SUMMARY

Education is the backbone of any society or country. It is the process of development and providing equal opportunities to all. It enables the person to expand knowledge and helps to find new ideas and new ways of life. Education is not concerned with present but it means looking further. Academic achievement is a comprehensive term. It is the unique, prime and perennial responsibility of a school or any other educational institution established by society to promote a wholesome scholastic growth and development of the child. It generally refers to the degree or levels of success of proficiency attained in some specific areas concerning academic work. It indicates what an individual has learnt or acquired in particular field. Touching, feeling, seeing and experiencing what is being taught would definitely enhance and enliven the teaching and learning process. It would also remove the necessity of mugging up lessons, something which consumes a lot of the students' time thus, setting them free to pursue their interests and hobbies. A correct platform in the form of a school is where the groundwork has to be done; for the fact remains, that it is the most important link in the whole chain that is to be monitored. In the last two decades, technology has dramatically penetrated into almost all areas
of our life and education is not an exception to it. Technology provides the means to keep students engaged, foster a positive learning experience, provide more personalized attention, improve classroom management, and mitigate the digital divide by providing access to technology at school. Educators cannot ignore the potential benefits of tablets and the opportunities afforded by bringing an integrated set of hardware and software solutions into the classroom (Demircioglu and Geban, 1996). The rapid changes occurring in information and communication technologies have also altered the traditional classroom environment and instructional methods. Projectors, internet linked computers in classrooms, flash disks, mobile phones, digital cameras and video recorders affect many aspects of education ranging from student projects to lesson presentations. Another novelty of the last 20 years has been the interactive whiteboard which consist of a connection between a computer, a projector and a touch screen electronic whiteboard. Owing to their amazing characteristics, interactive whiteboards are also known as “smart boards” (Akbas and Pektas 2011). The present education system is highly different from what it was in the past, especially with regard to application of technology. There is a shift from pen to the computer keyboard, from blackboard presentation to
PowerPoint presentation, from paper-pen test to computer-based test, from interpersonal instruction to mediated instruction, from teacher-dependent learning to independent learning. In prompting education in the process of teaching, the exploitation of the educational technology and e-learning including the interactive smart board with its various application is considered a smart option that facilitate the achievement. Smart classroom is an interactive computer based aid through the smart classroom programmes and software. Teacher use digital resource such as animation, videos, diagram maps, graphs, working model. It gives the teacher facility and flexibility of bringing a mobile labs right into the classroom. This helps in making the learning of subject more interesting. The new and modern education system involves modern technologies in the teaching-learning process for teaching the 21st century students. By using the modern technologies in classroom, students enjoy different experience in different environment.

**Justification of the Study**

In the present scenario, heavy bags full of text books and notebooks are observed with students at every school. Sad faces of the kids walking to the school bus, to be taught some facts from textbooks which have not been updated from so
many years, to further repeat these facts during exam time, to compete for marks as if lives of students and parents depends on it only. Schools, because of their inherent power to shape young minds are the foundation of any society, so it becomes their responsibility to find out the ways and means to make studies more of a 'fun' activity, than it is currently. On the other side, schools have limitations to cater to a large volume of students which affords little scope for innovation and improvisation (DNA Academy report 2009).

“The huge technological capabilities and attendant software of the Interactive Whiteboard (IWB) are fairly captivating to user, efficiently take them into the lesson content. They offer that the technology of Interactive Whiteboard (IWB) might be encouraging is of bounded function as significant as studies of motivation if it is not accompanied by important gains in students’ educational attainment” (Torff and Tirotta 2010). Because of all these causes Interactive Whiteboards are used in a wide range of applications. By applying smart space technologies in a real classroom, the Smart Classroom project bridges the gap between tele-education and traditional classroom activities in terms of the teacher’s experience and seamlessly integrates these two currently separate educational practices. More specifically, extend the user
interface of a legacy desktop-based tele-education system to the 3D space of an augmented classroom (Koila 2009).

In the words of Marzano (2009), “students who were instructed using smart board technology showed a substantial increase in the scores over student who received the same instruction without use of interactive technology. Adding various peripheral devices such as the interactive technology further increased the performance of students instructed with the smart board technology.”

According to Shi (2003), “In the Smart Classroom, teachers can use multiple natural modalities while interacting with remote students to achieve the same effect as a teacher in a classroom with local students. The system turns a physical classroom into a natural user interface for tele-education software. Teachers in the Smart Classroom can move freely, using conventional teaching methods to instruct remote students. Because they are in a real classroom environment, they can accommodate local students at the same time. Simultaneously instructing local and remote students also require a smaller workforce than separate on-campus and tele-education operations.”

