CHAPTER SIX

TEACHING GENERAL SCIENCE THROUGH
ELECTRONIC CLASSROOM: THE EXPERIMENT

6.1 Introduction

The present chapter describes in detail the preparation, arrangements, training of teachers, scheduling, teaching through electronic classroom technique and evaluating the impact of the electronic classroom technique in comparison with the traditional teaching technique.

6.2 Planning and Preparation

Before entering the planning and preparatory phase for implementing the electronic classroom teaching project, the investigator decided to observe the existing classroom teaching and learning to have an in depth knowledge of how general science was being taught at secondary level in the school where the experiment was to be carried out.

For this purpose, the investigator observed actual teaching of science to the students of classes 7th, 8th and 9th in the school. He sought permission from the management of the school before starting his observations of day to day science teaching in the classes. He started observing the science lessons in classes which were to be selected for study. During these visits, he found that the teaching of general science in the school was mostly conventional. Teachers were teaching science using chalk and talk method and during teaching they were utilizing only conventional teaching aids like chalk, board, duster etc. In addition to this, either they would draw diagrams on the board with the chalk or they sometimes used to show charts borrowed from the library. Some teachers followed a planned way of teaching while the others, who were experienced ones, used to teach even without prior preparation. This was so because they felt that the
content they were going to teach had been fully mastered by them as they had taught the same over a period of years to the same class.

Most of the steps followed by the teachers during a period lasting for 35-40 minutes based on RCEM plan given by Regional College of Education, Mysore. According to this plan of teaching, the process phase of teaching is divided into four major parts i.e. a) motivation (3-5 minutes), b) announcement of the topic (1 minute), c) presentation(20-25 minutes), d) recapitulation (3-5 minutes), concluding statements and home assignment (2-4 minutes).

a) Motivation and Testing Previous Knowledge

It was noticed that the teachers utilized some time, usually ranging from 3 to 5 minutes, for testing what the students had learnt from previous lessons. During this time, teachers verbally assessed the assimilation of previous knowledge of the students. This was also supported by the motivational statements or questions before announcing the topic of teaching. Some teachers also utilized this time for preparing the black board for writing and establishing a rapport with the students thus making classroom environment congenial for teaching.

b) Announcement of the Topic to be Taught

During this phase, teachers uttered a statement viz. “Today, we are going to study about....” for announcing the topic to be taught in that period. This statement was found to be common among all teachers as teaching was based on the topic to be taught during the particular period.

c) Presentation of the Content to be Taught

This part of the lesson consisted of step by step teaching of the topic from science. In this phase, the teacher took the help from text book and used board and chalk to deliver the content. He/she cited examples and sometimes showed teaching aids like charts and models etc. related to the nature of the topic. During the course of teaching, the students would mostly listen to the content and specific instructions given by the teacher, note down whatever was required
to be noted and answered the questions asked by the teacher during the course of teaching science. The presentation part was thus totally devoted to curriculum transaction i.e. delivery of content as per their text book. Most of the teachers observed by the investigator were found to use lecture method for teaching general science during their periods. In few lectures, it was also found that the proceedings had to be stopped due to the external distractions which were usually caused by unavoidable circumstances like students noise, pranks, announcements related to teaching etc. These distractions were found to halt the progress of the teaching and learning inside the classes.

d) Recapitulation

During recapitulation, the teachers tried to know whether students had assimilated the knowledge imparted during the lecture. Teachers usually tried to explain the content in detail and cite some more examples if it was found necessary to make students learn the content.

e) Concluding Statement and home assignment

After knowing what the students had gained during the delivery of content, the teachers made a statement regarding the completion of the topic. In the end, teachers usually instructed the students to refer to the text book to have in-depth knowledge while studying at home. To ensure this, students were assigned home task or an exercise related to the topic from the text book.

It was observed that the teachers in general were;

a) unable to arouse deep interest in learning general science among students during a period of 35-40 minutes duration even after citing several examples and using conventional teaching aids.

b) found to be busy in the completion of the topic/ syllabus in the assigned time within the limits of text books.
c) found to be helpless whenever asked by the students to resolve their doubts or queries related to the topic. The relevance of the topic with day to day activities of the world were also not highlighted properly. Teachers were nevertheless able to clear those doubts of the students which were directly related to the facts contained in the topic or content.

