

**Chapter 3 –  
Plan and Procedure  
of  
the Study**

## **Chapter 3**

### **Plan and Procedure of the Study**

#### **3.1 Introduction**

This chapter gives details of the methodology adopted by the Researcher in carrying out the Study. It includes details of the research design, population, sampling techniques, tools, sources of data, procedure of data collection and finally the way the data were analyzed. Details of the instructional strategy designed on the 5E instructional model based on the Constructivist approach to learning have been given in the next chapter.

The Researcher, in this Study, designed an instructional strategy based on the Constructivist approach and studied the effectiveness of this strategy. The 5E instructional model proposed by Roger Bybee (2009) (Engage, Explore, Explain, Elaborate and Evaluate) was adopted to teach Social Science content.

#### **3.2 Design of the Study**

According to Gay et al (2012), “experimental research is the only type of research that can test hypotheses to establish cause-effect relations. In experimental research, the researcher manipulates at least one independent variable, controls other relevant variables, and observes the effect on one or more dependent variables.”

The major characteristic of a true experiment design is control; that is the Researcher is in control of many factors that influence the Study namely the way in which the sample of the Study is determined, how participants are assigned to the different treatment conditions and how the environment is designed during the instruction and evaluation. This is extremely important in order to reduce the effect of extraneous variables so that any change seen in the dependent variable can be attributed to the independent variable other factors/variables having been controlled.

Given the field realities, it was not possible to control all variables that would have significant impact on the Study. In such cases, quasi-experiments are conducted since random assignment is difficult and very often not permissible.

Thus, a Quasi-experimental approach was used for the present Study; the design used was Equated Experimental Control groups only post-test design to test the hypotheses.

The research design for the present Study is represented as below:

O1 X O2	where O1, O3 are pre-tests	X is experimental group
O3 C O4	where O2, O4 are post-tests	C is control group

The Researcher took enough measures to ensure that the two groups, which could not be selected randomly, were as similar as possible. This was ascertained by the following factors - both groups were selected from the same school; the teachers were of the same sex, similar age with similar teaching styles; a pre-test was conducted to assess students' knowledge of Social Science of the previous academic year and there was no significant difference in the mean achievement scores of both the selected group of students; the pre-test, post-tests and comprehensive post-test were validated by Experts and the researcher personally implemented tests for both groups; during the course of the intervention no student dropped out from either group and thus experimental mortality too was taken care of.

With these measures taken, the Researcher was able to increase the internal validity of the Study by controlling some of the important confounding variables. However, there could still be some other uncontrolled confounding variables which were addressed by adopting suitable statistical techniques.

### **3.3 Population of the Study**

All Standard IX students of CBSE English medium Secondary schools of Vadodara City, Gujarat, Academic Year 2016-17, following the CBSE Syllabus was the target population of the present Study.

### **3.4 Sample of the Study**

The total number of CBSE schools in Vadodara city was identified. However, the selection of the 2 schools for the Study had to be done purposively being the only 2 schools that agreed to support the research endeavour and permit the implementation of the Constructivist approach on its students.

Thus two (2) English medium Senior Secondary schools of Vadodara City, Gujarat, academic year 2016-17, following the CBSE Syllabus were selected purposively – one, for carrying out the Pilot Study and the other, for implementation of the Constructivist teaching via 5E model.

Two sections from this school - Standard IX-A and IX-C were randomly selected as Control Group and Experimental Group respectively. Both Experimental and Control Group had 33 students each.

It was not feasible for the Researcher to go for random assignment of students to both groups; thus, whilst groups were randomly assigned as Experimental and Control groups, the students within the groups could not be done so.

### **3.5 Tools Used for Data Collection**

The tools and techniques used by the researcher and the objective for which they were designed is given below -

**Achievement Tests:** Achievement tests were prepared by the Researcher for Pre-Test, Post-Test 1, Post-Test 2, Post-Test 3 and Comprehensive Post-Test with knowledge, understanding, application and high order thinking skill.

The Pre-Test was conducted before the intervention to compare both the groups with respect to their Social Science knowledge of the previous academic year.

The Post-Tests were prepared based on the content taught during the intervention.

