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CHAPTER V

SUMMARY FINDINGS AND CONCLUSIONS

5.0 Summary of the Study

The profound shifts undergone in the field of education due to ICT requires a pedagogical shift. Traditional teaching and learning paradigms have been shaken by the impact of ICT on educational practices. One of the greatest challenges which we need to overcome on our way to the 21st century is to enable teachers and students to achieve competency and mastery in the use of technology. The challenge is to use ICT in teaching learning and if this is to happen then the change has to begin from the roots of education i.e., the teacher education system. Teacher education institutions must provide the leadership for pre and in-service teachers and model new pedagogies and tools for teaching learning. Teacher educators should expose pre-service teachers to regular and pervasive modeling of ICT. Unless and until teacher educators do not model effective use of ICT in their own classes it will not be possible to prepare a new generation of teachers who effectively use ICT in their transaction of teaching learning. Although standalone computers have been in most educational institutions for more than two decades now, teachers continue to grapple with how to use ICT to enhance teaching and learning environments. There has been a growing recognition that technology used in the absence of a sound theoretical framework or pedagogy is generally not very effective in reaching program goals.

The present research is a small contribution in the large pedagogical change that is required to keep teacher education abreast with the rapid changes and growth in education due to ICT. The researcher has made a humble effort to model ICT based sessions on sound theoretical framework by developing an ICT based model of curriculum transaction based on 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. The development of this model and the study of its effectiveness constitute the purpose of this research.
5.1 Background

Teacher training is understood as essential and key for the development of the knowledge society and in a more restricted area to reach success in the acceptance and implementation of ICT in the teaching. Despite the willingness of many teachers to defy difficulties and integrate ICT into their teaching procedures, still the use and deployment of ICT in teaching is far from being a reality. Only with a correct acquisition by teachers of both pedagogical and technological skill and proper competency will we be able to face the challenge that living in the Society of Knowledge supposes. Ideal integration of ICT into the teaching learning process requires access to ICT in the classroom, the motivation to use it but most of all a practical model of ICT integration.

5.2 Importance of the Research

The present research is an effort to fill the lacuna created by the absence of any specific model for integration of ICT into the teaching of the theory courses in the B.Ed. curriculum. The present research is an endeavour to promote change from the topmost echelons of teacher training i.e., by integrating ICT into the curriculum transaction of B.Ed. course. Successful implementation of the information and communication technology ICT based model of curriculum transaction on teacher trainees will help in improving the quality of teacher training being imparted in teacher training institutions. The concepts of constructivism, active learning, collaborative learning, self learning, continuous assessments, reflective practice and justified use of technology on which the model is based will find expression in day to day teaching thus putting ideal theory into model practice.

5.3 Title of the Research

A study of the effectiveness of an information and communication technology based model of curriculum transaction.

5.4 Statement of Aim

To research current practices of ICT based teaching in colleges of education and to design, develop and test the effectiveness of an information and communication technology (ICT) based model of curriculum transaction.
5.5 Operational Definitions

Study of Effectiveness

- The difference in teacher trainee’s achievement in content test after curriculum transaction through ICT based model on experimental group and traditional method on control group.

- Teacher trainee’s feedback on the criteria of effectiveness given: Preparation, Use of Teaching Aid / ICT Tool, Management of Session / Activities, Teacher Educators Role, Teacher trainees Role, Collaborative Learning, Assessments and Overall Impression.

- Peer teacher educator’s feedback on the criteria of effectiveness given: Preparation, Use of Teaching Aid / ICT Tool, Management of Session / Activities, Teacher Educators Role, Teacher trainees Role, Collaborative Learning, Assessments and Overall Impression.

- Study the usability of ICT based model of curriculum transaction through Usability Quality Components - Understandability, Learnability, Objective Achievement, Operability, User Satisfaction and Applicability.

Information and Communication Technology Based Model - ICT Based Model

The ICT based model developed by the researcher 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.

Curriculum Transaction

An inclusive phrase to mean the organization of the teaching, learning, assessment, evaluation and reflection of the sessions for the theory component of the B.Ed. course of University of Pune.

Teacher Educators

Teachers teaching in the B.Ed. course.
5.6 Objectives of the Research

1. To analyze the ICT based curriculum transaction practices by teacher educators.
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. To determine the effect of ICT based model of curriculum transaction on teacher trainee’s achievement.
4. To examine the effectiveness of ICT based model of curriculum transaction through teacher trainee’s feedback.
5. To examine the effectiveness of ICT based model of curriculum transaction through peer teacher educator feedback.
6. To find the usability of the ICT based model of curriculum transaction for teacher educators.

5.7 Assumptions

It is assumed that the teacher trainees have a basic level of ICT competency i.e., able to operate computers and internet as it is a compulsory theory paper of 40 marks weightage and practical work with 60 marks weightage in the B.Ed. syllabus of University of Pune.

5.8 Research Questions

For Objective 1

• What are the current ICT based curriculum transaction practices by teacher educators?

For Objective 6

• 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?
5.9 Hypothesis

**Research Hypothesis for Objective 3, 4 and 5.**

**H$_1$** - The ICT based model of curriculum transaction will produce better teacher trainee achievement in content test than the traditional method.

**H$_2$** - The ICT based model of curriculum transaction will be more effective than the traditional method through teacher trainee feedback.

**H$_3$** – The ICT based model of curriculum transaction will be more effective than the traditional method through peer teacher educator feedback.

**Null hypothesis for Objective 3, 4 and 5.**

**H$_{01}$** - There is no difference in teacher trainee’s achievement in content test between the ICT based model of curriculum transaction and traditional method.

**H$_{02}$** - There is no difference in effectiveness between the ICT based model of curriculum transaction and traditional method through teacher trainee feedback.

**H$_{03}$** - There is no difference in effectiveness between ICT based model of curriculum transaction and traditional method through peer teacher educator feedback.

