CHAPTER-III
METHODOLOGY

3.0   Introduction

Methodology is used to denote the approach to a particular research. It is concerned with the description of research methods. So, this chapter discusses about methodological approach, the research strategy and procedures adopted to carry out the present study.

3.1   Choosing a Methodology

One has to decide his access to research site, devise measurement techniques, enlist the cooperation of a sample of participants, establishes a schedule of observation that specifies when, where, for whom and by whom particular variables measured before collection of data. To accomplish these special purposes qualitative research in its natural settings was chosen as effective method. Qualitative research studies the routinical as well as specific problems, meanings in individuals' lives. Accordingly a variety and a wide range of interconnected interpretive practices are deployed to get a better understanding of the problem at hand. Hence, case-study was used.

The present study examined the construction of social skill behaviors through constructivist approach of learning. An attempt has been made to search answers to research questions through *Qualitative Case-Study*.PBL process in small group was designed to elicit the Social Skill behaviors of teacher trainees. Field notes were prepared daily during and after the period of group learning. At the same time, audio-video recording was also taped during PBL. The analysis of field note was done from the beginning of Problem Based Learning. Different stages of analysis were followed. Each stage of analysis formed about change of specific social behaviors.

The main dimensions from which the different components of Social Skill behaviors were inferred are as follows:

1. *PBL Process in Small Group*

2. *Transcript*

3. *Check List Matrix of Dynamics of Behavior*

4. *Content Analysis Summary of Dynamics of Behavior*

5. *Social Skills Check List*

6. *Factor Analysis*

7. *Perception of Teacher Trainees towards PBL*

8. *Teacher Trainees Written Feedback towards PBL*

3.1.1 Case-Study as Research Strategy

'Case-study' is a generic term for the investigation of an individual, group or phenomenon while the techniques used in the investigation may be varied and may include both quantitative and qualitative approaches. This is intensive analysis and descriptions of a single unit or system bounded by space and time. Topics often examined in case study include individuals, events or groups. Case-study researcher holds this to understand a case, to explain why things happen as they do, and to generalize or predict from a single example. It requires an in-depth investigation of the inter-dependencies of parts and of the patterns that emerge. Through case study, researcher hopes to gain in-depth understanding of situations and meaning for those involved.

Keeping research questions of

➢ How did social skilled behaviors evolve during problem-based learning?

➢ How did sharing of knowledge occur to create learning environment?

➢ How did pre-service teachers use the constructivist components like sharing, socialization during PBL strategy?

in mind, qualitative case-study can look at all of these aspects. Multiple data collection procedures were employed to develop insight into the issues of PBL and social skill behavior. Crucially, the focus of case-study was on problem-based learning situation with teacher trainees in a pre-service teacher education institution which was familiar to the researcher. The aim was to provide a clear picture about construction of social skill behaviors. In these way interactions, inter-personal relationships and other factors were studied in a unique educational setting.

The case-study was done in the following three phases:

Phase-1: Maintaining researcher's diary throughout all phases

1. *Made Initial Contact*

2. *Obtained Consent*

3. *Formation of Groups*

4. *Identification and Validation of Problem Scenario*

5. *Orientation towards PBL*

6. *Assigning the Learning Activities for PBL*

7. *Participant Observation using Video Tape*

8. *Begin Iterative Analysis*

Phase-2: Focused Exploration Using

1) *Participant Observation*

2) *Focus Group*

3) *Field Notes*

4) *Transcribing Video Tapes*

5) *Editing (Extending The Field Notes)*

6) *Coding the Text*

7) *Check List Matrix of Dynamics of Behavior*

8) *Content Analysis Summary of Dynamics of Behavior*

9) *Social Skills Check List*

10) *Factor Analysis*

11) *Perception of Teacher Trainees towards PBL*

12) *Content Analysis of Feedback Towards PBL*

Phase-3: Communicating the Result

1.   Compiled Preliminary Case-Study

2.   Checked By Guide

3.   Finalized Case-Study Write Up

3.1.2 Situating the Present Study

The study is related to problem-based group learning. The nature of learning was concerned with the essence of social reality. The teacher trainees thought process was through language. The activity within the group was dialogue, discussion and debate to make valid interpretation, thus, creating 'valid' knowledge. The reality of learning was *socially grounded*. Knowledge was socially constructed. Therefore, the implications of group-learning considered valid' means of collecting data that can be used objectively.

