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Promoting ICT enhanced Constructivist Teaching Practices among Pre-service Teachers: a case Study

Dr. Kalpana Kharade, Ms. Rupal Thakkar

K. J. Somaiya College of Education and Research, Mumbai, India

Abstract- The accelerated growth of information communication technology (ICT) and its wide application in our personal as well as professional life has made the teacher educators think seriously about creating ICT enhanced learning context for pre-service teachers to develop their understanding about role of ICT in providing constructivist learning experiences to their students. The reflections of the researchers on the need for developing new understanding about growing involvement of ICT in teaching and learning process and relation between technology and pedagogy while integrating ICT in instructional practices among the pre-service teachers motivated researchers to take a proactive action in this direction. This resulted in the development and implementation of a ICT mediated language education project for Std 7th school students in which twelve pre-service teachers were involved as co -researchers.

This paper describes the project experiences of Pre-service teachers in terms of their perceptions about utility of ICT in creating constructivist learning environment in the classroom.

Index Terms- Constructivist Classroom, ICT Integration, ICT mediation, Pre-service Teachers

I. Introduction

With the extensive infusion of technology in our personal and professional lives, teacher educators in teacher preparation programs are challenged to provide learning environments where pre-service teachers learn how to learn and learn how to teach, with and through information communication technology (ICT). Within the framework of their teacher education programs, how are teacher educators to design intentional learning environments, where pre-service teachers develop new understandings of learning and teaching with rapidly evolving ICT? How are teacher Educators to assist pre-service teachers in developing an understanding of the critical relationship between pedagogy and technology, in fostering the integration of pedagogy and technology? These were some of the questions made us reflect and motivated to take some proactive action in this direction.

As teacher educators within the Bachelor of Education program at the K. J. Somaiya College of Education and Research, Mumbai, we (both the authors) worked as co-researchers with a group of 12 preservice language teachers in a ICT mediated language teaching project. During the project, pre-service teachers explored how children cope and respond to ICT mediated learning situations. ICT was integrated throughout various stages in the inquiry to gather information, to make decisions, to communicate, to collaborate, and to represent school children's understandings. This paper describes the project experiences of Pre-service teachers in terms of their perceptions about utility of ICT in creating constructivist learning environment in the classroom.

This study was based on two premises. The first concerns the implementation of the ICT- enhanced constructivist learning today in classroom. The second refers to the emerging need for the appropriate teacher education and professional development as a presupposition for the implementation of constructivist innovation in classrooms.

II. Theoretical Framework

ICT and the constructivism paradigm

There is wide consensus in education that learning is no longer seen simply as the result of a transmission of knowledge. Nowadays pedagogical strategies employed in the current ICT-based learning are linked to constructivism paradigm.

According to constructivism, knowledge is considered to be socially as well as individually constructed; learning is the acquisition of meaningful competences in a realistic context; learning is advanced through interactive and authentic experiences that match with the interests of the student. So the focus of teaching should be on the development of a suitable environment for constructing knowledge rather than for its transfer. In such an environment the use of ICT can help to promote constructivist innovation in the teaching learning process, contributing to the realization of meaningful authentic, active-reflective and problem-based learning. It will help the students to "learn how to learn". Students here will be able to seek solutions to real world problems. The ICT based technological and pedagogical framework will help to engage students' curiosity and initiate learning, leading to critical and analytical thinking. Thus the constructivist education philosophy aims at creating a learning context in a school where students learn how to learn, in a learner-centered environment with emphasis on learning through discovery and exploration and experiences and teacher as a facilitator is expected to play a major role in this process.

The emerging need for preparing teachers for ICT-enhanced constructivist teaching: ICT-enhanced constructivist classroom practices demand that teachers play a new role. This means that opportunities, like exposure to a number of critical examples and experience in designing ICT-based activities and integrating them in their classroom practice in constructivist ways are of great priority. The aim is to convince teachers for the potentiality of ICT as constructivist learning tool. This has to be done through their experiences of their professional preparation

framework. For this reason the development and implementation of appropriate learning opportunities is very important for the teachers' professional development and crucial for the success of innovative approaches using ICT. Teachers need to go beyond traditional approaches and become acquainted with new methods in order to get a clear understanding of the educational functionality of technological tools in their instructional practices. The approaches to ICT integration in Pre-service Teacher Education Program should include the need for awareness of the advantages and possible difficulties of the proposed instructional practices for classroom teaching and learning and usage of sociological and psychological settings and technological tools for fostering active learning among the learners in constructivist way.

