, the score was zero.

STATISTICAL TECHNIQUES USED IN THE STUDY

The data thus obtained were then analysed by using appropriate statistical techniques such as Mean, Standard Deviation and t-test.

FINDINGS AND CONCLUSIONS

1) There is no significant difference between the pre-test and the post-test Mean scores of the control group slow learners taught through traditional lecture method. Though their performance was better in the post-test, they could not make any significant difference (refer Table 1)

Table-1: Pre-test and Post-test Scores Analysis of Control Group Slow Learners

Name of the Test	*N*	*Mean*	*SD*	*Calculated t-value*
Pre-test	25	20.6	5.25	1.62*
Post-test	25	23.2	6.15	

*Note: *Not significant at 0.05level*

2) There is significant difference between the pre-test and the post-test Mean scores of the experimental group slow learners when Mathematics subject is learnt through e-learning strategy. Further, their achievement is higher in the post-test than in the pre-test (refer table 2)

Table-2: Pre-test and Post-test Scores Analysis of Experimental Group

Name of the Test	*N*	*Mean*	*SD*	*Calculated t-value*
Pre-test	25	20.2	5.21	11.26**
Post-test	25	42.4	8.42	

*Note: ** Significant at 0.01level*

As seen from Table 2, an analysis of the rate of progress made by both control group and experimental group throws light on the effectiveness of e-learning strategy in teaching Mathematics to slow learners. From a meagre Mean score of 20.2 in the pre-test, they could gain an impressive Mean score of 42.4 in the post-test, which is more than double the pre-test Mean score. But the control group slow learners could not make significant Mean gain in the post-test. This vouchsafes the advantage of e-learning strategy over the traditional lecture method with special reference to slow learners. This finding is in agreement with the findings of Reddy and Ramar (1997, 1998)

3) There is significant difference between the post-test Mean scores of control group slow learners taught through traditional lecture method and the experimental group slow learners who learnt Mathematics through e-learning strategy. Further, the achievement of experimental group slow learners is higher than the achievement of control group slow learners (refer Table 3)

Table-3: Post-test Scores Analysis of Control Group and Experimental Group

Name of the Group	*N*	*Mean*	*SD*	*Calculated t-value*
Control group	25	23.2	6.15	9.23**
Experimental group	25	42.4	8.42	

*Note: ** Significant at 0.01level*

Moreover, the rate of progress made by the experimental group slow learners is higher than that of the control group slow learners. In terms of percentage, the rate of progress shown by the experimental group slow learners who learnt Mathematics through e-learning strategy is 109.9 percent, while the rate of progress made by the control group slow learners is 12.62 percent. The variation in the rates of progress made by both the groups is the resultant product of implementation of e-learning strategy and it vouches for the effectiveness of e-learning strategy with special reference to slow learners. This is in tune with the findings of Ramar (1996) and Reddy and Ramar (1997, 1998).

4) There is significant difference between the post-test Mean scores of control group slow learners and the normal group students. Further, the achievement of normal group students is higher than the achievement of control group slow learners (refer Table 4)

Table-4: Post-test Scores Analysis of Control Group and Normal Group

Name of the Group	*N*	*Mean*	*SD*	*Calculated t-value*
Control group	25	23.2	6.15	14.29**
Normal group	25	51.6	7.84	

*Note: ** Significant at 0.01level*

As seen in Table 4, the Mean value (23.2) obtained by the control group slow learners in the post-test reveals that they could make a meagre Mean gain only and they could not narrow down the gap between them and the normal group students. It means that the traditional lecture method could not enable control group slow learners to cope with normal students.

5) There is significant difference between the post-test Mean scores of the experimental group slow learners and the normal group students. The achievement of normal group students is higher than the achievement of experimental group slow learners (refer Table 5)

Table-5: Post-test Scores Analysis of Experimental Group and Normal Group

Name of the Group	*N*	*Mean*	*SD*	*Calculated t-value*
Experimental group	25	42.4	8.42	3.97**
Normal group	25	51.5	7.84	

*Note: ** Significant at 0.01level*

However, a critical analysis of Mean values signifies that the experimental group slow learners significantly improved their achievement after the experiment. Moreover, the e-learning strategy enabled the experimental group slow learners to cope with normal students to a great extent. The narrowed down gulf of difference between both the groups bears testimony to the effectiveness of the e-learning strategy. Further, a comparative study of Table 4 and Table 5 testifies to the advantage of e-learning strategy over the traditional lecture method. This buttresses the findings of Ramar (2000) and Reddy and Ramar (2000).

CONCLUSIONS

The above analysis and the findings lead to the conclusion that e-learning strategy is more effective than the traditional lecture method in teaching Mathematics to the slow learners at secondary level. Further, the strategy enables the slow learners to cope with normal students to a considerable extent. Hence, this strategy can be applied as a viable learning strategy in inclusive setting.

IMPLICATIONS

- The proposed learning strategy will ensure wide coverage of student population transcending the barriers of space and time.
- Expertise of teaching professional can be made available to a wider population across the country.
- The e-learning programs can be telecast from one centre and all the students can reap its benefits.
- The e-learning has a motivating quality of its own and it enhances the achievement of the backward students like low achievers, underachievers, slow learners etc. Hence, it will diminish wastage and stagnation in our schools. A necessary orientation can be given at DIET level so that adequate awareness can be developed among primary school teachers also and they will be able to tackle slow learning at the early stage itself.

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