CHAPTER 3

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CHAPTER 3

METHODOLOGY OF RESEARCH

3.0 Introduction

Research in common parlance refers to a search for knowledge. Research is a structured enquiry that utilizes acceptable scientific methodology to solve problems and create new knowledge that is generally applicable. (Kothari, 1989). In this chapter materials and methods employed in the research study have been clearly specified.

3.1 Type of Research

Applied research is defined as a systematic study to gain knowledge or understanding necessary to determine the means by which a recognized and specific need may be met. (Hedrick, Bickman, Rog, 1993). Development is defined as systematic application of knowledge or understanding directed toward the production of useful materials, devices, and systems or methods, including design, development, and improvement of prototypes and new processes to meet specific requirements. (Nel Verhoeven, 2009).

The present research study is applied research. The theory of constructivism and the principles of student centered and active learning, collaborative learning, continuous assessment, justified use of technology, teacher as a facilitator and reflective practice have been applied in the development of the ICT based model of curriculum transaction and its sample sessions as shown in Fig. 4.
3.2 Method of Research

Research using mixed methods research is a mixture of qualitative and quantitative approaches in many phases in the research process. As a method, it focuses on collecting, analyzing, and mixing both quantitative and qualitative data in a single study or series of studies. (Creswell, 2009).

In the present research study a mixed method of research has been used. The methods of survey research, product development research and experimental research have been used for the present research as shown in Fig. 3.2. An analysis of current practices, viewpoints of experts and existing models has been done under survey research. An ICT based model of curriculum transaction has been developed under product research and the experimental method has been used to test the effectiveness of the ICT based model of curriculum transaction developed by the researcher.
3.3 Population

All teacher trainees undergoing B.Ed. course of the University of Pune and all teacher educators teaching in the B.Ed. course of the University of Pune.

3.4 Sample/Informants Selection

A sample is a segment of the population selected to represent the population as a whole. The term informant has been used by anthropologists to describe the persons who provide key information on the important aspects of research. (Lecompte and Goetz, 1982).
Table 5. Sample/Informants Selection

<table>
<thead>
<tr>
<th>S. no.</th>
<th>Sample/Informants</th>
<th>Size of Sample/Informants</th>
<th>Purpose</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Teacher Educators</td>
<td>50</td>
<td>Assess current practices</td>
<td>Incidental</td>
</tr>
<tr>
<td>2.</td>
<td>Teacher Trainees</td>
<td>91 in EG 91 in CG</td>
<td>Participants in the sessions of the ICT based model</td>
<td>Purposive</td>
</tr>
<tr>
<td>3.</td>
<td>Peer Teacher Educators</td>
<td>9 in EG 9 in CG</td>
<td>Observers of the sessions of the ICT based model</td>
<td>Incidental</td>
</tr>
<tr>
<td>4.</td>
<td>Teacher Educators</td>
<td>15</td>
<td>Usability of the ICT based model</td>
<td>Incidental</td>
</tr>
</tbody>
</table>

EG – Experimental group, CG – Control group

3.5 Tools of Research

The research tool provides the input into a study and therefore the quality and validity of the output (the findings), are solely dependent on it. The tools used for the research have been divided into tools used for data collection and tools used for statistical analysis.

3.5.1 Research Tools used for Data Collection

The tools used by the researcher for data collection are represented in the Fig. 6.
3.5.2. Research Tools Used for Statistical Analysis

The researcher used both descriptive statistical tools as well as inferential statistical tools for analyzing the data and drawing conclusions about the research. They are represented in Fig. 7.
3.6 Methodology and Procedure of Research for Objective 1

Objective 1 - To analyze the ICT based curriculum transaction practices by teacher educators in colleges of education.

The research question for the above objective is

- What are the current ICT based curriculum transaction practices by teacher educators in colleges of education?

3.6.1 Method of Research

Survey Research - An analysis of the ICT based curriculum transaction practices by teacher educators in colleges of education has been done using survey research. The survey is a non-experimental, descriptive research method. Surveys can be useful when a researcher wants to collect data on phenomena that cannot be directly observed. (Babbie, Earl R., 1973).

3.6.2 Tool of Research - Questionnaire

A questionnaire was used to analyse ICT based curriculum transaction practices by teacher educators in colleges of education.

The questionnaire was constructed paying attention to the bibliographical review that had taken place. The questionnaire and its construction involved the following steps:

1) Construction of the first version of the questionnaire
2) Validation of the questionnaire by the experts (Judgment by experts - Appendix 1)
3) Pilot Testing
3) Elaboration of the final version of the questionnaire, from the observations carried out by the experts.

3.6.2.1 Construction of the First Version of the Questionnaire

The design of the questionnaire implies formulation of a set of questions that involve examining ideas and practices related to the object of study. The selection of the type of questions that are part of the questionnaire is closely related with the scheme of the research and with the type of information that was to be obtained. Designing the questions of the questionnaire is not at all an easy task and a series of elements have to be
necessarily taken into account. A long process of elaboration leads to construction of the final version. The different elements that were taken into consideration was the information used for the elaboration of the questionnaire, the validation process, the reliability, the pilot study, the design, dimensions and aspects of the final questionnaire and the relationship of the aspects of the questionnaire with the goals to be achieved. The process of elaboration of the questionnaire involved a complex procedure, the nature of the questions, the way in which they were planned, the order in which to specify the different questions... All these elements conform and affect directly the results obtained (Oppenheim, A.N. 1992.). Attempts were made not to leave any important element aside and the whole process of construction was tedious and difficult as it involved discussion with colleagues and experts. A review of the literature was done of the questionnaires designed in other studies which had a relationship with the object, i.e., the research study: the use of ICT in the educational field, the practices adopted by teachers and trainers in the use of ICT, training and formative needs of teachers.

After review and due consultation with experts the 6 aspects which needed to be studied about current practices of teacher educators in ICT based sessions were finalized as follows:

- Use
- Preparation and Planning
- Selection of ICT Resource
- Practice in the ICT based session
- Evaluation
- Opinion

For the formulation and disposition of the different questions in the first draft, a series of recommendations carried out by (Foddy, W. 1993) were followed with respect to:

1) Order of difficulty, inserting easy questions at the beginning
2) Formulating concrete questions, avoiding ambiguity.
3) Using simple, clear language and suitable vocabulary bearing in mind the target sample.
4) Asking different types of questions.

The first version of the questionnaire that was formulated and constructed constituted 6 main aspects and 20 questions giving qualitative feedback from teacher educators.

3.6.2.2 Establishing Reliability and Validity of the Questionnaire

Once the first version of the questionnaire was constructed, it was necessary to validate it. The validation process tries to determine if the procedure or instrument used in the research measures what it is intended to measure. There are different types of validations and the means that are used in order to test it. The researcher decided to use the validity of contents because it was the method that could provide more information about the objective, that is: Were the contents of the items appropriate? In order to test validity Judgment by Experts technique was used. The selection of the experts was carried out as follows:

1. Senior and experienced teacher educators teaching in B.Ed. colleges.
2. Resource persons for ICT in education associated with University of Pune.

The chosen experts have vast experience in the field of education, ICT in education, methodology of the research, computer knowledge and educational technology and above all are specialists in teacher training processes, especially those which involve ICT-based teacher training.