III. Research Elaborations

Designing ICT mediated Constructivist Teaching Experiences for the Pre-service Language Teachers:

Under the pre-mentioned theoretical framework, a ICT mediated collaborative language teaching project for Std 7 school students was designed in which 12 pre-service language teachers were involved as the project participants. Their participation in the project was voluntary. The group of pre-service teachers consisted of one male and 11 females with the age ranging from 22 to 31 years. Out of these participants 4 were post graduates while 8 were graduates. All the participants were ICT natives and used digital technology effectively.

Context of the Project:

The project started with the idea of bringing together the selected Schools' students and pre-service English language teachers in an ICT mediated learning environment and create learning situations, which sees the technology as a means of enhancing oral and written communication between students and teachers as well as among themselves. The study has gone beyond the traditional classroom activities because of intending to provide a ICT-supported collaborative learning environment. Thus, the project aimed at : providing the pre-service teachers with the opportunity to use ICT for Creating constructivist learning environment for language learning among the 7th std students and Studying their perceptions about usefulness of ICT mediation in creating constructivist learning environment for learning English language.

The Research Questions:

The study is centered on the following research problem:
What according to pre-service teachers perceived potential educational value of ICT in creating constructivist learning environment?
The following research questions have been developed to address the research problem:
1) What are the perceptions of the pre-service teachers about the educational usefulness of ICT in the teaching - learning process?
2) What are the experiences of pre-service teachers about ICT mediated language instruction provided through the project?
3) What are the positive pedagogical issues identified by the pre-service teachers in the ICT mediated language learning strategy designed by them?

Methods:

According to Windschitl (1998), qualitative approaches to classroom research are appropriate because they employ a variety of methods that can help clarify phenomena, add valuable contextual information, emphasize discovery (rather than verification), and describe what is happening to study participants. In particular, case studies are well suited to in-depth examination of educational practice (Merriam, 1998; Patton, 1990; Windschitl, 1998). The study described here was qualitative in nature and employed a case study methodology. It took the form of teacher research, which we, like many educators (e.g., Baumann, Shockley-Bisplinghoff, & Allen, 1997; Cochran-Smith & Lytle, 1990) value as a form of systematic, intentional inquiry about classroom dynamics. Quantitative methods were used in conjunction with qualitative to triangulate findings and strengthen the study (Patton, 1990).

Study Setting:

A week long project was applied after getting the academic support from the pioneering schools which adopted a policy of supporting ICT Mediated communication for different academic and administrative purposes. For this three near by schools were chosen according to appropriateness of its technical Infrastructures and whole hearted cooperation of the staff.

Organization of the Project:

In the organization of the project, two English method masters (who were the co-researchers), twelve pre-service teachers (facilitators), English language teachers, ICT center staff and school principles took part.

Facilitators:

As mentioned earlier the 12 prospective English language teachers of K. J. Somaiya college of Education were assigned the job of the facilitators of students' engagement in ICT mediated language learning. They worked in 3 schools. Each school was allotted one group of 4 teachers. Each group was given the responsibility of one division of std 7. Further, the students in the allotted class were divided into subgroups. These groups were made as per the activity selected by them. Each sub-group had one leader, two content managers and two technologies managers. Each sub- group worked under the pre-service teachers who functioned as facilitators for their projects.

Student Participants:

The student participants of the project consisted of - 7th-std students from selected three schools. Throughout the project, students improved their ability to investigate specific topics, analyze and synthesize the findings. In addition, students worked cooperatively in groups to attain academic as well as affective and social goals.

ICT centre staff:

Each selected school had an A.V. room supervised by a trained staff that used to help the students and prospective teachers in case any technological problem arose.

English Language Teachers:

Language teachers controlled the relevance of selected instructional materials and tasks and their appropriateness for the students ' age and prior language competences.

