

Investigating Pre Service Economics Teachers' Experiences in Developing and Implementing ICT Integrated Lessons

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Abstract:

The purpose of the paper was to investigate Pre Service Economics Teachers (PSETs) experiences in developing and implementing ICT integrated lessons through collaborative design teams using knowledge building activities. The ICT lessons were based on TPACK Model by Mishra and Koehler. were achieved by using interpretative phenomenological analysis where the emergent themes were identified and interpreted. These themes were extracted from the PSETs written reflections, semi-structured interviews. The themes were then clustered in a meaningful way by looking for connections between them to answer minor research questions of PSETs experiences during a) development of ICT integrated lesson plans for teaching Economic concepts using on learning activity type of knowledge building, b) during the implementation of ICT integrated lessons in Economics, c) challenges did the PSETs face while integrating ICT in the teaching of Economics for knowledge building and d) perceptions of PSETs of the LBD approach to developing TPACK.

Keywords: TPACK, Economics Lessons, Pre service Economics Teachers, Learning by Design

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I. INTRODUCTION

The digital natives are being exposed to ICT since their childhood. The students are adept at using technology more than the teachers. With the rise in use of technology, the school education also demands that the teachers should be equipped with technological skills. The skills of using technology should not be limited to personal use but they should also know how to make use of technology in the teaching learning process. The teacher education has been structured to orient and sensitize the teachers to distinguish between developmentally appropriate and detrimental uses of technology. The teachers should be oriented to technology use in the preparation stage itself and a need is felt to continually upgrade professionally also.

The NCFTE, 2009 also has given a systematic and comprehending framework of curriculum for the teacher education and also highlights the strategies to implement it. The teacher education in India has seen a shift in its curriculum. Many changes have taken place in the teacher education curriculum in order to enhance the quality of teachers. The curriculum changes are necessitated in order to equip the teachers who are competent to face the 21st century challenges of changing society. It also is imperative that teacher education should be abreast of recent developments and trends. It emphasises more on making the nature of experiences to be offered to the student teachers to make them reflective practitioners. The course structure offers a comprehensive coverage of themes and rigorous field engagement with the child, school and community.

Under the broad curricular area of Engagement with the Field, NCTE curriculum suggests course on Enhancing Professional Courses (EPC). One of the EPC course is Critical Understanding of ICT. The course of pedagogy of a

school subject is offered under the broad curricular area of Curriculum and Pedagogic Studies.

The rest of the paper is organized as follows. The need for the study in Section II, Research Questions in Section III, Research Methodology in Section IV are explained. Analysis is presented in section V. Concluding remarks are given in section VI.

II. NEED

Majority of the teachers use technology or multimedia in schools for mere sake of it, without realizing the potential of technology to liberate learning. The use of technology is more often not more than cosmetic. It is also often touted as a panacea for shortage of teachers. The mere use of technology often proves to be detrimental to the learning. Teachers need to distinguish between the learner oriented use and detrimental namesake use of technology.

Therefore, it is the pressing need of the hour to prepare teachers who are adept in breaking the boundaries between concepts of technology, pedagogy and content. Teacher training is insufficient when a training program only offers instruction of technological knowledge and isolates it from content and pedagogy. Instead of focusing solely on technologies, need to help pre-service teachers develop a range of abilities to apply technological skills into content teaching with appropriate pedagogy. Technology training is not aligned with the curriculum. The present curriculum simply develops the basic technological skills. These skills are not enough. There is a necessity to relate the technological skills with the content and the pedagogy.

Little empirical data is available about the extent of preparation of social studies teachers to use technology.

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Most conclusions about social studies teachers' technology training must be inferred from the general literature about preservice and in-service preparation (Ehman & Glenn, 1991). There is hardly any research to investigate economics classroom processes. This has greater implications on curricular reforms in economics. As such the economics curriculum is generally perceived as dull and unexciting among learners. Similarly, discussion and debate on the emerging areas, inclusion / deletion of topics, pedagogy of teaching learning in economics, evaluation methods, inter-linkages between school and college or university level economics curriculum are lacking.

III. RESEARCH QUESTIONS

Learning about technology keeping in mind the context of the content, students, pedagogy, technological hindrances and affordances help the pre service teachers to develop TPACK. Learning by Design (LBD) is a learner-centered instructional theory that engages learners in the designing of an artifact for a real-world context, requiring learners to construct their understanding and meaning (Han & Bhattacharya 2001).

Learning activities are differentiated, in large measure, by content area (Stodolsky, 1988). Learning activity types function as conceptual planning tools for teachers; they comprise a methodological shorthand that can be used to both build and describe plans for standards-based learning experiences. Each activity type captures what is most essential about the structure of a particular kind of learning action as it relates to what students do when engaged in that particular learning-related activity (e.g., "group discussion;" "role play;" "fieldtrip"). Activity types are combined to create lesson plans, projects and units. They can also serve as efficient communication tools for educators wanting to share their plans for students' learning with each other, as science education lesson study research in Japan has shown (Linn, Lewis, Tsuchida, & Songer 2000).

