

Effectiveness Of Interactive White Board(IWB) On The Achievement Of Higher Secondary Students In Physics

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Abstract

This experimental study intends to find out whether the interactive white board is effective among the higher secondary students in their physics learning and examine how it is beneficial to the students in their achievement. In addition to that, this study also tries to find out IWB 's role among different student achievement categories with regard to their cognitive objectives namely knowledge, understanding and application. From the study it is found that the Interactive White Board technology is more effective in teaching and learning Physics than the conventional method.

Keywords: Interactive White Board, Physics, IWB, Effectiveness

Introduction

Educational technology has always been considered as the effective force of bringing pedagogical change. An emerging class of technology that offers enormous potential in generating these pedagogical changes is the *interactive whiteboards*. It also offers a great deal of opportunity to increase the interactivity among the students, the teacher and the students and the student and the curriculum. The recent educational technology aims at emphasizing the shift from memory –based learning towards the understanding-based learning where the student is given ample space both physically and intellectually to construct their own meaning facilitating the learning process. This study attempts to examine the effectiveness of an emerging class of educational technology called the Interactive White Boards(IWB) which has gained unparalleled significance in the recent years in the educational institutions, on the achievement of the students in Physics.

Significance of the Study

This study intends to provide knowledge in the process of technology integration in education by introducing valuable findings for educators interested in present and future Interactive White board technology.

The incredible increase in the number of IWB installed in the classrooms across the world both in the developed and developing nations has the evidence that this technology is certainly manifesting some oblivious qualitative behavioral modifications in the students like elevated engagement level, motivation, creating a positive attitude among the teachers and students. But there arises a need to examine the quantitative changes that may occur in the learners as a result of the impact of this technology therefore, a permanent or a concrete change rather than the temporal changes which may wither away with time. Hence this study will measure these quantitative changes in a

statistical way so as to determine how far the Interactive White board is effective in the teaching-learning process, in the classroom. In particular this study will bring into light, the level of understanding and comprehension accentuated with the use of Interactive White board when the students are introduced to complex, concepts in physics. This study will also be help to derive comparison between the traditional method of teaching and the technological integrated method of teaching. The scope of this study also extends to inform the educators, educational managers who are responsible for the curriculum development and the delivery strategies and also helpful to the heads or the directors of teaching and learning institutions and organizations.

Operational definition of the important terms

1. Interactive white board: An interactive white board is a large interactive electronic display that connects to a computer and projector. A projector projects the computers' desktop on to the board surface where the users control the computer and also the board using a pen, finger or other device called Stylus. The board is typically mounted to a wall. They are used in a variety of settings, including classrooms at all levels of education. The learning content under many number of modules appropriate to all the grade levels is stored in the server and can be retrieved by permitted persons using the IWB depending upon the teaching and learning needs.

2. Effectiveness: The effectiveness is a measure of the ability of a program, project or a task to produce desired result. This study measures the effectiveness in terms of achievement scores when the interactive white board is used in teaching Physics.

Methodology used for the study

The method adopted by the investigators for the study is the true experimental design: *pre test, post test equivalent group design*. The true experimental designs are more sophisticated form of experimental design wherein it employs randomization to provide for control of the equivalence of groups and exposure to treatment. The investigators adopted the experimental method, because, the researcher can manipulate one variable and control/randomize the rest of the variables.

Selection of the Sample: A sample group of 60 students were randomly selected from the higher secondary first year students of Little Flower Matriculation Higher Secondary School, Tirunelveli Town and the group test of intelligence was administered to this group. Pairs of subjects who had the identical or the nearly identical scores were selected. One of them was assigned to one group and the other one in the pair to the another group. After assigning the subjects equally in both the groups (i.e 30 in each group) the decision about which group would serve as the experimental or the control group was made by tossing a coin.

Tools for study: The investigator has used the following tools for the study,

The Interactive White Board along with the accompanying learning content developed by the Physics experts and the software professionals at Educomp solutions Pvt Limited.

1. Group Test of Intelligence, Constructed and Standardized by Dr.(Mrs.)Pramila Ahuja, Central Institute of Indian Languages, Mysore.
2. Pre-test developed by the investigators.
3. Post-test/Achievement test developed by the investigators.

Statistical Techniques Used: Mean, variance and 't' test for determining the significance of difference between the means of the two matched groups are used for data analysis.

Conducting the experiment

1. Before the treatment the pretest was administered to both the experimental and control group and the mean scores of both the groups were found to be almost identical, which indicated that the groups are equivalent with regard to the previous knowledge.
2. The experiment was conducted for three weeks where the experimental group received lessons with IWB in the smart classroom and the control group received the same lessons in the conventional method.
3. After the treatment has ended, both the groups were administered the post test on the same day. The obtained post test scores were statistically analyzed to examine the effectiveness of the IWB.

Results and Discussion

Objective 1 :To find the significant difference between the gain scores of the experimental group and the control group.

