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Developing Attitude And Learning Mathematics Among Students Using Interactive Whiteboards In Classrooms

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Abstract:
The present study envisages the enhancement of attitude and learning of Mathematics among students when Interactive Whiteboards are used in classrooms for teaching. Experimental method of investigation is designed on the basis of the problem, assumption and hypotheses formulated and it also warrants a psychometrically sound design, procedure, tools and execution. This experimental study is conducted in two classes of standard IX for a period of 30 days. One section of students, called control group is taught by traditional method and the other section of students, called experimental group is taught with the help of Interactive Whiteboard in the classroom. The results of the statistical analyses show a significant difference between experimental and control group students pertaining to attitude and academic achievement in Mathematics. The gain scores pertaining to attitude and academic achievement in Mathematics of students in experimental group are found to be significantly higher than the scores of students in control group.

Keywords: Attitude, Academic Achievement in Mathematics, Interactive Whiteboard

1. Introduction

As education is an integral part of helping the children become good citizens, it should strive to inculcate self-discipline, good attitudes and commitment in them. In today's era, both information and knowledge stand out as very important and a critical input for growth and survival of the young ones. Education not only imparts knowledge and skills, it is also responsible for building a human capital with good values and attitudes, so as to bring about technological innovation and economic growth.

Rather than viewing education simply as a means of achieving social upliftment , the society must look at education as an engine of advancement in an information era propelled by its wheels of knowledge and research leading to development. Education should be joyful to students rather than burden and boredom.

Though Mathematics is an important subject from the ancient period, it has not been the subject of interest for many students. Mathematics being highly abstract is concerned with ideas rather than objects; with the manipulation of symbols rather than the manipulation of objects. It is a closely-knit structure in which ideas are interrelated. Mathematical concepts are hierarchical and interconnected, much like a house of cards. Unless lower-level concepts are mastered, higher-level concepts cannot be understood. Teaching of Mathematics is not only concerned with the computational know how of the subject but is also concerned with the selection of the mathematical content and communication leading to its understanding and application. So while teaching Mathematics, one should use teaching methods, strategies and pedagogic resources that are useful in developing better attitudes towards the subject and an urge to perform better each time.

Attitude towards Mathematics plays a crucial role in the teaching and learning of Mathematics and it affects the achievement of students in Mathematics. The teaching method, school environment, family and students' attitude towards school, all affect the attitude towards Mathematics of students. Usually, the way Mathematics is presented in the classroom and perceived by students stands to alienate many students from Mathematics and researchers have concluded that a positive attitude towards Mathematics leads students towards success in Mathematics (Barton, 2000). According to Ma and Xu (2004), attempts to improve attitude towards Mathematics at lower level provides a base for higher studies in Mathematics and also brings about a positive effect in the achievement of Mathematics at Secondary school level. Thus a need is felt to investigate the development of attitude and academic achievement towards Mathematics using advanced technology like Interactive Whiteboards for better teaching and learning.

An Interactive Whiteboard features touch detection for user input. It is a touch-sensitive screen that works in conjunction with a computer and a projector. Educators were the first people to recognize the Interactive Whiteboards as a potential tool for improving student learning outcomes and streamlining lesson planning. These boards operate as part of a system that includes a projector and computer software. The projector displays what is on the computer onto the whiteboard, either by writing with one of the specialized pens or by touching the screen, and the projected image can also be altered from its original state, which creates an interactive teaching and learning opportunity for both teachers and students.

2. Review of related Literature

The purpose of the investigation is to study effect of using Interactive Whiteboards in classrooms for developing attitude and enhancing academic achievement in Mathematics among students. The studies reviewed pertaining to attitude towards Mathematics, academic achievement in Mathematics and use of Interactive Whiteboards in classrooms are compiled and presented hereunder.