3.6.2.3 Validation of the Questionnaire by Experts

After the experts were located, communication with them was carried out through telephone and e-mail. After analyzing the questionnaire many of the experts opined that it reflected and contained the precise items that would shed some light on the topics that were going to be analyzed in this study, there were some changes suggested which were made in order to create the final version of the questionnaire. The comments and observations recommending certain modifications on the part of the experts included the redistribution and improvement of the questions of the questionnaire, based mainly in: compacting the questionnaire better, a better sequencing of the elements, specification of
determinate items, clarification of terms, improvement of the writing, and unification and grouping of questions according to aspects and give sub headings of aspects. Based on the suggestions given by the experts, changes in the questionnaire to assess current practices were made. Once the modifications had been made, the questionnaire was given back to the experts who had revised it initially, and to the guide. After approval to the revised version, the questionnaire was finalised.

3.6.2.4 Pilot Study of the Questionnaire

To establish validity of the questionnaire a pilot study was conducted. Five teacher educators were selected and the questionnaire to assess current practices in use of ICT was administered to them. The objective was to check for any problems in understanding and administration.

The pilot study yielded the following results:

- The reported teacher educators did not have doubts about the questions
- Instructions needed to be repeated at least two times for better understanding.
- Instruct teacher educators to give honest answers.
- The questions posed covered the main areas of the subject of study. They agreed that all the basic areas were covered and that there was no area that did not appear in it as far as their experience and their previous knowledge related to Information and Communication Technology was concerned.

The questionnaire was understood and the different questions extracted the information required, that they didn’t confuse the reader or generate ambiguity. The questions satisfied the needs of the reported teacher educators and there were some slight changes related to terminology introduced according to different suggestions that teachers had made. The questionnaire to assess current practices in use of ICT was thus standardized and ready for use.
3.6.2.5 Elaboration of the Final Version of the Questionnaire

This section includes the design, development, dimensions and variables of the final questionnaire. After making all the changes as per suggestions by teachers and experts, the final version of the questionnaire was developed. (Appendix 2). The final version of the questionnaire which was given to the teacher educators who participated in this research constituted of 6 main dimensions and 20 questions.

Table 6. Aspects of Assessment of ICT Practices by Teacher Educators.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Aspects</th>
<th>No. of questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Use</td>
<td>2</td>
</tr>
<tr>
<td>2.</td>
<td>Preparation and Planning</td>
<td>5</td>
</tr>
<tr>
<td>3.</td>
<td>Selection of ICT Resource</td>
<td>2</td>
</tr>
<tr>
<td>4.</td>
<td>Practice in the ICT based session</td>
<td>7</td>
</tr>
<tr>
<td>5.</td>
<td>Evaluation</td>
<td>2</td>
</tr>
<tr>
<td>6.</td>
<td>Your Opinion</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>20</strong></td>
</tr>
</tbody>
</table>

- **Use** – The questions were based on the use of ICT by teacher educators in terms of number of sessions conducted and the tools used. These answers would help to know about the frequency of usage of ICT, and help us to obtain an idea of which functions are used by them.

- **Preparation and planning** - The answers to this section helped to get an accurate idea of the practices and procedures used by teacher educators in referencing and preparing and planning for conducting an ICT session. The answers helped in providing a direction to the development and formulation of an ICT based model of curriculum transaction.

- **Selection of ICT resource** – The questions helped to know about the knowledge that teacher educators have of ICT tools and resources and their justification and
pedagogical use of ICT. The information gathered helped to perceive the degree of competence that teacher educators have in relation to the selection of ICT tools and resources and the justification of the different ICT-based tools.

- **Practice in ICT based session** - The answers to this section shed light on the practices, procedures, assessments and roles of teacher educators and teacher trainees currently used for conducting an ICT session. The answers helped in providing a direction to the modeling of objectives, techniques, and procedures in an ICT based model of curriculum transaction.

- **Evaluation** – This section aims to assess the evaluation procedures currently used by teacher educators and thus provide a direction to ideal evaluation procedures which can be incorporated in the curriculum transaction of an ICT based session.

- **Your opinion** – The opinions helped in summarising the knowledge teacher educators have of their previous ICT practices, their appraisal and opinion shed light on specific needs in the transaction of an ICT based session. In the end there was an open part in which teacher educators suggest and propose requirements in an ideal ICT based session.

### 3.6.3 Population

The objective of the study was to analyze the ICT based curriculum transaction practices by teacher educators in colleges of education hence all teacher educators teaching in colleges of education of University of Pune constitute the population of the study.

### 3.6.4 Sample

A sample of 50 teacher educators was selected to assess and analyze current ICT based curriculum transaction practices by teacher educators in colleges of education. The sample was selected using incidental sampling. The criteria used for selection of the sample were as follows:

a) A maximum of two teacher educators were included from one college of education.

b) Only those teacher educators who were available and willing to cooperate were selected.

c) 50 teacher educators were selected from 30 different colleges of education.
3.6.5 Data Collection
The questionnaire was distributed during February 2009 to 50 teacher educators of 30 different colleges of education which has been listed in Appendix 3. The questionnaire was distributed to the teacher educators on a one to one basis and filled in immediately in front of the researcher to avoid any confusion and to get honest answers.

3.6.6 Data Analysis Tools
After collection of data the analysis of the data (both qualitative and quantitative) was done. The data obtained was treated with percentage analysis for the quantitative data and listing of responses was done for qualitative data.

3.7 Methodology and Procedure of Research for Objective 2
Objective 2 - To develop an ICT based model of curriculum transaction integrating the theory of constructivism, using the principles of student centered and active learning, collaborative learning, self learning, continuous assessments, reflective practice and justified use of technology through the medium of ICT in the curriculum transaction process.

3.7.1 Method of Research – Product Development Research
Product development research has been defined as the systematic study of designing, developing, and evaluating instructional programs, processes, and products that must meet criteria of internal consistency and effectiveness. (Kenneth N. Ross, 2005). One of the objectives of the current research was to develop an ICT based model of curriculum transaction and for this purpose product development research method was used.

Designing an instructional model is a complex process which requires immense thinking, intricate planning and systematic execution of the steps in designing and this can be successfully achieved only if standardized instructional design steps are followed. Models for instructional design provide procedural frameworks for the systematic production of instruction. They incorporate fundamental elements of the instructional design process including analysis of the intended audience or determining goals and objectives (Braxton et al., 1995). An instructional design model gives structure and meaning to an instructional design process, enabling the would-be designers to negotiate
their design task with a semblance of conscious understanding. Models help to visualize the problem, to break it down into discrete and manageable units. A model should be judged by how it mediates the designer's intention, how well it can share a work load, and how effectively it shifts focus away from itself toward the object of the design activity (Ryder, 2006). Instructional models prescribe how combinations of instructional strategy components should be integrated to produce a course of instruction (Braxton et al, 1995).

3.7.2 Designing the ICT Based Model of Curriculum Transaction

After reviewing various options for designing and developing the ICT based model of curriculum transaction, the researcher has used the ADDIE steps (Originator: Russell Watson, 1981) for designing the ICT based model of curriculum transaction. The ADDIE steps is the generic process traditionally used by instructional designers and training developers. The five phases—Analysis, Design, Development, Implementation, and Evaluation—represent a dynamic, flexible guideline for building effective training and performance support tools. (Hodell, 1997).

ADDIE steps were followed by the researcher for development of the ICT based model of curriculum transaction for teacher educators.

3.7.2.1 The ADDIE Analysis Phase

The ADDIE analysis phase serves as a formal planning and quality assurance step. In order to develop an effective ICT based model of curriculum transaction detailed planning and analysis are required. The researcher conducted an analysis as represented in the Fig. 8.
• **Analysis of Current Practices** – Detailed survey was done for fulfillment of the 1st objective of the research. The prepared questionnaire was given to 50 teacher educators of colleges of education and responses were used to analyze the ICT based curriculum transaction practices by teacher educators in colleges of education.