The participants who were the focus belonged to teacher trainees of Dr. HRGCE, Adipur, Kutch, and Gujarat. The researcher was the faculty of the same institution engaged with the same teacher trainees. He was teaching Science and Mathematics method to the same sample of teacher trainees. It was possible to find out details about their knowledge, educational and family background to conceive research of interest. It seemed possessing homogeneity characteristics of group working in a social setting. So, involving them in activities of group learning, taking up their time would be positive and useful for the focused study.
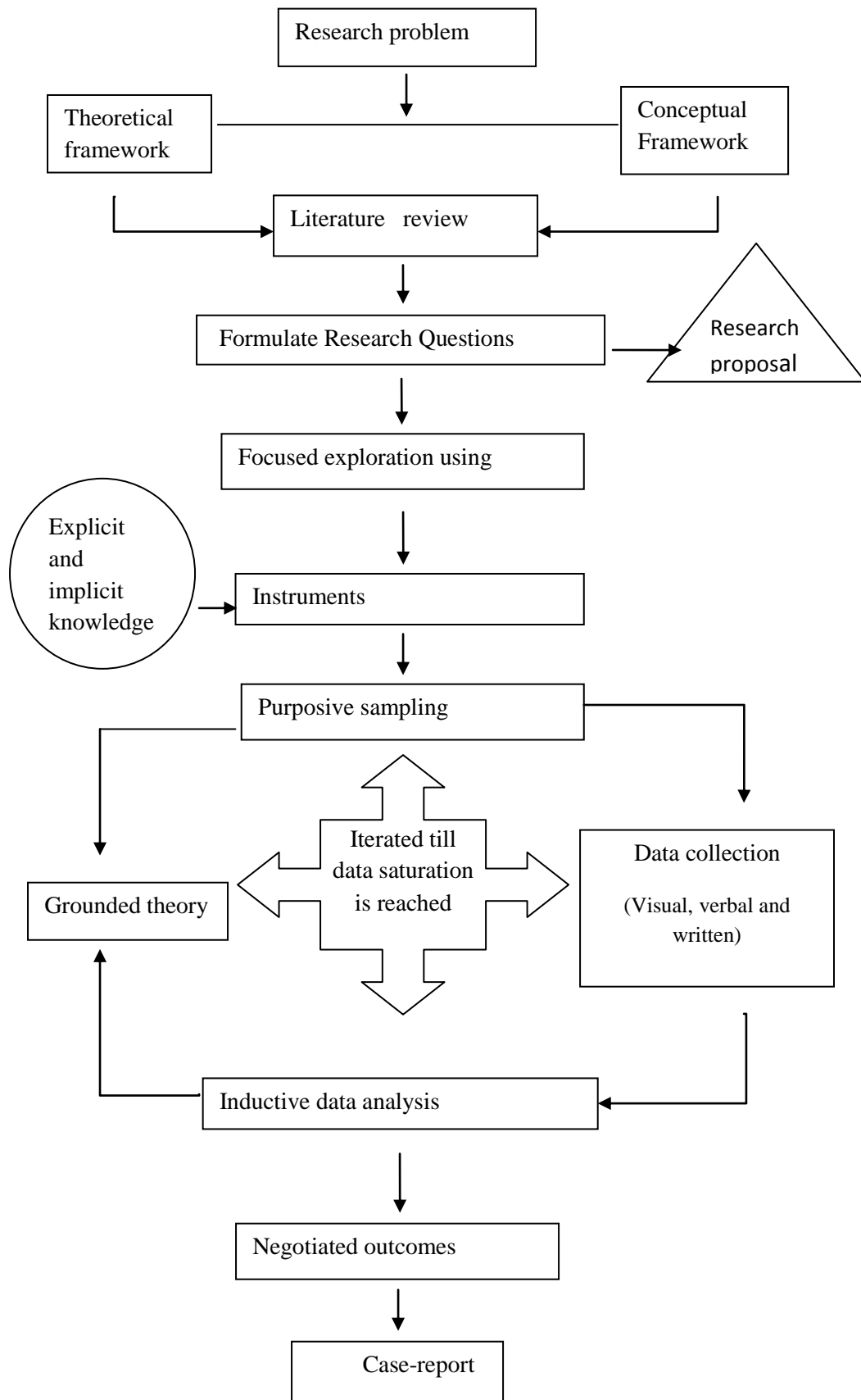
The researcher worked with two small groups over four week extending a case-study on trainees' social skill behavior during PBL process. During the small group discussion, trainees reported their social skill behaviors at random times when solving the given problem.

3.2   Research Design

The present study is based on the following research design **(figure-3.1).** This design illustrates a clear road way from identification of problem to providing a case report.

