A CRITICAL STUDY OF EFFECTIVENESS OF ONLINE LEARNING ON STUDENTS' ACHIEVEMENT

By

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ABSTRACT

An experimental design was carried out to study the effectiveness in learning of tenth grade students in Physics, when taught through online and face-to-face (F2F). A mash-up of different online tools and learning environment was used for the study. Website 'Wiziq.com' provided these online tools and learning environment hence it is used for the study of effectiveness of online learning on students' achievement. A high score in achievement among students' taught and studied through online tools and online learning environment was found through this research. Similarly achievement among students of F2F teaching was found to be low, this is because in F2F learning, collaborating and sharing of resources is limited to the walls of classroom, but online learning made it possible for learning, collaborating, and sharing of resources beyond four walls. Online learning environment provides features such as, user centre, user control and communication, and making teaching learning process learner centric.

Keywords: Online Learning Environment, face-to-face, Web 2.0, Social Networking Sites.

INTRODUCTION

"Tell me and I will forget"

"Show me and I will remember"

"Involve me and I will understand"

- Confucius

In this research effectiveness in learning was studied by comparing achievement in Physics of students of tenth graders when taught through online learning environment with the achievement of students in Physics of tenth graders in F2F learning. Learning of Physics concepts are necessary because it helps students to apply the principles, concepts and laws of physics in solving problems faced by them in their day to day life. Hence teachers make concepts and laws clear and teach students from books, albums, pictures and maps, which fails to achieve the goal of the learners. Teachers in classroom use different approaches in teaching Physics to the learners which is not effective to achieve the exact competency, but giving first hand experiences to the students is the effective method for teaching physics, in which children can have experiences that make concepts clear, but most of the concepts in Physics are abstract and difficult to give firsthand experience to the learner hence there is need to provide learners to visualize through animation, graphics and interactivity. This is possible through use of online tools which provides a conducive learning environment to the students and this Online Learning Environment (OLE) and tools are provided through website Wiziq, where learners get Online White board, uploaded flash animation, and tools for communication and sharing digital resources. In the OLE and White board, learner can enjoy learning, here learning is active and there is provision of interactive and communicative space. Online learning environments are hugely diverse in size, capabilities and services offered, and can cater for individuals ranging in attainment and is not limited to web pages with text, but it includes audio, video, interactivity, games and technologies like videoconferencing and live broadcasting, which has made communication more flexible, comprehensive and dynamic. In terms of academic results, OLE can represent a more successful learning environment and has proven to be motivating in context for learning. The future of OLE has many innovative and exciting possibilities.

Online Learning Environment (OLE)

An Online Learning Environment (OLE) is a set of teaching and learning tools designed to enhance a student's learning experiences by including computer and the

internet in the learning process.

Meaning of Online Learning Environment (OLE)

According to encyclopedia of educational technology (Siddiqui) Online Learning Environment can be described as online domains that permit Synchronous, collaborative interaction among teachers and students, while also providing Asynchronous learning resources for students at any time. OLE offers a learning system made up of many components with the entire advantages of computer – based learning.

Definition

As cited in (VLE, nd), Juan R. Pimentel defines an OLE as follows,

We define an Online learning environment as one that allows learners to perceive the environment, assess situations and performance, perform actions and proceed through experiences and lessons that will allow them to perform better with more experience on repetition on the same tasks in similar circumstances.

This definition of an OLE emphasizes the importance of learning. Learners in an OLE are expected to make use of and include examples, observations, experiences, situations, rules, concepts and techniques in a continuous (e.g., day by day or week by week), permanent (i.e., committing knowledge into memory) fashion to improve the performance of the execution of tasks (VLE, nd).

What is Web 2.0?

The World Wide Web provides digital resources, by helping learners to search, share and collaborate learning, which has surpassed the reach of the traditional classroom. Kahn, observe in (Wisher & Olson , 2002, p. 2), that Web makes possible learning experiences that are open, flexible and distributed, providing opportunities for engaging, interactive and efficient instruction. Dills and Romiszowsk observed in (Wisher & Olson , 2002, p. 2), more than 40 instructional paradigms seeking to advance and improve the online learning experience beyond the traditional classroom. The concept of "Web 2.0" became popular during a conference brainstorming session between O' Reilly and Media Live International. Dale Dougherty observes in (O'Reilly, 2005, p. 1) that "far from having "crashed", the web was more important than ever, with exciting new applications and sites popping up with surprising regularity". Web 2.0 is defined as the, advanced Internet technology and applications including blogs, wikis, RSS (Really Simple Syndication)and social bookmarking.