5.10 Scope of Research

- The study covers teacher educators teaching in B.Ed. in colleges of education, University of Pune.
- The study extends to teacher trainees pursuing B.Ed. in colleges of education, University of Pune.
- The study relates to the curriculum transaction of theory component of B.Ed. course of University of Pune.
- The ICT based model developed by the researcher 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 is a guideline and framework for curriculum transaction of theory component of the B.Ed. course.
5.11 Limitations of the Research

- The impact of the teacher trainee’s I.Q., interest in learning, motivation levels for the session, and background knowledge on teacher trainee’s achievement in content test and responses in teacher trainee feedback has not been considered.
- The tools used for data collection are not standardized tools but have been developed by the researcher.

5.12 Delimitations of the Research

- The ICT based model of curriculum transaction is designed in English language only.
- The present research is delimited to implementing the ICT based model of curriculum transaction by researcher in theory part of curriculum transaction in B.Ed. course only.
- The present research is delimited to implementing the ICT based model by researcher for curriculum transaction of sample sessions developed for three topics one each in three different theory papers of B.Ed. curriculum of University of Pune
- The difference in teacher trainee’s achievement of experimental group and control group is reflected by scores in content test only.
- The criteria of effectiveness studied are Preparation, Use of Teaching Aid / ICT Tool, Management of Session / Activities, Teacher Educator’s Role, Teacher trainee’s Role, Collaborative Learning, Assessments and Overall Impression only.
- The usability quality components studied are understandability; learn-ability, objective achievement, operability, user satisfaction and applicability only.

5.13 Theoretical Base of the Study

The development of the ICT based model of curriculum transaction is based on the theory of constructivism. The principles of student centered and active learning, collaborative learning, continuous assessments, reflective practice support the theory of constructivism. Teacher as a facilitator and justified use of technology are principles which are necessary for effective use of ICT.
5.14 Significance of the Study

It is hoped that this study will stand the test of time by focusing on the pedagogical process rather than a process of implementation of ICT. The distinction here is that this change concerns the personnel involved i.e., the Teacher Educator and teacher trainees, whereas implementation concerns the technology involved. The findings of this study are expected also to contribute to theoretical and methodological knowledge and give clear and useful advice and support relating to effective curriculum transaction through integration of information and communication technologies. This study identifies teacher trainee and teacher educator related factors that optimize teacher trainee learning outcomes in an ICT-rich learning environment. In doing so, it is expected that educational leaders, nationally and internationally, can better formulate strategies for developing ICT embedded curricula that support learning from a holistic approach.

5.15 - Review of Related Literature

The researcher has conducted the following theoretical and research reviews

**Table 82. Summary of Reviews Conducted**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Area of Research</th>
<th>Theoretical articles</th>
<th>Research articles</th>
<th>Ph.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Impact of ICT on Education</td>
<td>3</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>2.</td>
<td>ICT and Teacher Education</td>
<td>5</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>3.</td>
<td>ICT and Pedagogy</td>
<td>8</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>4.</td>
<td>Theory of constructivism and its application</td>
<td>5</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>ICT and Constructivism</td>
<td>6</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td>Models of ICT based curriculum transaction</td>
<td>9</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>7.</td>
<td>Instructional system design</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8.</td>
<td>Evaluation methods for testing effectiveness of sessions</td>
<td>3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>9.</td>
<td>Usability testing</td>
<td>4</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
5.16 Type of Research
The present research 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.

5.17 Method of Research
The present research has used a mixed method of research. The methods of survey research, product development research and experimental research have been used for the present research.

5.18 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.

5.19 Methodology and Procedure of the Research
The methodology and procedure of the research has been summarized in the table 83
<table>
<thead>
<tr>
<th>Objective</th>
<th>Procedure</th>
</tr>
</thead>
</table>
| 1. To analyze the ICT based curriculum transaction practices by teacher educators. | **Method of research** – Survey method  
**Tool of Research** - Questionnaire  
Discussion with experts, study of existing models, survey of current practices in ICT based curriculum transaction by teacher educators.  
**Preparation of questionnaire** - 20 Questions  
Aspects of analysis – Use, Preparation and Planning, Selection of ICT Resource, Practice in the ICT based session, Evaluation, Overall opinion  
**Establishing reliability and validity**  
- Expert opinion - 5 teacher educators  
- Pilot Study - 5 Teacher Educators  
- Finalization of questionnaire  
**Sample** - 50 teacher educators - incidental sampling  
**Data collection** - Administration of questionnaire to 50 Teacher educators  
**Data analysis** - Quantitative - Percentage analysis, Qualitative – Record of responses |
| 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, | **Method of Research** – Product Development Research  
**Designing the ICT Based Model of Curriculum Transaction**  
Use of ADDIE Instructional system design steps for development of the ICT based model of curriculum transaction.  
A – Analysis  
D – Design  
D – Develop |
<table>
<thead>
<tr>
<th><strong>Objective</strong></th>
<th><strong>Procedure</strong></th>
</tr>
</thead>
</table>
| continuous assessments, reflective practice and justified use of technology. | I – Implement  
E - Evaluate |