Research on classroom situations and creativity can be credited to Lewin (1935) who theorized that the environment
and its interaction with personal characteristics of the individual are potent determinants of human behaviour. Despite the fact that the educational environment is a somewhat subtle concept, remarkable progress has been made in conceptualizing assessing and researching its determinants and effects.

Taking into consideration another angle it has been shown that there is a definite increase in creativity and creative linking or creative activity among the young children when constraints of the classroom are relaxed and creative is encouraged (Torrance, 1965). In India the fields of creativity research in relation to classroom have been right dubbed as being of elementary and fragmentary nature, having been carried on small dimensions mostly by isolated individuals’ (Raina 1971).

The trend of the studies on the concept of teaching in smart classroom shows that numerous studies have been conducted on these variables in the western countries but little emphasis has been given to such studies in India. Above all, the studies related to Smart classroom were rare in India and at its earliest stage. Looking into the importance attached to these variables the researcher has opted this topic for
research pursuit. Thus, the problem for the present study is stated as under:

Statement of the Problem

EFFECT OF TEACHING IN SMART CLASSROOM ON THE ACHIEVEMENT, RETENTION AND CREATIVITY OF HIGH SECONDARY SCHOOL STUDENTS OF COMMERCE.

Operational definitions of the Terms used

Effect

Oxford Dictionaries of languages (2014) "A change which is a result or consequence of an action or other cause."

In the present study the effect was taken as the change in the behaviour or level of learning of the students of commerce studying in Eleventh class as result of the experiment.

Teaching

"Teaching is an interactive process, primarily involving classroom talk which takes place between teacher and pupil and occurs during certain definable activity" (Amidon, 1967).

Gagne (1962) has defined teaching from democratic point of view, "Interpersonal influence aimed at changing the behaviour potential of another person."
In the present study, teaching in smart classroom was considered to deliver the Lessons of Commerce (Business studies) with the help of multi-media devices i.e. Laptop with internet connection, Projector and screen, smart board, Digital Versatile Disk player, Microphone and speaker(s), Control devices such as switches and remotes and softcopy of study material used by the teacher on Smart board.

**Smart Classroom**

“A smart classroom relates to the optimization of teaching content presentation, convenient access of learning resources, deeply interactivity of teaching and learning, contextual awareness and detection, classroom layout and management etc.” (Huang, 2011).

“A traditional Smart Classroom is a traditional lecture style teaching space that has available technological equipment that can be used to aid and enhance instruction of a course. The traditional Smart Classroom is equipped with the basic technology that will enable to connect laptop to the video projector or to play a VHS/ Digital Versatile Disk movie, just to name a few scenarios” (Sacramento 2009).

“A smart classroom is a classroom that has an instructor station equipped with computer and audio-visual equipment, Personal Computer, Overhead Projector, Wireless Internet
Access, Digital Versatile Disk Player, Smart Board” (Perret 2008).

In the present study, a Smart Classroom is one room, equipped with multimedia components i.e. a Laptop with internet connection, Projector and screen, smart board, Digital Versatile Disk player, Microphone and speaker(s), Control devices such as switches and remotes and softcopy of study material used by the teacher on Smart board.

**Achievement**

Achievement means something accomplished successfully, especially by means of exertion, skill, practice or perseverance (The American Heritage, 2009).

Crow and Crow (1969) defined achievement (academic) as the extent to which the learner is profiting from instruction in a given area of learning.

In the present study, achievement was taken as the marks obtained by students studying in XI class in the achievement test of commerce developed by the investigator himself.

**Retention**

Retention refers to the knowledge, skill and abilities the learner can exhibit at some time interval after instruction is completed. (Goldstein 1993).
“Retention involves capturing knowledge in the memories so that it can be used later” (Walsh and Ungson 1991).

In the present study, retention means the scores of the Achievement test achieved by the students after a period of two months.

**Creativity**

According to MacKinnon (1978), “Many are the meanings of creativity. Perhaps for most, it denotes the ability to bring something new into existence, while for others creativity is not ability but the psychological process by which novel and valuable products are fashioned. One would be ill-advised to seek to choose from among these several meanings the best single definition of creativity. Since creativity properly carries all of these meanings and many more besides. Creativity is indeed, a multi-faceted phenomenon”. Singh (1990) described creativity in Mathematics as an ability to produce original and unusual applicable methods and solutions to problems.

In the present study, Creativity of the students was considered as the scores obtained by them in Non Verbal Test of Creative Thinking by Baqer Mehdi.
High Secondary School Students of Commerce

In the present study, high secondary school students are the students who are studying in class XI commerce.