Hypothesis 1:There is no significant difference between the gain scores of the experimental group and the control group.

Table 1

Significant Difference between the gain Scores of the Experimental Group and the Control Group at 0.05 level

Group	df	Mean	Variance	't' cal	't' table	Remark
Control	29	10.3	65.3	2.56	2.04	Significant
Experimental		14.1	27.4			

Objective 2: To find the significant difference between the gain scores of the experimental and the control group in the dimensions of knowledge, understanding and application.

Hypothesis 2: There is no significant difference between the gain scores of the experimental and the control group in the dimensions of knowledge, understanding and application.

Table 2

Significant Difference between the gain scores of the Experimental Group and Control Group in the Dimensions (D) of Knowledge (K), Understanding(U) and Application(A) at .05 level

D	df	Control Group		Experimental Group		't' cal	't' table	Remark
		Mean	Variance	Mean	Variance			
K	29	5.5	20	7.4	8.5	2.27	2.04	Significant
U		1.9	10.7	2.3	4.3	0.67		Not significant
A		2.9	10.7	4.3	5.2	2.15		Significant

Observation and Discussion

Interactive White Board an effective Pedagogical tool

The results from Table 1 show that the experimental mean is greater than the mean of the control group while comparing the calculated 't' value and the table 't' value, thereby rejecting the null hypothesis. It indicates that the interactive white board is effective wherein it allows those classroom development activities that encourage greater focus, participation and interaction and improve the student learning outcome bringing into the classroom every possible advantage. The content is more memorable because of the visualization which provides a stronger medium and IWB medium simultaneously accommodates all the learners with different learning styles who would benefit substantially. Similar results can be derived from many number of studies, for instance, in a mixed method design study conducted by Grier (2009) indicated that all students regardless of their ability achieve greater mastery of science content in IWB classroom.

Hurdles on learning path

From the results from Table 2 it can be found that the means of the experimental and the control group doesn't differ much in the dimension of understanding. The investigator considers some of the reasons stated below may have imposed certain difficulties limited to this particular population. Firstly, the content of teaching along with the recorded voice though in English would rather have different style and accent which may be not familiar to the students. Secondly, a good teacher always gets clues from the students behavior and adjusts the pace accordingly giving elaborate explanations when necessary in the classroom while teaching. These factors may have been the obstacles in the learning path but can be overcome by ample amount of training and good practice on behalf of the teacher which would make learning through IWB more interactive and effective.

Moreover it has been observed from the study conducted by Daniel ,Rolf ,Katrin and Sonja(2005) that when learners explore dynamic and interactive visualization they are not often able to interact in a systematic and goal oriented way .This may be due to the lacking of the prerequisite knowledge such as

the coherent mental integration of symbolic and pictorial sources of information. This study also reveals that the active integration of static representations before processing dynamic visualizations resulted in better performance. The investigator considers that this unfamiliarity with the interactive media may also had some difficulty as the subjects were exposed to the interactive white board technology for the first time and they had no preliminary chances of familiarizing with it.

Objective 3: To find the significant difference between the gain scores of the high achievers in the experimental and the control group.

Hypothesis 3: There is no significant difference between the gain scores of the high achievers in the experimental and the control group.

Table 3

Significant Difference between the gain Scores of the high Achievers in the Experimental Group and the Control Group at 0.05 level

Group	df	Mean	Variance	't' cal	't' table	Remark
Control	9	19.6	8.7	.4	2.262	Not Significant
Experimental		19.7	6.2			

Objective 4: To find the significant difference between the gain scores of the high achievers in the experimental and the control group in the dimension of knowledge(K), understanding(U) and application(A).

Hypothesis 4: There is no significant difference between the gain scores of the high achievers in the experimental and the control group in the dimension of knowledge(K), understanding(U) and application(A).

Table 4

D	Df	Control Group		Experimental Group		't' cal	't' table	Remark
		Mean	Variance	Mean	Variance			
K	9	9.8	7.2	10.8	3.9	1.3	2.262	Not Significant
U		3.1	2.05	3.5	3.7	0.25		Not Significant
A		6.3	4.4	5.7	3.7	.27		Not Significant

Observation and Interpretation

Need for more sophisticated Measuring tools

From the tables 3 & 4, it can be inferred that there is no significant difference in the gain scores of the high achievers of the experimental group and control group on the whole as well as the in any of dimension. So the null hypothesis cannot be rejected.

This may be attributed to the fact the high achievers are by their own accord fast learners, meticulous, intrinsically motivated who demand very little effort on the part of the teacher. The investigator also speculates the following, the investigator had devised a measuring tool to measure those cognitive objectives namely the knowledge, understanding and application, but there are also other functions in the hierarchy of cognition like reasoning, analysis and more prominently the concept formation etc. which were not measured in the study. But with the redesign of the study and with the reconstructed sophisticated tool for measuring those cognitive objectives would reveal vivid results about the specified ways in which the IWB technology would aid the students learning especially in the high achievement category. These ideas derive their strength from the results of the study by David(2008) which indicate that an integrated, IE model of instruction can concurrently promote the conceptual content mastery and epistemological development of Advanced Physics Students.

