International Journal of Sciences: Basic and Applied Research (IJSBAR)

ISSN 2307-4531
(Print & Online)

http://gssrr.org/index.php?journal=JournalOfBasicAndApplied

Technology in Virtual Mathematics Classrooms in Distance Learning and Students Outlook

Sandhya Kattayat[a*], Smitha Josey[b], Dr. Asha J. V[c]

[a]*Faculty of Engineering and Technology, Higher Colleges of Technology, Abudhabi, UAE*

[b]*Faculty of Engineering and Technology, Higher Colleges of Technology, Fujairah, UAE*

[c]*Asst.Professor(Education) , University of Kerala, Trivandrum, INDIA*

[a]*Email: sandhyamenon24@gmail.com*

[b]*Email: vivianvarsha@gmail.com*

[c]*Email: Ashajv3@gmail.com*

Abstract

Instructional methods are changing in line with the growing world of technology. Distance learning techniques are incorporating technology based techniques. The virtual classrooms bring the classrooms to a wider framework. This study is investigating effect of technology in virtual mathematical classrooms and its impact in student's achievement. Statistical techniques are used to analyze the final result. The final result confirmed that technology in virtual mathematical classrooms increases student's achievement. Student's opinion regarding the use of technology in classrooms is also taken in to account in this study.

Key words: Technology; virtual classrooms; distance learning.

1. Introduction

Distance education is a field of education that includes students from different strata and from different parts of the word. This focusses of different aspects of learning.

---

* Corresponding author.

In cooperating technology facilitates in delivering content to the students who are not physically present "on site" to receive the content. In the changing world of technology this approach is going to change the face of education. The sustained growth of distant education with the wide spread growth of the internet can be seen worldwide**.** Activities in distance education are designed based on the discipline, context, goals of the course etc. Web based instructional methods are increasingly popular due to its accessibility, flexibility and wide spread nature. Online courses are normally acceptable to all as it is dynamic nature irrespective of geographic barriers and culture of the students or gender. Feedback sessions can be made available to the students in affixed time or at a convenient time preferred by both the learner and the instructor. This technique is found to be more student centric promoting independent student work.

1.1 Objectives of the study

This study has 3 main objectives

a. To investigate the effect of technology in virtual mathematical classrooms and its impact in student's achievement
b. To compare the student's achievement in mathematics based on their exposure to technology in distance learning.
c. To gather student's opinion based on the technology assisted distance learning in mathematics

2. Review of literature

Tool that allows different modes of synchronous distance teaching of mathematics was described in a study [1] Module costing models to compare the costs of delivery of: A traditionally delivered face-to-face module, a web-based distance learning module delivered by in-house academic staff. A web-based distance learning module delivered by external contracted staff is investigated in another study. Another [2] study focuses on three groups of problems: quality of distance learning and e-learning; necessity to develop the facilitation skills for teachers who work using distance learning technologies; realization of inclusive approach for the organization of distance learning in inclusive groups where people with disabilities study with people without any disabilities [3]. Another study investigates the opinions of university students about providing value education through distance learning system [4] 3DHT as a good distance learning technology and have the potential of overcoming existing limitations. Reference [5] An article looked into the uses of digital and online tools in distance learning to improve literacy and numeracy of offenders in New Zealand prisons [6]. Another study explains possible educational utilization of Web 2.0 tools, namely blogs, wikis, podcasts and social networks, from the point of importance of interaction for distance education. The second purpose of this study is to investigate adoption process of Web 2.0 tools in distance education by defining theories and models which have different construct that effect this process [7].

3. Method

3.1 Purpose of the research

The purpose of this study is to investigate the effects of technology in virtual classroom on students' achievement at distance education. In the context of this study, "Is technology in virtual classroom more effective in terms of student achievement at distance education?" research question was investigated and examined.

3.2 Mathematical methods

Survey method is used in collecting the data. Along with that semi experimental technique is used to find the effect of technology assisted virtual class rooms. In order to analyze the data, the statistical techniques used are mean, t value and p values. The calculated t and p values are interpreted and the result is given.

3.3 Sample selection and procedure

The participant of this study was 70 second-year undergraduate mathematics students. From this population sample of 64 students were selected in the final stage and their responses were collected. This sample selection was based on the pattern of usage of technology in distance mathematical class rooms and avoiding drop outs. The details of the sample were collected from 12 distant learning centers in Trivandrum district, Kerala, India. The total study was conducted in a span of one academic year. The student's track record of using the technology in distant learning virtual mathematical classroom was checked for each student by checking the number of logins in the programs by the students, total time spend in each, grades in each problem, total grade in each technology based assignment and the attempts of students in each topic or problem. Software programs were set to observe these for each student in the beginning of the program. The data collected were cross checked during the interview section.