**Observation:** Observation of student participation and responses in the various stages of the 5E model of teaching were important sources of data to gauge whether the students were able to make the required connections between the present, past and future. Thus, the learning tasks assigned had to ensure active engagement (mental and physical) of each student. The next stage ‘Exploration’ was equally crucial wherein the Researcher designed activities that allowed students to go to the next level and investigate – in this phase it was important to assess how students were investigating and arriving at conclusions by observing patterns, seeing connections and recognizing new situations, technologies and procedures. The stage of ‘Explanation’ revealed their ability to explain their concepts with clarity and good communication skills. Not only this; their ability for negotiation, interpretation, collaborative learning and the ability to convey ideas via other media too was observed. Having understood the concept the, students were able to extend and apply this knowledge to other situations and observation helped the Researcher to gauge how well students were able to transfer their learning. While observation of the earlier phases helped the Researcher to evaluate the ‘process’ aspects, the final phase of ‘Evaluation’ helped the Researcher to evaluate the ‘learning outcomes.’ Thus, observation helped the Researcher to evaluate student learning towards achieving the pre-determined educational objectives.

**Reaction Feedback Scale:** This was designed by the Researcher to capture students’ reaction feedbacks on the effectiveness of the Constructivist teaching.

### **3.6 Development and Validation of Tools**

Validation of all the ten (10) Lesson Plans, Scholastic Achievement Test papers for the Pre-Tests, Post-Tests 1, 2, 3 and Comprehensive Post-Test developed by the Researcher were validated by the Experts (Subject and Language) as listed in Appendix 6.

Likewise, the Reaction Feedback Scale developed by the Researcher for obtaining students' feedback reaction on the Constructivist teaching approach was also validated by the Experts.

### **3.7 Procedure of data collection**

The present Study used a quasi-experimental design - Equated Experimental Control groups only post-test design to study the effectiveness of an intervention based on the 5E instructional model.

The Study was conducted in the following Phases –

Phase 1: Formation of Experimental and Control Groups

Phase 2: Design and Development of the instructional strategy (Lesson Plans), Reaction Feedback scale.

Phase 3: Pilot Study and Feedback

Phase 4: Administration of Pre-Test

Phase 5: Implementation of Lessons based on 5E model.

Phase 6: Administration of Post-Tests 1, 2, 3 and Comprehensive Post-Test

Phase 7: Assessment and Consolidation of Test Scores

Phase 8: Administration of Reaction Scale and Collection of Students' Reaction Feedbacks

#### **Phase 1: Formation of Experimental and Control Groups.**

The Study was conducted in a Senior Secondary CBSE School in Vadodara city. Standard IX-C and IX-A each comprising 33 students were randomly selected, by lottery method, as a whole section as Experimental and Control Groups respectively for implementation of the intervention. Individual students in neither of the two groups could be selected randomly as this was not permitted by the school authorities. The students were not previously exposed to Constructivist method of teaching.

The Researcher taught the Experimental Group through Constructivist Approach and Control Group was taught through traditional approach by the school Social Science teacher.

Time taken for teaching both groups of students via different modes was the same.

## **Phase 2: Design & Development of Lesson Plans & Reaction Scale**

During Feb-May 2016, the Researcher designed and developed ten (10) Lesson Plans (LP) covering three (3) Lessons of Democratic Politics of Standard IX CBSE English medium, each consisting of multiple sub-topics (total 10 nos.). These 3 lessons were selected as these were the lessons that were scheduled to be taught during that time of the academic year (2016-17). This plan helped the school to maintain their schedule, as pre-decided. Total ten (10) Lesson Plans (LP) based on Constructivist approach to teach Social Science to Standard IX CBSE English medium were developed by the Researcher based on 5E Model – Engage, Explore, Explain, Elaborate and Evaluate – approach as given by Bybee (2009). The 5E model induces students into activity at every stage and encourages them to create their own concepts.

**Engage:** Teacher assesses the learners' prior knowledge and helps them to engage in a new concept of the teaching-learning process of the content being taught.

**Explore:** Students are encouraged to explore and deep dive in their environment and allowed to formulate a basis for new knowledge.