Objectives of the study

Following were the objectives of the study:

1. To develop lesson Plans in Commerce for XI class for teaching in Traditional classroom and Smart Classroom.

2. To develop and Standardize Achievement test in Commerce to measure the achievement and retention of subject matter among students of commerce.

3. To study the effectiveness of teaching in smart classroom on the achievement in commerce of the students of commerce.

   a) To Study the significant difference in the pre-test scores of achievement test in commerce of students in control and experimental group.

   b) To study the significant difference in the pre-test scores of achievement test in commerce of girls in control and experimental group.
c) To study the significant difference in the pre-test scores of achievement test in commerce of boys in control and experimental group.

d) To study the significant difference in the pre-test and post-test scores of achievement test in commerce of the students in control group.

e) To study the significant difference in the pre-test and post-test scores of achievement test in commerce of the girls in control group.

f) To study the significant difference in the pre-test and post-test scores of achievement test in commerce of the boys in control group.

g) To study the significant difference in the pre-test and post-test scores of achievement test in commerce of the students in experimental group.

h) To study the significant difference in the pre-test and post-test scores of achievement test in commerce of the girls in experimental group.

i) To study the significant difference in the pre-test and post-test scores of achievement test in commerce of the boys in experimental group.
j) To study the significant difference in the post-test scores of the achievement test in commerce of students in control and experimental group.

k) To study the significant difference in the post-test scores of the achievement test in commerce of girls in control and experimental group.

l) To study the significant difference in the post-test scores of the achievement test in commerce of boys in control and experimental group.

m) To study the significant difference between the gain scores of all students in Control group and experimental groups.

n) To study the significant difference between the gain scores of girls in Control group and experimental groups.

o) To study the significant difference between the gain scores of boys in Control group and experimental groups.

4. To study the effectiveness of teaching in smart classroom on the retention of the students of commerce.

a) To study the significant difference in the post-test scores of achievement test in commerce and
achievement test (after two months for retention) in commerce among students in control Group.

b) To study the significant difference in the post-test scores of achievement test in commerce and achievement test (after two months for retention) in commerce among girls in control Group.

c) To study the significant difference in the post-test scores of achievement test in commerce and achievement test (after two months for retention) in commerce among boys in control Group.

d) To Study the significant difference in the post-test scores of achievement test in commerce and achievement test (after two months for retention) in commerce of the students in experimental group.

e) To Study the significant difference in the post-test scores of achievement test in commerce and achievement test (after two months for retention) in commerce of the girls in experimental group.

f) To Study the significant difference in the post-test scores of achievement test in commerce and achievement test (after two months for retention) in commerce of the boys in experimental group.
g) To study the significant difference in the scores of achievement test (after two months for retention) in commerce of the students of commerce in control group and experimental group.

h) To study the significant difference in the scores of achievement test (after two months for retention) in commerce of the girls of commerce in control group and experimental group.

i) To study the significant difference in the scores of achievement test (after two months for retention) in commerce of the boys of commerce in control group and experimental group.

5. To study the effectiveness of teaching in smart classroom on the creativity of the students of commerce.

a) To study the significant difference in the pre-test scores of the creativity of the students of commerce in control group and experimental group.

b) To study the significant difference in the pre-test scores of the creativity of the girls of commerce in control group and experimental group.
c) To study the significant difference in the pre-test scores of the creativity of the boys of commerce in control group and experimental group.

d) To study the significant difference in the pre-test and post-test scores of creativity of the students of commerce in control group.

e) To study the significant difference in the pre-test and post-test scores of creativity of the girls of commerce in control group.

f) To study the significant difference in the pre-test and post-test scores of creativity of the boys of commerce in control group.

g) To study the significant difference in the pre-test and post-test scores of creativity of the students of commerce in experimental group.

h) To study the significant difference in the pre-test and post-test scores of creativity of the girls of commerce in experimental group.

i) To study the significant difference in the pre-test and post-test scores of creativity of the boys of commerce in experimental group.
j) To study the significant difference in the post-test scores of creativity of the students of commerce in control group and experimental group.

k) To study the significant difference in the post-test scores of creativity of the girls of commerce in control group and experimental group.

l) To study the significant difference in the post-test scores of creativity of the girls of commerce in control group and experimental group.