Most of the classes were live virtual mathematical class were the instructor can see the students progress in an assignment live. At the live virtual mathematics classroom, the instructor presented different topics. Students were able to ask questions to instructor at the misunderstanding/difficult points and the instructor had solved mathematics problems in detailed online with students. In addition, students could follow the recorded lessons whenever they want.

In this study, to investigate the effects of technology in virtual classroom on students' achievement at distance learning; test 1, midterm and final exam scores of students were examined after the technology assisted virtual mathematics classroom (TAVMC) implementation. In addition, the interviews were carried out with students to determine students' opinion about the technology assisted virtual Mathematics classroom. The interviews were recorded and reported by 3 experts. Students' responses were evaluated and similar responses were classified within the scope of the study.

In order to investigate the effects of technology assisted virtual Mathematical classroom on students' achievement at distance learning, students test 1, midterm exam, final exam scores were examined in detailed and the results were presented for *Virtual Mathematics Classroom Followers Rarely (VMCFR)* and *Virtual Mathematics Classroom Followers Frequently (VMCFF)* groups.

Table 1: Group 1- *Virtual Mathematics Classroom Followers Rarely (VMCFR)*

No of students	Test 1 score	Test 2 score	Final score	Average	No of live Mathematical class following									
					July	Aug	Sep	Oct	Nov	Dec	January	feb	march	total
1	78	76	69	74.3	0	1	2	0	0	1	1	2	1	8
2	74	73	73	73.3	0	0	2	1	0	0	0	1	1	5
3	80	79	80	79.7	1	0	0	2	1	1	1	1	2	9
4	65	60	59	61.3	0	0	0	0	0	1	0	0	1	2
5	72	70	69	70.3	0	1	1	0	2	1	3	0	0	8
6	81	81	82	81.3	2	2	1	0	1	1	0	3	1	11
7	70	73	71	71.3	0	0	0	1	2	0	2	1	1	7
8	69	69	66	68	1	0	1	0	0	1	1	1	1	6
9	74	70	77	73.7	2	3	1	0	1	0	0	0	1	8
10	78	77	74	76.3	0	2	0	1	0	3	1	1	0	8
11	62	69	71	67.3	0	1	0	0	0	2	1	0	1	5
12	61	64	63	62.7	0	0	0	0	1	0	0	1	0	2
13	69	68	71	69.3	0	1	0	1	0	0	2	0	2	6
14	70	77	79	75.3	1	0	2	2	1	0	2	1	1	10
15	66	61	67	64.7	1	0	1	0	0	1	0	0	1	4
16	80	77	82	79.7	1	2	0	1	0	3	1	1	0	9
17	85	86	83	84.7	2	2	1	3	1	1	2	3	1	16
18	77	81	88	82	1	1	2	0	1	1	2	3	1	12
19	74	70	71	71.7	0	1	0	1	2	0	2	1	1	8
20	84	83	85	84	2	1	2	2	1	1	0	3	2	14
21	82	83	79	81.3	0	2	1	0	1	3	2	2	1	12
22	80	74	76	76.7	2	0	1	0	1	1	2	2	0	9
23	75	70	69	71.3	1	0	0	1	2	0	2	1	1	8
24	74	71	69	71.3	0	1	1	1	1	1	1	1	1	8
25	75	78	80	77.7	1	1	0	2	1	1	1	0	2	9
26	84	80	85	83	1	2	1	0	1	2	3	0	1	11
27	88	78	79	81.7	0	2	0	1	1	1	2	3	2	12
28	68	75	76	73	1	1	2	1	0	0	0	1	1	7
29	77	75	79	77	1	1	1	0	2	0	2	0	2	9
30	80	78	78	78.7	1	2	0		0	2	1	1	0	7
31	66	68	63	65.7	0	0	0	1	1	0	0	0	1	3
32	70	75	76	73.7	1	0	0	2	1	1	1	1	1	7

Table 3: Comparison of the groups

Group	mean	Number of students	Standard Deviation	t -value	p-value
Group 1	74.4	32	28.017	-2.64	0.005237
Group 2	78.3	32	11.841		

Table 2: Group 1- Virtual Mathematics Classroom Followers Frequently (VMCFF)