**Implementation of the ICT based model of curriculum transaction.**

**Method of Research** – Experimental Research  
**Research Design** - Two group post test design  
**Independent Variables** - The ICT based model of curriculum transaction  
**Dependent Variable** - Teacher trainee achievement, Teacher trainee feedback, Peer teacher educator feedback  
**Extraneous Variables** - Difference in achievement of teacher trainees Teaching competency of researcher, Difference in expertise in handling the ICT tools, Subjectivity in scoring the content test  
**Sample** - Purposive selection of 91 + 91 teacher trainees for experimental group and control group  
- Two equivalent groups were selected on the basis of 1st term exam results  
- Conduct Experimental group sessions using ICT based model sample session plans for 3 topics 3X3 = 9 sessions, 3 groups = 91 teacher trainees  
- Conduct control group sessions using Traditional method for 3 topics 3X3 = 9 sessions, 3 groups = 91 teacher trainees
<table>
<thead>
<tr>
<th><strong>Objective</strong></th>
<th><strong>Procedure</strong></th>
</tr>
</thead>
</table>
| **3. To determine the effectiveness of ICT based model of curriculum transaction on teacher trainee’s achievement.** | **Preparation of content test** - based on blue print = 60 marks  
**Establishing reliability and validity**  
- Expert opinion - 5 teacher educators  
- Pilot Study - 5 Teacher Educators  
- Finalization of content test  
**Data collection** - Administration of content test to both experimental group and control group after completing teaching of all 3 topics.  
**Data analysis** – Mean, Histogram, Standard deviation, T-test |
| **4. To examine the effectiveness of ICT based model of curriculum transaction through teacher trainee’s feedback.** | **Preparation of teacher trainee feedback form** using Likert scale  
**Establishing reliability and validity**  
- Expert opinion - 5 teacher educators  
- Pilot Study- 5 Teacher trainees  
- Finalization of feedback form  
**Data collection** - Teacher trainee feedback from both experimental group (91) and control group (91) was collected after completing teaching of all 3 topics.  
**Tabulation of data** - For Likert scale responses of peer teacher educators were converted to scores and tabulated.  
**Data analysis** – Mean, Histogram, Standard deviation, T-test |
<table>
<thead>
<tr>
<th><strong>Objective</strong></th>
<th><strong>Procedure</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>5. To examine the effectiveness of ICT based model of curriculum transaction through peer teacher educator’s feedback.</td>
<td><strong>Preparation of peer teacher educator feedback form</strong>&lt;br&gt;<strong>Establishing reliability and validity</strong>&lt;br&gt;- Expert opinion - 5 teacher educators&lt;br&gt;- Pilot Study - 5 Teacher Educators&lt;br&gt;- Finalization of feedback form&lt;br&gt;&lt;br&gt;<strong>Informants</strong> – 9 teacher educators&lt;br&gt;&lt;br&gt;<strong>Data collection</strong> – Peer teacher educator feedback was collected after completing teaching of topics.&lt;br&gt;&lt;br&gt;<strong>Data analysis</strong> – Mean, Histogram, Standard deviation, T-test.</td>
</tr>
<tr>
<td>6. To find the usability of the ICT based model of Curriculum Transaction</td>
<td><strong>Usability criteria were finalized</strong> – Understandability, Learn ability, Objective achievement, Operability, User satisfaction, Applicability.&lt;br&gt;&lt;br&gt;<strong>Usability questionnaire was developed</strong>&lt;br&gt;&lt;br&gt;<strong>Establishing reliability and validity</strong>&lt;br&gt;- Expert opinion - 5 teacher educators&lt;br&gt;- Pilot Study - 5 Teacher Educators&lt;br&gt;- Finalization of Usability Questionnaire&lt;br&gt;&lt;br&gt;<strong>Informants</strong> - 15 Teacher educators&lt;br&gt;&lt;br&gt;<strong>Data collection</strong> - 15 Teacher educators selected through purposive sampling were given the manual + CD of the ICT based model. A log of actual use of the model was maintained. Feedback on usability of the ICT based model was then collected.&lt;br&gt;&lt;br&gt;<strong>Data analysis</strong>&lt;br&gt;- Quantitative - Percentage analysis&lt;br&gt;- Qualitative – Record of responses</td>
</tr>
</tbody>
</table>
5.20 Findings of the Research for Objective 1

Objective 1 - To analyze the ICT based curriculum transaction practices by teacher educators.

Research Question 1 - What are the current ICT based curriculum transaction practices by teacher educators in colleges of education?

Criteria 1 - Use:

- 68% of teacher educators conduct 2 ICT based sessions in a year. 24% of teacher educators conduct 4 ICT based sessions in a year and 8% of teacher educators conduct >4 ICT based sessions in a year.
- 100% of teacher educators use PPT and OHP Transparencies as ICT tools. 8% of teacher educators use internet as an ICT tool.

Criteria 2 - Preparation and Planning:

- 100% of teacher educators use reference books and internet for reference of content for the ICT based session.
- 16% of teacher educators make a record of the references used for the ICT based session. 84% of Teacher educators do not make a record of the references used for the ICT based session.
- 100% of Teacher educators do not determine authenticity of the source while referring information from the internet.
- 8% of Teacher educators prepare a session plan for conducting the ICT based session. 92% of Teacher educators do not prepare a session plan for conducting the ICT based session.
- 100% Teacher educators do not separately list the objectives achieved through ICT while conducting the ICT based session.

Criteria 3 - Selection of ICT Resource:

- 100% teacher educators do not use any criteria for selection of ICT tool for the ICT based session.
• 100% teacher educators do not consider the benefits of using specific ICT resources to the teaching learning process.

**Criteria 4 - Practice in the ICT based session:**
• 72% teacher educators make use of ICT at one stage only in the session. 18% teacher educators make use of ICT at one stage only in the session. 10% teacher educators make use of ICT at one stage only in the session.
• 48% teacher educators make use of ICT for generating active participation of teacher trainees. 52% teacher educators do not make use of ICT for generating active participation of teacher trainees.
• 100% teacher educators do not use interactive ICT tools.
• 100% teacher educators do not use group work/pair work during an ICT based session.
• 100% teacher educators integrate assessments into the ICT based session by asking questions.
• 100% teacher educators play an active role in an ICT based session.
• 56% teacher trainees play an active role in an ICT based session but the activity is answering questions only. 44% teacher trainees play a passive role in an ICT based session.