Figure 3.1:

Research Design

Research problem

Theoretical framework

Conceptual Framework

Literature review

Formulate Research Questions

Research proposal

Focused exploration using

Explicit and implicit knowledge

Instruments

Purposive sampling

Iterated till data saturation is reached

Grounded theory

Data collection

(Visual, verbal and written)

Inductive data analysis

Negotiated outcomes

Case-report

3.2.1 Selecting the Case-Study Teacher Training Institution

The study was aimed to conduct PBL at pre-service teacher training institution. The researcher was working at Dr. H.R. Gajwani College of Education. So this was selected as research site for such case-study as per convenience of the researcher.

3.2.2 Gaining Access to the Research Site

It was relatively easy to identify the college of Education because I was working as a faculty in this college. First, I took verbal consent of the principal and trustee. Then I requested through a formal letter to the principal for the conduct of PBL group work and it was approved. Even, the principal offered additional help in providing menial staff to manage the physical facilities for this group work. The computer laboratory was chosen for the research site to facilitate internet use. The permission to be 'on site' with the menial assistant was granted. After that each of the teacher trainees were conveyed about the nature of group work. I oriented the teacher trainees about the working style of PBL in a group through PPT slide presentation. The personal acquaintances with each other were identified during formation of two groups. The arrangement of group-1 or group-2 was made free to them. One session was carried out during morning and another during afternoon on each day including holidays. The timings from 8.30 to 10.30during morning and 4.00 to 6.00 during afternoon hours were allotted to them. Their preferred timings to sit in the event were decided by them. Accordingly, they were placed in any of two sessions. At last, each group consisting of six teacher trainees was constituted. All who belong to that site were cooperative and had trust on the researcher.

Mathematics and Science Education teacher trainees were the participants. They availed a personal space but others had curiosity what was going on? The researcher sought cooperation of all including research participants. He took responsibility in making early arrangements to collect data and by the way the nature of his researching context was understood to him.

- **Informed Consent:** A formal informed consent form was read and understood by all research participants to create mutual understanding and cooperation throughout the research process. The consent was voluntary

- **Confidentiality:** The data provided by teacher trainees were promised to keep confidentially.

- **Acknowledgement:** The findings from research were specific and such samples of trainees were acknowledged.

- **Protecting participants:** The teacher trainees had given extra time out of their daily routine work. Extra preparation for this work was contributed by them. So, they were taken care in their personal academic problem as and when necessary by them.

3.2.3 Ethical Considerations

The researcher took care of teacher trainees with sensitivity and respect for their status as human beings. The teacher trainees had genuine differences of opinion as to why one should be a subject in the process of research? Such ambiguity was well addressed by the researcher before hand.

a) Informed consent:

All the teacher trainees were agreed to take part after having good knowledge about the PBL process. There was no compulsion either to arrest their anxiety level or getting easy recognition within the student community. The aspects of PBL procedure in which they would be expected to provide data were discussed clearly. Even, they were assured to keep their names undisclosed.

b) Orientation towards PBL Process

The 'how' of PBL process was explained to teacher trainees? The way of recording data through video tape was ensured to find natural in formations. Information sheet about the steps with power point slides were supplied to the participants. They had inquired further to be convinced about the research. Standard and basic information was ensured to all teacher trainees. Detailed regarding the PBL orientation is presented in **Appendix-A.**

c) *Anonymity*

An explanation about 'PBL' as special approach for the data collection was focused. It was well informed that a 'case' as problem would be given in which they were to find out multiple solutions. They were instructed to work in a small group in days' together and could use all types of learning objects including web-based resources during the work.

d) *Small group ethics*

The experiment was ensured to conduct in the computer laboratory, an atmosphere of silent and pleasant with sufficient privacy. Provision of drinking water for teacher trainees was also arranged. The chairs were placed around a common table to make circular seating arrangement. Reflective diary was provided for confirming learning journals. The teacher trainees were helped to find their own place in any of the groups comfortably. They felt at ease to work within small group which was possible to control over the data collection process.

3.2.4 Sample of the Study

Research began with the following type of sampling questions in mind

➢ Who would be an information-rich data source for my study?

➢ Who could be talked to and observed to confirm my understandings?