It was found that the students were involved minimally in the overall teaching process. After completing one topic, the teachers proceeded to teach the second topic and taught it in the same manner. The topic by topic teaching by science teachers was focussed on the completion of syllabus for the next examination. As a part of comprehensive evaluation, class tests, unit tests, terminal tests and annual tests were regularly conducted by the teachers to assess the achievement of students in the subject throughout the session.

These proceedings motivated the investigator to know the attitudes of students towards learning general science by the conventional method. It was also decided to record the achievement levels of the students in science subject before exposing them to teaching science through electronic classroom technique.

6.2.1 Possibility of Using Technology for Teaching General Science

From classroom observations, the investigator became fully convinced that something needed to be done to arouse the interest in general science among students at secondary level. The investigator decided to utilize educational technology for teaching general science to the students. However, it was also important to establish whether introduction of technology for teaching science could play an important role in developing favourable attitudes and lead towards increasing students’ achievement. He, therefore, worked towards planning and executing a plan to make this intervention successful and study its effectiveness.

While working on his plan, the investigator started; a) orienting and training teachers to use modern technology, b) developing a strategy for teaching through technology, c) making arrangements for the conduct of teaching through
electronic classroom and d) conducting trials in actual classroom situations respectively. The main focus was on the assessment of difference between teaching general science through traditional method and through electronic classroom technique for students at the secondary level.

### 6.2.2 Planning for Teaching Science through the Electronic Classroom Technique

When the investigator discussed his proposal to teach general science through electronic classroom with school teachers they expressed their reservations as they had never been trained to use educational technology in the teaching of science. However they were willing to cooperate in the experiment provided they were duly trained for the purpose. A plan was adopted for teaching and the investigator worked along with the teachers and helped them in developing teaching plan for at least one topic to be taught in the class using technology. The standard plan, as given in annexure 3.2 consisted of introduction (2 minutes), step by step multimedia presentation (5 minutes), quick assessment and explanation (10 minutes), broader understanding (10 minutes) and summarization (5 minutes).

While, most of the steps followed for teaching were similar to the RCEM approach the only difference was in the presentation of content. To illustrate, in a 35-40 minutes period, teacher were asked to introduce the topic and state the learning objectives in first two or three minutes after the commencement of the period. Teacher, then required to conduct a slide-by-slide multimedia presentation (2D or 3D) on the topic for five to ten minutes depending upon the content. The teacher was required to conduct a quick assessment of learning and after knowing the level, explain parts not clear to students on the blackboard to ensure that all students had achieved a good understanding of the concept being taught. This phase lasted for 10 minutes. In the next 10 minutes, teacher was required to help students to acquire a broader understanding of the concept taught and its application and importance in life through additional referral materials in the form of film and video clipping etc. The teacher was asked to
summarizes the topic, its application and importance and conclude the session in last five minutes.

This exercise helped the teachers to develop a teaching plan on a particular topic which was supposed to integrate their teaching with technology. As compared to traditional teaching, in this plan, part of content required to be taught with the help of multimedia digital content in the form of animations and videos. Even after preparing the sample lesson teachers were found to be reluctant in changing their methodology. They were found to be hesitant to use technological gadgets. Therefore, it was decided to conduct an in-depth training so that teachers could feel as comfortable in teaching with the assistance of electronic media.

6.2.3 Training of Teachers for Teaching General Science with Electronic Classroom Technique.

This part of the preparation was considered to be crucial, as the success of the experiment was based on effectiveness to teach science through the electronic classroom technique in regular classroom settings. A schedule was prepared by the investigator in consultation with the Principal of the school and the schedule of training was divided into two types of sessions. These were a) micro and b) macro teaching sessions during this training.

a) Conduct of Micro Sessions

Organisation of Micro sessions was considered necessary due to lack of teachers’ acquaintance with technological gadgets. Micro sessions were conducted according to the following schedule.
Table 6.2.3.1
Schedule for Micro Sessions (10 minutes duration)