• **Viewpoints of Experts** – Collecting feedback from experts is an important step in the quality assurance process. In order to ensure quality the researcher has followed the following steps in collecting expert viewpoints.

  a) **Selection of Experts** - The 1st step was to select experts who are most knowledgeable about issues or questions of concern i.e., effective ICT based curriculum transaction.

  b) **Familiarization of Experts** - Once the experts were finalized the researcher embarked upon issue familiarization of experts by providing sufficient details on the issue i.e., the development of an effective ICT based model of curriculum transaction. The researcher interacted with 6 ICT experts in
education to find out their viewpoints about their ideas on effective use of ICT in the curriculum transaction process.

c) **Reexamination of Issues** - After collecting views from all the experts a final review of results by the experts and revision of initial answers by experts was done. This iterative reexamination of issues helps in increasing the accuracy of results.

- **Study of Existing Models** - The researcher surveyed 10 models of ICT based teaching learning and noted down their salient features.

### Table 7. Summary of Models Surveyed

<table>
<thead>
<tr>
<th>S.No</th>
<th>MODEL</th>
<th>MAIN TENETS</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>“Technology Integration Model” Dr. Ali Zuhdi H. Shaqour</td>
<td>Utilizing constructivist learning principles and integrating new technologies namely computers and the Internet into pre-service teacher training programs.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ajman University of Science and Technology Network</td>
<td>• Working collaboratively</td>
<td>Constructivism</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Flexibility</td>
<td>Collaboration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Discovery</td>
<td>Reflection</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Reflection</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Knowledge construction</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>The 361° Model for Transforming Teaching and Learning with Technology DePauw University in Greencastle, Indiana</td>
<td>1. Put learning first.</td>
<td>Active learning</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Align IT with institutional mission and culture.</td>
<td>Student centered</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Technology fluency</td>
<td>Learning</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Invest more in people and support</td>
<td>Collaboration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Support sustainable technologies.</td>
<td>Justified use</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6. Actively involve student.</td>
<td>of ICT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7. Collaboration is essential.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>8. Use technology to remove barriers.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>9. Design space to enhance learning and build community.</td>
<td></td>
</tr>
<tr>
<td>S.No</td>
<td>MODEL</td>
<td>MAIN TENETS</td>
<td>REMARKS</td>
</tr>
<tr>
<td>------</td>
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<td>---------</td>
</tr>
<tr>
<td>3.</td>
<td>Mayes: The Conceptualisation Cycle Mayes &amp; Fowler Glasgow Caledonian University</td>
<td>That learning with technology involves a cycle of conceptualisation, construction and dialogue.</td>
<td>Constructivism Collaborative learning</td>
</tr>
<tr>
<td>4.</td>
<td>Laurillard's Conversational Model Diana Laurillard, The Institute of Education, University of London</td>
<td>One of the major characteristics of this model is the way in which the student and tutor interacts Technology can support these interactions Narrative, interactive, adaptive, communicative, discursive and productive.</td>
<td>Interactive learning</td>
</tr>
<tr>
<td>5.</td>
<td>Gilly Salmon: 5-stage model and e-Moderating Executive Director and Professor at the Australian Digital Futures Institute (ADFI) at the University of Southern Queensland, Toowoomba, Australia.</td>
<td>The first two stages of Salmon's model focus on • acclimatising the learner to the online environment and • developing a supportive social environment. • information exchange • knowledge construction • reflect on their own learning. • The role of the tutor - the moderator</td>
<td>Constructivism Collaborative learning Teacher as a facilitator Reflective learning</td>
</tr>
<tr>
<td>6.</td>
<td>A Blended-learning Pedagogical Model EMERITA BAÑADOS Universidad de Concepción</td>
<td>blended-learning (b-learning) pedagogical model that includes: (a) learners work with UdeC English Online, (b) online monitoring, (c) face-to-face EFL teacher-led classes, and (d) conversation classes with native speakers of English.</td>
<td>Interactive learning</td>
</tr>
<tr>
<td>S.No</td>
<td>MODEL</td>
<td>MAIN TENETS</td>
<td>REMARKS</td>
</tr>
<tr>
<td>------</td>
<td>-------</td>
<td>-------------</td>
<td>---------</td>
</tr>
</tbody>
</table>
| 7.   | A Model to Integrate Online Teaching and Learning Tools Into the Classroom, Klaus Schmidt and Dan Brown, Illinois State University. | Five steps to creating a quality mix of online and traditional classroom teaching and learning.  
  • Step 1: Examine your teaching style  
  • Step 2: Assess your students’ preferred learning styles  
  • Step 3: Study online and traditional teaching and learning tools  
  • Step 4: Select online teaching and learning tools  
  • Step 5: Reflect, implement, reflect, and revise | Student centered learning Reflection |
| 8    | A generic model Qiyun Wang* National Institute of Education, University. Singapore | Three fundamental elements:  
  • pedagogy,  
  • social interaction and technology.  
  • Constructivist learning theories, interactivity | Constructivism Interaction |
| 9    | TPACK-Model. Mishra and Koehler (2006). Michigan University | Three phases for developing teachers' TPACK through ICT instruction. The phases are: fostering teachers' acceptance and technical proficiency; pedagogical modeling; and pedagogical application. | Pedagogy is important |
| 10   | Learning Spaces: YVES PUNIE | An ICT-Enabled Model of Future Learning in the Knowledge-Based Society  
The "learning spaces" vision puts learners at the centre of learning, but, at the same time, conceives learning as a social process. | Student centered learning Collaborative learning |
• **Audience Analysis** - As the user of this ICT based model of curriculum transaction is a teacher educator the researcher has made assumptions about the teacher educator’s needs, knowledge and capabilities in ICT based on familiarity of audience and observations.

  - The teacher educator needs a proper guideline on which an ICT based session can be modeled.
  - The teacher educator has basic knowledge and competency level in handling ICT tools.

• **Instructional Analysis** – There is a strong need for sound theoretical base and principles of use to direct instructional planning because the theoretical base and principles for the use of ICT based model of curriculum transaction will help in guiding the instructional process during the use of the ICT based model of curriculum transaction. A thorough study of the various theories and their impact on ICT based teaching learning was done by surveying existing models of ICT based teaching learning after which the theory, principles of use and objectives were finalised.

• **Output of the Analysis Phase** – Based on the above analysis the goal, theoretical bases, principles and objectives of the ICT based model of curriculum transaction was finalised.

• **Goal of the ICT Based Model of Curriculum Transaction**. - To effectively plan, design, develop, conduct, assess, evaluate and reflect on curriculum transaction using ICT.

• **Theoretical Bases** - Constructivism is the theoretical basis of the ICT based model of curriculum transaction. Constructivism describes a *learner-centered environment* where knowledge and the construction of knowledge is *interactive, inductive, and Collaborative*, where multiple perspectives are represented, and where questions are valued. The use of ICT can play a significant role in applying constructivist approach in today’s classroom. The key to success lies in finding the appropriate points for
integrating technology with constructivism into pedagogical practice, so that it supports the deeper, more reflective self-directed activity students must use if they are to be competent members of the society in the future.