**Criteria 5 – Evaluation:**
• 100% teacher educators evaluate the ICT based session through self evaluation. The factors considered in the evaluation - No specific criteria or format is used by the teacher educators in evaluation of the ICT based sessions conducted by them. It is a general overall evaluation of the quality of the session like excellent, good, fair, poor.

**Criteria 6 - Your Opinion:**
• 100% teacher educators are not satisfied with the way in which the ICT based sessions are conducted.
• Ideal of an ICT based session as given by teacher educators.
Qualitative Conclusions from Feedback

- For planning a separate lesson plan format should be used for an ICT based session.
- Selection of ICT resource should be done judiciously and variety of ICT resources should be used.
- Teacher’s role should be as a guide and facilitator.
- Teacher trainee’s role should be as active participants.
- Assessments are essential.
- Evaluation is essential.

5.21 Findings of the Research for Objective 3

Objective 3 - To determine the effectiveness of ICT based model of curriculum transaction on teacher trainee’s achievement in content test.

H1 – The ICT based model of curriculum transaction will produce better teacher trainee achievement in content test than the traditional method.

H01 - There is no difference in teacher trainee’s achievement in content test between the ICT based model of curriculum transaction and traditional method.

A Topic wise Mean of Achievement in Content Test

- The mean of the results of the content test of all three topics CCR, MTT and GPW is 15.98, 16.38 and 15.84 of the experimental group is greater than the mean all three topics CCR, MTT and GPW of the control group which is 12.42, 12.16 and 13.95.

An Overall Mean of Achievement in Content Test

- The mean of the results of the content test of the experimental group is 48.2 which is greater than the mean of the control group which is 38.53.

Significance of Difference of Mean for Topic of Coefficient of Correlation

- The obtained ‘t’ value is 15.02 at 0.05 level of significance which is greater than the table ‘t’ value 2.63. Hence ‘t’ value is significant and so it means that the research hypothesis is accepted and the null hypothesis is rejected.
Significance of Difference of Mean for Topic of Memory Training Techniques

- The obtained ‘t’ value is 16.42 at 0.05 level of significance which is greater than the table ‘t’ value 2.63. Hence ‘t’ value is significant and so it means that the research hypothesis is accepted and the null hypothesis is rejected.

Significance of Difference of Mean for Topic of Group work Pair work

- The obtained ‘t’ value is 9.45 at 0.05 level of significance which is greater than the table ‘t’ value 2.63. Hence ‘t’ value is significant and so it means that the research hypothesis is accepted and the null hypothesis is rejected.

Significance of Difference of Overall Mean

- The obtained ‘t’ value is 16.96 at 0.05 level of significance which is greater than the table ‘t’ value 2.63. Hence ‘t’ value is significant and so it means that the research hypothesis is accepted and the null hypothesis is rejected.

5.22 Findings of the Research for Objective 4

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

H2 - The ICT based model of curriculum transaction will be more effective than the traditional method through teacher trainee feedback.

H02 - There is no difference in effectiveness between the ICT based model of curriculum transaction and traditional method through teacher trainee’s feedback.

The criteria of effectiveness analyzed 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. The findings are as follows

Criteria 1 – Preparation

- The mean of responses as per teacher trainee feedback on preparation by teacher educator for experimental group is 4.8 which is greater than that of the control group which is 4.34.
Criteria 2 - Use of Teaching Aid / ICT Tool

- The mean of responses as per teacher trainee feedback on use of teaching aid / ICT tool for selection of teaching aid / ICT tool is 4.82 and contribution of teaching aid / ICT tool is 4.86 for experimental group which is greater than that of the control group which is 3.57 & 3.52.

Criteria 3 - Management of Session / Activities

- The mean of responses as per teacher trainee feedback on management of session / activities for organized presentation of material – OPM is 4.71, presentation of teaching points with examples – PTE is 4.84, sequencing of activities - SA is 4.71, management of transition of activities – TA is 4.86 for experimental group which is greater than that of the control group which is 3.69, 3.38, 3.87 & 3.86.

Criteria 4 - Teacher Educators Role

- The mean of responses as per teacher trainee feedback on teacher educators role for response to difficulties – RD is 4.86, individual attention – IA is 3.71 and enthusiasm – E is 4.71 for experimental group which is greater than that of the control group which is 3.02, 1.26, 4.27. The mean of responses for active role AR for experimental group is 3.01 which is smaller than mean of responses for active role AR for control group which is 4.14.

Criteria 5 - Teacher trainees Role

- The mean of responses as per teacher trainee feedback on teacher trainees role for level of motivation/interest – LMI is 4.8, active participants in learning – AP is 4.93, directly involved in learning process – DI is 4.9, ability to choose learning (what and when) – CL is 3.62 for experimental group which is greater than that of the control group which is 3.63, 3.12, 3.02 & 1.41

Criteria 6 – Use of Collaborative Learning

- The mean of responses as per teacher trainee feedback on use of collaborative learning for encouraged interaction and cooperation among students - IC is 3.52,
monitor learning in groups / pairs – ML is 4.37 for experimental group which is greater than that of the control group which is 1.13 & 1.13.

Criteria 7 – Use of Assessments
- The mean of responses as per teacher trainee feedback on use of assessments by teacher educators for interwoven assessment of learning – IA is 4.19 and assessment tasks – AT is 4.76 for experimental group which is greater than that of the control group which is 2.38 & 3.33.

Criteria 8 - Overall Impression
- The mean of responses as per teacher trainee feedback on overall impression of session is 4.82 for experimental group which is greater than that of the control group which is 4.03.

Findings of Total Mean of Effectiveness
- The total mean of responses on effectiveness as per teacher trainee feedback for experimental group is 89.98 which is greater than that of the control group which is 62.12.