The researcher sought respondents who could help with the research as potential participants. So, the researcher viewed to the preferred characteristics of respondents. Hence, purposive sampling procedure was adopted to identify potential participants within the case,

Teacher trainees of Dr. HRGCE were the population for this study. All Mathematics and Science Education teacher trainees were good subjects for this study as the researcher was their method teacher. They were from Science stream only. Their choices of course papers were same. They were attending same periods in B.Ed class. Ultimately, they had similar experiences and insights towards the B.Ed course. They were grouped together within the course. The researcher following their class

time selected the research site and context for group learning. It was opportunity for the researcher to take advantage of their participation and experience that could contribute towards quest for understanding of research questions. The time duration and effort were convenient to all. Thus, the sampling was consequently purposive that was by nature not biased which was not easy to replicate.

3.2.4.1 Sample Size

In qualitative research, sample size is not a serious issue because it does not strive for statistical significance, minimizing errors and not to estimate quantities in the population. Guest (2006) in 'field methods' proposed that twelve (12) participants in a homogenous population is often enough to reach saturation. In this study, the sample size was 12 which was based on the selection of homogeneous group taking all Mathematics and Science teacher trainees of B.Ed course.

3.3   Data Collection Techniques

Data collection techniques were emerged depending on the site and to establish what was needed from whom within the social context. How the potential participants shared during group work with their own experiences were studied through such techniques. The apparent data collection techniques available to capture those experiences and the meanings made through those experiences by the participants were

1.   *Participant Observation*

2.   *Focus Group*

3.   *Field Notes*

4.   *Transcribing Video Tapes*

5.   *Teacher Trainees' Perception towards PBL*

6.   *Teacher Trainees' Feedback towards PBL*

3.3.1 Procedure of Data Collection

For collecting data, the formal consent was requested and received in October 2009 from each teacher trainees involved in the study. The researcher used specific research techniques in order to collect the data. A case-study was adopted. It included observation through video-tapes, questionnaires and check-list of Social Skill behaviors. The data were collected from all the *Science and Mathematics education teacher trainees of B.Ed course during 2009-2010 academic years.*

3.3.1.1 Formation of Group

Two Small groups were formed for PBL activity. Each group was constituted with six teacher trainees. The involvement of teacher trainees into two groups was voluntary.PBL activity was situated in two shifts. The shift of work was held during morning hour between 8.30a.m to 10.00a.m and afternoon hour between 4.00 p.m to 5.30 p.m. First group was working in the morning hour and second group was working in the afternoon.

3.3.1.2 Construction of PBL Problem Scenarios

Two PBL problem scenarios were constructed for each group of teacher trainees as per the following steps:

3.3.1.2.1 Objectives of PBL Problem Scenarios

PBL is executed through a problem scenario. A scenario is a problematic one, chosen from daily life situations of teacher trainees. It requires practical resolutions. It is ill-structured and has multiple solutions, depends on various view points of teacher trainees. It facilitates group collaborative learning where socialization takes place. So, the objectives of PBL scenario is to carry out learning through which social skill behaviors can be developed during socialization.

3.3.1.2.2 Finding PBL Problem Scenarios

A defining characteristic of PBL problem scenario is that they are based on real world of teacher trainees. So real-world is the source of finding a problem. Magazines, News paper articles, school issues, social issues, environmental issues were also relevant to find a problem scenario. It usually fits with the concepts that are related to the school curriculum and local & national objectives.

The researcher identified the environmental issue for one of the PBL problem scenario and health issue for another scenario. First scenario aligns with the environmental science comprising chemistry, Biology, physics and mathematics. The major concepts included in this problem were the understanding of global warming, ozone depletion, green house effect, sink of carbon dioxide, CFC and etc. from General science. Similarly the second problem scenario ally with biology. The major concept included in the scenario was the understanding effects of good bacteria and harmful bacteria in human body. The sub concepts were quality of human diets, food and immune system, relationship between popular foods and drugs and green revolution in food grain production and etc.

3.3.1.2.3 Preliminary Form of the PBL Problem Scenarios

The PBL problem scenario-1 **(Appendix-B)**was an illustration about the global temperature rise in the environment. Its effects to the different components of environment were cautioned to a resource person of the environmental protection organization.

The PBL problem scenario-2 **(Appendix-C)** was an illustration about the effects of Bacteria which are found in the human body. Two types of bacteria were said in the scenario: good and harmful which are found in the human physiological system.

The facts of endanger to environment and effects of bacteria to human body were referred from the magazines of Indian geography and reference book of environmental science to ensure multiple resolutions correctly.