Web 2.0 and Social Networking Sites (SNS)

A typical Web 2.0 phenomenon is social software. Clay Shirky in (Anderson, 2008, p. 225) defines social software as, "software that supports group interaction", the group interaction may be one to many and many to many, examples are E-mail, Listserv, Discussion Forum, Blogs, Second Life and Virtual Classroom. The Social Software uses a collaborative medium that allows users to communicate, work together, share and publish their ideas and thoughts with high degree of self-organization (Rollett, Lux , Strohmaier , Dösinger , & Tochtermann , nd, p. 7). Skiba observe in (Staples, 2010, p. 248), the tools used to create social network applications and online social networks, are also called as social networking tools and they let users to create self-profile and connect to others to build and maintain a personal network.

Online Versus F2F Classroom

As cited in (Tamargo, nd, p. 27), Schutte observed that the F2F classroom could be sometimes an inhibiting environment for students and its structure can be pressurizing and intimating. Whereas the Online environment encourages freedom of expression and students are more open to communicate and express opinion and would often thrive in these environments. While these results are impressive and online environments have the obvious benefit of being more accessible than F2F classrooms, and are often a more flexible and convenient approach to education, they do however have several unfortunate consequences.

E-books

E-books are new tool for sharing information in learning environment. As cited in (Galloway, Boland, & Benesova, 2006), Siegel and Sousa state that, the goal of Online text books is to move learners skills include… evaluating and synthesizing information from diverse sources; understanding and applying the difference between fact and opinions; grasping multiple and diverse perspectives;

and drawing insights from these perspectives within the context of one's own knowledge base and experiences, thus the web seems to be more suitable for this than the textbooks in many ways.

Whiteboard

Most teachers make use of a chalkboard for further clarification of a point. The instructor of Online learning environment might make use of the shared whiteboard to answer questions from students. In these sessions students can share data visualization and create documents collaboratively-producing and editing text in real time (Galloway, Boland, & Benesova, 2006).

The sound / video system and F2F interaction

An important part of the physical class environment is the personal interaction as questions are asked by the students. Allowing all students to 'hear' the questions and answers helps everyone to learn and encourages additional questions List servers can be used to redistribute e-mail messages, use-net newsgroups, computer conferencing and collaborative work space may serve for sharing this kind of interaction (Galloway, Boland, & Benesova, 2006).

Objectives of the study

- To make a comprehensive study about achievements in teaching physics through Online learning environment and F2F learning environment among tenth grade students.
- To make a comprehensive study about achievement in teaching physics through Online Learning Environment among boys and girls of tenth grade students.

Hypotheses

- There is no significant difference in the level of achievement in Physics of tenth grade students when taught through F2F Method and Online Method.
- There is no significant difference in the level of achievement in Physics of tenth grade boys and girls when taught through Online Method.

Research Design and Methodology

In this research Experimental Method is used to study achievement in Physics of tenth grade students when taught through online method and F2F method.

Sample in this Research

Subjects are randomly assigned to Experimental and Control group i.e., 20 (equal number of boys and girls subjects) are tested under F2F learning Environment group and 20 (equal number of boys and girls subjects) are tested under Online Learning Environment group.

There are about 15 schools of (Maharashtra Board of Secondary and Higher Secondary Schools) in Aurangabad city, out of this 1 school is selected randomly. Researcher took 50% of the sample as boys and 50% of the sample as girls. Table 1 shows distribution of students in Online Learning Environment and F2F Learning Environment.

The sample consisted of different categories of students like (i) female students of Online Learning Environment and F2F learning environment (ii), male students of Online Learning Environment and F2F learning environment. In all 40 students were studied as sample, representing the tenth grade population of Aurangabad city.

Tools and Techniques

A teacher made achievement test is used to study achievement of students in Physics of grade 10th. In this study the test was designed by considering the instructional objectives, questions were framed according to their types and blue print was prepared. Since, the test prepared was teacher made and is not a standardized test. Hence, test was first verified by five experts in the field of education, teachers of Physics and teachers who has taught Science methodology. Expert suggestions and views of these persons were taken into account and face validity of the test was considered.