Significance of Difference of Mean of Criteria of Effectiveness
- The obtained ‘t’ value for preparation is 6.97, Use of Teaching Aid / ICT Tool is 11.26, Management of Session / Activities is 17.28, Teacher Educators Role is 13.85, Teacher trainees Role is 25.25, Collaborative Learning is 51.18, Assessments is 24.92 and Overall Impression is 11.29 which is greater than table t value at 0.01 level of significance of 2.63 for all the criteria of effectiveness as per teacher trainee feedback. Hence ‘t’ value is significant and so it means that the research hypothesis is accepted and the null hypothesis is rejected.

Significance of Difference of Total Mean of Criteria of Effectiveness
- The obtained ‘t’ value of 24.23 is greater than table t value of 2.63 at 0.01 level of significance for effectiveness as per student feedback. Thus the research hypothesis is accepted and the null hypothesis is rejected.
5.23 Findings of the Research for Objective 5

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

H₃ – The ICT based model of curriculum transaction will be more effective than the traditional method through peer teacher educator feedback.

H₀₃ - There is no difference in effectiveness between ICT based model of curriculum transaction and traditional method through peer teacher educator feedback.

The criteria of effectiveness analyzed 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. The scores were tabulated and analyzed Criteria wise the findings are as follows:

Criteria 1 – Preparation

- The mean of responses on preparation for research is 4.78, plan is 4.67, prep. is 4.89 and session plan is 4.67 for experimental group which is greater than that of the control group which is 3.44, 4.22, 4.22 & 3.56.

Criteria 2 - Use of Teaching Aid / ICT Tool

- The mean of responses on use of teaching aid / ICT tool for selection of teaching aid / ICT tool is 5, contribution of teaching Aid / ICT tool is 5, handling of teaching aid / ICT tool is 4.67 and justification of teaching aid / ICT tool is 4.78 for experimental group which is greater than that of the control group which is 3.78, 3.56, 3.56 & 3.89.

Criteria 3 - Management of Session / Activities

- The mean of responses on management of session / activities for organized presentation of material – OPM is 4.89, presentation of teaching points with examples – PTE is 4.89, sequencing of activities - SA is 4.78, management of transition of activities – TA is 4.67 for experimental group which is greater than that of the control group which is 3.78, 4.33, 3.89 & 3.89.
Criteria 4 - Teacher Educators Role

- The mean of responses on response to difficulties – RD is 4.56, individual attention – IA is 4.89 and enthusiasm – E is 4.78 for experimental group which is greater than that of the control group which is 3.56, 1.22, 4.33. The mean of responses for active role AR for experimental group is 2.67 which is smaller than mean of responses for active role AR for control group which is 4.78.

Criteria 5 - Teacher Trainee’s Role

- The mean of responses as per peer teacher educator feedback on teacher trainees role for level of motivation/interest – LMI is 5, active participants in learning – AP is 5, directly involved in learning process – DI is 4.89, ability to choose learning (what and when) – CL is 3.67 for experimental group which is greater than that of the control group which is 3.67, 1.67, 1.33 & 1.11

Criteria 6 – Use of Collaborative Learning

- The mean of responses for encouraged interaction and cooperation among students - IC is 4.78, monitor learning in groups / pairs – ML is 4.78 for experimental group which is greater than that of the control group which is 1.00 & 1.00.

Criteria 7 – Use of Assessments

- The mean of responses by teacher educators for interwoven assessment of learning – IA is 4.78 and assessment tasks – AT is 4.22 for experimental group which is greater than that of the control group which is 1.33 & 2.33.

Criteria 8 - Overall Impression

- The mean of responses as per peer teacher educator feedback on overall impression of session is 4.89 for experimental group which is greater than that of the control group which is 3.81.

Findings of Total Mean of Effectiveness

- The total mean of responses on effectiveness as per peer teacher educator feedback for experimental group is 116.56 which is greater than that of the control group which is 77.83.
Significance of Difference of Mean in Criteria of Effectiveness

- The obtained ‘t’ value for preparation is 4.6, Use of Teaching Aid / ICT Tool is 6.75, Management of Session / Activities is 4.83, Teacher Educators Role is 4.24, Teacher trainees Role is 19.6, Collaborative Learning is 26.07, Assessments is 13.33 and Overall Impression is 7.14 which is greater than table t value at 0.01 level of significance of 2.63 for all the criteria of effectiveness as per teacher trainee feedback. Hence ‘t’ value is significant and so it means that the research hypothesis is accepted and the null hypothesis is rejected.

Significance of Difference of Total Mean of Criteria of Effectiveness

- The obtained ‘t’ value of 11.35 is greater than table t value 2.92 at 0.01 level of significance for effectiveness as per peer teacher educator feedback. Hence ‘t’ value is significant and so it means that the research hypothesis is accepted and the null hypothesis is rejected.

5.24 Findings of the 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?

Findings of Usability Quality Component I - UNDERSTANDABILITY

- 100% of the users responded that the ICT based model is easy to understand
- 80% of the users responded that it was easy to understand constructivism as the theoretical base of ICT based model. 20% of the users responded that it was not easy to understand constructivism as the theoretical base of ICT based model. They did not understand constructivism as a theory and thus constructivism as the theoretical base of ICT based model was not easy to understand.
• 93.4% of the users responded that the principles of the ICT based model are easy to understand. 6.6% of the users responded that the principles of the ICT based model are not easy to understand. They did not understand the principle of reflective practice and thus the principles of the model were difficult to understand.

• 100% of the users responded that the procedure of the ICT based model is easy to understand.

• 100% of the users responded that the stages of the ICT based model easy to understand

• 100% of the users responded that the reflective material of the ICT based model was easy to understand

• 100% of the users responded that the sample sessions of the ICT based model were easy to understand.

Usability Quality Component II – LEARN-ABILITY

• 100% of the users responded that the ICT based model were easy to learn to use.

• 100% of the users responded that teacher trainees were able to learn effectively through teaching by this ICT based model.