3.3.1.2.4 Design of Content Analysis Format of the PBL Problem Scenarios

The validity of content of the problem scenarios was ensured through content analysis. The nature of the scenarios was multi-disciplinary and was based on real world life which seeks multiple resolutions. Therefore, to know to what extent, the content covers a good deal of matter as per its nature, the validity was ensured. In order to know the continuation of components of the problem scenario, different categories were developed. The categories were focused on the nature of scenario and its relevance towards mental, emotional and social aspects of behavior. Twelve categories were included in the content analysis format. The categories were responded in a dichotomous scale. The kinds of responses were demanded either in positive or negative way. The content analysis format was structured (**Appendix-F**). In order to find certain hidden responses 'others if any' column is given.

3.3.1.2.5 Content analysis of the PBL problem scenarios

One expert was referred to analyze the content of problem scenarios. The content analysis format along with the preliminary draft of scenario-1 and scenario-2 was supplied to Dr. M.M. Mohanty, for the expert's opinion. He gave affirmative responses to retain the content of both the scenarios. He had suggested delimiting the clues of questions provided in the scenario-1. He informed to correct the given *clues* which might restrict to the teacher trainees towards their open thinking. However in scenario-2, no negative suggestion was put forward. He corrected into the use of *'bacteria'* instead of using *'bug'*. Contents of both scenarios were reviewed to find as true and valid by the expert.

3.3.1.2.6 Editing the text of PBL problem scenarios

After review of the content, the necessary suggestions were taken care of as per the expert's opinion. Then each problem scenarios was checked by the guide. Use of words in the text was repeatedly read out to see its interpretative meanings. Based on appropriateness, some words were edited in Scenario-2.

3.3.1.2.7 Final Form of the PBL problem scenarios

Keeping in view of the results of content analysis and suggestions from the guide, the researcher followed corrective measures. As a result, two clues were removed and hence, four clues were retained in Scenario-1. So, the final form was prepared with the necessary change of preliminary form **(Appendix-D)**.Similarly, Scenario-2 was edited with respect to use of words. Then, the two sheets of scenarios were made ready separately for learning process **(Appendix-E).**

3.3.1.3 Orientation towards PBL

One orientation class about PBL strategy facilitated by Vygotsky's Approach of Learning (VAL) was organized for the teacher trainees. The class was held in two sessions. In the first session, the researcher informed about theoretical principles of VAL and its emphasis on problem-based learning strategy. The *"what"* and *"why"* aspect of the PBL was more discussed. The second session was an interactive session in which views of teacher trainees towards PBL was focused. The practical questions like *'how to work in the small group?', 'what type of skills are necessary to enable the group active?'* were solved through detailed discussion.

3.3.1.4 Assigning PBL Activities

Each of the two groups was posed with two problem scenarios one after another for learning. The problem scenarios were same for the both group. The scenario was presented both in soft copy through OHP and hard copy through printed page attached in their reflective diaries. The total working hours of both the groups with respect to two problem scenarios were 16 hours. The counting is presented in Table-3.1.

Table-3.1:

Time-Period Taken for PBL Activities

Group	PBL problem scenario	Number of days	Number of periods	Time taken in Hours	Total time period taken in Hours
TT_1	Scenario-1	10	10	10	
	Scenario-2	06	06	06	16
TT_2	Scenario-1	10	10	10	
	Scenario-2	06	06	06	16

PBL activity of scenario-1 was finished in 10 days. Each day's activity was one hour of duration. So, it took 10 days (10 hours) to complete the task of PBL problem scenario-1. Where-as PBL activity of scenario-2 was continued for six days. Each day, one hour was allotted. So, scenario-2's activity was completed in six days (six hours).Each of the two groups was assigned two PBL problem scenarios. Thus, each group made use of 16 hours to complete their PBL process.

The reflective diary was supplied to everybody to prepare their learning journal. The learning journals contained the different ideas and viewpoints of teacher trainees according to the steps of PBL activities. The PBL activities were organized as per the following steps.

1) **Loud reading of the problem statement**

The text of problem scenario reflected through OHP was seen on the screen in front of the teacher trainees. This was read loudly by one participant and then it was followed by others through their hard copy. They were silently reading and repeating the same. It was active listening.

2) **Exploring the problem**

The problem as a whole was read in the group. There was small discussion on the problem. They were deriving the meaning(s) by studying the different parts of the problem. Some of them were re-writing the statements. They were dividing the problem statement to understand its different parts. Every word and its meaning were declared.

3) **Listing the known data**

The teacher trainees listed the facts and data which were available in the given scenario. The given data was 'known data' for them.

4) **Listing out the unknown data**

The teacher trainees listed out the 'unknown data' under two types. One category was 'what is known' and other was 'needs to know' to them.

5) **List out the hypothesis**

They derived possible solutions from strongest to weakest point of consideration. Then these were listed in a sequential order.