2.1 Use of Interactive Whiteboards in Classrooms and Attitude towards Mathematics

Interactive whiteboards are regarded as one of the most revolutionary instructional technologies for various educational levels. Considering the possible advantages of Interactive Whiteboards, teachers can enrich their instructions with various instructional strategies and techniques and, therefore, increase students' attention, attitude, motivation, participation, and collaboration by means of an Interactive Whiteboards (Levy, 2002; Beauchamp and Parkinson, 2005; Hall and Higgins, 2005; Glover, Miller, Averis, and Door, 2007).

Robinson and Matthew (2004) conducted a study investigating the impact of the interactive electronic Whiteboard on student attitude and achievement in Middle school Mathematics .The sample consisted of two seventh grade Mathematics classes. The experimental class had access to the use of the interactive electronic Whiteboard while the control class was taught without the use of the board. Pre and post-tests were given to measure the students' change in visualization skills and content knowledge over the course of instruction. Interviews with students were conducted to investigate the nature of the interactive Whiteboard and its impact on student attitude towards technology and student attitude towards the teaching and learning of Mathematics. Though the outcome showed no significant difference in content learning or visualization gains, student motivation and interest in Mathematics class evidenced a significant increase.

Berna and Avten (2010) investigated the attitudes and views towards usage an Interactive Whiteboard in Mathematics lessons. The sample consisted of 60 students from a public school, whose lessons were covered using an Interactive Whiteboard for 5 weeks. Qualitative and quantitative data were collected and at the end of the research, it was determined that students' attitudes towards the use of Interactive Whiteboard in Mathematics classes was at a medium level and that students saw the Interactive Whiteboard as a tool which increased the interest and facilitated learning of Mathematics among students.

Suleyman (2010) developed an attitude scale for smart board use in education. The sample consisted of ten students, one teacher trainer specialized in smart board use, three teachers experienced in smart board use, and a language expert participated in the qualitative part. Data was collected from 203 elementary students from two local schools in Malatya, Turkey. The goodness of fit indices produced by Confirmatory Factor Analysis confirmed the fit of the model to the data. Reliability of Smart Board Attitude Scale was also proved through multi-analyses.

Biro (2011) presented the opinions of 618 students in connection with the new device, Interactive Whiteboard used for teaching. Based on their positive reaction, the students appreciate the new equipment since it made the lesson more interesting, more enjoyable, more fun and easier to understand. Also they were more motivated to search for information on the internet and internet helps them to enjoy the process of learning. A similar study was conducted by Rahimi and Hosseini (2011). In their study, they assessed Iranian high-school students' attitudes towards learning English as a foreign language in Computer Assisted Language Learning environment before and after experiencing some computer-based activities. The findings revealed that students had moderate positive attitudes towards Computer Assisted Language Learning. This was improved after the experiment generally under the influence of computer-based instruction.

2.2 Use of Interactive Whiteboard in Classrooms and Academic Achievement in Mathematics

Achieving proficiency in the area of Mathematics appears to be a particular area of challenge for students in most of the countries. Research in the area of Mathematics achievement has examined a number of explanations as to why some students are test proficient and many are not (Hyde et al., 1990; Mevarech, Silber, and Fine, 1991; Rangappa, 1993, 1994; Mason and Scrivani, 2004). Many correlates, like intelligence, curriculum have been researched to explain academic achievement in Mathematics (Choudhary, 2004; Thomas and others, 2010). In the present era, technology in classrooms has gained momentum and has also become an important determinant of learning of Mathematics among students.

According to Goldberg (2009), the Missouri Research and Education Network and the Missouri Department of Elementary and Secondary Education included SMART interactive whiteboards in school programmes and the Annual report that analyzed the impact of the program on student learning found the academic achievement of students to be much higher than before.

Jeffrey (2009) conducted a study to examine the impact of SMART Board technology on the Mathematics performance of fourth grade gifted students in North Carolina. The sample consisted of 175 students from six elementary schools with similar populations. Three of the schools used SMART Boards during Mathematics instruction, and three schools did not use SMART Board technology. All students were taught the Mathematics curriculum according to the North Carolina Standard Course of Study. The instrument for evaluating growth was the state End-of-Grade Mathematics test. A formula developed by the State's Accountability Department was used to compare third grade Mathematics results to fourth grade Mathematics results to determine the degree of growth for each student. The results did not indicate significant growth among gifted students who received instruction using SMART Board technology.