Objective 5: To find the significant difference between the gain scores of the moderate achievers in the experimental and the control group.

Hypothesis 5: There is no significant difference between the gain scores of the moderate achievers in the experimental and the control group.

Objective 6:To find the significant difference between the gain scores of the moderate achievers in the experimental and the control group in the dimension of knowledge, understanding and application.

Hypothesis 6 There is no significant difference between the gain scores of the moderate achievers in the experimental and the control group in the dimension of knowledge, understanding and application.

Table5

Significant Difference between the gain Scores of the moderate Achievers in the Experimental Group and the Control Group at 0.05 level

Group	df	Mean	Variance	't' cal	't' table	Remark
Control	9	10.2	6.4	8.5	2.262	Significant
Experimental		14.3	1.5			

Table 6

Significant Difference between the gain scores of the moderate Achievers in the Experimental Group and Control Group in the Dimensions(D) of Knowledge(K), Understanding(U) and Application(A) at 0.05 level.

D	df	Control Group		Experimental Group		't' cal	't' table	Remark
		Mean	Variance	Mean	Variance			
K	9	5.7	4.4	7.5	3.6	3.3	2.262	Significant
U		2.1	2.2	2.9	3.6	0.93		Not significant
A		2.3	5.5	3.9	4.1	1.44		Not significant

Observation and discussion

From the tables 5 and 6,it is observed that the experimental mean is greater than the control mean on the whole and the null hypothesis is rejected. But while considering the dimension of understanding and application the experimental and the control mean do not differ significantly and the null hypothesis cannot be rejected and it is accepted.

Objective 7: To find the significant difference between the gain scores of the low achievers in the experimental and the control group.

Hypothesis 7 : There is no significant difference between the gain scores of the low achievers in the experimental and the control group

Objective 8: To find the significant difference between the gain scores of the low achievers in the experimental and the control group in the dimension of knowledge, understanding and application.

Hypothesis 8 : To find the significant difference between the gain scores of the low achievers in the experimental and the control group in the dimension of knowledge, understanding and application.

Table 7

Significant Difference between the gain Scores of the Low Achievers in the Experimental Group and the Control Group at 0.05 level

Group	df	Mean	Variance	't' cal	't' table	Remark
Control	9	1.3	9.3	23	2.262	Significant
Experimental		8.3	8.4			

Table 8

Significant Difference between the gain scores of the Low Achievers in the Experimental Group and Control Group in the Dimensions(D) of Knowledge(K), Understanding(U) and Application(A) at 0.05 level

D	df	Control Group		Experimental Group		't' cal	't' table	Remark
		Mean	Variance	Mean	Variance			
K	9	1	9.7	4.1	6.7	4.2	2.262	Significant
U		.3	1.2	.7	2.3	0.68		Not significant
A		.1	2.5	5.9	6.0	4.08		Significant

Observation and Discussion:

Interactive White Board Most Beneficiary to low achievers

From the Tables 7&8 it can be inferred that there is a significant difference in the gain scores of the low achievers of the experimental and the control group on the whole and also in the dimensions of knowledge and application. From the results obtained it can be understood that this variance from the low achievers category may have contributed much more than any other category, to the total variance that had risen out of the experimentation. This may be undoubtedly attributed to the enormous learning opportunities IWB brings into the classroom like the visual images presented in the content which facilitates the learners to store a lot of information and retrieve them as effectively as possible and also owing to the factors like sustaining the attention and focus of the learners. From this inference we can understand that this technology is highly effective with the low achievers by enhancing their learning.

From another perspective the investigator who served as the teacher during the experiment also observed through Self observation that the IWB was very beneficial in gaining a deeper understanding of the subject matter and to develop efficient strategies for teaching. These observations can be confirmed with the findings of a case study conducted by Joseph and George (2009) suggest that Interactive white boards may serve as a catalyst for changes to teacher pedagogy.

Also, in a study conducted by Lyn (2008) indicate that use of interactive white board as an instructional tool has beneficial effect on students engagement in classroom lessons and leads to improved student behavior. In another qualitative study conducted by Bruce and Rose(2010) indicate that the students in the treatment group reported higher levels of motivation relative to the control group students.

Major Findings of the study

1)It can be deduced from this study that the Interactive White Board along with the accompanying software is more effective than the conventional method in Physics teaching and learning.

2)The Interactive White board technology is more beneficial to the low achieving category of the students by increasing their level of engagement and motivation.

To sum up, Interactive White Board can be considered to be a value addition in quality, this innovative technology presenting a wide range of opportunities by simultaneously encouraging the whole group and also by entertaining the individualistic needs of the group to optimize learning.

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