6) **Plan of action**

A list of actions in order to search different type of resources and reaching towards solution was framed within the group. The division of work in between the teacher trainees was led by one willingly and it was accepted by others. The time frame was also prepared. Recording in the journal about progress of learning was also distributed. PBL steps of listing out known data, unknown data, needs to know data, possible solutions were recorded in the journal. The distribution of record work was done with the consent of all teacher trainees. Home task was taken voluntarily.

7) **Write up solutions**

The solutions were listed after reviewing their ideas.

3.3.1.5 Participant Observation

The researcher used a note-pad all the times to write down immediately the information and thoughts about the event after each encounter. In the beginning, he sought in-formations and sometime asked questions. An observation sheet was developed by the researcher to identify demonstrated social skill behaviors during PBL activities. The sheet had a part of preliminary information about the events of observation. Some feelings of teacher trainees were also marked on the sheet. During participant observation, the approach of conversations, discussions and interactions as well as demonstrated social skill behaviors were recorded.

3.3.1.6 Focus Group

The PBL small groups were called focus groups. The potential teacher trainees were posed problem scenarios in a group. They were encountered to find most appropriate solution(s) through conversations, discussions and interactions in a collaborative manner. The learning activities were facilitated by the researcher. The facilitator had introduced the problem, asked specific questions, sought further information, controlled aggressions and kept them on the right track of conversations. The work of focus group was continued for one hour daily. Teacher trainees, those were coming late and/or leaving early from the discussion was not included in any of the groups. The confidentiality of the discussion was assured by the researcher. Their discussion was acknowledged through active listening by making good eye contact and taking notes to their points of view. Each of the teacher trainee's contribution was ensured co-operatively and democratically. The researcher followed the issues that had been raised during the discussion during each event. Each focus group's activity was video-recorded.

3.3.1.7 Field Note

It was the main way of recording data. It was prepared on immediate observations of learning activities and behaviors of the participants. The date, time and numbers of the event details were noted. The PBL process was carried out in a computer laboratory of Dr HRGCE. There was circular seating arrangement where a common table was kept at the centre. Facilities of computers were available at hand to them. The sketch of seating arrangement of participants in the group was outlined in

the note. Teacher trainees were seating in their chosen places within the group. Dynamics of seating arrangement of teacher trainees were also noted in the field note. The information about the time duration of each activity, the kind of activity, the learning resources and materials being used by the teacher trainees during PBL were included in the field note. The valuable information about exposition to different learning resources used by the teacher trainees, procedure of feedback to one another, co-operation, scaffolding and negotiation between and among the participants of PBL group were written in the note-pad. Sometimes, the theoretical ideas related to particular aspects of social skill behavior and/or situations were added in the note. At times, symbols and shorthand were used. Everything in textual form was stored event wise during participant observation. This was field note by the researcher. As the PBL process moved, a preliminary analysis was started. The notes were classified and coding was done. A sample field note is presented in **Appendix-G.**

3.3.1.8 Video- Recording

The PBL work was video-recorded. The photographs and prospect of both verbal and non-verbal activities/behaviors were traced with the help of video-recording. Photographs added the valuable description about the images in different context.

3.3.1.9 Learning Log

Each teacher trainee used a reflective diary to prepare his\her learning journal. The trainees recorded their ideas, view points, issues relating to the steps of PBL activities. Sometimes during activities, the trainees recorded relevant writings, sketched diagrams and certain ideas in their reflective diaries. These materials were known as 'Learning Logs'. These were used for the analysis.

3.3.1.10 Perception of Teacher Trainees towards PBL

Perception of teacher trainees was collected to know the effectiveness of PBL. The procedure which was adopted was as follows:

3.3.1.10.1 Objectives of Perception

PBL was carried out among teacher trainees to develop social skill behaviors. Two PBL problem scenarios were designed for each of two groups of teacher trainees. The contents of PBL intermingled with the curriculum in such a manner that these

allow interactivity among teacher trainees and make them more enjoyable. The effectiveness is judged to the extent of its engagement and reflective actions during the process. On such grounds the effectiveness of PBL is known through perceptions of teacher trainees. So, a perception scale was used for this purpose.