- **Principles** - The use of ICT must be linked to the principles given as follows.
  1. Justified use of ICT
  2. Student centered and active learning
  3. Co-operative learning
  4. Continuous assessment
  5. Teacher as a facilitator
  6. Reflective practice

- **Objectives and specifications** - The objectives and specifications of the ICT based model of curriculum transaction are finalized.
  1. To conduct an internet research of a topic.
     - To access various information sources using internet to get in depth and up-to-date information.
     - To be able to sift, sort and select relevant information.
     - To be able to save information for further use.
  2. To survey all the available ICT resources.
     - To be able to evaluate the suitability of ICT resources for a topic.
  3. To select the most suitable ICT resource.
     - To be able to identify the ICT resource for a topic.
  4. To identify the objectives, which can be achieved through use of ICT.
     - To identify general objectives and objectives achieved by use of ICT
  5. To justify the use of the ICT resource.
     - Consider the advantages and disadvantages of using an ICT resource
  6. To plan the session using the ICT resource
     - To judge student’s present level of performance and knowledge
     - To plan sequence of activities during the lesson
     - To plan for student centered learning, active learning and reflective questions.
7. To manage the use of ICT in the session
   - To be able to organize students in the ICT based lesson
   - To be able to monitor students during the course of the ICT based lesson
   - To take care of health and safety issues during the course of the ICT based lesson

8. To assess learners' work and monitor progress
   - To be able to plan for effective assessments
   - To be able to record students performance
   - To be able to evaluate students performance
   - To be able to report students performance

9. To be able to reflect on the pros and cons of the ICT based session.

10. To plan for further improvement and consolidation of learning.

- **Output** - The researcher confirms the goals, theoretical bases, principles, and objectives of the ICT based model of curriculum transaction after consultation with the experts.
3.7.2.2 The ADDIE Design Phase

After finalizing the goals, theoretical bases, principles and objectives of the ICT based model of curriculum transaction the researcher commenced finalization of the design of the ICT based model of curriculum transaction for teacher educators.

- **Grouping and Sequencing the Stages**

  Step by step, general to specific and part to whole grouping and sequencing options were selected by the researcher for the ICT based model of curriculum transaction. This decision was based on the structure that makes the most sense for the target group i.e., teacher educators and the content of the model. The stages in the use of ICT based model of curriculum transaction were finalized which helped in guiding the instructional process during the use of the ICT based model of curriculum transaction. The stages were finalized on the basis of the content of the model, viewpoints of experts and analysis of existing models.

Stage 1: Investigating a topic using internet to get in-depth and up-to-date information

Stage 2: Evaluating, Justifying and Identifying the ICT Resource for teaching a topic
Stage 3: Planning for ICT based session

Stage 4: Planning for Assessment in ICT based session

Stage 5: Managing the Use of ICT

Stage 6 Reflecting on the impact of ICT based session

- **Instructional Methods Used to Present Material**
  
The researcher selected a reflective design i.e., the researcher uses questions to guide the teacher educator through the various stages of the ICT based model of curriculum transaction. The use of questions ensures that the teacher educator does in-depth thinking or reflection before deciding on the course of action in each and every stage. This process guarantees balanced and justified actions by the teacher educator.

- **End Product as a Measure of Accomplishment.**
  
An ICT based curriculum transaction session plan for 3 topics from the B.Ed. syllabus were developed as the end product of the model.

- **Selecting the Format for the Model** - The researcher surveyed various formats for the design of the model.
  
  - Instructor/ trainer-led course - This required an instructor /trainer to be present for the teacher educator to learn from the model which would drastically limit the use of the model.
  
  - Synchronous e-learning / Asynchronous e-learning – Highly technical knowledge is required to develop a model for use through the e-learning mode which the researcher does not possess.
  
  - Word-based reflective material – The researcher selected this format for development of the model for the following reasons.
    
      - Enhance creativity
      - Ease in designing
      - Ease of access
• Soft copies and hard copies both are possible and thus will increase usability and accessibility.

• **Write the Model’s Design Document** - As the outcome of this phase the researcher developed a design document which
  
  o Describes the overall learning approach
  
  o Identifies instructional media choices
  
  o Clusters and sequences objectives
  
  o Describes activities, and assessments

The instructional design serves as a major quality assurance checkpoint as it helps in the following ways.

  • Checks that the design concepts are cohesive and complete.
  
  • Presents the proposed structure of the model.
  
  • Invites feedback about the design

**Check the Design Concepts and Content** - The model’s instructional strategy should help the teacher educators to achieve the course's learning objectives. Once the instructional design document has been written, the researcher took a step back and looked at the whole design, not just individual pieces. The design document makes it easier to spot areas that have unresolved questions or need additional information.
ICT Based Model of Curriculum Transaction – Design Document

**THEORY CONSTRUCTIVISM**

Principles

**GOALS**

- To effectively plan, design, develop, conduct, assess and evaluate curriculum transaction using ICT.

**Stage 1: Investigating a topic using internet to get in-depth and up-to-date information**

**Objectives**

- To access various information sources using internet to get in-depth and up-to-date information.
- To be able to sift, sort and select relevant information.
- To be able to save information for further use.
Stage 2: Evaluating, Justifying and Finalising the ICT Resource for a topic

- Objectives
  - To be able to evaluate the suitability of ICT resources for a topic.
  - To be able to identify the ICT resource for a topic.
  - To identify general objectives and objectives achieved by use of ICT
  - To justify the use of the ICT resource for a topic.

Stage 3: Planning for ICT based session

- Objectives
  - To judge teacher trainee’s present level of performance and knowledge
  - To plan sequence of activities during the session
  - To plan for student centered learning, active learning and reflective questions.
  - To plan for classroom layout and grouping of teacher trainees
  - To plan for materials, resources and technology
  - To plan for assessment and evaluation

Stage 4 Planning and Implementing Assessment in ICT based session

- Objectives
  - To be able to plan for effective assessments
  - To be able to record teacher trainees performance
  - To be able to assess teacher trainees performance
  - To be able to report teacher trainees performance

Stage 5: Managing the Use of ICT

- Objectives
  - To be able to organise teacher trainees in the ICT based session
  - To be able to monitor teacher trainees during the course of the ICT based session
  - To take care of health and safety issues during the course of the ICT based session
Stage 6 Reflecting on the Impact of ICT

- **Objectives**
  - To reflect on the pros and cons of the ICT based session
  - To plan for further improvement and consolidation of learning.

ICT based model - Session plans

- **Topics**
  - PVS I Educational Evaluation - Coefficient Of Correlation
  - PHS II Educational Psychology - Memory Training Techniques
  - PVI English Education - Group Work Pair Work

Preparation Of Resource Guide

- A word based reflective material & CD was prepared. The researcher followed a reflective design i.e., questions inducing thinking, analysis and evaluation for writing the material. There are self evaluation questions at the end of each stage to assess the learning of the ICT based model and remedy the lacunae.

Assessments

- **Self Evaluation**
- **Content test**
- **Teacher trainee feedback**
- **Teacher Educator feedback**

Figure 10. ICT Based Model – Design Document
• **Invite Feedback About the Design** - After finalizing the instructional design, the researcher collected feedback from the experts. The experts gave the following suggestions based on which changes were made by the researcher and the design was finalized.

- The theory of constructivism selected by the researcher as the theoretical base of the ICT based model of curriculum transaction was approved by the experts.
- The principles of active learning is part of student centered learning so there is no need to list it separately— The principle of student centered learning was retained and active learning was included under it.
- Reflective learning by teacher trainees can be included under the common heading of reflective practice.
- The stage of planning for assessment should be stage 4 i.e., before managing the use of ICT and not after as stage 5. The necessary changes were made.
- The objectives of the model were approved.

