Chapter - 2

Methodology

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METHODOLOGY

2.0. Introduction

The present chapter contains the Research Design of the study. Research Methodology including Experimental Design, Population and Sample, Tools and Techniques, Development of ICT Aided Constructivist Learning Approach (ICTACLA) programme for Professional Development of Pre-Service Teachers, Data Collection, and the Data Analysis Techniques employed are presented in this chapter.

2.1. Experimental Design

For the Pre-Service Teachers Experimental Control Group Pre-Test and Post-Test Quasi-Experimental Design has been employed, whereas, for Schools Students Single group Pre-Test Post-Test Pre-Experimental Design has been employed.

2.1.1. Quasi-Experimental Design (Nonequivalent Pre-Test and Post-Test Control - Group Design):

Here the Experimental Group and The Control Group were selected without random assignment. Both the groups were administered Pre-Test and Post-Test. Only the Experimental group received the Intervention on ICTACLA. The control group received the conventional guidance.

Experimental Group O_1 ..... X ..... O_2

Control Group O_3 ..... O_4

Where X represents Intervention. O_1 & O_3 represents Pre-Tests and O_2 & O_4 represents Post Tests.

2.1.2. Pre-Experimental Design:

Single Group Pre-Test Post-Test Design. Here this Design Involved a Pre-Test measure followed by an Intervention and a Post-Test for a single group.

Single Group O_1 ..... X ..... O_2

Where X represents Intervention, O_1 and O_2 represents Pre-Test and Post–Test.

2.2. Population for the Study

In the present study, the population is constituted of all the Science Method Secondary Pre-Service Teachers of Karnataka State (2011-2012), and all the Secondary School Students of IX Std. of Karnataka State (2011-2012).

2.3. Sample for the Study

1. Sample includes all the 35 Science Method Pre-Service Teachers of University College of Education Dharwad, as the Experimental Group, whereas, that of 30 Science Method Pre-Service Teachers of Dr. Kamala Baliga College of Education, Kumta, as the Control Group of the academic year 2011-2012.
2. All the IX Std. students of two practicing divisions from each school of all six practicing schools of University College of Education were considered as student sample. About 437 school students constituted the sample.
3. The Colleges of Education were selected purposively, whereas, the Pre-Service Teachers and the School Students were selected through cluster sampling.

2.4. Tools and Techniques

The Tools, namely Questionnaire, Reaction Scales, Observation Schedule, Semi-Structured Interview Schedule were constructed by the Researcher and validated by the Experts. Reliability of the Questionnaire was found through Test-Retest method. Achievement Tests were constructed by the Pre-Service Teachers. Field Notes were taken by the Researcher. Pre-Service Teachers' Observed Daily Diary and Conducted Focused Group Discussion with the Pre-Service Teachers. Rubric has been used for analyzing the lessons designed by the Pre-Service Teachers.

2.4.1. Questionnaire

The Researcher constructed a Questionnaire by following the general principles and characteristics of Constructivist Learning Approach and Integration of ICT and principles according to Brooks (1993), A Classroom environment questionnaire for Science Educators interested in Constructivist reform of School science by Tylor et al., (1994),

and Students Instruction and Motivation Survey by Giddings (1993). The development of questionnaire followed the five point Likert Scale - Very Often, Often, Sometimes, Seldom and Never. The questionnaire contains the two forms, namely, As Teachers perceived form and As Learner perceived form. As Teacher perceived form contains 54 items which include 47 positive and 7 negative items and As learner perceived form contains 86 items which also contain 74 positive and 11 negative items. The questionnaire was used to collect the data related to the Pre and Post intervention professional status of Pre-Service Teachers. The content validity was established by the experts, and the Researchers found the reliability by test and retest method. (Appendix-II).

2.4.1.1. The Reliability of the Questionnaire

The Reliability of the questionnaire as Teacher Perceived form was 0.89, as Learner Perceived Form was 0.94, whereas As both Teacher and Learner Perceived form was 0.81. This shows that the constructed tool was highly reliable.

2.4.2. Reaction Scales

Reaction Scales were constructed by the Researcher to study the reactions of School Students, Pre-Service Teachers and Teacher Educators towards ICTACLA. Reaction Scale for School Students contains 27 items, for Pre-Service Teachers 42 items, whereas, as for Teacher Educators 16 items. All these are on 3 Point Scale-Always, Sometime and Never. (Appendix-III, IV, V).

2.4.3. Observation schedule

An Observation Schedule was constructed by the researcher to observe the implementation of lessons designed by Pre-Service Teachers through ICTACLA during practice teaching. The observation schedule contains the elements to be observed, namely like classroom environment, teacher behavior, Learner participation and interaction behaviors in the practice teaching classes. (Appendix-VI).

2.4.4. Achievement Tests

The tests constructed by the Pre-Service Teachers to study the Academic Achievement of School Students, both, Pre and Post intervention in the practice teaching, wherein, they conducted the classes by employing ICTACLA.