Hypotheses of the study

To achieve objectives of the present study following hypotheses were framed-

a) There exists no significant difference between the pre-test scores of achievement test in commerce among the students in control group and experimental group.

b) There exists no significant difference between the pre-test scores of achievement test in commerce among the girls in control group and experimental group.

c) There exists no significant difference between the pre-test scores of achievement test in commerce among the boys in control group and experimental group.
d) There exists significant difference between the pre-test scores and post-test scores of achievement test in commerce among the students in control group.

e) There exists significant difference between the pre-test scores and post-test scores of achievement test in commerce among the girls in control group.

f) There exists significant difference between the pre-test scores and post-test scores of achievement test in commerce among the boys in control group.

g) There exists significant difference between the pre-test scores and post-test scores of achievement test in commerce among the students in Experimental group.

h) There exists significant difference between the pre-test scores and post-test scores of achievement test in commerce among the girls in Experimental group.

i) There exists significant difference between the pre-test scores and post-test scores of achievement test in commerce among the boys in Experimental group.

j) There exists significant difference between the post-test scores of achievement test in commerce among the students in control group and experimental group.
k) There exists significant difference between the post-test scores of achievement test in commerce among the girls in control group and experimental group.

l) There exists significant difference between the post-test scores of achievement test in commerce among the boys in control group and experimental group.

m) There exists significant difference between the gain scores of achievement test in commerce among the students in control group and experimental group.

n) There exists significant difference between the gain scores of achievement test in commerce among the girls in control group and experimental group.

o) There exists significant difference between the gain scores of achievement test in commerce among the boys in control group and experimental group.

p) There exists no significant difference between the scores of post-test of achievement test and achievement test (after two months for retention) in commerce among the students in control group.

q) There exists no significant difference between the scores of post-test of achievement test and achievement test (after
two months for retention) in commerce among the girls in control group.

r) There exists no significant difference between the scores of post-test of achievement test and achievement test (after two months for retention) in commerce among the boys in control group.

s) There exists no significant difference between the scores of post-test of achievement test and achievement test (after two months for retention) in commerce among the students in experimental group.

t) There exists no significant difference between the scores of post-test of achievement test and achievement test (after two months for retention) in commerce among the girls in experimental group.

u) There exists no significant difference between the scores of post-test of achievement test and achievement test (after two months for retention) in commerce among the boys in experimental group.

v) There exists significant difference between the scores of achievement test (after two months for retention) in commerce among the students in control group and Experimental group.
w) There exists significant difference between the scores of achievement test (after two months for retention) in commerce among the girls in control group and Experimental group.

x) There exists significant difference between the scores of achievement test (after two months for retention) in commerce among the boys in control group and Experimental group.

y) There exists no significant difference between the pre-test scores of creativity test among the students of commerce in control group and experimental group.

z) There exists no significant difference between the pre-test scores of creativity test among the girls of commerce in control group and experimental group.

aa) There exists no significant difference between the pre-test scores of creativity test among the boys of commerce in control group and experimental group.

bb) There exists significant difference between the pre-test scores and post-test scores of creativity test among the students of commerce in control group.
cc) There exists significant difference between the pre-test scores and post-test scores of creativity test among the girls of commerce in control group.

dd) There exists significant difference between the pre-test scores and post-test scores of creativity test among the boys of commerce in control group.

ee) There exists significant difference between the pre-test scores and post-test scores of creativity test among the students of commerce in Experimental group.

ff) There exists significant difference between the pre-test scores and post-test scores of creativity test among the girls of commerce in Experimental group.

gg) There exists significant difference between the pre-test scores and post-test scores of creativity test among the boys of commerce in Experimental group.

hh) There exists significant difference between the post-test scores of creativity test among the students of commerce in control group and experimental group.

ii) There exists significant difference between the post-test scores of creativity test among the girls of commerce in control group and experimental group.
jj) There exists significant difference between the post-test scores of creativity test among the boys of commerce in control group and experimental group.

**Delimitations of the study**

Due to paucity of time and other factors the study was delimited to -

1. 80 students studying in XI class of commerce in high secondary school for conducting the experiment.

2. six specific units of Commerce (Business studies) from class XI for the experiment i.e. Nature and purpose of business, Form of business organization, Private, public and global enterprises, Business Services, Emerging modes of business, Social responsibility and Business ethics.

3. one public school with the facility of smart classroom from Kurukshetra district of Haryana, affiliated to CBSE, New Delhi for conducting the experiment.

4. experiment (treatment) of 25 days of leading 25 lessons of 45 minutes per day in each group.

**Methodology**

The present study was aimed to study the effect of smart classroom teaching on the achievement, retention and creativity of high secondary school students of commerce.
Keeping in view the nature and objectives of the study, experimental method (pre-test post-test experimental design) of research was used by the investigator.