No of students	Test 1 score	Test 2 score	Final score	Average	No of live Mathematical class following									
					July	Aug	Sep	Oct	Nov	Dec	January	feb	march	total
1	60	65	63	62.7	0	0	0	1	1	0	0	1	0	3
2	70	74	78	74	1	1	1	0	1	1	1	2	1	9
3	83	87	76	82	0	2	3	1	1	1	2	1	1	12
4	71	75	83	76.3	2	0	0	0	2	1	1	2	1	9
5	73	77	55	68.3	1	0	0	1	0	1	1	1	1	6
6	83	87	72	80.7	1	2	3	0	1	1	1	0	1	10
7	82	86	81	83	0	2	3	2	1	1	2	1	1	13
8	74	78	83	78.3	1	0	1	1	1	0	1	2	1	9
9	83	87	68	79.3	1	1	1	0	1	1	1	1	2	9
10	83	87	65	78.3	1	0	2	1	1	0	2	0	1	8
11	71	75	83	76.3	1	1	1	1	2	1	1	1	1	10
12	82	86	75	81	1	2	1	1	0	1	2	1	3	12
13	77	81	47	68.3	0	1	0	0	0	2	1	2	1	7
14	78	82	82	80.7	1	2	1	2	2	1	1	0	2	12
15	70	74	83	75.7	2	1	1	1	1	1	0	1	1	9
16	74	78	53	68.3	0	1	0	1	0	1	1	0	1	5
17	81	85	73	79.7	1	1	0	1	1	1	2	1	1	9
18	85	89	79	84.3	2	1	3	1	4	2	1	1	1	16
19	74	78	88	80	0	0	3	4	0	1	2	0	0	10
20	83	87	81	83.7	1	1	2	0	1	2	3	1	3	14
21	76	80	87	81	0	2	1	3	2	0	2	0	1	11
22	79	83	83	81.7	2	0	3	2	2	1	0	1	1	12
23	71	75	75	73.7	1	1	0	1	1	0	0	2	1	7
24	83	87	68	79.3	1	0	1	2	1	1	1	1	2	10
25	67	71	87	75	0	1	1	1	1	1	1	0	1	7
26	78	82	88	82.7	1	0	1	3	1	2	2	2	1	13
27	88	92	83	87.7	3	3	4	3	3	3	3	1	2	25
28	81	85	79	81.7	0	2	3	2	0	0	2	2	2	13
29	88	92	58	79.3	1	2	0	0	1	1	0	0	1	8
30	82	78	88	82.7	1	2	3	3	0	3	1	0	1	14
31	84	82	73	79.7	1	0	3	0	3	0	1	1	1	10
32	72	87	83	80.7	1	0	2	4	1	0	0	0	1	9

4. Analysis

The first objective of the study is to investigate the effect of technology in virtual mathematical classrooms and its impact in student's achievement. In order to investigate the effects of technology assisted virtual classroom on students' achievement at distance education, students' midterm exam, final exam was examined in detailed. According to data analysis, it was found that VMCFF group had significantly higher mean score than VMCFR group's mean score during The technology assisted virtual mathematics classroom and independent group t-test results showed that there was statistically significant difference between VMCFF and VMCFR groups' scores (p= 0.005237).The average score of students for the full course proved that technology assisted virtual classrooms where the students used them frequently surpassed the group where they used it sparingly. According to the findings, it was seen that VMCFF group more successful than VMCFR group.

The second objective of the study was to compare the student's achievement in mathematics based on their exposure to technology in distance learning. Independent t-test was habituated to compare the achievement of groups of students- who were using technology assisted virtual classrooms rarely and who were using technology assisted virtual class rooms frequently. According to the independent t-test results, it was found that there was a consequential distinction between groups' test scores in favor of the group who were exposed technology assisted virtual class rooms frequently. This shows the effect of technology assisted virtual classrooms enhances student's ability of comprehension and thus elevates their achievement. The quality and intensity of the working pattern is high in this approach. The self- interactivity and the focus of content related to the technology assisted classrooms enhance the information processing and knowledge construction. The test result showed low p value for the (less than 0.12) which shows that the result is significant at 95% confidence interval. This low p- value is an indication that result that we obtained is not by chance. This shows the advantage of frequent use of technology assisted virtual classrooms over technology assisted virtual class rooms where it is used sparingly.

The 't' value the comparison of two groups in mathematics was 2.64. This shows that the interdisciplinary approach is significant at 95% confidence interval (critical t value1.96) and the high value of 't' contrast to the 'p' value indicates that frequent use of technology assisted virtual class rooms definitely is a preferred method in distant learning in contrast to the virtual distance learning classrooms where it is used sparingly as it enhances the student's achievement. The value of p is 0.0052 which shows that the result is significant at $p < .05$.