Schmakel (2009) conducted a year-long study at the University of New Brunswick and found combining relevant professional development of teachers with the use of Interactive Whiteboards improved the education experience for both teachers and students.

The study conducted by Amiri and Sharifi (2014) intended to determine the influence of using Interactive Whiteboards in teaching writing to students who learn English as a foreign language and how it affects on the use of adverbs in their writing. In the other words, the study was a comparison of traditional approaches regarding teaching adverbs and using them in writing versus using Computer Assisted Language Learning devices in teaching adverbs and their use in writing. 80 male students learning English in Iranian Secondary schools comprised the study group which ranged from 12 to 16 years old. They were divided in two groups. A two-phase mixed-method research design was utilized to collect data. First, a traditional approach was applied to study group for teaching adverbs. Then, an Interactive Whiteboard was used for teaching adverbs. Then, the writings of students in both phases were examined in order to understand how much they used adverbs in their writing correctly. The findings of the study indicated students used the adverbs more accurately in their writing when Interactive Whiteboard was used to teach these concepts.

2.3 Critique

Though a number of researches pertaining to attitude towards Mathematics of students have established the significance of the variable in the learning of Mathematics, studies have been inconclusive pertaining to gender (Saha, 2007; Muhammed Farook et al., 2008). Further due to scanty research in the use of Interactive Whiteboards and academic achievement in Mathematics in India, and inconclusive results, further investigation of developing attitude and learning Mathematics using Interactive Whiteboards in classrooms among students was thus called for.

3. Statement of the Problem

The present study aims at enhancing attitude towards Mathematics and improving academic achievement in Mathematics by using Interactive Whiteboards in classrooms and the study is organized around the following questions:

(i) Does the use of Interactive Whiteboard significantly improve attitude and learning of Mathematics among students?

(ii) If so to what extent will students in the experimental group show enhancement in attitude and learning of Mathematics?

Based on the review of related literature and the research questions, the study is undertaken keeping in mind the following objectives:

(i) To prepare a plan of action to teach using Interactive Whiteboards in classrooms;

(ii) To investigate the possible significant difference between the pre and post-test scores of attitude towards Mathematics among standard IX students in experimental and control groups;

(iii) To investigate the possible significant difference between the pre and post-test scores of academic achievement in Mathematics among standard IX students in experimental and control groups;

(iv) To investigate the possible significant difference between the gain scores of attitude towards Mathematics among standard IX students in experimental and control groups and

(v) To investigate the possible significant difference between the gain scores of academic achievement in Mathematics among standard IX students in experimental and control groups.

Thus the problem is stated as Developing Attitude and Learning Mathematics among Students using Interactive Whiteboards in Classrooms.

4. HYPOTHESES

The following hypotheses have been framed for the present study:

(i) There is no significant difference between the pre and post-test scores of attitude towards Mathematics among standard IX students in experimental and control groups.

(ii) There is no significant difference between the pre and post-test scores of academic achievement in Mathematics among standard IX students in experimental and control groups.

(iii) There is no significant difference between the gain scores of attitude towards Mathematics among standard IX students in experimental and control groups.

(iv) There is no significant difference between the gain scores of academic achievement in Mathematics among standard IX students in experimental and control groups.

5. Method of Investigation

The method of investigation has been designed on the basis of the problem, assumptions and hypotheses formulated and it also warrants a psychometrically sound design, procedure, tools and execution. The investigation is planned to verify hypotheses using suitable tools and appropriate statistics for data processing.