• 94.33% of the users responded that self evaluation questions were helpful in enhancing learning of the ICT based model. 6.67% of the users responded that self evaluation questions were not helpful in enhancing learning of the ICT based model. They felt that self evaluation is not appropriate as it may not be reliable.

Usability Quality Component III - OBJECTIVE ACHIEVEMENT

• 86.66% of the users responded that the ICT based model help in fulfilling the goal of enabling the teacher educator to effectively plan, design, develop, conduct, assess and evaluate curriculum transaction using ICT. 13.34% of the users responded that the ICT based model did not help in fulfilling the goal of enabling the teacher educator to effectively plan, design, develop, conduct, assess and evaluate curriculum transaction using ICT. They felt that the goal of enabling the teacher educator to effectively plan, design, develop, conduct, assess and evaluate curriculum transaction using ICT
through use of the model was not feasible as it is not possible to achieve mastery over all the aspects.

- 86.66% of the users responded that the objectives of the ICT based model were achievable. 13.34% of the users responded that the objectives of the ICT based model were not achievable. They felt that it is not possible to achieve all objectives of the ICT based model.

**Usability Quality Component IV - OPERABILITY**

- 94.33% of the users responded that the stages of the ICT based model were appropriately sequenced. 6.67% of the users responded that the stages of the ICT based model were not appropriately sequenced. The teacher educator felt that the stage 6 - Reflecting on the impact of ICT based lesson is not necessary.

- 86.67% of the users responded that use of constructivism in the ICT based model is possible. 13.34% of the users responded that use of constructivism in the ICT based model is not possible. The teacher educator felt that the use of constructivism in the ICT based model will bring restrictions in an ICT based session.

- 100% of the users responded that it is possible to use the principles highlighted in the ICT based model while conducting the session.

- 94.33% of the users responded that it is possible to follow the procedure stated while conducting the ICT based session. 6.67% of the users responded that it is not possible to follow the procedure stated while conducting the ICT based session. The teacher educator felt that a lot of planning will be required to follow the procedure stated in the ICT based Model.

**Usability Quality Component V - USER SATISFACTION**

- 100% of the users responded that ICT based model helps in effective curriculum transaction

- 100% of the users responded that they like the ICT based model of curriculum transaction.
Usability Quality Component VI - **APPLICABILITY**

- 100% of the users responded that ICT based model can be applied for teaching theory component of any subject in the B.Ed. curriculum.
- 100% of the users responded that ICT based model can be used by D.T.Ed. Teacher educators.
- 94.33% of the users responded that ICT based model can be used by teacher trainees. 6.67% of the users responded that ICT based model cannot be used by teacher trainees. Teacher trainees may not be able to understand the concepts in the model.
- 94.33% of the users responded that ICT based model can be used by school teachers. 6.67% of the users responded that ICT based model cannot be used by school teachers. School teachers may not be able to understand the concepts in the model.

**Overall Qualitative Feedback about Usability**

The ICT based model of curriculum transaction is liked because -

- Effective for teaching any topic.
- Use of constructivism
- Justified use of ICT
- Increase creativity of teacher educator
- Good option to traditional teaching
- Teacher as a guide and facilitator
- Objectives are well defined
- Principles are appropriate
- Self learning
- Reflective practice
- Self evaluation
- User friendliness of the manual

The ICT based model of curriculum transaction is not liked because -

- Constructivism will be difficult to implement in an ICT based session.
- Reflective questions were difficult.

The changes suggested in the ICT based model of curriculum transaction are
• Other techniques like problem solving, brainstorming, brain based learning should be included.
• Manual should be in Marathi also.
• Reflective questions should be replaced by instructions.

**Overall Findings of the Data about Usability of ICT Based Model**

• The understandability of the ICT based model is 96.2%. The learn ability of the ICT based model is 98.1%. The objective achievement of the ICT based model is 86.7%. The operability of the ICT based model is 93.8 %. The user satisfaction of the ICT based model is 100%. The applicability of the ICT based model is 97.2 %. Total % of usability of ICT based model is 95.3%.

• The total % of usability of ICT based model was found to be 95.3%.

**5.25 Conclusions of the Research for Objective 1**

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

**Criteria 1 - Use :**
- In general teacher educators conduct very few ICT based sessions.
- The most commonly used ICT tools are PPT and OHP transparencies.
- Very few teacher educators use internet as an ICT tool.

**Criteria 2- Preparation and Planning:**
- Reference books and internet are used commonly by teacher educators for reference in an ICT based session.
- In general teacher educators do not make a record of the references used for the ICT based session.
- Teacher educators do not determine authenticity of the source while referring information from the internet.
- In general teacher educators do not prepare a session plan for conducting the ICT based session.
Teacher Educators do not separately list the objectives achieved through ICT while conducting the ICT based session.

Criteria 3 - Selection of ICT Resource:
- No criteria are used by teacher educators for selection of ICT tool for the ICT based session.
- Teacher educators do not consider the benefits of using specific ICT resources to the teaching learning process.

Criteria 4 - Practice in the ICT based session:
- In general teacher educators make use of ICT at one stage only during an ICT based session.
- In general use of ICT does not generate active participation of teacher trainees.
- Teacher educators do not use interactive ICT tools.
- Teacher educators do not use group work/pair work during an ICT based session.
- Teacher educators use only questions as assessment tools.
- Teacher educators play an active role in an ICT based session.
- Involvement of the teacher trainees in an ICT based session conducted by the teacher educator was mostly passive except for answering of questions.

Criteria 5 – Evaluation:
- All the teacher educators evaluate the ICT based session by using self evaluation method only.

Qualitative Conclusions from Feedback
- No specific criteria or format is used by the teacher educators in evaluation of the ICT based sessions conducted by them.
- It is a general overall evaluation of the quality of the session like excellent, good, fair, poor.

Criteria 6 - Your Opinion:
- Teacher educators are not satisfied with the way in which the ICT based sessions are conducted.