<table>
<thead>
<tr>
<th>A) Demonstration</th>
<th>Date</th>
<th>Venue</th>
<th>Group</th>
<th>Timing</th>
<th>Topic</th>
<th>Technology tools Used</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dec. 26,08 &amp; Dec. 27,08</td>
<td>Electronic Classroom, 1st floor.</td>
<td>All Teachers &amp; All Members associated with Electronic Classroom</td>
<td>11:30 PM to 2:30 PM</td>
<td>Basics of Electronic classroom</td>
<td>Interactive Electronic classroom Technology</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B) Micro Teaching Sessions</th>
<th>Date</th>
<th>Venue</th>
<th>Group</th>
<th>Timing</th>
<th>Topic</th>
<th>Technology tools Used</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dec. 29, 08 to Dec. 31, 08</td>
<td>Electronic Classroom No. 1 (1st floor)</td>
<td>Teachers teaching class 7th</td>
<td>11:30 PM to 2:30 PM</td>
<td>Using Hardware &amp; Software</td>
<td>All</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Electronic Classroom No. 2 (2nd floor)</td>
<td>Teachers teaching class 8th</td>
<td>11:30 PM to 2:30 PM</td>
<td>Using Hardware &amp; Software</td>
<td>All</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Electronic Classroom No. 3 (2nd floor)</td>
<td>Teachers teaching class 9th</td>
<td>11:30 PM to 2:30 PM</td>
<td>Using Hardware &amp; Software</td>
<td>All</td>
</tr>
</tbody>
</table>

Photographs

Photograph 5. Photographs Showing Two Different Training Sessions

After initial training (shown in part A of Table 6.2.3.1), a feedback was taken from the teachers regarding their comfort level. It was found that they were willing to be trained through micro sessions. Therefore, they were taken to the
next phase of micro sessions (shown in part B of Table 6.2.3.1. In this phase, micro teaching sessions of 10 minutes duration were organised in electronic classroom settings. Through these sessions, all the teachers were trained in a workshop by the investigator. Every teacher was given a practice to teach his/her topic for 10 minutes and he/she was asked to practise only the presentation part of the lesson plan because teachers already knew the other steps and they had enough experience in performing those tasks. During these ten minutes they were trained to teach through technology by using 2D, 3D animations and video clippings.

Teachers, during these training sessions and later in the actual teaching general science through electronic classroom technique, were asked to follow a predetermined cycle of activities. This cycle of activities consisted of the following steps:

a) Selection of a topic to be taught,

b) Preparation of the lesson plan,

c) Browsing the resources, mainly the knowledge centre server, for the availability of the digital content for teaching,

d) Modification of the lesson plan according to the digital content,

e) Practising the presentation before the session,

f) Presentation during the training or workshop,

g) Feedback regarding the improvement required in the presentation,

h) Repeating the cycle for next topic or similar topic depending upon the feedback.

∪
This cycle of activities started from the selection of topic from the prescribed syllabus to be followed in the particular class. A complete plan based on RCEM approach of teaching was developed for teaching in a period of 35-40 minutes duration. Teachers were then required to search for the availability of digital content in the knowledge centre server through any client end computer. The knowledge centre server happened to be a computer containing the repository of thousands of digital content in the form of animations, video clippings and presentations etc. This server had been acquired from a company which provided access to the digital content for use only in the institution. The server was connected to a desired number of nodes in the institution through a local area network (LAN). The content could, therefore, be accessed from any class/room in the institution.

After going through the digital content, the teachers were required to modify the plan according the multimedia presentation to be employed during actual teaching. The presentation could be repeated as many times as one wanted for ensuring a comfortable delivery of the lesson. A presentation was next made as per the standard plan by the concerned teacher and after presentation, a feedback was collected for improvement. This cycle was repeated for every topic to be taught in the class. This cycle was also followed during all micro sessions to develop expertise in the steps of teaching through the electronic classroom technique.

After completion of the micro lessons, feedback was collected. Analysis of the feedback revealed that teachers had enjoyed the training and they could be taken to the next round of training on an integrated system.

b) Conduct of Macro Sessions

Training through macro sessions consisted of a workshop in which the teachers were trained to teach a topic for 35-40 minutes duration using the electronic classroom technique. Each teacher was trained to integrate the training received from micro sessions with the macro lessons according to the following schedule.
Table No. 6.2.3.2

Schedule for the Macro Sessions (35-40 minutes duration)