English Method Masters:

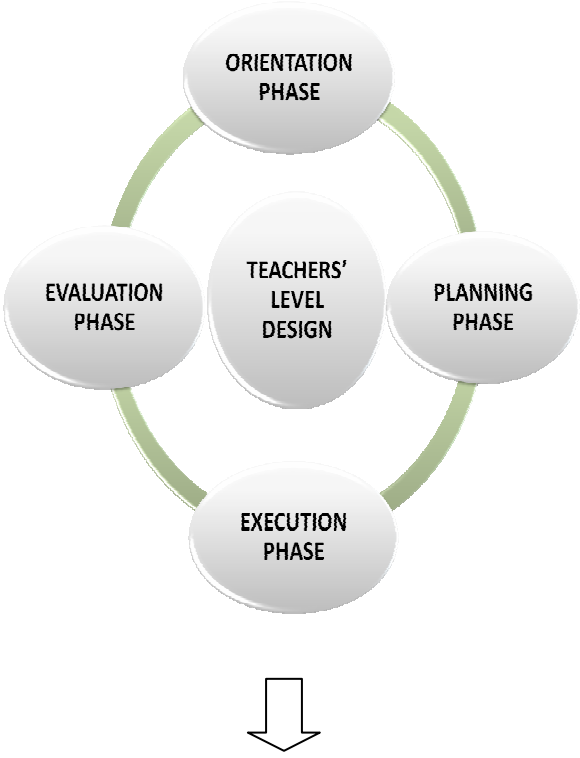
Two English method masters were of K. J. Somaiya college of Education and Research had designed the 2 phase instructional module for providing the pre-service teachers the learning opportunity of using ICT for creating constructivist learning environment for language learning. They guided the pre-service teachers in planning, executing and evaluating the module.

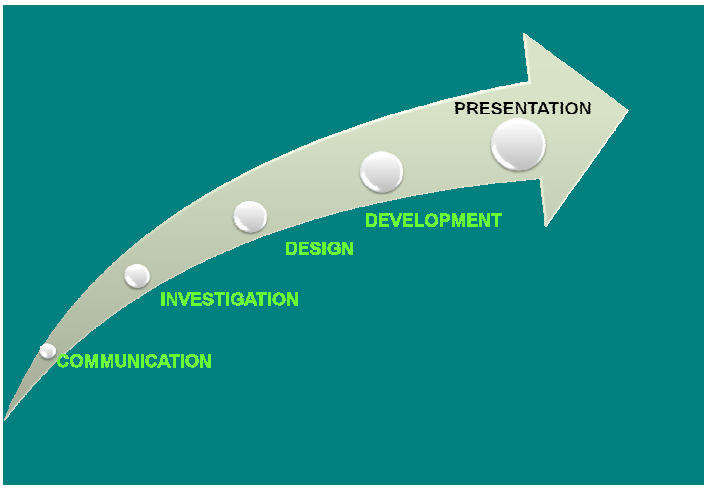
Principals of the Schools:

They were all expected to provide the administrative support for the project by making necessary adjustments in school schedules and coordinating project and school activities.

Project Design:

The team of the researchers had designed a 2 stage module for this project. The first stage dealt with the prospective teachers' level, while the second stage was related to the students' level. The module can be diagrammatically shown as follows-





A. Teachers' Level Design:

At this level the design had the following objectives

1. To design a training module for the pre-service teachers for:

a. Developing understanding about theoretical background of constructivism and its application in language learning,

b. Developing technological and pedagogical knowledge for building a technological and pedagogical framework for transacting the selected language content in ICT mediated learning environment**.**

2. To scaffold the developing of the instructional materials for promoting standard 7 students engagement in language learning in ICT mediated language learning environment.

This level design had the following phases:

a) Orientation phase - At this phase the prospective teachers were oriented to constructivism as a learning theory and constructivist instructional strategies , need for ICT mediation for enhancing students learning and need for using ICT for creating constructivist learning environment for language learning.

b) Planning phase- The team of researchers under the guidance of English method masters selected 3 areas of language learning namely- writing composition, poetry comprehension and creative writing. School group 1 of pre-service teachers selected "My favorite place" as a topic for written expression. But the forms of written expressions were beyond the traditional writing of compositions. The sub- groups of the students in the class chose to write issue based news paper articles, compose poetry depicting the glory of the place and TV narratives. All these products were developed with ICT applications. The second school group decided to work on in depth poetry comprehension. The sub- groups were expected to develop concept webs, literary analysis and effective recitations of the given poems. The third school group worked on creative story writing, converting the plots into scripts and make ICT supported animated presentations of the scripts in the form of E-comics. Here the English method

masters along with the prospective teachers planned the daily sessions, instructional materials, rubrics and concept webs.

c) Execution phase- A detail schedule of 4-5 days comprising of 5 stages was chalked. These stages included- communication, investigation, design, development and presentation. The detailed explanation of these stages is given in the second phase.

d) Evaluation phase –

- The evaluation of the project was based on
- A 5-point Likert scale measuring the degree to which pre-service teachers agreed or disagreed with four statements regarding the educational usefulness of ICT based on the project experiences.
- Answers and explanations on open ended questions given in written form asking them to identify and mention any positive educational issues they had found in ICT mediated learning.
- Three collaborative project reports about the results and experiences of the pre-service teachers and school students about the project.