**Population and Sample**

In the present study all XI class students, studying in recognized secondary schools having smart classroom facility affiliated to CBSE opted Commerce stream, in Kurukshetra district comprise population of the present study. As it was not possible to encompass the entire population, research was conducted by the means of sample drawn from the target population on the basis of which generalization are drawn and made applicable to the population as whole. One school that was taken as sample was B.R.I. Public School, Kurukshetra. The school was selected on the basis of random sampling technique. From the above selected school, the investigator selected all students of class XI opted stream commerce. All the students of commerce were tested by Non Verbal Group Intelligence Test (NVGIT) by Imtisungba Ao (2005) to match their level of intelligence. The results of the test were matched equally and the students were divided into two groups i.e. Experimental Group and Control group, having 40 students each, were taken as sample for the
experiment. In control group there were 19 girls and 21 boys, while in Experimental group there were 20 girls and 20 boys.

**Design of the Study**

For the present venture, pre-test and post-test experimental design was used. After taking the control factors into consideration, on the basis of intelligence Non Verbal Group Intelligence Test (NVGIT), developed by Imtisungba Ao (2005) to match their level of intelligence, the students were distributed in two groups named as experimental group and control group. Both the groups were pre-tested with Non Verbal Test of Creative Thinking developed by Baqer Mehdi (2005) to measure the Creativity. An Achievement test for each unit of Commerce (Business Studies) was developed by investigator himself, which they have not learnt beforehand. The Experimental group was taught in Smart classroom and control group was taught with same lesson plan in Conventional classroom for twenty five days one lesson in each group for 45 minutes. After the experiment both the groups were post tested with Achievement test in commerce to measure their Learning. Then the scores of Achievement test were compared in order to assess the effectiveness of two types of classrooms. After the complete treatment the groups were post tested with test of Creativity to assess the change in creative thinking of both groups. After period of two
months, same achievement test was taken as post-test which was administered on each group for each unit to measure the retention of the students. Retention Scores obtained by the two groups on the retention test were compared in order to assess the effectiveness of teaching in both types of classrooms.
Figure 1

Sample and Research Design

Sample of 100 Students
Tested by (NVGIT) by Imtisungba Ao and results matched to make

Control Group of 40 students
(19 Girls and 21 Boys)

Experimental Group of 40 students
(20 Girls and 20 Boys)

Pre-test
3. Achievement test (Business Study)
4. Test of Creativity

Taught in Conventional Classroom

Experiment for one month

Post-test
3. Achievement test (Business Study)
4. Test of Creativity

After Two Months
Retention Test

Taught in Smart Classroom
Variables used

In the present study there were three types of variables:

Independent Variables

Teaching in Smart classroom was independent variable.

Dependent Variables

Achievement, Retention and Creativity, were the dependent variables for the present study.

Controlled Variable

Those variable and the steps to control them are given below:

a. Socio-economic status

Single school was selected to control the socio economic status.

b. Grade level

Only High secondary school students studying in class (11th) worked as the sample for the present study.

c. Intelligence

Students were divided in two groups on the basis of the results of Intelligence Test (NVGIT) by Imtisungba Ao to match their level of intelligence.
d. Prior knowledge about the subject

An achievement test was administered as pre-test on the subject in both treatment groups prior to experimentation.

e. Mode of treatment

In the present study, there were two modes of treatment i.e. treatment in Smart classroom and treatment in Conventional classroom. In order to bring equality in the treatment process, both classrooms were arranged logically on the basis of the results of Intelligence Test (NVGIT) by Imtisungba Ao.

f. Contamination Effect

Contamination effect is the difference created due to receiving tuitions beyond instructions in the classrooms. For controlling this, the researcher conducted the experiment in the beginning of the session i.e. in the months of April.

Every possible attempt was made to control those factors during experiment, which could create biasness during the experiment.

Firstly, the researcher himself provided treatments to both the groups. It is generally believed that the competence and attitude of a researcher may affect the treatment effects. It was, therefore, to control the inter-group variation that the
researcher himself performed the experiment in both the groups.

Secondly, the measuring devices were based on behavioural objectives so that the devices could not be the source of bias.

Thirdly, every effort was made to maintain the experimental conditions similar in both the groups.

Fourthly, the students of both the groups were requested to maintain good attendance for the experimental period. Also they were requested to remain honest while going through the programme.

**Tools Used**

In the study, the researcher used three two types of tools – instructional tools and measuring tools.

**Instructional tools**

A smart classroom and Lesson plans to teach in Smart Classroom and in Conventional classroom.

**Measuring tools**

Non Verbal Group Intelligence Test (NVGIT) by Imtisungba Ao (2005), a self made achievement test to measure achievement of the students, and Non Verbal Test of Creative Thinking
(NVTCF) developed by Baqer Mehdi to measure the creativity were used during pre-test and post-test.

**Data Collection**

In experimental research, the researcher needs to collect data from the selected sample before and after the treatment. For the present study the data was collected in four stages.