### 3.7.2.3 The ADDIE Development Phase

![Diagram of ADDIE Development Phase]

**Develop**
- Develop the word based reflective material
- Conduct a Tabletop Review
- Conduct an Expert Review
- Pilot Testing

**Output**
- Manual of the ICT based Model of Curriculum transaction
- CD
- Sample session plans

*Figure 11. The ADDIE Development Phase*
Develop the Word Based Reflective Material - The researcher developed the materials by referring to the materials found in the survey and aligning them with the objectives and the instructional design document. The researcher followed the reflective design i.e., questions inducting thinking for writing the material.

Conduct a Tabletop Review - After the word based self study material was developed, the first draft of the word based self study material was ready for a tabletop review. During the tabletop review, the researcher with the help of a teacher educator checked the word based self study material content's accuracy and completeness. The objective was to go through the word based self study material as experts looking for errors. The tabletop review served as a quality assurance step.

- It helped in using common terminology throughout the manual.
- It helped in having a common format throughout the manual.

Conduct an Expert Review - After the word based self study material was developed, the second draft of the word based self study material was ready for an Expert review. The word based self study material was given to 5 teacher educators and their feedback about the word based self study material was taken. The expert review served as a quality assurance step. The teacher educators gave the following suggestions based on which the changes were made by the researcher and the word based self study material was finalized.

- There should be summary of important points of each stage - Summary in the form of overview of each stage was added
- How will you evaluate learning of the model by Teacher educators? - Self Evaluation questions were added and result analysis was given on the basis of which the teacher educator will be able to locate lacunae and relearn to attain mastery over use of the model.
- More detailed information of Constructivism theory should be provided as it is the base of the model. - A comparative table of traditional classroom, constructivist classroom and ICT based model classroom was added to clarify understanding of use of constructivism in the ICT based model.
• Index should be provided. - An Index with page numbers was provided for easy navigation through the ICT based model self learning manual.

**Pilot Testing** - The 3 sample session plans developed as part of the material of the ICT based model of curriculum transaction were now ready for the pilot test which would be the first time actual implementation of the ICT based model of curriculum transaction by a teacher educator with the teacher trainees. The pilot test of the 3 sample session plans of the ICT based model of curriculum transaction took place before the actual implementation. Before the pilot test, the researcher developed a checklist of issues which need to be observed:

• Measure the amount of time learners need for each activity.

• Check learners' engagement with the ICT tool.

• Detect points where material/ICT tool may be too easy/too difficult.

• Confirm that learners understand the instructions for activities and exercises

• Evaluate the flow and balance of the session

• Test how well learners achieve the stated learning objectives by the end of the session

• Validate the assessment tools

• Collect feedback from learners about the session

• Locate points where the session should be revised

The issues identified from the pilot test are as follows:

1. Time was noted and planning was done accordingly.

2. It was noted that the ICT resources used should be saved on the desktop for easy access.

3. A small demonstration of which ICT resource to access on which instruction should be given to the teacher trainees at the beginning of the session.

4. Use of Video with audio disturbs other teacher trainees and so headphones need to be used for audios.
3.7.2.4 The ADDIE Implementation Phase

The 3 sample session plans of the ICT based model of curriculum transaction were used for conducting the sessions for the experimental group. The control group was taught using the traditional method.

**Conducting the Sessions** - The sessions for experimental group using the ICT based model of curriculum transaction for all three topics were conducted in 3 batches of 30 teacher trainees each.

The sessions for control group using the traditional lecture method of teaching for all three topics were conducted in 3 batches of 30 teacher trainees each.
3.7.2.5 The ADDIE Evaluation Phase

The effectiveness of the ICT based model of curriculum transaction was evaluated with the help of the following:

- Evaluation by measuring teacher trainee learning through a content test
- Teacher trainee feedback about the session
- Peer teacher educator feedback about the session
- Establish effectiveness of the ICT based model
- Suggestions for improvement

Figure 13. The ADDIE Evaluation Phase
3.8 Methodology and Procedure of Research for Objective 3, 4 and 5.

Objective 3 - To determine the effect of ICT based model of curriculum transaction on teacher trainee’s achievement.

Objective 4 - To examine the effectiveness of ICT based model of curriculum transaction through teacher trainee’s feedback.

Objective 5 - To examine the effectiveness of ICT based model of curriculum transaction through peer teacher educator feedback.

3.8.1 Method of Research – Experimental Research

A study of the effectiveness of the ICT based model of curriculum transaction developed by the researcher was done using experimental method.

3.8.2 Research Design

Research design is the conceptual structure within which research would be conducted. (Creswell, 2009). The simplest and best of all experimental designs is the two-group posttest-only randomized experiment for assessing cause-effect relationships. One group gets the treatment or program (the X) and the other group is the comparison group and doesn't get the program. A pretest is not required for this design. Usually a pretest is included in order to determine whether groups are comparable prior to the program. In this design, there is more interest in determining whether the two groups are different after the program. The groups are measured on one or more measures and compared by testing for the differences between the means using a t-test. (Trochim, 2000).

In the present research two group post test design was used.

- The marks achieved by teacher trainees in the 1st term exam of the B.Ed. course were considered for dividing teacher trainees into two equivalent groups – Control group and Experimental group.

- First group was the control group that was taught in a traditional manner.

- The second group was the experimental group that was taught using the ICT based model of curriculum transaction.
• Post tests on content of both groups were conducted to determine if a statistically significant difference occurred in content knowledge.

• A teacher trainee feedback form using a Likert rating scale to measure effectiveness through teacher trainee feedback of both groups with the session was used to determine if a statistically significant difference occurred.

• A Likert rating scale cum questionnaire was used to get peer teacher educators feedback about the session to determine effectiveness.

![Figure 14. Research Design – Two Group Post Test Design](image)

### 3.8.3 Research Variables

#### Independent Variables

The ICT based model of curriculum transaction was the independent variable of the research.

#### Dependent Variable

a. Teacher trainee achievement in content was the dependent variable of this research.
b. Teacher trainee feedback of the session was the dependent variable of this research.
c. Peer teacher educator feedback of the session was the dependent variable of this research.
Extraneous Variables

a. Difference in achievement of teacher trainees – in order to minimize the effect of difference in achievement of teacher trainees in content test the researcher used the scores obtained by teacher trainees in the 1st term exams in order to divide teacher trainees into two equivalent groups.

b. Teaching competency of researcher – To minimize the effect of teaching competency of researcher on achievement in content test and teacher trainee feedback, the researcher has taught both the groups i.e., control group by the traditional method and the experimental group by the sample sessions of the ICT based model of curriculum transaction.

c. Difference in expertise in handling the ICT tools required for the session in teacher trainees – The researcher gave 5 minute training to the teacher trainees on handling the ICT tools required for the session in order to minimize the effect of lack of expertise in handling the ICT tools required for the session by the experimental group.

d. Subjectivity in scoring the content test – To reduce the subjectivity in scoring the content test the researcher used a model answer and marking scheme for examining the content test.

3.8.4 Population

All teacher trainees undergoing B.Ed. course of University of Pune and all teacher educators teaching in the B.Ed. course of University of Pune.

3.8.5 Sample/ Informants Selection

Selection of Colleges - The researcher has selected teacher trainees undergoing the B.Ed. course of University of Pune in the year 2010 – 2011 in English medium from three Colleges of Education located in Pune city.