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Teaching Through Electronic Classroom</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>6 Lessons</td>
</tr>
<tr>
<td>B</td>
<td>6 Lessons</td>
</tr>
<tr>
<td>C</td>
<td>6 Lessons</td>
</tr>
<tr>
<td>D</td>
<td>6 Lessons</td>
</tr>
</tbody>
</table>

Every teacher prepared ten lesson plans and delivered six lessons during the training workshop. This phase was an important one because the teachers were now well versed with the use of technology gadgets and their confidence level had increased. Teachers received training in several types of electronic classrooms as described in Chapter 4, because the developments were taking place at a very fast pace and technological gadgets were being procured, tested and made available for use in classroom situations. It was very important to expose teachers to different technological advancements so that they did not feel uncomfortable during actual teaching. A total of six lessons per teacher delivered in presence of peer experts, and the investigator made the work much easier in terms of uniformity of procedure and teaching at any class level from 7th to 9th grade. It was ensured that a teacher could teach any class or section by following the lesson plan with ease and expertise. Teachers were assessed according to the teaching plan by the investigator and they were provided with necessary feedback which helped them in improving their performance. In the same manner, it was ensured that teachers were able to attain the mastery level. After the completion of macro level training, teachers were asked to work on the modification of lesson plans in the light of feedback received by them.
6.2.4 **Content to be Taught through Electronic Classroom**

After the training of teachers, an important task was to select the content from the prescribed syllabus which would be covered for teaching general science through electronic classroom technique. For this, a topic-wise list was prepared and selected for different classes. Equal number of lessons/topics was selected from physics, chemistry and biology sections of general science in 9th class. 60 lessons spread over two units from 9th class were considered for enrichment with the digital content. In addition to this, 120 lessons/topics were also included in the list for teaching at the 7th and 8th class levels. Thus a total of 180 lessons were selected. These have been shown Figure 6.2.4.1.

*Figure No. 6.2.4.1 Division of Topics/Content into Number of Lessons*

**Division of Topics/Content into Number of Lessons**

- **Class 7th Science (60 Lessons)**
  - Nutrition
  - Food
  - Photosynthesis
  - Respiration
  - Digestive System
  - Balanced Diet

- **Class 8th Science (60 Lessons)**
  - Carbon & Carbon Compounds
  - Petroleum
  - Coal
  - Light
  - Reflection
  - Metals

- **Class 9th Science (60 Lessons)**
  - Motion
  - Force
  - Matter
  - Mixture
  - Cell
  - Tissues

- **Physics (20 Lessons)**
- **Chemistry (20 Lessons)**
- **Biology (20 Lessons)**
The above representation shows the selection of topic in each class. Each topic was sub divided into number of lessons according to a temporal plan as shown in Figure 6.2.4.1. This was followed by enriching the content with required digital audio - video presentations and supplementary text material available from the directory of ICT material.

6.2.5 Enrichment of Content with Digital Content

The selected topics were mapped with the digital content available in the server for teaching general science through electronic classroom technique. The enrichment of the content with the digital 2D or 3D animations animation and video clippings was done for each topic selected for teaching. It was ensured that adequate material was available in digital form for all topics to be taught. A final list of topics was prepared which has been given in Appendix VI. This list was circulated among the science teachers so that they could prepare their lesson plan/s for each topic. This exercise helped the teachers to develop at least five lessons per class before the commencement of teaching through electronic classroom technique.

The investigator also helped the teachers in the development of lesson plans. These twenty lesson plans were next checked by three experts in teaching of science, who were teaching in the local colleges of education. All 180 plans were developed on the basis of the approved format. In each lesson plan, the RCEM approach of lesson planning was followed. However, it was further modified by adding multimedia presentations in place of lecture for lesson delivery. The procedure of teaching through electronic classroom technique has been shown in a tabular form in Table 6.2.5.1.
Table 6.2.5.1

Procedure for Teaching through Electronic Classroom

<table>
<thead>
<tr>
<th>Steps</th>
<th>Planning Phase</th>
<th>Presentation Phase</th>
<th>Testing</th>
<th>Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Selection of Topic, Warm up Session,</td>
<td>Preparing a Test,</td>
<td>Observing the activities,</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Preparation of Plan, Introduction of the Topic,</td>
<td>Administering,</td>
<td>Analysing,</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Enrichment with Digital Content, Slide by slide presentation,</td>
<td>Checking of answer sheets,</td>
<td>Drawing out weak and strong points,</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Study of the Digital Content, Quick Assessment,</td>
<td>Assigning Marks,</td>
<td>Passing these to the concerned,</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Finalisation of the availability of digital content and Plan, Supporting or Repeating the Presentation and summarising</td>
<td>Cumulative Records</td>
<td>Improving in the light of suggestions</td>
<td></td>
</tr>
</tbody>
</table>

The steps in the procedure, shown in Table 6.2.5.1, followed by the science teachers made them comfortable in the use of educational technology. Even the teachers who were found to be reluctant showed interest in teaching through electronic classroom technique.