Stage-I - Administration of the Non Verbal Group Intelligence Test (NVGIT), Achievement test in commerce and Non Verbal Test of Creative Thinking (NVTCF). On the basis of results of Non Verbal Group Intelligence Test (NVGIT) and matching the scores investigator divided the students in two equal groups.

Stage II – The second stage was the treatment stage, where the investigator taught Commerce in smart classroom as well as in the conventional classroom for 25 working days for 45 minutes every day.

Stage III – The Third stage was post-test stage where the achievement of the students again evaluated after the smart classroom program by administering achievement test of commerce and Non Verbal Test of Creative Thinking (NVTCF).

Stage IV – At the fourth and last stage investigator administered same achievement test after two months of
experiment on both the groups to evaluate their level of retention in commerce.

**Statistical Techniques Used**

In the present study ‘t’ test was employed by the researcher to find out significant difference between the mean scores of experimental and control group.

**Main Findings**

Findings of the results are divided into three sections Section A deal with the Achievement test, Section B deals with Retention and the section C related to creativity.

**Section- A**

**Findings of the Achievement in commerce**

1. There exists no significant difference between the pre-test scores of achievement test in commerce among the students in control group and experimental group. Thus, it concludes that both the groups were at same level of achievement in commerce before the commencement experiment.

2. There exists no significance of difference between the Pre-test scores of achievement test in commerce among the girls in control group and experimental group. This
means there was no significant difference between achievement in commerce among the girls of control group and experimental group before commencement of the experiment.

3. There is no significant difference between the means of pre-test scores of achievement test in commerce among the boys in control group and experimental group. Thus, it concludes that before commencement of experiment the achievement level of commerce were same in the boys.

4. There exists significant difference between the pre-test scores and post-test scores of achievement in commerce of the students in control group. Thus it concludes that the significant difference between pre-test and post-test achievement in commerce among the students of control group which shows the effectiveness of the treatment. The result reveals that the treatment had an effect on the students of control group and their achievement during treatment was significant.

5. There exists significant difference between the Pre-test scores and Post-test scores of Achievement test in Commerce among the girls in Control group. Thus, it means that difference between the achievement of girls
in commerce in control group before and after the experiment is found significant.

6. There exists significant difference between the Pre-test scores and Post-test scores of Achievement test in Commerce among the boys in Control group. Thus, it concludes that after taught in conventional classroom significant difference is found between the pre-test and post-test scores of achievement in commerce among the boys.

7. There exists significant difference between the pre-test scores and post-test scores of achievement test in commerce of students in Experimental group, which means that there is significant difference in the level of knowledge among the students of experimental group prior to and after the treatment. It shows that the achievement of the students in commerce in significantly differ from their knowledge they had prior to the treatment.

8. There exists significant difference between the pre-test scores and post-test scores of achievement test in commerce among the girls in Experimental group. This means that the knowledge of girls in experimental group
has increased after the treatment of teaching in smart classroom.

9. There exists significant difference between the pre-test scores and post-test scores of achievement test in commerce among the boys in Experimental group. Thus, it means that the knowledge of boys in experimental group has improved after the treatment of teaching in smart classroom.

10. There exists significant difference between the post-test scores of achievement test in commerce among the students in control group and experimental group is accepted. It indicates that the students of two groups differ significantly. Thus, it indicates that significant difference is found in the achievement in commerce between the experimental groups that taught in Smart Classroom in comparison to control group that taught in traditional classroom.

11. There exists significant difference between the post-test scores of achievement test in commerce among the girls in control group and experimental group. Thus, it indicates that the academic achievement among girls in experimental group those taught in Smart Classroom is
significantly effective in comparison to girls in control
group taught in traditional classroom.

12. There exists significant difference between the post-test
scores of achievement test in commerce among the boys
in control group and experimental group. Thus, it
conclude that the results of achievement test in
commerce of boys in experimental group taught in smart
classroom are significantly different from the results of
boys in experimental group taught in traditional
classroom taught teaching in Smart Classroom.

13. There exists significant difference between the gain
scores of achievement test in commerce among the
students in control group and experimental group. Thus,
it concludes that the achievement in commerce among
the students in experimental group enhanced more than
the achievement in commerce among the students of
control group.

14. There exists significance of difference between the gain
scores of achievement test in commerce among the girls
in control group and experimental group. Thus, it
indicates that after being taught in smart classroom
significant difference is found between the gain scores of
girls in experimental group.
15. There exists significance of difference between the gain scores of achievement test in commerce among the boys in control group and experimental group. Thus, it indicates that after being taught in smart classroom significant difference is found between the gain scores of boys in experimental group.