Qualitative Conclusions from Feedback
- For planning a separate lesson plan format should be used for an ICT based session.
Selection of ICT resource should be done judiciously and variety of ICT resources should be used.
Teacher’s role should be as a guide and facilitator
Teacher trainee’s role should be as active participants
Assessments are Essential
Evaluation is Essential

5.26 Conclusions of the Research for Objective 3

Objective 3 - To study the effectiveness of ICT based model of curriculum transaction on teacher trainee’s achievement in content test

H₁ – The ICT based model of curriculum transaction will produce better teacher trainee achievement in content test than the traditional method.

H₀₁ - There is no difference in teacher trainee’s achievement in content test between the ICT based model of curriculum transaction and traditional method.

- The ICT based model of curriculum transaction is more effective on teacher trainee achievement than traditional method as per content test for the topic of coefficient of correlation.
- The ICT based model of curriculum transaction is more effective on teacher trainee achievement than traditional method as per content test for the topic of memory training techniques.
- The ICT based model of curriculum transaction is more effective on teacher trainee achievement than traditional method as per content test for the topic of group work pair work.
- The ICT based model of curriculum transaction is more effective for all three topics than traditional method as per achievement in content test.
- The ICT based model of curriculum transaction is more effective on teacher trainee achievement than traditional method as per content test.
- The t-value for content test results obtained indicates that the ICT based model of curriculum transaction which was adopted for teaching the experimental group was significantly more effective in teacher trainee achievement than the traditional
method used for teaching the control group and thus the null hypothesis was rejected and the research hypothesis was accepted.

5.27 Conclusions of the Research for Objective 4

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

H2 - The ICT based model of curriculum transaction will be more effective than the traditional method through teacher trainee feedback.

H02 - There is no difference in effectiveness between the ICT based model of curriculum transaction and traditional method through teacher trainee’s feedback.

Criteria 1 – Preparation - Preparation done by the teacher educator
➢ The ICT based model of curriculum transaction is more effective in preparation by teacher educator than traditional method as per teacher trainee feedback.

Criteria 2 - Use of Teaching Aid / ICT Tool
➢ The ICT based model of curriculum transaction is more effective than traditional method in use of teaching aid / ICT tool by teacher educator as per teacher trainee feedback.

Criteria 3 - Management of Session / Activities
➢ The ICT based model of curriculum transaction is more effective than traditional method in management of session / activities by teacher educator as per teacher trainee feedback.

Criteria 4 - Teacher Educator’s Role
➢ The ICT based model of curriculum transaction is more effective than traditional method in teacher educator’s role as per teacher trainee feedback.

Criteria 5 - Teacher trainee’s Role
➢ The ICT based model of curriculum transaction is more effective than traditional method in teacher trainee’s role as per teacher trainee feedback.
Criteria 6 – Use of Collaborative Learning

- The ICT based model of curriculum transaction is more effective than traditional method in use of collaborative learning by teacher educator as per teacher trainee feedback.

Criteria 7 – Use of Assessments

- The ICT based model of curriculum transaction is more effective than traditional method in use of assessments by teacher educators as per teacher trainee feedback.

Criteria 8 - Overall Impression

- The ICT based model of curriculum transaction is more effective than traditional method in overall impression as per teacher trainee feedback.

Conclusions about Effectiveness of ICT Based Model

- The t-value obtained indicates that the ICT based model of curriculum transaction which was adopted for teaching the experimental group was significantly more effective than the traditional method for all criteria of effectiveness as per teacher trainee feedback. Thus the research hypothesis is accepted and the null hypothesis is rejected for all criteria of effectiveness.

- The ICT based model of curriculum transaction has more effectiveness than traditional method as per teacher trainee feedback.

5.28 Conclusions of the Research for Objective 5

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

H₃ – The ICT based model of curriculum transaction will be more effective than the traditional method through peer teacher educator feedback.

H₀₃ - There is no difference in effectiveness between ICT based model of curriculum transaction and traditional method through peer teacher educator feedback.

Criteria 1 – Preparation - Preparation done by the teacher educator

- The ICT based model of curriculum transaction is more effective in preparation by teacher educator than traditional method as per peer teacher educator feedback.
Criteria 2 - Use of Teaching Aid / ICT Tool

- The ICT based model of curriculum transaction is more effective than traditional method in use of teaching aid / ICT tool by teacher educator as per peer teacher educator feedback.

Criteria 3 - Management of Session / Activities

- The ICT based model of curriculum transaction is more effective than traditional method in management of session / activities by teacher educator as per peer teacher educator feedback.

Criteria 4 - Teacher Educator’s Role

- The ICT based model of curriculum transaction is more effective than traditional method in teacher educator’s role as per peer teacher educator feedback.

Criteria 5 - Teacher trainee’s Role

- The ICT based model of curriculum transaction is more effective than traditional method in teacher trainee’s role as per peer teacher educator feedback.

Criteria 6 – Use of Collaborative Learning

- The ICT based model of curriculum transaction is more effective than traditional method in use of collaborative learning by teacher educator as per peer teacher educator feedback.

Criteria 7 – Use of Assessments

- The ICT based model of curriculum transaction is more effective than traditional method in use of assessments by teacher educators as per peer teacher educator feedback

Criteria 8 - Overall Impression

- The ICT based model of curriculum transaction is more effective than traditional method in overall impression as per peer teacher educator feedback.
Conclusions about Effectiveness of ICT Based Model

➢ The t-value obtained indicates that the ICT based model of curriculum transaction which was adopted for teaching the experimental group was significantly more effective than the traditional method for all criteria of effectiveness as per peer teacher educator feedback. Thus the research hypothesis is accepted and the null hypothesis is rejected for all criteria of effectiveness.

➢ The ICT based model of curriculum transaction is more effective than traditional method as per peer teacher educator feedback.