The third objective of the study was to gather student's opinion based on the technology assisted distance learning in mathematics. The interview result showed two trends. It was observed that students had of two main opinions as follows: (1) technology assisted virtual classroom is highly essential in today's changing world and (2) To be able to access the recorded virtual mathematical classroom at any time by students will accelerate students understanding of the concept in a better way. These two were recommended by students as the most important factors of students' achievement. These results indicate that the technology assisted virtual mathematics classroom at distance education is generally positively affecting the student's achievement. Technology assisted virtual classroom has the advantage of being able to show an image and pre produced video footage. The unique advantage of technology assisted virtual classroom is that they provide two-way interaction

between the instructor and the students. Data analysis and student's interview results support importance of technology assisted virtual classroom in distance education. An important advantage in using recorded technology assisted virtual classroom is that students can have control over the program by using the stop, rewind, replay, and fast forward features to proceed at their own pace. Recorded live virtual classroom is also a very flexible medium. This facilitates students to use the recorded live virtual classroom at a time that is suitable to them. Students can repeat the recordings and the material utility until they gain mastery of the concept. This is possible by understanding and analyzing the topic. Students consider the use of the virtual classrooms in two ways. First they prefer it due to the easiness in accessibility. Second is the convenience in timing and pace. It is much easier with the content available on the Web because it is available throughout the year. Distance learning courses give importance to the students as it can be done at any time by sitting at any part of the world. Students can view and use the content in the absence of direct classroom situation. This support the students interview results that providing the recorded live virtual classroom in distance education enhances students' success.

Students whose average score is more is found to be more frequently involved in technology based classrooms. This shows the effectiveness of frequent use of technology in classrooms. The students showed a general trend to use this method towards the end of the course specially just before the exam.

5. Result and recommendations

The result clearly indicates the importance of frequent use of technology in virtual class room situations. This will promote students understanding and achievement. The students are finding it easy to follow the content if technology is used frequently in class rooms. In depth comprehension of topic is possible for the students as the visuals and activities promotes the reasoning abilities. The active engagement of the students in the online activities enhances student's interest and hence it elevates the motivation level of the students. This study was conducted in distant learning program. And was limited to the discipline mathematics. This study was conducted among undergraduate students.

This study can be conducted in other disciplines such as physics, chemistry and biology. This study can be extended to graduate level and secondary level in variety of disciplines. This study can be extended to adult education as this group is mostly working class and prefer in depth study of the topic and the comprehension of the content in lesser time. Even this study can be made in a wider framework by including the aspect of STEM education and by extending it to engineering topics. This study showed that technology assisted instruction is definitely found to enhance the achievement and interest of the students in the respective disciplines. As mobile learning technique is increasingly popular as it is a handy medium, frequent use of technology assisted virtual classrooms are accessible from any place or at any time.

References

[1] Luiz Carlos Guimarães, Thiago Guimarães Moraes, Francisco Roberto Pinto Mattos, Cooperative Distance Learning in Mathematics. Sep. 2005, Volume 2, No.9 (Serial No.10) US-China Education Review, ISSN1548-6613, USA

[2] Chris Garbett, Activity-Based Costing Models for Alternative Modes of Delivering On-Line Courses, European Journal of Open, Distance and E-Learning, http://www.eurodl.org/?p=current&article=431

[3] Daniya Z. Akhmetova, International Education Studies; Inclusive Approach to the Psycho-Pedagogical Assistance of Distance Learning,Vol. 7, No. 11; 2014 ISSN 1913-9020 E-ISSN 1913-9039

[4] Handan deveci,Turkish Online Journal of Distance Education-TOJDE value education through distance learning:opinions of students who already completed value education January 2015 ISSN 1302-6488 Volume: 16 Number: 1 Article 8

[5] Pradeep Kalansooriya, Ashu Marasinghe, and K.M.D.N. Bandara, Assessing the Applicability of 3D Holographic Technology as an Enhanced Technology for Distance Learning, The IAFOR Journal of Education Technologies & Education Special Edition 44,

[6]Caroline Seelig and Leanne Rate, Journal of learning for development The Role Distance Learning has to Play in Offender Education, Vol 1, No 1 (2014), ISSN 2311-1550

[7] Yasemin Koçak Usluel, Sacide Güzin Mazman, science direct,Adoption of Web 2.0 tools in distance education, Procedia Social and Behavioral Sciences 1 (2009) 818–823