2.4.5. Semi-Structured Interview Schedule

Semi-Structured Interview Schedule was developed by the Researcher to interview the Pre-Service Teachers on ICTACLA. It contained the aspects, namely, Opinion of the Pre-Service Teachers regarding ICT Aided Constructivist Learning Approach, Utility of ICTACLA in Science, Feeling during the preparation of the lessons employing of ICTACLA for Practice Teaching, Experiences during practice teaching using ICTACLA in the schools, Role of Pre-Service Teachers in the ICTACLA in future teaching Profession, Organization of Instructional Environment employing Constructivist Learning Approach, Problems faced during lesson preparation employing ICTACLA, Problems faced during practice teaching employing ICTACLA, Opinion regarding the effectiveness of ICTACLA and Suggestions on the orientation programme employing ICTACLA in Science. (Appendix-VII).

2.4.6. Focused Group Discussion (FGD)

The Researcher has conducted Focused group discussion with Pre-Service Teachers to collect their reflections on ICTACLA. 'Any group discussion may be called a focus group as long as the researcher is actively encouraging of and attentive to the group interaction' (Kitzinger and Barbour, 1999). The Focus Group provides an opportunity to generate the data that are amenable to analyze data which emphasized the active construction of meaning. In the present study the Focused Group Discussion gives the insight of the process of ICTACLA in terms of their reflections. (Appendix-VIII). The initial reflections of the Pre-Service Teachers on ICTACLA have probed them to discuss various aspects further namely, feel of ICTACLA, ICTACLA facilitating Science, lesson designing employing ICTACLA, experiences during practice teaching while employing ICTACLA, exploring the Possible Role of Pre-Service Teachers in the context of ICTACLA in their Profession, Designing Constructivist Learning Approach Environment, problems faced during Practice Teaching with ICTACLA, Effectiveness of ICTACLA in Science, Suggestions of the Pre-Service Teachers on ICTACLA in Science.

2.4.7. Pre-Service Teacher's Diary

The Researcher has provided each Pre-Service Teacher a note-book to mention the daily activities on ICTACLA throughout the programme, their views on the orientation programme and suggestions for further improvement. These diaries were collected by the researcher at the end of the orientation programme.

2.4.8. Researcher's Diary for Field Notes

The Researcher maintained the diary from the first day to the last day of data collection, wherein the notes were taken during orientation in the College of Education, during practice teaching and after practice teaching.

2.4.9. Rubric

Rubric has been constructed and used by the Researcher to assess the lesson plans of Pre-Service Teachers which are designed based on the ICTACLA. The constructed Rubric contains 12 Categories, namely, Learning Objectives, Required Elements, Cooperation, Use of ICT, Use of Students Prior Knowledge, Use of Students' Interest, Use of student-centered activities, Engagement, Exploration, Explanation, Elaboration and Evaluation. The lessons are going to be assessed on 4 point scale namely, Excellent, Very Good, Satisfactory and Needs Improvement, and they involves certain criteria for assessing which are given in the Rubric. (Appendix-IX).

2.5. Development of the program on Information and Communication Technology Aided Constructivist Learning Approach (ICTACLA)

The researcher has developed a Program for orientation of the Pre-Service Teachers on ICTACLA. Developments of the Program in terms of Introductory Manual where in various modules have designed and developed are:

I. Information and Communication Technology (ICT)

- Introduction
- ICT and Education
- Integration of ICT in Education

- Model of ICT Integration
- Role of ICT in Instruction
- Web 2.0 technologies
- Activities

II. Constructivist Learning Approach

- Introduction
- History
- Concept
- Types
- Principles
- Constructivism and Learning Process
- Constructivism and Teacher
- Constructivism and Learner
- Pedagogies based on Constructivism
- Constructivist Learning Designs
- Activities

III. ICT Aided Constructivist Learning Approach

- Introduction
- Strategies of Using ICT in Constructivist Classroom
- Model Lesson Designs on different Science Concepts namely, Food Chain, Energy Resources, Oil & Environment, Food Web, Water Pollution, Animal Husbandry, Soil Erosion, The Universe, Water, Magnetism, Micro Organisms, Bacteria, Protozoans, Algae and Mammals by employing ICT Aided Constructivist Learning Approach. The developed ICTACLA based Lessons on various Science concepts by using various Constructivist models, namely, 5E, 7E, Constructive Learning Cycle Model, The Information Construction (ICON) Model and Inquiry Based Model.

The Introductory module has been developed and its content validated by experts in the field. This has been used as a resource by the researcher during the orientation programme delivered to Science Pre-Service Teachers. (Appendix-I).

2.6. Collection of the Data

The data were collected through the following phases:

Phase 1

In the first phase the researcher studied the entry professional level of Science Pre-Service Teachers' on ICTACLA through the Questionnaire. The researcher conducted the same test on the control group, but the control group was not orientated on ICTACLA.