Keeping this in view, the following major and minor research questions were formulated:

Major Research Question: What are PSETs experiences in developing and implementing ICT integrated lessons through collaborative design teams using knowledge building activities?

Minor research questions (1) What are the experiences of PSETs about developing ICT integrated lesson plans for teaching Economic concepts based on learning activity type of knowledge building? (2) What did PSETs experience during the implementation of ICT integrated lessons in Economics? (3) What challenges did the PSETs face while integrating ICT in the teaching of Economics for knowledge building? (4) What are the perceptions of PSETs of the LBD approach to developing TPACK?

IV. RESEARCH METHODOLOGY

As a qualitative research approach, Interpretive Phenomenological Analysis (IPA) has its theoretical origins in phenomenology and hermeneutics. The framework was designed by Smith, Jarman and Osborn (1999). A researcher can deploy IPA if the aim of the study is to explore individuals' perceptions as well as understand how they

(individuals) make sense of their experiences. IPA aids in the interpretation of perceptions, experiences, events and actions held for individuals in a study (Chapman & Smith, 2002). The framework helps in explanations that give insights to understand human experience better (Fade, 2004). IPA is both phenomenological and interpretative. It is phenomenological because it "seeks an insider perspective on the lived experiences of individuals", and is also interpretive because it "acknowledges the researcher's personal belief and standpoint and embraces the view that understanding requires interpretation" (Fade, 2004).

Researchers start a project with certain assumptions about how they will learn and what they will learn during their inquiry. This is termed as a 'knowledge claim' or a 'world view'. These claims might be called 'paradigms' (Lincoln & Guha, 2000; Mertens, 1998); or broadly conceived 'research methodologies' (Neuman, 2000). The choice of a certain methodology and research design is informed by researchers' theoretical perspective, which is also commonly referred as research 'paradigm'. This includes researchers' world views, values, attitudes and beliefs, which influence all of their decisions in the design of a study.

The paradigm that underpins this study is interpretive (Qualitative Method). The researcher believes that human behaviour is the collection of activities performed by human beings and influenced by culture, attitudes, emotions, values, ethics and authority. Therefore, preservice teachers' TPACK and use of ICT can best be understood when observed in the context of their actions. This belief about human behaviour is consistent with the characteristics of the interpretive paradigm of research according to which: humans actively construct their own meanings of situations; meaning arises out of social situations and it is handled through interpretive processes; behaviour and, thereby, data are socially situated, context-related, context-dependent and context-rich (Cohen, Manion and Morrison et al, 2004).

The researcher believes that TPACK and use of ICT in teaching of economics represent personal and private knowledge which is influenced by the social and cultural settings in which preservice teachers teach economics. Therefore, what the researcher studied was personal and private knowledge, constructed by preservice teachers, based on their experiences with TPACK. The above characteristics of the interpretive research paradigm are related to the Social Practice Theory (SPT) (Jaworski, 2007) which sees knowledge as being in practice. "Practice" is doing in social context and thus, research should focus on what people do and what is involved in doing it. Pre service Economics Teachers TPACK development in Learning by Design setting and reflected and implemented during their practice teaching was studied in the context of courses offered in Two Years Bachelors of Education Program and the practice teaching school social contexts. Without taking these contexts into account it was not possible to understand what preservice teachers knew and do. The researcher expected to find differences in TPACK design lessons, varied use of technology, beliefs about the instructional use of ICT, but at the same time, the researcher expected to find commonalities, the identification of which would be helpful to future teachers. So, the characteristics of the interpretive research paradigm and the SPT provide the context in which

the researcher places her research and her belief that human behaviour must be treated as a collection of activities performed by human beings in a particular social context and influenced by beliefs, values and attitudes.

A learning design “documents and describes a learning activity in such a way that other teachers can understand it and use it in their own context. Typically, a learning design includes descriptions of learning tasks, resources and supports provided by the teacher” (Donald, Blake, Girault, Datt, & Ramsay, 2009). A main challenge in designing pre-service teacher training courses that encourage teachers to elaborate on the learning opportunities that ICT can provide to students, is to make it happen in a constructive manner, promoting the design of artifacts, peer collaboration, and reflective discourse (Schlager & Fusco, 2004). To this end, learning by design is a promising approach focusing on constructing artifacts instead of lecturing, giving learners the control over their learning.

In order to enhance the PSETs ICT integration competence the researcher implemented the LBD based TPACK instructional module to give them an overview of TPACK, Learning Activity Types to be reflected in their artifacts created in design teams, discussions and reflective discourse.