Section - B

Findings of Achievement test for Retention of achievement in commerce

1. There exists no significant difference between the scores of post-test of achievement test and achievement test (after two months for retention) in commerce among the students in control group. Thus, it concludes that no significant difference is found between the post-test scores of achievement in commerce among the students and the scores of the achievement test conducted after two months for retention in control group.

2. There exists no significant difference between the scores of post-test of achievement test and achievement test (after two months for retention) in commerce among the girls in control group. Thus, it concludes that the achievement level in commerce of girls is found not
significantly different from their achievement level after two months in control group.

3. There exists no significant difference between the scores of post-test of achievement test and achievement test (after two months for retention) in commerce among the boys in control group. Thus, it concludes that there is no significant difference found in the achievement level in commerce among boys at the end of treatment and after two months in control group.

4. There exists no significant difference between the scores of post-test of achievement test and achievement test (after two months for retention) in commerce among the students in experimental group. Thus, it concludes that there is no significant difference among the students’ achievement level at the end of the experiment and after two months in experimental group.

5. There exists no significant difference between the scores of post-test of achievement test and achievement test (after two months for retention) in commerce among the girls in experimental group. Thus, it concludes that no significant difference is found in the level of achievement in commerce at the end of experiment and after two months among the girls in experimental group.
6. There exists no significant difference between the scores of post-test of achievement test and achievement test (after two months for retention) in commerce among the boys in experimental group. Thus, it concludes that no significant difference is found in the level of achievement in commerce at the end of experiment and after two months among the boys in experimental group.

7. There exists significant difference between the scores of achievement test (after two months for retention) in commerce among the students in control group and Experimental group. Thus, it concludes significant difference is found in retention in commerce among the students taught in smart classroom in comparison to those who taught in traditional classroom.

8. There exists significant difference between the scores of achievement test (after two months for retention) in commerce among the girls in control group and Experimental group. Thus, it concludes significant difference is found in retention in commerce among the girls taught in smart classroom in comparison to those who taught in traditional classroom.

9. There exists significant difference between the scores of achievement test (after two months for retention) in
commerce among the boys in control group and Experimental group. Thus, it concludes significant difference is found in retention in commerce among the boys taught in smart classroom in comparison to those who taught in traditional classroom.

Section C
Findings of Creativity

1. There exists no significant difference between the pre-test scores of creativity test among the students of commerce in control group and experimental group. Thus, it concludes that no significant difference is found in the scores of creativity test among the students of control group and experimental group before the commencement of experiment.

2. There exists no significant difference between the pre-test scores of creativity test among the girls of commerce in control group and experimental group. Thus, it concludes that no significant difference is found in the scores of creativity test among the girls of control group and experimental group before the commencement of experiment.

3. There exists no significant difference between the pre-test scores of creativity test among the boys of
commerce in control group and experimental group. Thus, it concludes that no significant difference is found in the scores of creativity test among the boys in control group and experimental group before the commencement of experiment.

4. There exists no significant difference between the pre-test scores and post-test scores of creativity test among the students of commerce in control group. Thus, it concludes that no significant difference is found between the creativity scores among the students of control group before and after the experiment.

5. There exists no significant difference between the pre-test scores and post-test scores of creativity test among the girls of commerce in control group. Thus, it concludes that no significant difference is found between the creativity scores among the girls of control group before and after the experiment.

6. There exists no significant difference between the pre-test scores and post-test scores of creativity test among the boys of commerce in control group. Thus, it concludes that no significant difference is found between the creativity scores among the students of control group before and after the experiment.
7. There exists no significant difference between the pre-test scores and post-test scores of creativity test among the students of commerce in Experimental group. Thus, it concludes that no significant difference is found between the creativity scores among the students of experimental group before and after the experiment.

8. There exists no significant difference between the pre-test scores and post-test scores of creativity test among the girls of commerce in Experimental group. Thus, it concludes that no significant difference is found between the creativity scores among the girls of experimental group before and after the experiment.

9. There exists significant difference between the pre-test scores and post-test scores of creativity test among the boys of commerce in Experimental group. Thus, it concludes that no significant difference is found between the creativity scores among the boys of experimental group before and after the experiment.

10. There exists significant difference between the post-test scores of creativity test among the students of commerce in control group and experimental group. Thus, it concludes that significant difference is found in the creativity scores of post-test among the students of
experimental group those who taught in smart classroom in comparison to the students in control group those who taught in conventional classroom.

11. There exists significant difference between the post-test scores of creativity test among the girls of commerce in control group and experimental group. Thus, it concludes that significant difference is found in the creativity scores of post-test among the girls of experimental group those who taught in smart classroom in comparison to the students in control group those who taught in conventional classroom.