Phase 2

The Researcher oriented all the Pre-Service Teachers towards ICT and basics of ICT skills by providing examples, activities and discussions. The concept of Constructivism was made clear through activities, demonstrations and discussions and followed by group activities and presentations. The Researcher oriented the Pre-Service Teachers on the ICT Aided Constructivist Learning Approach in Science. Here in this phase the researcher demonstrated the Model Lesson Plans from the Introductory Manual. The researcher created the Constructivist Environment in the guidance classes, wherein the researcher started the orientation by following ICTACLA, made groups among the Pre-Service Teachers, provided group activities including hands on experiments, role playing, reflective dialogue, classroom assignments both individual and group wise as per the themes, and followed by group discussions, presentations and feedback. Conducted field trips both on-campus and off-campus. Researcher along with the Teacher Educators has taken Pre-Service Teachers to University of Agricultural Sciences Dharwad. Where in they visited green houses, various fruits farms, Dairy, Poultry, Horticulture Department, and Department of Home Science, Agricultural Science Centre and many other departments. In the field visit Pre-Service Teachers have been given lectures by the Agricultural Scientists, Professors and conducted brain storming sessions. Researcher also suggested Pre-Service Teachers to include, Activities, Experiments and field visits in their classes in schools.

Phase 3

Lesson plans were designed by the Pre-Service Teachers by employing ICTACLA. These were corrected by the researcher; Pre-Service Teachers presented and practiced the lessons in class and collected feedback. This process was continuously going on till they got acquainted with the ICTACLA. Also the researcher oriented them on the observation of lessons conducted through ICT Aided Constructivist Approach during the practice teaching.

Phase 4

Pre-Service Teachers designed the lessons through the ICT Aided Constructivist Approach as per the orientation for the Practice Teaching by the researcher. Along with designing the lesson plans, Pre-Service Teachers developed their own different teaching aids; they referred various online resources for developing the teaching models and teaching aids. The researcher evaluated the lesson designs and provided suggestions to pre-service teachers.

Phase 5

Pre-Service Teachers conducted Pre-Test for school students and implemented the lessons with ICT Aided Constructivist Approach in their practice teaching. Here Pre-Service Teachers conducted the classes by creating constructivist environment, where in the classes were active and lively, made groups among the students during discussion, performed experiments with the help of students, taken all students to the campus gardens and ponds. Engaged all the students towards classroom activities and there was reflective dialogue between students-teachers and students-students. In the classroom some of the Pre-Service Teachers showed the virtual field trips to students on various concepts. The Teacher Educators observed the implementation of lessons. The other Science Pre-Service Teachers who were attending the particular class also observed the lesson. The researcher also observed the implementation of the lessons as a participant observer and noted the important points of the implementation process and classroom activities. Photos and Videos of experiments and some discussions were taken. Pre-Service Teachers conducted Post-Test in terms of achievement test at the end of the lessons.

Phase 6

The Researcher collected the Reactions of School Students towards the ICTACLA. In each of the school the Researcher collected reactions from the students of those classes where Pre-Service Teachers conducted the classes based on ICTACLA.

Phase 7

The Researcher studied the Effectiveness of these lessons through Academic Achievement of school students in the Post-Test conducted by Pre-Service Teachers.

Phase 8

The Orientation was continued after practice teaching because Pre-Service Teachers needed to deliver innovative lessons which were one month after practice teaching. All the Science Pre-Service Teachers liked to deliver their lessons on ICTACLA. So they demanded some more discussion on this. Accordingly they practiced some more lessons employing ICTACLA and presented their lessons. The researcher observed and noted all the practices as a participant observer.

Phase 9

Researcher Collected the Reactions of Pre-Service Teachers and Teacher Educators towards ICTACLA by administering the Reaction Scales. Conducted written Semi-Structured Interview about the orientation programme on ICTACLA in terms of specific aspects. Conducted the Focus Group Discussion with the Pre-Service Teachers regarding the orientation programme on ICTACLA which was video recorded. Post-Test was administered on ICTACLA to study the at end level of Pre-Service Teachers on ICTACLA.

The researcher conducted the Post-Test on the Control group also.

2.7. Data Analysis Techniques Employed

The collected data were analyzed both qualitatively and quantitatively. Responses on the Questionnaires were analyzed through Chi Square Contingency; Responses on the Reaction scales were analyzed through Chi Square. Observations were analyzed through frequency percentage count, Chi Square and Academic Achievement analyzed through Mean, SD and 't test'. Semi-Structured Interview and Focused Group Discussions, Pre-Service Teachers' Diary and the Researchers' Field notes were Content Analyzed, lesson designs were analyzed by Rubric through frequency and percentage.

Table 2. Objectives and Tools wise Analysis of the Collected Data

Objectives	Tools / Programme	Analysis Techniques Employed
1	ICTACLA	Designed, Developed and Validated.
2.1, 2.2 & 2.3	Reaction scales	Chi Square & Frequency, Percentage Count
2.4	Achievement test	Mean, S.D. and t- test
2.5	Observation	Frequency, Percentage count & Chi Square
2.6	Semi-Structured Interview	Content Analysis
2.6	Focused Group Discussion	Content Analysis
2.7	Pre-Service Teacher's Diary & Researcher's Diary	Content Analysis
3	Questionnaire	Chi Square Contingency