6.2.6 Temporal Plan for Teaching through Electronic Classroom Technique

The success of training sessions led the investigator towards the development of a temporal plan for the actual science teaching through the electronic classroom technique. The temporal plan contained allotment of periods in the time table of the school. Though some minor changes and adjustments had to be made, yet during actual conduct, it was ensured that electronic classroom teaching did not affect the overall schedule of classes as well as curricular activities of the school.
The day by day, period by period allotments have been shown in the Tables 6.2.6.1 and 6.2.6.2.

**Tables 6.2.6.1**

*Electronic Classroom schedule for Gen. Science*

<table>
<thead>
<tr>
<th>Day/Time</th>
<th>08:20</th>
<th>09:00</th>
<th>09:40</th>
<th>10:20</th>
<th>11:20</th>
<th>11:55</th>
<th>12:30</th>
<th>13:05</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td></td>
<td></td>
<td></td>
<td>7B</td>
<td>7B</td>
<td>7B</td>
<td>8A,7B</td>
<td>9B P,8A,7B</td>
</tr>
<tr>
<td>Tuesday</td>
<td></td>
<td></td>
<td></td>
<td>7C</td>
<td>7B</td>
<td>7B</td>
<td>8A,7B</td>
<td>9B P,8A,7B</td>
</tr>
<tr>
<td>Wednesday</td>
<td></td>
<td></td>
<td></td>
<td>7C</td>
<td>7B</td>
<td>7B</td>
<td>8A,7B</td>
<td>9B P,8A,7B</td>
</tr>
<tr>
<td>Thursday</td>
<td></td>
<td></td>
<td></td>
<td>7C</td>
<td></td>
<td></td>
<td></td>
<td>9A C, 9B B</td>
</tr>
<tr>
<td>Friday</td>
<td></td>
<td></td>
<td></td>
<td>7A</td>
<td>7B</td>
<td></td>
<td></td>
<td>9A C, 9B B</td>
</tr>
<tr>
<td>Saturday</td>
<td></td>
<td></td>
<td></td>
<td>7C</td>
<td></td>
<td></td>
<td></td>
<td>9A C, 9B B</td>
</tr>
</tbody>
</table>

A total of 180 lessons were planned to be delivered by following the above time table. The teaching was proposed to last for 53 working days as shown in Table 6.2.6.2.

**Table 6.2.6.2**

*Class-wise Distribution of Periods/Lessons*

<table>
<thead>
<tr>
<th>Class</th>
<th>Section</th>
<th>Periods/Lessons</th>
<th>Working Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>A</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>A</td>
<td>60</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>9A Physics</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9B Physics</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9A Chemistry</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9B Chemistry</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9A Biology</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9B Biology</td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

**6.2.7 Settings for Electronic Classrooms**

With the finalization of temporal plan, stage was finally set for actual conduct of science classes with electronic classroom technique. So, after seeking
permission for conducting classes, the approved temporal plan was distributed among teachers so that they could go through the digital content and prepare for teaching. Teachers were allowed to visit the knowledge centre created for the purpose of accessing animations, video clippings and other digital contents in advance. The computer laboratory was also made ready to provide easy access of digital content from the knowledge centre server. Further, they were facilitated to the extent that they could access the digital contents from any computer in the school. Teachers were encouraged to view animations and videos as many times as they wanted. Teachers usually consulted the investigator for clarifications and assistance as he was available at all times to help them. Every effort was thus made to neutralize the influence of any factor related to teaching and learning which otherwise would have affected their performance.