5.1 Research Design

The present study envisages the effect of using Interactive Whiteboards in classrooms on attitude and academic achievement in Mathematics among standard IX students using a pre and post experimental design. The design is as follows:

Groups	**Sample**	**Pre-test Measures**	**Teaching**	**Post-test Measures**
Experimental Group	35 students	Attitude and Academic Achievement in Mathematics	Using Interactive Whiteboards	Attitude and Academic Achievement in Mathematics
Control Group	30 students	Attitude and Academic Achievement in Mathematics	Traditional Instructional Strategy	Attitude and Academic Achievement in Mathematics

This design was tested with the following experimental procedure.

E = A -------------- IWB ---------------B

C = A -------------- T ---------------- B

Where E = Sample chosen for the Experimental Group

C = Sample chosen for the Control Group

A = Pre-test measures of attitude and Academic Achievement in Mathematics

B = Post-test measures of attitude and Academic Achievement in Mathematics

IWB = Interactive Whiteboards

T = Traditional Method of Instructional Strategy

This instructional treatment was conducted over four weeks in a select private school. Two sections of standard IX students were enrolled in the study. The classes were selected randomly from the private school selected for the present study.

First, topics in standard IX Mathematics text book were selected and a pre-test was conducted to estimate the attitudes and academic achievement in Mathematics among these students and to check if there is any significant difference between the two groups with regard to attitudes and academic achievement in Mathematics.

Next, drawing on relevant research, all activities were developed by the researcher. Lesson plans for the procedure were based on Gardner's (1993, 1999) suggestions on teaching for a deep learning.

In the next step, the students in the control group were instructed only with traditionally designed learning material. Most of the time, the teacher presented the topics and the students listened to their teacher and answered the questions asked by their teacher. At the same time they carried out activities in their text-books.

However, the instructions for the experimental group varied. Lesson plans were prepared with various activities based on using Interactive Whiteboards in classrooms.

5.2 Sample selected

For the purpose of the present study, two sections of standard IX students (comprising of 35 and 30) were selected by random sampling technique from a select private school.

5.3 Tools used for the study

For the present study, Attitude towards Mathematics Inventory (Tapia and Marsh, 2004) was used to assess the attitude towards Mathematics of students. A Mathematics Achievement Test was constructed by the investigator to assess the academic achievement in Mathematics of standard IX students.

6. Analyses and Discussion

The data collected from the students are subjected to analyses of variance, presented in appropriate tables and discussed.

6.1 Analysis of Variance with regard to the Pre and Post-test Scores of Attitude and Academic Achievement in Mathematics among Standard IX Students

The following set of tables (Table-1a and Table-1b) exhibits the analysis of variance among standard IX students in experimental and control groups with regard to pre-test scores of attitude and academic achievement in Mathematics.

Table-1a: Statistical Analysis of Means of Pre-test Scores of Attitude towards Mathematics among Standard IX Students in Experimental and Control Groups

Variable	Sample Size	Mean	SD	SEM	SED	CR
Experimental Group	35	137.03	19.23	3.25	4.48	0.66 NS
Control Group	30	134.07	16.45	3.00		

NS – Not Significant
SD-Standard Deviation
SEM-Standard Error of Mean
SED-Standard Error of Difference
CR-Critical Ratio

In Table-1a, the mean and standard deviation of pre-test scores of attitude towards Mathematics are 137.03 and 19.23 respectively among standard IX students in the experimental group and 134.07 and 16.45 respectively among standard IX students in the control group. The critical ratio value is 0.66, which is not significant. It is evident that there is no significant difference in pre-test scores of attitude towards Mathematics among standard IX students in control and experimental groups.

Table-1b: Statistical Analysis of Means of Pre-test Scores of Academic Achievement in Mathematics among Standard IX Students in Experimental and Control Groups

Variable	Sample Size	Mean	SD	SEM	SED	CR
Experimental Group	35	31.31	7.24	1.22	1.53	1.12 NS
Control Group	30	29.60	4.52	0.83		

NS – Not Significant
SD-Standard Deviation
SEM-Standard Error of Mean
SED-Standard Error of Difference
CR-Critical Ratio

In Table-1b, the mean and standard deviation of pre-test scores of academic achievement in Mathematics are 31.31 and 7.24 respectively among standard IX students in the experimental group and 29.60 and 4.52 respectively among standard IX students in the control group .The critical ratio value is 1.12, which is not significant. It is evident that there is no significant difference in pre-test scores of academic achievement in Mathematics among standard IX students in the control and experimental groups.