The most scientific procedure in sample selection is random sampling but the colleges were selected using purposive sampling method for the following reasons:

a. Permission of principal to conduct the teaching of 3 topics on 3 experimental groups and 3 control groups i.e., a total of 6 sessions.
b. Availability of computer lab/ LCD and ICT tools required for teaching the sample sessions of the ICT based model of curriculum transaction.

c. Availability of teacher trainees undergoing the B.Ed. course in English medium.

d. Cooperation of teacher trainees and concerned teacher educator.

e. Proximity to H.G.M. Azam college of education as researcher is working in the college and can easily commute to the colleges to conduct research related activities.

**Table 8. Selection of Colleges of Education for Conducting Research.**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE COLLEGE WITH ADDRESSS</th>
</tr>
</thead>
</table>

**Selection of Teacher Trainees** - The sample of 91 + 91 teacher trainees selected for the experimental group and the control group are from three different colleges of education. The ICT based model of curriculum transaction requires a small group of 30 students only for the sessions. In order to get a bigger sample of about 90 teacher trainees as a better representation of the population the researcher has conducted the same session three times on three groups of about 30 students each. In order to study the effectiveness of the ICT based model in different subjects in the B.Ed. course the researcher has selected three topics from three different subjects of the B.Ed. curriculum.

The researcher had the following options for distribution of sample of teacher trainees to experimental group and control group.

1. Using ICT competency levels – as the model does not demand any special technology skills, division of teacher trainees according to ICT skills does not serve any purpose.
2. Using I.Q. levels – conducting an I.Q. test for allotting teacher trainees to experimental and control groups and calculating I.Q. score for making two equivalent groups is a viable option but I.Q. does not necessarily guarantee learning ability which is what is to be tested after the implementation of the program.

3. 1st term exam results – the marks obtained by teacher trainees in the 1st term exam has been used for allotting teacher trainees to experimental and control groups for making two equivalent groups according to learning ability as that is what is to be tested after the implementation of the program.

4. The marks obtained in the first term exams were obtained from the college.

5. The teacher trainees were arranged in an ascending order according to marks obtained in the first term exam. The teacher trainees failing in the exam were excluded.

6. The teacher trainees were arranged in two equivalent groups according to marks scored.

7. 30 teacher trainees were selected in each group on the day of the session according to the attendance report.

**Table 9. Selection of Teacher Trainees from Colleges of Education**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of the college</th>
<th>Teacher trainees in Experimental Group</th>
<th>Teacher trainees in Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Azam College of Education</td>
<td>32</td>
<td>32</td>
</tr>
<tr>
<td>2.</td>
<td>P.M.E.T. College of Education</td>
<td>29</td>
<td>29</td>
</tr>
<tr>
<td>3.</td>
<td>Arihant College of Education</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>91</td>
<td>91</td>
</tr>
</tbody>
</table>
Selection of Informant Peer Teacher Educators - The experimental and control group sessions were conducted in three different colleges on three different topics from three different subjects. The teacher educators of the college of those subjects were the informants who gave feedback on the criteria of effectiveness for both the experimental and control group sessions. A total of 3 X 3 = 9 peer teacher educators gave feedback on criteria of effectiveness for both the experimental and control group sessions.

3.8.6 Data Collection Tools

To measure the effectiveness of the ICT based model of curriculum transaction was one of the objectives of the research and as it is related to teaching effectiveness. Review of related literature showed that there are twelve potential sources of evidence to measure teaching effectiveness (a) student ratings, (b) peer ratings, (c) self-evaluation, (d) videos, (e) student interviews, (f) alumni ratings, (g) employer ratings, (h) administrator ratings, (i) teaching scholarship, (j) teaching awards, (k) learning outcome measures, and (l) teaching portfolios. (Berk, 2005.) A unified conceptualization of teaching effectiveness is proposed to use multiple sources of evidence, to provide an accurate and reliable base for formative and summative decisions. Multiple sources build on the strengths of all sources, while compensating for the weaknesses in any single source. This triangulation of sources is recommended in view of the complexity of measuring the act of teaching and the variety of direct and indirect sources and tools used to produce the evidence. The researcher thus selected the following measures to determine effectiveness of the ICT based model of curriculum transaction.

1. Learning outcome measures – Content test
2. Student ratings – Teacher trainee feedback
3. Peer ratings – Peer teacher educator feedback
4. Teaching portfolios – Expert opinion on the sample sessions

3.8.6.1 Content Test

1. Preparation - The researcher selected three topics on which instructional sessions were prepared using the ICT based model of curriculum transaction. To study the effectiveness of the model on learning outcome measures in other words on
achievement in content test, the researcher prepared a content test on the topics. The content test was of 60 marks covering all three topics.

2. **Objective for Using Content Test** – To find the difference in achievement of teacher trainees in content test between experimental group and control group.

The following steps were used in the construction of the Content test:

3. **Instructional Objectives** - The first and the most important step in planning a test is to identify the instructional objectives of the content test. To judge the level of knowledge and understanding, ability of application, analysis, synthesis and evaluation of the concepts in coefficient of correlation, memory training techniques and group work and pair work.

4. **Design** - The second step in planning a test is to make the "Design". The design specifies weightages to different (a) instructional objectives, (b) types (or forms) of questions, (c) units and sub-units of the course content, (d) levels of difficulty. The weightages to all aspects mentioned above have been considered in the construction of the content test which are shown in the blueprint of the content test in Table - 6.

5. **Blueprint** - The third step is to prepare the "Blueprint". Decisions about how many questions are to be set for different objectives, unit/topic, and distribution over different objectives and content areas so as to obtain the weightages were taken and the blueprint of the content test was finalised. A blue print showing a three dimensional picture of the objectives, teaching points and marks allotted was prepared.
### Table 10. Blue Print of Content Test

<table>
<thead>
<tr>
<th>Topic</th>
<th>Objectives</th>
<th>Knowledge and understanding</th>
<th>Application</th>
<th>Analysis, Synthesis &amp; Evaluation</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub Topics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coefficient of correlation (CCR)</td>
<td>Definition of Correlation</td>
<td>2</td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Types of correlation</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Calculation of coefficient of correlation</td>
<td></td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Interpretation of coefficient of correlation</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Memory training techniques (MTT)</td>
<td>What is memory training</td>
<td>2</td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Memory training techniques</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Group work pair work (GPW)</td>
<td>Rationale of GPW</td>
<td></td>
<td>3</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Advantages of GPW</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Disadvantages of GPW</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Steps in GPW</td>
<td></td>
<td></td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>18</td>
<td>21</td>
<td>21</td>
<td>60</td>
</tr>
</tbody>
</table>

6. **Writing of Questions** - The next step after the finalization of the blueprint was writing appropriate questions in accordance with the broad parameters set out in the blueprint. One small block of the blueprint was taken at a time and the required questions were written. This was done for each block of blueprint. Once it was done, all the questions meeting the necessary requirements laid down in the blueprint were ready. Logical grouping and sequencing of questions was done to get the content test.
7. **Establishing Reliability and Validity of the Content Test**

**Expert Opinion** - The content test thus prepared was given to 5 experts i.e., 5 teacher educators teaching that topic in a B.Ed. college and their expert opinion was taken.

The experts suggested the following changes in the test:

- It is difficult to distinguish the questions for testing knowledge and understanding and so they should be clubbed together.
- It is difficult to distinguish the questions for testing analysis, synthesis and evaluation and so they should be clubbed together.
- Instead of essay questions include S.A. and V.S.A. questions to get a better picture of teacher trainees grasp of content and also avoid subjectivity in scoring.
- Don’t use multiple choice items in order to avoid guessing by the teacher trainees.