5.29 Conclusions of the 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?

Conclusions about Usability of the ICT Based Model of Curriculum Transaction

Usability quality component UNDERSTANDABILITY

• The ICT based model is easy to understand.

• It is easy to understand constructivism as the theoretical base of ICT based model.

• The principles of the ICT based model were easy to understand.

• It is easy to understand procedure of the ICT based model.

• It is easy to understand the stages of the ICT based model.

• It is easy to understand the reflective material of the ICT based model.

• It is easy to understand the sample session plans of the ICT based model.

Usability Quality Component - LEARN-ABILITY

• The ICT based model was easy to learn to use.
• Teacher trainees were able to learn effectively when taught by this ICT based model.
• Self evaluation questions were helpful in enhancing learning of the ICT based model.

**Usability Quality Component - OBJECTIVE ACHIEVEMENT**
• ICT based model helps in fulfilling the goal of enabling the teacher educator to effectively plan, design, develop, conduct, assess and evaluate curriculum transaction using ICT.
• The objectives of the ICT based model were achievable.

**Usability Quality Component - OPERABILITY**
• The stages of the ICT based model are appropriately sequenced.
• Use of constructivism in the ICT based model is possible.
• The principles highlighted in the ICT based model can be used while conducting the session.
• It is possible to follow the procedure stated while conducting the ICT based session.

**Usability Quality Component - USER SATISFACTION**
• ICT based model helps in effective curriculum transaction.
• ICT based model is liked by teacher educators.

**Usability Quality Component APPLICABILITY**
• The ICT based model can be applied for teaching theory component of any subject in the B.Ed. curriculum.
• ICT based model can be used by D.T.Ed teacher educators.
• ICT based model can be used by teacher trainees.
• ICT based model can be used by school teachers.

**Overall Qualitative Feedback on highlights of the ICT based model**
• Effective for teaching any topic.
• Use of constructivism
• Justified use of ICT
• Increase creativity of Teacher Educator and Teacher educator
• Good option to traditional teaching
Teacher as a guide and facilitator
- Objectives are well defined
- Principles are appropriate
- Self learning
- Reflective practice
- Self evaluation
- User friendliness of the Manual

Changes suggested in the ICT based model
- Other techniques like problem solving, brainstorming, brain based learning should be included.
- Manual should be in marathi also.

Usability of ICT based model for teacher educators.
- The understandability of the ICT based model is very good.
- The learn ability of the ICT based model is very good.
- The objective achievement of the ICT based model is very good.
- The operability of the ICT based model is very good.
- The user satisfaction of the ICT based model is very good.
- The applicability of the ICT based model is very good.
- Total usability of ICT based model is very good.

Expert comments about the ICT based Model
- The ICT based model has been very thoughtfully designed.
- Constructivism as the base for the ICT based model is very appropriate
- Principles of the ICT based model are very appropriate
- The stages of the ICT based model are logically sequenced
- Reflective design of the ICT based model is Very Good
- The Manual gives a complete idea about the ICT based model
- The ICT based model is very useful for conducting effective ICT based sessions.
- The sample sessions are excellently designed.
5.30 Major findings of the Research

Objective 1 - To analyze the ICT based curriculum transaction practices by teacher educators.
- There is no uniformity or specific format or design or model which is used for transaction of an ICT based session

Objective 3 - To determine the effectiveness of ICT based model of curriculum transaction on teacher trainee’s achievement in content test.
- The ICT based model of curriculum transaction is more effective on teacher trainee achievement than traditional method as per content test.

Objective 4 - To examine the effectiveness of ICT based model of curriculum transaction through teacher trainee’s feedback.
- The ICT based model of curriculum transaction is more effective than traditional method as per teacher trainee feedback.

Objective 5 - To examine the effectiveness of ICT based model of curriculum transaction through peer teacher educator feedback.
- The ICT based model of curriculum transaction is more effective than traditional method as per peer teacher educator feedback.

Objective 6 - To find the usability of the ICT based model of curriculum transaction for teacher educators.
- Usability of the ICT based model was proved on the basis of the usability quality components and responses of the user group of teacher educators. The total % of usability of ICT based model was found to be excellent.

5.31 Recommendations

- The ICT based model developed for curriculum transaction can be used by B.Ed. teacher educators
- The ICT based model developed for curriculum transaction can be used in other teacher training programs like M.Ed., D.Ed., T.T.C. etc.
- The ICT based model developed can be used by teacher trainees as a format for their ICT based lessons.
• The ICT based model developed can be used by schoolteachers for teaching their subjects.

5.32 Suggestions for Further Research

• The first research line to be followed would be addressed to study in depth the real transfer of the ICT based model into the classrooms on the teacher educator’s part. Therefore, apart from the teachers’ opinion, the results would shed light upon the long term and prolonged use effectiveness of the ICT based model. The success in the implementation of the model into the classroom then, could give way to similar initiatives in other teacher training programs.

• The Impact of the ICT based model on process of learning can be another line of research. How learning takes place and the contribution of ICT based model to the different stages of the learning process can be a question which can be pursued.

• The use of the ICT based model to cater to different learning styles of students as in what way and to what extent does the ICT based model impact students with different learning styles is a research question which requires deep thought.

• The impact of the ICT based model on different categories of learners i.e., the slow learner, the gifted learner, Children with special needs requires in depth study.

5.33 Contributions to Knowledge in the Field

The ICT-based model developed in this thesis has been used as a theoretical framework for curriculum transaction. The study has provided an evaluation necessary to guide the future development in the use of ICT-based models of curriculum transaction. In so doing, the study has made a contribution towards rapidly growing literature in ICT-based education. To conclude, the consolidation of ICT based teaching learning as a powerful training agent and the emergence of ICT savvy teacher educators and teachers to enhance further training and knowledge generation, will constitute the basis of the training processes of the future.