The analysis of variance between the pre-test and post-test scores of attitude and academic achievement in Mathematics among standard IX students in experimental and control groups are presented hereunder (Table-2a to Table-2d).

Table-2a: Statistical Analysis of Means of Pre and Post-test Scores of Attitude towards Mathematics among Standard IX Students in Experimental Group

Variable	Sample Size	Mean	SD	SEM	SED	CR
Pre-test	35	137.03	19.22	3.25	4.27	2.86**
Post-test	35	149.23	16.35	2.76		

**Significant at 0.01 level
SD-Standard Deviation
SEM-Standard Error of Mean
SED-Standard Error of Difference
CR-Critical Ratio

In Table-2a, the mean and standard deviation of pre-test scores of attitude towards Mathematics are 137.03 and 19.22 respectively and post-test scores are 149.23 and 16.35 respectively among standard IX students in experimental group. The critical ratio value is 2.86, which is significant. It is evident that the standard IX students in experimental group are significantly better in their post-test scores compared to their pre-test scores of attitude towards Mathematics.

Table-2b: Statistical Analysis of Means of Pre and Post-test Scores of Attitude towards Mathematics among Standard IX Students in Control Group

Variable	Sample Size	Mean	SD	SEM	SED	CR
Pre-test	30	134.07	16.45	3.00	4.20	1.14 NS
Post-test	30	138.9	16.10	2.94		

NS – Not Significant
SD-Standard Deviation
SEM-Standard Error of Mean
SED-Standard Error of Difference
CR-Critical Ratio

In Table-2b, the mean and standard deviation of pre-test scores of attitude towards Mathematics are 134.07 and 16.45 respectively and post-test scores are 138.9 and 16.10 respectively among standard IX students in control group .The critical ratio value is 1.14, which is not significant. It is evident that there is no significant difference in pre and post-test scores of attitude towards Mathematics among standard IX students in control group.

Table-2c: Statistical Analysis of Means of Pre and Post-test Scores of Academic Achievement in Mathematics among Standard IX Students in Experimental Group

Variable	Sample Size	Mean	SD	SEM	SED	CR
Pre-test	35	31.31	7.24	1.22	1.64	3.30**
Post-test	35	36.71	6.44	1.09		

**Significant at 0.01 level
SD-Standard Deviation
SEM-Standard Error of Mean
SED-Standard Error of Difference
CR-Critical Ratio

In Table-2c, the mean and standard deviation of pre-test scores of academic achievement are 31.31 and 7.24 respectively and post-test scores are 36.71 and 6.44 respectively among standard IX students in experimental group .The critical ratio value is 3.30, which is significant at 0.01 level. It is evident that the post-test scores of academic achievement in Mathematics of standard IX students in experimental group are significantly better compared to their pre-test scores.

Table-2d: Statistical Analysis of Means of Pre and Post-test Scores of Academic Achievement in Mathematics among Standard IX Students in Control Group

Variable	Sample Size	Mean	SD	SEM	SED	CR
Pre-test	30	29.60	4.52	0.83	1.19	2.32*
Post-test	30	32.37	4.72	0.86		

*Significant at 0.05 level
SD-Standard Deviation
SEM-Standard Error of Mean
SED-Standard Error of Difference
CR-Critical Ratio

In Table-2d, the mean and standard deviation of pre-test scores of academic achievement are 29.60 and 4.52 respectively and post-test scores are 32.37 and 4.72 respectively among standard IX students in control group .The critical ratio value is 2.32, which is significant at 0.05 level. It is evident that the post-test scores of academic achievement in Mathematics of standard IX students in control group are significantly better compared to their pre-test scores.