**Explain:** Here teacher explains the concepts the students were exploring. The students will be allowed to provide their conceptual understanding and demonstrate new skills and behaviours.

**Elaborate:** In this phase, Teacher elaborates and expands conceptual understanding of the students by developing deeper understanding of major concepts and refining their skills. This phase helps students to connect the new experience to the prior experience and develop better insights.

**Evaluate:** This phase encourages learners for assessment of their understanding & abilities by the teachers.

Lesson Plans (LP) for the different subtopics in the lessons selected and achievement tests were prepared by the Researcher with knowledge, understanding and application based short questions. At every stage, these were validated by Content/Subject as well as Language Experts and necessary modifications were made prior to final implementation. (List of Experts attached in Appendix 6)

Master Plan for the development and implementation of Lesson Plans is given in Figure 3.1 hereinafter:

Researcher also developed a Reaction Scale (Ref. Appendix 5) to take the reaction of students on the Constructivist approach as experienced by them.

### **Phase 3: Pilot Study and Feedback**

Pilot study was conducted in a CBSE school in Vadodara for Standard IX students in June-July 2016. Each day, (1) one-hour session was conducted. Total 3 lessons (total 10 topics) were taught and evaluated. Various activities carried out included group discussions, playing video clipping, debates, skit preparation and interviews.

Following feedbacks were obtained:

1. More time to be given for discussion
2. Few more activities e.g. chart making, adopting voting process, etc. to be included
3. Brainstorming session to be added
4. Evaluation items to cater to all 5E stages

Based on the above feedbacks and after a consultation with Experts, the plans were duly modified.

### **Phase 4: Administration of Pre-Test**

Based on the content of Standard VIII Social Studies, an achievement test was prepared by the Researcher. This included knowledge, understanding, application, appreciation and high order thinking skills. This exam was of 15 marks and of 40 minutes duration. Pre-Test was administered to both Experimental and Control Groups to assess whether there any significant difference existed between the two groups prior to commencement of Constructivist teaching to Experimental Group.

### **Phase 5: Implementation of the Lessons**

Total ten (10) Lesson Plans were implemented in thirty-four (34) classes each of 40 minutes duration. Further, ten (10) Home Assignments were given and 3 Post-Tests (one after each lesson) and 1 Comprehensive Post-Test (after completion of all 3 lessons) were also conducted in 6 months (between July and December 2016).

### **Phase 6: Administration of Post-Tests 1, 2, 3 and Comprehensive Post-Test**

Post-Tests 1, 2 and 3 were conducted for both Experimental and Control Groups after teaching each of the 3 lessons. Each exam was of 15 marks and duration of 40 minutes. In addition, a Comprehensive Post-Test covering all 3 lessons was also administered. The Comprehensive Post-Test was of 50 marks with 90 minutes duration. However, for statistical calculations and for the purpose of comparisons, marks obtained out of 50 marks were converted to scores out of 15 marks.

### **Phase 7: Assessment and Consolidation of Test Scores**

Student responses in Post-Test 1, Post-Test 2, Post-Test 3 and Comprehensive Post-Test were assessed and consolidated for further statistical analysis.

### **Phase 8: Administration of Reaction Scale and Collection of Students' Reaction Feedbacks**

The Researcher also obtained reaction feedbacks of the 33 students of the Experimental Group on the effectiveness of the Constructivist teaching method. Such responses / feedbacks were collected against 59 questions / statements set under the headings, Introduction (6), and '5E' components – Engage (13), Explore (9), Explain (16), Elaborate (6) and Evaluate (9).

### **3.8 Data Analysis**

The observations made by the Researcher were recorded in the form of field notes and these were analyzed to identify the different stages and associated skills.

The Pre-Test scores for both Control and Experimental Groups were analyzed by using the 2-sample independent t-Test.

The Comprehensive and Post-Tests scores were analyzed using the MANCOVA. Statistical techniques e.g. Mean, Standard Deviation, 2 Sample Independent t-Test and Multiple Analysis of Covariance (MANCOVA) were employed for carrying out the data analysis.

The Reaction Feedbacks were analyzed using frequency and percentage analysis.