3.3.1.10.2 The Perception Scale

Perception of teacher trainees towards PBL process was collected through a scale. A teacher made scale was constructed. There were ten items in this scale. The following steps were taken for construction of the scale.

a.   Preliminary draft of items

b.   Editing of items

c.   Final draft of items

d.   The format of scale

a.   Preliminary draft of items-

The items of the perception scale were structured around the nature of PBL problem scenario and the process of PBL. So, for framing the items, various sources of books, journals and magazines were referred. Even the personal experience of the researcher was used to find a good number of items. A preliminary draft consisting of 20 items were prepared.

b.   Editing the items-

The content, process and the output of PBL were focused to analyze the items. On the basis of appropriateness of content, its ease of use and the resultant development of teacher trainees, the items were either accepted or rejected. The language, grammar and syntax of each item were also considered to retain a particular item.

c.   Final draft of items-

After editing the items as per the nature of PBL, the draft of items was prepared. Out of 20 items, 10 items were accepted. These items were retained in the perception scale. The items, representative of the dimensions of PBL were mixed up. Further, items describing positive as well as negative aspects of PBL were organized. As such, total 10 items were assembled to make the final draft of items.

d.   *The scale-*

To know to what extent each item can measure a particular dimension of PBL, a continuum is required. This continuum is known as scale. A five point scale is used. It is considered practical for research purpose. The continuum of the scale is Mostly True (MT), Largely True (LT), Very True (VT), True (T), and Not True (NT). The graphical scale is MT, LT, VT, T, NT **(Appendix- H).**

3.3.1.10.3 Data Collection through the Perception Scale

How to respond the statement was explained to the teacher trainees during orientation about PBL process. Just after completion of PBL process, for the two problem scenarios the perception scale was administered to the teacher trainees. They were instructed to give Tick (√) mark against any scale point as per their preferences and priorities with respect to the given statement. The responses in the five point scale ranged from 'mostly true' to 'not true'. In case of favorable statement score of 4 was given for MT response. Similarly, 3 for LT, 2 for VT, 1 for T and zero for NT were scored for favorable statements. But, in case of unfavorable statements, the scoring was done in the reverse order.

3.3.1.11 Feedback of Teacher Trainees towards PBL

A written feedback was collected from all teacher trainees to know the effectiveness of PBL. The content of the feedback was analyzed on the theme of social behaviors. The size of the text, quotes and similar such things were the unit of content analysis. The key areas of social behaviors were sorted out to know the effectiveness of PBL.

3.3.1.11.1 Purpose of Feedback

The teacher trainees were involved in the PBL process in order to develop their social skill behaviors. Instead of social skill behaviors, other hidden aspects of their development could be known during PBL process. Such developments could be ascertained by knowing the effectiveness of PBL process. So, teacher trainees were asked to give feedback about overall effectiveness of PBL process.

3.3.1.11.2 Collection of Feedback

The written feedback from each of the teacher trainees were collected to know the extent of output of PBL process. All were informed to give their feedback in a sheet of paper. These were collected individually at the end of the PBL. These were unstructured textual responses.

3.4 Data Analysis

The analysis was carried out in relation to research questions. As it was qualitative research, the analysis started immediately with the progress of the research. It was continually refining and re-organizing in the light of the emerging results. Analysis was carried out to explore the qualitative data. The researcher searched out the instances to locate kinds of behavior. It was done through finding out the repetitions of incidents and other signs of social skill behavior during verbal/non-verbal conversations. Being immersed in the data, the researcher searched out behavioral patterns to generate the kinds of social skill behavior. There was continuous comparison of data with the theoretical ideas throughout the analysis. Subsequently, the researcher established the meanings and importance of patterns.

3.4.1 Units of Data Analysis

The unit of analysis was B.Ed students of Dr.H.R. Gajwani College of Education. They were Mathematics and Science education teacher trainees of B.Ed course. The researcher had selected a *size of 12* as appropriate units for analysis. Each unit was comprised of six teacher trainees. So there were two units for analysis.

3.4.2 Procedures of Data Analysis

The large amounts of qualitative data needed to be managed with standard procedures for codifying and analyzing. This fall into three concurrent flows of activity: *data reduction, data display and conclusion drawing*.

3.4.2.1 Preliminary Analysis during Data Collection

Raw field notes filled with some abbreviations and scribbled words were processed at first hand. All the data collected were not essential to resolve the research questions. Some data appeared superfluous in retrospect and needed to discard. So, the decision to discard some data and to retain others was very important with such qualitative data.

3.4.2.2 Preparing the Data in Transcript Form

The group work was video recorded and the analysis of video-tape was transcript. All the video-recordings were transcribed. The activity was a way down page making observation. Tapes were replayed. So, transcriptions were improved by rewinding the audio as well as video-tape. The sequence of utterances and body movements were checked sometimes. It was done to confirm the extract with the field notes. The sequence of related talk was identified. The social skill behaviors were examined during their talk, conversation, question-answer, discussion and other certain social roles.