The next set of analyses that investigated the variances among the post-test scores of attitude and academic achievement in Mathematics among standard IX students in experimental and control groups are presented in tables below (Table-3a and Table-3b).

Table-3a: Statistical Analysis of Means of Post-test Scores of Attitude towards Mathematics among Standard IX Students in Experimental and Control Groups

Variable	Sample Size	Mean	SD	SEM	SED	CR
Experimental Group	35	149.23	16.35	2.76	4.04	2.57**
Control Group	30	138.87	16.10	2.94		

**Significant at 0.01 level
SD-Standard Deviation
SEM-Standard Error of Mean
SED-Standard Error of Difference
CR-Critical Ratio

In Table-3a, the mean and standard deviation of post-test scores of attitude towards Mathematics are 149.23 and 16.35 respectively among standard IX students in the experimental group and 138.87 and 16.10 respectively among standard IX students in the control group. The critical ratio value is 2.57, which is significant at 0.01 level. It is evident that the post-test scores of attitude towards Mathematics of standard IX students in the experimental group are significantly better when compared to the post-test scores of attitude towards Mathematics of students in the control group.

Table-3b: Statistical Analysis of Means of Post-test Scores of Academic Achievement in Mathematics among Standard IX Students in Experimental and Control Groups

Variable	Sample Size	Mean	SD	SEM	SED	CR
Experimental Group	35	36.71	6.44	1.09	1.42	3.06**
Control Group	30	32.37	4.72	0.86		

**Significant at 0.01 level
SD-Standard Deviation
SEM-Standard Error of Mean
SED-Standard Error of Difference
CR-Critical Ratio

In Table-3b, the mean and standard deviation of post-test scores of academic achievement in Mathematics are 36.71 and 6.44 respectively among standard IX students in the experimental group and 32.37 and 4.72 respectively among standard IX students in the control group. The critical ratio value is 3.06, which is significant at 0.01 level. It is evident that the post-test scores of academic achievement in Mathematics of standard IX students in the experimental group are significantly better when compared to the post-test scores of academic achievement in Mathematics of students in the control group.

6.2 Discussion on the Analysis of Variance with regard to the Pre and Post-test Scores of Attitude and Academic Achievement in Mathematics among Standard IX Students

Shen and Pedulla (2000) reported that more students from lower performing countries (or systems) have more positive attitudes toward Mathematics and they found it easier and perceived themselves as more capable of doing well in Mathematics. These authors interpreted their findings as the consequence of more demanding curricula and high standards used in high achievement countries, which may lead the students to see Mathematics as a harder topic, and themselves as not so strong in doing Mathematics.

In Israel, Nasser and Birenbaum (2004) studied the relationship between Mathematics achievement and some learner-related variables, including self-efficacy, beliefs regarding knowledge, and attitudes toward Mathematics. The authors conducted their study in two samples of 8th graders: Arabs and Jews. They reported that in both groups the strongest predictor of Mathematics achievement was students' beliefs regarding their performance capabilities in Mathematics (self-efficacy). The better the students evaluated themselves in doing Mathematics, the higher their academic performance.

In the present investigation, investigating the use of Interactive Whiteboards in classrooms in developing attitude and academic achievement in Mathematics, no significant difference is found in the pre-test scores of students in both, experimental and control groups.

After exposing the standard IX students in the experimental group to teaching of Mathematics using Interactive Whiteboard, the students were again tested with the same attitude and achievement test and the post-test scores were coded systematically. The standard IX students in the control group were exposed to the regular traditional teaching method. Finally the students were again tested with the same attitude and achievement test tools and the data served as post-test score. On comparing the pre-test and post-test scores of attitude towards Mathematics and academic achievement in Mathematics among standard IX students in the experimental group, a significant difference was observed. The post-test scores of standard IX students in the experimental group was found to be significantly better than their pre-test scores. But on the other hand, no significant difference was observed between the pre and post-test scores of attitude towards Mathematics of students in control group and a very small difference was observed pertaining to their academic achievement in Mathematics. This makes it very clear that the use of Interactive Whiteboard has developed the attitude towards Mathematics and academic achievement in Mathematics significantly.