B. Design at the students' level:

At this level the design had the following objectives-

1. To develop an instructional design for promoting std 7th students
   engagement in learning language in ICT mediated environment,
2. To facilitate the students language learning in ICT mediated learning environment by:
   a. Fostering inter group and whole class communication.
   b. Encouraging them to investigate with respect to their selected language tasks.
   c. Facilitating students' designing, developing and presenting stages of language learning tasks by providing appropriate technological and pedagogical support.

There were 5 stages students entered throughout the project; communication, investigation, design, development, and presentation. Each phase approximately lasted for one day.

IV. RESULTS

To study perceptions of the pre-service teachers about educational value of the ICT mediation in creating the constructivist learning environment the data was collected with the help of:

- A 5-point Likert scale measuring the degree to which pre-service teachers agreed or disagreed with 5statements regarding the educational usefulness of ICT
- Answers and explanations on open ended questions given in written form asking them to identify and mention any positive educational issues they had found in the ICT mediated language instruction project,

Three collaborative reports about the results and experiences of the pre-service teachers and school students about the project:

- Focus group interviews of the pre-service teachers
- Reflection logs of the pre-service teachers.

The collected data was analyzed quantitatively as well as qualitatively. Based on this analysis the attempt is made to answer the following research questions:

R.Q. 1.What is the perceptions of the pre-service teachers about the educational usefulness of ICT use in teaching –learning process?

To answer this question A 5-point Likert scale measuring the degree to which pre-service teachers agreed or disagreed with 5 statements indicated in table 1 regarding the perceived educational usefulness of ICT.

Table 1: Pre-service teachers' perceptions about the usefulness of ICT

Sr. No.	Statements,	Strongly	Agree	No Comment	Disagree	Strongly Disagree	Total
1.	I feel ICT mediated language teaching is better than traditional method of teaching languages:	8	2	1	1	-	12
2.	ICT helps to make learning interesting	9	2	1	-	-	12
3.	ICT facilitates students learning	7	3	1	1	-	12
4.	ICT helps to create active learning environment for the students inside or out side the classroom	6	5	-	1	-	12
5.	ICT is useful for teaching all the aspects of language instruction	5	4	1	2	-	12

This table shows that majority of the pre-service teachers had positive perceptions about ICT use in classroom.

Out of 12 pre-service teachers 10 strongly agreed or agreed that ICT mediated language teaching is better than the traditional method of teaching .One of them disagreed and another had no comment. This shows that still few were not convinced about the superiority of ICT over the traditional method. Out of 12 11 pre-service teachers were of the opinion that ICT makes learning interesting, while one did not comment on this. 11 out of 12 pre-service teachers positively responded about ICT facilitating students' learning but, one still was not agreeing to it and another did not want to comment about it. 11 out of 12 pre-service teachers felt that ICT helps to creat active learning environment inside as well as outside the classroom and only one were not convinced about it. 9 out of 12 pre-service teachers found ICT useful for teaching all the aspects of language instruction but 2 of them did not agree to this and one did not want to comment. This analysis is creating positive picture about the prospective teachers' perceptions about ICT use. This finding is supporting the findings of earlier researchers who have shown the favorable attitude toward and positive perceptions about ICT use among pre-service teachers as a result of intentional learning opportunities for ICT integration in Teacher Education (Lee, Teo, Chai, Choy, Tan, 2007; Gill & Dalgarno,2008; Yasemin Gülbahar,2008).

R.Q.2 what are the experiences of pre-service teachers about ICT mediated language instruction provided through the project?

To answer this question the data was gathered from three collaborative project reports, the reflection logs of the pre-service teachers and focus group interviews of the pre-service teachers.