Analysis and Interpretation of Data

Method of Research

There are different methods of research for different types

S.No	Gender	Online Learning Environment	Face to Face Learning Environment	Total.
1.	Boys	10	10	20
2.	Girls	10	10	20
Total.		20	20	40

Table 1. Distribution of Students in Online Learning Environment & Face to Face Learning Environment

of hypothesis problems. As the researcher has decided to find achievement in Physics of School students of Aurangabad city, the best possible method is Experimental Method. Researcher conducted a pre-test on Physics subject, on students of tenth grade to form an equivalent group, and distributed students who scored equally to control group and experimental group. Control group was taught with F2F method and Experimental group through Online Learning Environment.

Researcher took a topic "Newton's Laws of Motion" of tenth grade from the syllabus of Maharashtra State Board of Secondary and Higher Secondary Education, and prepared lesson plan. Both the groups i.e., students of Online Method and F2F method were taught by using the same lesson plan for 45 minutes in a day for a period of one week (i.e. 6 days). Online Learning Environment provides tools for sharing and communication. Hence, students of Online Method were given opportunities to share knowledge by giving them task of preparing assignment in a group and sharing it through Google documents and submitting it through Moodle Learning Management System (LMS), they were also given experience of communicating through Google groups and web conferencing. Similarly students of F2F method were given assignment in groups and they have to prepare it by collaborating and communicating with each other through F2F. An online test was conducted on the students of Online Learning Method, by using Moodle learning Management System and for the students of F2F a paper pencil achievement test was conducted to find their achievement. The independent sample t-test, Mean and Standard Deviation was analyzed using IBM SPSS Statistics19, Release Version 19.0.0.

The level of significance

The level of significance was set to .05 level, if the value of calculated critical ratio equals or exceeds "t" critical, it may be concluded that the difference between means is significant at the .05 level.

Results

H 1.1

There is no significant difference in the level of achievement in Physics of tenth grade students when taught through F2F Method and Online Method.

Inference

The p value (p=.00) is less than .05, thus difference is Significant at .05 level, hence Null hypothesis is rejected.

Explanation of Study Outcome

From Table 2, the average scores of Face to Face methods (M = 13.65) differ significantly from that of Online Method (M = 17.70), and as shown in Table 3, the p-value is less than .05 and the value "t" (38) = -6.4, therefore, the null hypothesis is rejected. Thus the level of achievement in Physics of tenth grade students when taught through Online Method was better than the traditional method hence online method is effective.

From the above results it is clear that students who has studied Physics through Online Learning Environment has scored better in Physics test, their mean score (M = 17.70) was higher than the mean score of students of F2F method (M = 13.65). Scores of the Students of Online method are better because they have access to information and teaching material 24 hours a day and 7 days in a week. Similarly abstract concepts were explained with animation, graphics and interactivity, from different online resources. Scores of Online Method group were better for categories of application and analysis questions, similarly their scores were higher in assignment but the students of F2F method scored lowered in test, particularly questions related with

Group Statistics

	Online and Face to Face Methods	N	Mean	Std. Deviation	Std. Error Mean
Students Score	Face to Face Method	20	13.65	2.20	.49
	Online Method	20	17.70	1.75	.39

Table 2. Group Statistics for F2F and Online methods

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2 tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Students Score	Equal variances assumed	.53	.47	-6.43	38	.00	-4.05	.629	-5.32	-2.77
	Equal variances not assumed			-6.43	36.12	.00	-4.05	.629	-5.32	-2.77

Inference: Difference is Significant at 0.05 level, hence Null hypothesis is rejected.

Table 3. Independent Samples Test for F2F and Online methods

application and analysis and also their score was lower in assignment because they did not got opportunities to access information, interact with learning objects and collaborate in learning at their convenience therefore they scored lower.

H 1.2

There is no significant difference in the level of achievement in Physics of tenth grade boys and girls when taught through Online Method.

Inference

The p value (p=1.00) is greater than .05, thus difference is insignificant at .05 level, hence Null hypothesis is retained.

Explanation of Study Outcome

From Table 4 the average scores of Boys' students of Online Classroom (M = 17.70) similar with Girls students of Online Classroom (M = 17.70), and from Table 5, the p value is greater than .05 and the value "t" (18) = 00, Thus achievement of boys and girls in Physics are similar, when taught through Online learning method.