3.4.2.3 Formatting the Transcript for Analysis

The data reduction was further refined by editing the text. It was process of cutting out and pasting lines of the paragraph and/or sections of text from transcripts and field note under various headings. While editing, the differences in the data were judged. A classification of data was built up to form sub-group behaviors within the category of Social Skill behavior.

The development of coding system was facilitated during transcripts and editing the data. The coding was interpretive to categorize the nature of social skill behavior. The meanings to type of social skill behavior were conceptualized. This helped to prevent 'data overload' and to reduce the data.

3.4.2.4 Identifying Meaningful Data Units

A case-study was conducted to examine perspectives of social skill behavior on the materials collected and understandings of the potential participants. The information was preserved in field notes, reflective diaries of teacher trainees, observations and video recordings. Typically these were written documents and some were transcriptions of video-recordings and audio reordered verbal communications. Determining what materials to include or exclude and how to order the presentation of substantive materials during data analysis were important. A careful, detailed and systematic examination of materials to construct meaning was done. Therefore, objective analysis of text to convey coherent pattern is amenable to content analysis.

3.4.2.5 Checklist Matrix of Dynamics of Behavior

Keeping in focus to research question the description of interactions of teacher trainees were taken from the transcripts. The social actions and interactions (both verbal and non-verbal) were the descriptions. The evidences of feelings and any form of emotional and social behaviors were analyzed. The descriptions were analyzed to locate categories of behaviors. When the behaviors were categorized, themes were kept in mind. After finding the categories of behaviors, some selected social skill behaviors were accomplished. This was done using a matrix. The matrix was constituted with four specifications:

1. *Describing the category of behavior*

2. *Showing examples on the evidences of behavior*

3. *How was the behavior?*

4. *Why the behavior was important?*

This was known as *check list matrix of dynamics of behavior* (**Appendix-I**).

3.4.2.6 Content analysis summary of dynamics of behavior

With reference to check list matrix of dynamic of behavior, the specific categories of behavior were enlisted. The frequencies of occurrences of those categories of behavior were calculated. Tally marks were used for the frequency calculation. How many times a particular category of behavior was demonstrated by each teacher trainees were calculated and the frequencies of dynamics of behavior are displayed in tabular form (**Appendix-J**).47 categories of behavior were traced out among teacher trainees in group-1 where as the 44 categories were found in case of group-2.

3.4.2.7 Social Skills Check List

Understanding of data in a systematic and coherent manner was done through Social skills check list (**Table-5.3**). The data were categories of behavior. The numbers of categories of behavior in both the groups were 47 and 44 respectively. It was traced out in the content-analysis summary table. The data were found in large numbers. So it was needed to find out the central and meaningful types of behavior

for clear understanding. Five factors were found to describe social skill behaviors. The factors were relevant to social skill behavior. The meanings of factors of social skill behaviors were derived from bulky categories of behavior. These five factors are *interpersonal skills, understanding others, nurturing communication, learning autonomy, positive self-perception*. These are abbreviated as '**IUCAP**' factors.

3.4.2.8 Factor Analysis

The **'**IUCAP' factors were the description of social skill behaviors. In order to find out meaningful factors, the Factor analysis was done. Out of five, which factor(s) contributed to describe the social skill behaviors meaningfully, the factor analysis was conducted. SPSS version 13 Program was used to conduct factor analysis. The analysis was done separately for each of the two groups.

3.4.2.9 Content Analysis of Feedback

The content of the written feedback was analyzed to find out the categories of social behavior. On the basis of category of behaviors Social Skill components were searched out.

3.5 Challenges of Case-Study Research/Problems relating to Logistics

It was not possible to foresee every problem on the part of researcher. The researcher was aware of awkward situations. Confidentiality before and during data collection was ensured. Difficulties in gaining access to data, quantity of data that were collected and schedule of work related to PBL was faced positively. In order to get rid of negativity, reflect, analyze, learn by own mistakes and move on principle was adopted promptly.

While designing case-study method, qualitative data analysis considerations were taken care of in the present study. Factor analysis was adopted to ensure the factors as meaningful in describing certain social skill behaviors. It is noted that factor analysis was neither integrated throughout the study nor treated as a second kind of data analysis to reach at conclusion. So, it is clear that the methodology incorporated in the present inquiry was qualitative case-study only but not a mixed-method inquiry which considers two or more different kinds of data gathering and analysis techniques within a particular study.