Case study of group 1:

Group 1 consisted of 4 pre-service language teachers and 45 Class 7 students. Out of 4 teachers 2 had previous teaching experience in schools while the other two had only experience of field teaching practice of 10 language lessons. All of them were enthusiastic. The only difference between the experienced and inexperienced teachers was that initially the former were hurrying to do direct teaching rather than playing the role of the facilitators. The school where the group conducted the project was one of the good schools in the vicinity having a computer lab. But the administrative authority was very rigid. The principal initially opposed the idea of the project as according to her it was a shear waste of time. The first of the 4 days of the project was full of disappointments for the pre-service teachers. They themselves were finding it difficult to play the role of the facilitators. They were rather unsure about the students' active participation in the project. The school students too were also inactive and waited for the instructions from the teachers' mouths. The teacher pupils interaction pattern changed slowly with more and more engaging the students in the process of learning through ICT mediation. As described earlier the group worked on writing activity. The topic chosen was "My favorite place". The presentations of issue based newspaper article, TV narrative and a group composed poem was done with the help of ICT application. The principal who was initially so skeptic about the project happened to be there when the students' presentations were going on. She appreciated the students and the pre-service teachers saying that she could never imagine that her students could do so much.

Case study of group 2:

The second group of pre-service teachers worked with the 50 class 7 students. This school too had good infrastructure. The school authority was flexible and easy to approach. They were very receptive to innovative practices. But the students wanted to know whether this activity will give them mark, if they will be escaped from periodical test, if the entire group members will be graded same etc. This shows that students are still bothered about the grades or marks rather than getting involved in the creative task.

The pre-service teachers could establish good rapport with the language teacher and the students from the school. Here too the first day ended with lot of confusion on the part of students. But the task gained momentum from the next day. By the end of the project the cooperative and collaborative spirit among the participants was significantly increased. The group of pre-service teachers was inexperienced in terms of school teaching. All of them were very young and friendly in nature. The pre-service teachers as well as students had sound knowledge and skills of ICT. This group decided to work on in depth poetry comprehension. The sub- groups were expected to develop concept webs, literary analysis and effective recitations of the given poems. The ICT assisted presentations of the students were very much appreciated by the school teachers and principal.

Case study of group 3:

The 3rd group of the pre-service teachers was allotted a school with appropriate technical facilities. Unlike other 2 groups this group of pre-service teachers themselves was apprehensive about the use of ICT mediation in fostering creative writing among 47 class 7 students. They were also unsure about the students' readiness for working collaboratively in constructivist learning environment. But the response they received on the first day of the project proved to be the eye opener for them. This group worked on creative story writing, converting the plots into story maps and further into scripts and make ICT supported animated presentations of the scripts in the form of E-comics. They shared these comics with students from other divisions of the school.

All these case studies help us to observe the following:

The school authorities are not sure about the potential of the students to construct knowledge, the prospective teachers still have apprehensions about their role that of facilitators. See the following remarks from their reflection logs:" I was wondering how the small children can analyze the poem"…," I feel the teacher should give them the points for the newspaper write up"…, " I do not think the students will be able to create a story plot"…It was interesting to see the changes in their notes after the projects. See some of the following remarks:

Group 1:

"The students were so committed on their tasks; they fulfilled their responsibility of the group project very well"

"The students after an initial frustration showed great interest in the project work and great commitment to their tasks all of them reached sufficiently good results".

"They were engaged in an exploratory way of learning very different from what they were used to so far".

Group 2:

Evaluating their students' work the group notes that "students participated actively in the whole learning process", "it was very productive for students to see their work being displayed on the screen ". They observed that "what students liked more in this project was the opportunity they had to work with autonomy, to make decisions and act on them without having to listen passively to teachers." They concluded that "it was a self-regulating process for students facilitating learning through exploration and discovery".

Group 3:

As mentioned earlier the members of the group were very skeptic about the potential of students in working independently in cooperative and collaborative manner and do creative story writing with ICT application. The same group mentions in the report the following:

"The students were showing great interest and enthusiasm in preparing the story plot."" It was a great pleasure to see the creative story ideas pouring in from the students. "Overall activity acted very positively for student learning and that "the traditional teaching approaches cannot help students in the development of creative way of thinking… "It is very important for students to be engaged in problem solving in a creative, not mechanistic way working collaboratively in the class…"

These last points imply a remarkable shift from their initial skepticism to a more positive attitude to ICT mediated constructivist learning, indicating a positive effect that the project work had on them.