Suggestions

This experiment was intended to assess the achievement in Physics of School students of a F2F classroom, against online classroom. The data indicate that students of online classroom perform better than the F2F classroom.

Group Statistics					
	Boys and Girls	N	Mean	Std. Deviation	Std. Error Mean
Students Score	Boys	10	17.70	1.63	.51
	Girls	10	17.70	1.94	.61

Table 4. Group Statistics for boys' students of F2F Method and Online Method

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2 tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Students Score	Equal variances assumed	1.16	.29	.00	18	1.00	.00	.80	-1.68	1.68
	Equal variances not assumed			.00	17.48	1.00	.00	.80	-1.69	1.69

Inference: Difference is insignificant at 0.05 level, hence Null hypothesis is retained.

Table 5. Independent Samples Test for boys' students of F2F Method and Online Method

Following are some of the suggestions for enhancing teaching and learning of Physics among students.

- From the hypothesis proved, the learners of online classroom scored higher than the F2F classroom, because they get an opportunity to interact and manipulate learning objects actively, which is provided in the Wiziq Online environment. But the learners of F2F classroom did not get the opportunity to interact actively and manipulate learning objects.
- Students' achievement in Physics when taught through Online classroom was better, because the Online learning removes geographical barriers (Anywhere learning) by allowing learners and teachers to attend a single live training session from any place in the world. Hence in F2F Classroom students should be given an opportunity to access learning objects 24/7 and from any place. Thus a blended form of learning should be adopted for enhancing learning.
- Students achievement in Physics when taught through Online classroom was better, because they gets an opportunity to engage in the learning experience that took place from the recorded session feature in a Wiziq Online classroom, If learners miss a F2F classroom-based training session, they have very little opportunity to engage in the learning experience that took place, even the teachers get an opportunity to review their own or their colleagues' performance.
- Mash-up of different tools in the Wiziq Online classroom help teacher to organize sessions more quickly than F2F classroom-based training. Classrooms, board, speakers and projectors do not need to be reserved; materials do not need to be distributed. The sessions are easier to schedule or reschedule since attendees will not be traveling to the venue of the session.
- From the hypothesis proved, the learners of Wiziq Online classroom scored higher than the F2F classroom, because of the individual attention given to each student, but since in F2F classroom, whole class was given learning experiences and hardly there was one to one communication.
- PowerPoint slides, videos, movie clips and flash

animation uploaded on Wiziq helped learner to view independently, where they can respond to questions posted by the teacher. Hence learner got an opportunity to view and revise their lesson, till the concepts get cleared, thus the learner of Wiziq Online classroom scored higher than the F2F classroom.

- Students of Wiziq Online classroom got an opportunity to independently explore websites that support or supplement the content presented, this helps in self-learning among learner.
- Online classroom provides an opportunity to have live applications, such as Word and Excel Students can use programs independently to do tasks and assignments.
- Wiziq Online classroom provides learner, the opportunity to participate in several types of activities including: hands-on practice with software applications answer multiple-choice surveys make notes with annotation tools play games designed to test and validate knowledge visit Websites view slides and presentations watch video lessons.
- Wiziq Online classroom provides learners with features such as Whiteboard and to record class notes and highlight important details of discussion.
- Wiziq online classroom provides learners with features such as Text chatting and Video chatting. Collaborative learning is possible through online chat, video chat, and discussions. Students can interact through a content related discussion topic; it also allows multiple learners to speak at the same time while others only allow one person to speak at a time.
- Through Screen sharing and simulation features in Wiziq Online classroom provides supervised hands-on practice with software applications.
- Wiziq Online classroom provides feature like write on whiteboards which provides students, moderators and instructors to put their views and figures.
- Online resources provide learners 24/7 access to curriculum.
- White board provides access to link web resources for assignments.
- Wiziq Online classroom provides feature which helps in sharing resources with teachers and students' thus students can share and submit their work and get their work reviewed quickly.

Conclusion

Online Learning Environment is highly effective and facilitates the comprehensions and assimilation of concepts in Physics. From the scores obtained it can be inferred that girls and boys have achieved equally when taught through online learning environment. Students should be given an opportunity to learn through online classroom, where they can interact with the content, and gets space to share learning objects. Similarly they also get an opportunity to collaborate with their peers in creating knowledge. In Online learning environment teacher can explain abstract concepts with the help of animation and graphics, thus developing imagination among students.

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