Based on the suggestions changes in the blueprint and content test were made.

8. **Pilot Study** – Five teacher trainees were selected and the content test was administered to them to confirm the following points and check for any problems in administration of the test.

- Measure the amount of time learners need for the content test.
- Detect points where questions may be too easy/too difficult.
- Confirm that learners understand the instructions for answering questions.
- Validate the assessment tools.
- Locate points where the content test should be revised.

**Conclusions:**

- The time taken for completion of test was 30 min.
- Instructions regarding mode of answer needed to be added.
- There was no problem with the difficulty level of the questions.

The changes in the content test were made and the content test was thus standardized and ready for use.
9. **Scoring Key/Marking Scheme** - The fifth step is to prepare the "Marking Scheme". The marking scheme helps prevent inconsistency in judgement. In the marking scheme, possible responses to items in the test are structured. The various value points for answers are graded and the marks allowed to each value point indicated. The marking scheme ensures objectivity in judgement and eliminates differences in score which may be due to idiosyncrasies of the evaluator. The marking scheme, of course, includes the scoring key, which is prepared in respect of objective type questions.

10. **Question-wise Analysis** - The sixth and the last step is that of question-wise analysis. Such an exercise helped in ensuring that there is no imbalance in the question paper. During question-wise analysis, an analysis of each question on various parameters stated in the blueprint is done based on the responses in the pilot test and expert opinion.

11. **Conducting the Content Test** - After instructing teacher trainees the content test was conducted under exam conditions immediately on conclusion of the sessions. No preparation time was given to ensure that performance of teacher trainee on content test was a result of teaching effectiveness and not due to revision, study or preparation by the teacher trainee. The content test was marked objectively using the marking scheme cum scoring key. The results were tabulated.

**3.8.6.2 Teacher Trainee Feedback**

The effectiveness of the sessions of the ICT based model of curriculum transaction cannot be judged only by a content test as it is a teaching model and so teacher trainee feedback and peer teacher educator feedback is also necessary to judge teaching effectiveness of the model. Student evaluations of teaching help us to identify and to support effective teaching and provide the information about student perceptions of the quality of instruction. (McKeachie, 1997).

1. **Preparation** – In order to get feedback from the primary participants in the sessions i.e., the teacher trainees about the effectiveness of the session, a teacher trainee feedback form was used. The researcher followed these steps in the preparation of the teacher trainee feedback form.
2. **Review of Various Student Evaluation Forms** - After referring to various student evaluations of teaching forms the criteria of effectiveness to be evaluated by the teacher trainees were finalized as follows
   a) Preparation
   b) Use of teaching aid / ICT tool
   c) Management of session / activities
   d) Teacher educators role
   e) Teacher trainees role
   f) Collaborative learning
   g) Assessments
   h) Overall Impact

3. **Consultation with Experts** – The criteria selected were then discussed with experts and finalized.

4. **Design** - The researcher finalized 8 criteria to test effectiveness of the session and prepared the teacher trainee feedback form with 20 questions and a five point Likert scale. The important characteristic of a Likert scale is that it has respondents answer questions by picking a response on a numerical continuum. The form was specifically designed to evaluate both traditional as well as ICT based model of teaching and give an effective comparison. The questions were carefully formulated to avoid ambiguity and overlapping.

5. **Establishing Reliability and Validity of the Teacher Trainee Feedback**

   **Expert Opinion** - The teacher trainee feedback form thus prepared was given to 5 experts i.e., 5 teacher educators in a B.Ed. college and their expert opinion was taken. The experts suggested the following changes in the teacher trainee feedback form
   - Group items according to aspects of effectiveness being observed.
   - Give sub headings of aspects effectiveness.

Based on the suggestions changes in the teacher trainee feedback form were made.
6. **Proofread, Edit and Pilot Test** – After receiving feedback from the experts the teacher trainee feedback form was read carefully and edited for any ambiguity, difficult wordings and spelling errors. The teacher trainee feedback form was then ready for pilot testing.

7. **Pilot Study** – Five teacher trainees were selected and the teacher trainee feedback form was administered to them to check for any problems in administration of the test. The pilot study yielded the following results:

- Instructions should be repeated at least two times for better teacher trainee understanding.
- Instruct teacher trainees to mark only one option for each question.
- Instruct teacher trainees to judge objectively and then give honest answers.
- Make sure that teacher trainees do not discuss with each other while giving their responses to avoid peer influence.

The teacher trainee feedback form was thus standardized and ready for use. Refer Appendix 8

8. **Collecting Teacher Trainee Feedback** - At the end of the sessions after giving clear instructions the teacher trainee feedback forms were distributed and collected immediately on completion. Teacher trainees were not allowed to consult each other during the time given for filling up the feedback forms in order to avoid peer influence. The results of the teacher trainee feedback forms were tabulated.

**3.8.6.3 Peer Teacher Educator Feedback**

Peer review of teaching is composed of two activities: peer observation of in-class teaching performance and peer review of the written documents used in a course. *Peer observation of teaching performance* requires a rating scale that covers those aspects of teaching that peers are better qualified to evaluate than students. The scale items typically address the instructor’s content knowledge, delivery, teaching methods, learning activities, and the like (Berk, Naumann, & Appling, 2004).
**Preparation** - After referring to various peer review forms the researcher finalized 8 criteria to test effectiveness of the session and prepared the Peer teacher educator feedback form having two parts.

**Quantitative Feedback** - The researcher prepared the Likert scale peer teacher educator feedback form with 25 questions and a five point scale. The criteria used are as follows.

1. Planning & Preparation
2. Use of Teaching Aid / ICT Tool
3. Management of Session / Activities
4. Teacher Educators Role
5. Teacher trainees Role
6. Collaborative Learning
7. Assessments
8. Overall Impact

**Qualitative Feedback** – The researcher prepared 5 questions to know about the positives, negatives, changes in future sessions, classroom organization factors and achievement of objectives.

The form was specifically designed to evaluate both traditional as well as sample sessions of ICT based model of teaching by teacher educator and give an effective comparison.

**Establishing Reliability and Validity of the Peer Teacher Educator Feedback**

- **Expert Opinion** - The peer teacher educator feedback form thus prepared was given to 5 experts i.e., 5 teacher educators in a B.Ed. college and their expert opinion was taken.

  The experts suggested the following changes in the peer teacher educator feedback form.

  - Group items according to aspects of teacher effectiveness being observed.
  - Give sub headings of aspects teacher effectiveness.

Based on the suggestions changes in the peer teacher educator feedback form were made.

- **Pilot Study** – Five teacher educators were selected and the teacher educator feedback form was administered to them to check for any problems in administration of the test. The pilot study yielded the following results:
• Instruct teacher educator to mark only one option for each question.
• Instruct teacher educator to judge objectively and then give honest answers.
• The qualitative feedback questions required instructions to write only precise points.

The peer teacher educator feedback form was thus standardized and ready for use. Refer Appendix 12.

• **Collecting Peer Teacher Educator Feedback** - The researcher made sure that the teacher educator who observed the session filled up the feedback form immediately after the session was concluded in order to increase validity, reliability and objectivity of the feedback. The results of the teacher educator feedback forms were tabulated.

### 3.8.7 Data Analysis Tools

The researcher used the following tools used for statistical analysis.