All the three case studies indicate that our pre-service teacher succeeded in implementing in their groups ICT mediated language learning activities in a constructivist way. They seem through his report to recognize in their students' reactions and behavior in the classroom some of the expected outcomes of the constructivist learning approach. They also seem to appreciate this kind of learning as exploratory, self-regulating and different from the teaching methods they and their students used to have experienced till then.

R.Q. 3 what are the positive pedagogical issues identified by the pre-service teachers in the ICT mediated language learning strategy designed by them?

To answer this question the pre-service teachers were asked to answer one open ended question.

Question: What positive educational issues did you find, if any, in ICT mediated language learning project? Explain your opinion in brief.

Answers and Explanations to open ended question:

The pre-service teachers' responses were analyzed and categorized as follows:

Table 2: Positive Educational Issues Identified by the Pre-service Teachers:

Sr. no	Response	Frequency
1.	Evokes enthusiasm	8
2.	Leads to creative learning	6
3.	Is captivating and interesting for students	8
4.	Fosters learning through exploration and discovery	9
5.	Facilitates the effective understanding of concepts	10
6.	Facilitates active learning of the students	9
7.	Gives opportunity to rectify students' mistakes and improve them	4
8.	Develops students' imagination and creativity	11
9.	Nurtures inquiry skills	4
10.	Enhances motivation for learning	3
11.	Crystallizes abstract notions into concrete things	1
12.	Is useful as an assignment after teacher's presentation only	1
13.	no specific response	2

Positive educational issues identified by pre-service teachers: (open question) (N=12)

All the 12 students answered the open question. The answers to question were analyzed and categorized qualitatively according to the educational issue mentioned by pre-service teachers. The emerged categories are presented on the table 2 (most of the pre-service teachers mentioned features belonging to more than one category). The majority of them (9/11) could identify and mention several constructivist issues belonging to or approaching constructivist ideas ("leads to creative learning", "active learning by the students", "opportunity to learn from mistakes" etc). They seemed to have been influenced and understood the educational meaning of the activities. This was more obvious in the following representative answers and explanations:

"…the students are involved in a creative process that requires deep thinking and use of their Imagination to come out the final product".

"…The students are able to observe their mistakes and are able to correct them".

"…In this way students are constructing their knowledge through exploratory work instead of simply passively receiving information from a teacher"

"…Students can approach literary concepts and tasks in a more creative, joyful way"

"…Students are active, they use their imagination and cultivate their creativity"

"… It helps students to put themselves in the position of a journalist" Two pre-service teachers could not mention any specific educational characteristics and answered in very general and unclear terms. For example: "This method is good", "This

method is interesting" etc. Three others re-confirmed that the method was useful and interesting but they would prefer the traditional method of classroom teaching before this kind of activity. As one of pre-service teachers mentioned "…we should first present the poem and then apply this activity for better comprehension".

Another pre-service teacher mentioned " First I would explained the students how to write a story then discuss with them the plot and then suggest them the correct way to write the story".

Though such replies were very few (2) still they indicate that, a lack of clarity and misunderstanding of the pedagogic rationale of constructivist approach of our project and shows their conviction about the traditional way of the teacher-led instructional practices for teaching the new concepts instead of the proposed knowledge construction by students themselves.

V. CONCLUSION

The conclusions drawn from the data presented in this paper indicate that the inclusion of ICT mediation in the field experiences of pre-service teacher education programmed in a constructivist way helped pre-service teachers to identify the pedagogical potential of ICT for students' constructivist learning. Although there were some confusion in the students' mind and few cases of misunderstanding were noticed, overall the whole project seems to have had a significant impact on the majority of pre-service teachers. This impact included acquaintance of the pre-service teachers with the constructivist learning strategy through their own concrete personal experience of an exploratory and constructivist teaching that can inspire their future teaching methodology and convinced them to use ICT as a constructivist learning tool. Although the findings from this study may not be generalized beyond this study's population because of the small sample size and the fact that the pre-service teachers were volunteers to participate in the study, the study does provide suggestions on how pre-service teachers can be prepared for using ICT as a teaching and learning tool for constructivist learning environment.

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First Author – Dr. Kalpana Kharade, Associate Professor, K. J. Somaiya College of Education and Research, Mumbai, India, Email: kkharade@gmail.com

Second Author – Ms. Rupal Thakkar, Assistant Professor, K. J. Somaiya College of Education and Research, Mumbai, India, Email: r.a.thakkar@gmail.com