6.3 Analysis of Variance with regard to the Gain Scores of Attitude and Academic Achievement In Mathematics of Standard IX Students

The results of the analysis of gain scores of Standard IX students in experimental and control groups are presented below in Table-4a and Table-4b.

Table-4a: Statistical Analysis of Means of Gain Scores of Attitude towards Mathematics among Standard IX Students in Experimental and Control Groups

Variable	Sample Size	Mean	SD	SEM	SED	CR
Experimental Group	35	12.20	8.76	1.48	2.09	3.55**
Control Group	30	4.80	7.92	1.45		

**Significant at 0.01 level
SD-Standard Deviation
SEM-Standard Error of Mean
SED-Standard Error of Difference
CR-Critical Ratio

In Table-4a, the mean and standard deviation of gain scores of attitude towards Mathematics are 12.20 and 8.76 respectively among standard IX students in the experimental group and 4.80 and 7.92 respectively among IX standard students in the control group. The critical ratio value is 3.55, which is significant at 0.01 level. It is evident that the gain scores of attitude towards Mathematics among IX standard students in experimental group are significantly better when compared to the gain scores of students in the control group.

Table-4b: Statistical Analysis of Means of Gain Scores of Academic Achievement in Mathematics among Standard IX Students in Experimental and Control Groups

Variable	Sample Size	Mean	SD	SEM	SED	CR
Experimental Group	35	5.40	3.91	0.66	0.95	2.76**
Control Group	30	2.77	3.75	0.68		

**Significant at 0.01 level
SD-Standard Deviation
SEM-Standard Error of Mean
SED-Standard Error of Difference
CR-Critical Ratio

In Table-4b, the mean and standard deviation of gain scores of academic achievement in Mathematics are 5.40 and 3.91 respectively among standard IX .students in the experimental group and 2.77 and 3.75 respectively among standard IX students in the control group. The critical ratio value is 2.76, which is significant. It is evident that the gain scores of academic achievement in Mathematics of standard IX students in experimental group are significantly better when compared to the gain scores of the students in control group.

6.4 Discussion on the Analysis of Variance with regard to the Gain Scores of Attitude and Academic Achievement in Mathematics of Standard IX Students

Educational reform calls for a shift away from organizing instruction around time devoted to lecture or practicing discrete skills in specific academic disciplines toward an emphasis on engaging students in long-term, meaningful projects. Technology can enhance student acquisition through drill and practice. From the beginning of the computer age, educational researchers and practitioners have told us that for technology use to be successful in our schools it needed to be closely tied to school reform. The impact of technology on student learning is growing rapidly. The integration of technology within education increases student stimulation and comprehensive interaction while enabling a differentiation in teaching methodologies. Both academically and professionally, society has become dependent on technology. As technological development progresses, education must make adjustments to remain on track.

Instruction, assessment, and teaching abilities must adapt to technology, influencing a positive change in academic progression.

In the present investigation, it is found that the gain scores of attitude and academic achievement in Mathematics of students in experimental group are found to be significantly better than the gain scores of students in control group. This is because of the exposure of the students to teaching using Interactive Whiteboards in classrooms, which the students in control group are deprived of.

7. Conclusion

Technology has a crucial influence on the life and education of children. Since information technologies have permeated the lives of children, it is apparent that information computer technology should be an integral part of learning in contemporary schools. Using traditional blackboards as teaching media is no longer suitable for children growing up with computers (Yang et al., 2012). Teachers must develop technology skills to motivate and generate interest in learning of school subjects. So to develop a positive attitude towards Mathematics, modern technologies have to be used and it has been found that Interactive Whiteboard makes the learning very effective, especially for a subject like Mathematics.

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