12. There exists no significant difference between the post-test scores of creativity test among the boys of commerce in control group and experimental group. Thus, it concludes that no significant difference is found in the creativity scores of post-test among the boys of experimental group those who taught in smart classroom in comparison to the students in control group those who taught in conventional classroom.

**Discussion of the results**

The present investigation has been carried out to study the effect of teaching in smart classroom on achievement, retention and creativity of high secondary school students of
commerce. In the light of the findings of ‘t’ ratio statistically significant differences were found between the mean scores of achievement, retention and creativity of experimental group and control group. In order to test the hypotheses, pre and post achievement test in commerce were taken and analyzed. It is found significant difference in the results of experimental group and control group, which also proves the assumption. There were statistically significant differences between the mean scores of the two groups in achievement for the experimental group which is also supported by Marzano (2009). In the study conducted by Marzano (2009), students who were instructed using smart board technology shown a substantial increase in the scores over student who received the same instruction without use of interactive technology. In the present study the results of Achievement test in commerce shows significant difference between the students of commerce in Control and Experimental group.

From a general perspective, the results of the study were similar to those encountered in the literature. It was also found during the study that lessons conducted with smart classroom were more fun, more interesting and greater participation. The most significant evidence for the academic improvement resulting from interactive whiteboard use was a comprehensive study conducted by Becta (2003). In this
study, the term 'improvement' was used instead of reference to 'increasing academic achievement'.

Based on these results, it can be claimed that an interactive whiteboard in the classroom be seen as a tool that increases academic achievement, and one that brings information and communication technologies to the classroom and leads to new teaching and learning activities. In the present study all scores had been collected from 80 students of class 11th. Among these 80 students, 40 students constitute one group known as control group, and other 40 students constitutes another experimental group. The pre-test of Achievement test and Creativity test shown, not significant difference between experimental and control group while the post-tests scores of both control group and experimental group were analyzed and their mean and standard deviation and t-test calculated which lead the study towards difference in the achievement, creativity and retention. The calculated t-value is much greater than table value at df = 78 at 0.01 level of significance. According to the result of t-test, significant differences exist between control Group and Experimental Group in achievement test, creativity test and retention test and thus suggesting that the level of both groups were not similar. It was found that the achievement test scores of control and experimental group differ significantly at the end of the study. Hence, there exist a significant difference
between the achievement, Creativity and retention of student when teaching through smart classroom and traditional classroom.

Based on these result it can be claimed that while teaching through smart classroom is more effective than traditional classroom and used as a tool that increases in academic achievement and leads to new teaching and learning activities.

Similar result were obtained in the study by Dhindsa & Emran (2006) compared pre- to post-test gains between college classes taught six organic chemistry lessons either with or without interactive whiteboards in classroom. The authors found statistically significant gains for students taught using interactive whiteboards, with the interactive whiteboard group averaging a mean effect size of 2.68 and the control group averaging a mean effect size of 2.16 and in the study of Marzano (2009) The students who were instructed using smart board technology showed a substantial increase in the scores over student who received the same instruction without use of interactive technology. Adding various peripheral devices such as the interactive technology further increased the performance of students instructed with the smart board technology.
Educational Implications

The most outstanding characteristic of any research is that it must contribute something new to the development of the area concerned. Every study has its utility and implications in some or other area. The present study is supposed to add to the existing stock of knowledge in the field of education. The study has an important bearing on education in our country where students are taught through the chalk and talk method. It indicates that students can be taught better through new methods of teaching like through smart classroom. However, in view of inevitable limitation of technology, the present study has wider implications for teachers and students. The present study offers a number of implications. It has been found that there is a significant relationship between the achievement of students when teaching through smart classroom and traditional classroom. So, with the present method of teaching through smart classroom is very effective and it will help to attain the objective of teaching. It may also be noted that science and technology are growing rapidly and it is becoming harder and harder for school teachers to keep pace with the change. In this regard smart classroom is very helpful to equip them with latest content and they will be able to keep pace with time. Although teachers whose students scored at or below
the mean on academic assessments also were most likely to use the interactive features of whiteboards in the classroom, they tended to use these for more teacher centered activities. Many of these teachers used it to play a variety of language games and many used its timer function for timed seatwork. Due to its effective role in enhancement of academic achievement, the ministry of education must work on providing the sufficient number of smart boards in schools in accordance with their importance and their effect on providing a positive learning atmosphere within the school.

**Suggestions for Further Studies**

Any research work cannot say the final word of a problem because it is very difficult for a researcher to touch all the aspect of a problem. The present investigation identified several ways of possible exploration and number of important findings has been reported in the present study.

Suggestions for further research in this direction may not be kept out of place here. They can be enumerated as follow.

- The present study has been tried out in limited area and sample. So it is can be carried out in large sample and in different areas of the state for its validation.