• **Content Test - Mean** - After administration of the content test to the experimental and control groups the test papers were scored using the model answer and marking scheme. The results were tabulated and the mean of both the groups was calculated. Total mean of experimental group (EGM) and total mean of control group (CGM) was calculated. Topic wise mean was also calculated for experimental group. Experimental group mean for the topic coefficient of correlation (ECCR). Experimental group mean for the topic memory training techniques (EMTT). Experimental group mean for the topic group work pair work (EGPW). Topic wise mean was also calculated for control group. Control group mean for the topic coefficient of correlation (CCCR). Control group mean for the topic memory training techniques (CMTT). Control group mean for the topic group work pair work (CGPW). They are represented in the table 11.
Table 11. Calculation of Mean of Content Test

<table>
<thead>
<tr>
<th>EXPERIMENTAL GROUP</th>
<th>ECCR</th>
<th>EMTT</th>
<th>EGPW</th>
<th>EGM</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONTROL GROUP</td>
<td>CCCR</td>
<td>CMTT</td>
<td>CGPW</td>
<td>CGM</td>
</tr>
</tbody>
</table>

- **Content Test - Histogram** - After calculation of the mean of the content test administered to the experimental and control groups the histogram of both the groups was drawn to compare topic wise performance and overall performances of both the groups.

- **Content Test - Standard Deviation** - After calculation of the mean of the content test administered to the experimental and control groups the S.D. of combined mean EGM and CGM was also calculated.

- **Content Test – T-Test** - Using the mean and standard deviation values calculated, the t value for the significance of the difference in means of experimental and control group was then calculated with the help of T- test for uncorrelated groups.

- **Teacher Trainee Feedback – Mean** - As a 5 point likert scale was used the feedback was converted to scores as follows: 1 = bad, 2 = inadequate, 3 = fair, 4 = good and 5 = excellent. The scores were tabulated and criteria wise mean was calculated for both the experimental group and the control group.

- **Teacher Trainee Feedback – Histogram** - The mean of results obtained from the teacher trainee feedback forms were analyzed criteria wise and the histogram of both the groups was drawn to compare performances of both the groups. The criteria of effectiveness for which histograms were drawn are as follows: Preparation, Use of Teaching Aid / ICT Tool, Management of Session / Activities, Teacher Educators Role, Teacher trainees Role, Collaborative Learning, Assessments and Overall Impression.

- **Teacher Trainee Feedback - Standard Deviation** - After calculation of the criteria wise mean of the teacher trainee feedback of the experimental and control groups the
criteria wise S.D. of the teacher trainee feedback of the experimental and control groups and the combined S.D. of the experimental and control groups was also calculated.

- **Teacher Trainee Feedback - T – Test** - Using the mean and standard deviation values calculated the t value for the significance of the difference in means in teacher trainee feedback of experimental and control group was then calculated with the help of T- test for uncorrelated groups.

- **Peer Teacher Educator Feedback – Mean** - As a 5 point likert scale was used the feedback was converted to scores as follows: 1 = bad, 2 = inadequate, 3 = fair, 4 = good and 5 = excellent.

  The scores were tabulated and criteria wise mean was calculated for both the experimental group and the control group.

- **Peer Teacher Educator Feedback - Histogram** - The results obtained from the teacher educator feedback forms were analyzed criteria wise and each area was represented with the help of a histogram thus showing comparison between teacher educator feedback from experimental and control groups.

- **Peer Teacher Educator Feedback - Standard Deviation** - After calculation of the criteria wise mean of the Teacher educator feedback of the experimental and control groups the criteria wise S.D. of the teacher educator feedback of the experimental and control groups and the combined S.D. of the experimental and control groups was also calculated.

- **Peer Teacher Educator Feedback - T- Test** - Using the mean and standard deviation values calculated the t value for the significance of the difference in means in teacher educator feedback of experimental and control group was then calculated with the help of T- test for uncorrelated groups.

  Qualitative analysis of teacher educator questionnaire was done by listing out the different responses given and drawing conclusions from them.
3.9 Methodology and Procedure of Research for Objective 6.

Objective 6 - To find the usability of the ICT based model of curriculum transaction for teacher educators.

Research Questions

- What would be the response of the user group of teacher educators about the usability of the ICT based model of curriculum transaction?
- How much is the total usability of the ICT based model of curriculum transaction for teacher educators?

Usability testing is a technique used to evaluate a product by testing it with representative users. In the test, users will try to complete typical tasks while observers watch, listen and takes notes. The goal is to identify any usability problems, collect quantitative data on participants' performance (e.g., time on task, error rates), and determine participant's satisfaction with the product. (Dumas, Redish, 1999). Usability is the combination of fitness for purpose, ease of use, and ease of learning that makes a product effective. (Rubin, Chisnell, 2008). Usability testing focuses on determining if the product is easy to learn, satisfying to use and contains the functionality that the users desire. (Barnum, 2002). One of the criteria of a model’s effectiveness is its usability and thus the researcher conducted the usability test in order to find the usability of the ICT based model of curriculum transaction.

3.9.1 Selection of Components to Test Extent and Quality of Usability

The researcher after review of related literature selected the components to test extent and quality of usability of the ICT based model of curriculum transaction and finalized them.

- Understandability
- Learn ability
- Objective achievement
- Operability
- User satisfaction
- Applicability
3.9.2. Selection of Usability Testing Method
The researcher selected questionnaire as a tool to test the usability. Questions were framed to test various criteria of usability. Responses were both quantitative and qualitative.

3.9.3 Expert Opinion
The usability test questionnaire thus prepared was given to 5 experts i.e., 5 teacher educators in a B.Ed. college and their expert opinion was taken. The experts suggested the following changes in the usability test questionnaire.

- Group items according to aspects of usability testing.
- Give sub headings of aspects Usability.
- Include achievement of objective to test usability

Based on the suggestions changes in the usability test questionnaire were made.

3.9.4 Pilot Study
Five teacher educators were selected and the usability test questionnaire was administered to them to check for any problems in administration of the test. The pilot study yielded the following results:

- Instruct teacher educator to mark only one option for each question.
- Instruct teacher educator to judge objectively and then give honest answers.
- The qualitative feedback questions required instructions to write only precise points.

The usability test questionnaire was thus standardized and ready for use. Refer Appendix 15.

3.9.5 Identify Target Audience / Population
The target audience/ population who will be using the ICT based model of curriculum transaction are teacher educators.

3.9.6 Selecting the Informants for Usability Testing
15 teacher educators of different colleges were selected to conduct the usability test. Refer Appendix 14. Selection of the teacher educators was done on the following criteria:
a) Teacher educators with a command over English language as the manual and CD for the ICT based model of curriculum transaction has been framed in English language.
b) Permissions and willingness to participate in the usability test.
c) Teacher educators who were willing to learn how to use the ICT based model of curriculum transaction.
d) Teacher educators who were ready to plan, design and implement sessions using the ICT based model of curriculum transaction.
e) Teacher educators who could be monitored by the researcher while using the ICT based model of curriculum transaction.

3.9.7 Administration of the Usability Test
The Manual and CD were given to the 15 teacher educators and they were requested to use the manual. An initial orientation was done by the researcher on important aspects of the ICT based model of curriculum transaction. Weekly progress and review was done to ensure that the teacher educators were using the ICT based model of curriculum transaction. After three weeks the researcher asked the teacher educators to give feedback about usability through the questionnaire prepared.

3.9.8. Data Analysis Tools
The observations of the researcher were noted. The responses of the users were tabulated and percentage analysis was done for quantitative data. Listing of responses was done for qualitative data.