Before the commencement of the intervention, all hardware and software items were checked for smooth functioning. It was ensured that all parts of the system were well placed and working as per the teaching requirements. The hardware and software details have been given in Chapter 4. The smooth working of server, computers, projectors, converters, uninterrupted power supply, remote controllers, networking and other accessories was ensured well in advance. To ensure flawless working of the systems, help from teachers, engineers and concerned officials was also sought. In that way, seven electronic classrooms were set up and connected to the server and other devices.

A meeting with the Principal, science teachers and the concerned support staff was arranged in which all aspects of the conduct of the experiment were explained and discussed. A circular was issued by the Principal in which it was also mentioned that the conduct of classes shall be taken up as a regular activity in the school time table. It acted as a ready reference for conducting classes in accordance with the following schedule given in Table 6.2.7.1.
A copy of the time table, as given in Table 6.2.7.1, was distributed to the concerned teachers. They were also informed about the possibility of the presence of the investigator as an observer during the actual conduct of classes. The teachers willingly agreed to the suggestions as they were very comfortable and at ease with the investigator.

As per experimental design of the study, it was decided to administer science attitude scale before the commencement of the classes. The scale was administered to the students a few days before the commencement of the experiment of teaching through electronic classroom. The investigator also collected the previous science achievement scores of students from the school records.

### 6.3 Teaching General Science through Electronic Classroom Technique

On the first day, the investigator reached the school early and ensured the smooth functioning of every device and equipment. He also confirmed the presence of the concerned science teachers in the school staff room. Being the first day, the investigator was careful to conduct the proceedings according to the proposed plan. The bell rang at 8:20 a.m. and it was time to conduct the first class in 8th A by teacher A in Electronic Classroom no. 3 as it has been shown in serial number 1 of the activity Table 6.3.1.
The investigator entered the classroom and observed the proceedings by sitting on the last bench of the room. The topic to be taught was ‘Carbon’. It was noticed that the teacher followed the plan effectively. She used every step of the plan and taught ‘Carbon’ with the help of an animation. This animation was related to the scientific knowledge of carbon as an element.

During the period, the students who were used to taking out text books to understand concepts in science, did not even think of opening their books. They followed the content shown on the screen and their involvement in learning showed that their interest had been aroused during the presentation. The teacher took 12 minutes to teach through animation, going ahead step by step. The teacher also put questions from the content and most of the students responded quickly. However, some of the students took time to express the response in their own words. This indicated that they had gained the knowledge but were unable to respond properly due to linguistic difficulties.

The investigator was satisfied with the working of the systems, performance of the teacher and overall behaviour of the students in the classroom. The period
lasted for 35 minutes. After the class was over, it was time to leave and observe
the second class of the day.

The investigator entered class 7\textsuperscript{th} at 9 a.m. where teacher C was starting the
class. The teacher was to teach the topic ‘Nutrition’. He followed the standard
plan and was able to do justice to motivation, presentation, recapitulation and
concluding steps of the plan. He used one 3D animation and took 10 minutes to
explain the concepts of nutrition. It was observed during the presentation that
the teacher was comfortable in using technology while the students were found
to be eager to know the content.

The investigator observed classes at random throughout the teaching phase and
was able to visit a total of 30 classes out of 180. As per the proposed plan, a
total of 180 lessons were to be delivered and the conduct of these classes was to
last for about three months. In these months, most of the lessons were delivered
by the designated teachers. However, the investigator also took some classes to
teach photosynthesis, hydrocarbon and laws of motion to 7\textsuperscript{th}, 8\textsuperscript{th} and 9\textsuperscript{th} classes
respectively as the concerned teachers were on leave during those days. In these
periods, he found that he was able to perform his duty as a teacher satisfactorily
while the students were able to respond well after the delivery of the content.

All classes were conducted smoothly in a similar manner and the field trial
phase of teaching general science to the secondary level students was completed
as per the scheduled plan.

After the completion of 180 lessons in three classes, teacher made tests were
administered to the students to know their achievement levels in science. After
this ‘Students’ Attitude Towards General Science’, ‘Students’ Questionnaire on
Effectiveness of Electronic Classroom’ and ‘Questionnaire on Teachers’
Interactions’ were also administered one by one. ‘Science Teachers’ Attitudes
Towards Technology’ scale was also administered to the science teachers who
were involved in the present study.

Photographs related to teaching through technology are given in Chapter IV.