In the present study the PSETs work in design teams creating a learning design which is the five columnar lesson plans on TPACK to teach economics. The learning design i.e. the five columnar lesson plans described the learning tasks, resources and support provided by the PSETs to the students for economics. In order to work in design teams and share their learning the PSETs documented their learning designs through the design lessons.

Participants: Eighteen Pre Service Economics Teachers who had Pedagogy of Economics either as their first or second pedagogy. The following figure 1 illustrates the participants’ profile.

■ Gender ■ Age wise ■ Economics Pedagogy ■ Educational Qualifications



Figure 1: Participants Profile

The researcher followed the purposive convenient sampling procedure defined by McMillan (2000), where a group of participants is selected because of availability and with a purpose. This study revolves around PSETs from a particular teacher education institution affiliated to Mumbai University.

Purposive sampling ensured recruitment of a sample group with similar characteristics. Moreover, it helped to learn, to explore, and to understand a central phenomenon taking place within a particular sample group.

The Design Teams (DTs) consisted of two to three pre service economics teachers each. The members of DTs changed according to the practice teaching school allotted to them. Total of 18 members formed the DTs.

To realize the objectives, the PSETs maintained a reflective journal noting their experiences of designing lessons, implementing them in real classroom context and challenges faced by them in the use of ICT integrated economics lessons. The researcher also employed a semi structured interview with the PSETs.

V. ANALYSIS

Minor Research Question 1: What are the experiences of PSETs about developing ICT integrated lesson plans for teaching Economic concepts based on learning activity type of knowledge building?

The PSETs reflected and wrote a range of experiences which are categorized as initial apprehensions, students’ engagement in learning, lesson foundation, technology reworking, reconnoitering the technological tools, augmenting economics content knowledge base, usage of learning activity types, skill building, shift in education viewpoint to use technology, pedagogical practices.

Initial apprehensions PSETs shared that initially they were inhibited by the use of technology to teach economics. While the majority of the study’s pre-service teachers were committed to utilizing technology, some of them commented about the initial trepidation of using technology in economics. This inhibition would be the initial unclear thoughts about merging the TPACK domains using the learning activity type and integrating it with the economics content. This is interpreted by the following remark of a PSET: “I was just afraid to use the technology and that too for educational purpose along with the learning activity type, which seemed to be easy when we did it in the college. But I was apprehensive and at a loss how to use the activity type for economics teaching.” But a shift in the confidence level can be judged based on the following remark: “Initially I thought that it was just too much taxing preparing lesson plans. We had to no choice in the economics content since it was given by the school teacher. We had to choose an appropriate learning activity type, an appropriate technology and an innovative pedagogy to make the lesson plan. But eventually, I as we proceeded to give lessons, based on the guidance, discussion with friends, feedback I was able to write the lesson plan using a suitable learning activity type.” Although they had exposure to basic Office, they were not aware how to make use of it in the teaching-learning process. One of the PSETs remarked to having time to explore various technologies mattered.

They said they would be motivated to spend the time and that they were adequately prepared with enough technology skills and know-how to learn almost any tool to the basic operational level. One of the PSET was continually ready to use a new pedagogy and technological tool which she had

previously not used. She was the one who implemented almost all the technologies successfully by judiciously blending the allotted economics content, choosing an appropriate pedagogy and technology. For example, she used images, crossword puzzle for explaining Trade to STD IX students. She interlinked this technology by using lecture-cum-discussion method.

All PSETs felt that technology is beneficial to enhance society and boost interaction in the classroom. Although there was initial fear of incorporating technology even after the workshop the PSETs confidence to implement ICT integrated lesson increased which is evident from the following comment, 'initially I thought that technology is difficult to integrate but gradually I realised that technology can be effectively utilised in all stages of lesson.' The PSETs expressed that they had used technology for entertainment purpose, but none of them reported the use of technology for educational purpose. The PSETs were satisfied with the try-out of the new technologies in the teaching learning process although they did not have choice regarding the economics content.

Students' engagement in learning

The PSETs felt that ICT integrated lesson plans were challenging to design since with every lesson the content differed accordingly the pedagogy and the technology also varied. The above reference can be inferred from the following reflection, "I felt that the content was easy since it is only STD IX content- Factors of Production. Checking the content in the textbook I felt the content was too less. It did not cover the requisite knowledge which is required to understand factors of production. Therefore, I looked for extra information online, integrated that to build my content on each factor of production. I could take each factor of production in a single period. Hence I required four lessons to complete factors of production."

PSETs shared that ICT integration improves the classroom management and creates interest in the students. They agreed that the use of technology does draw students' attention towards them and they participate whole heartedly in the teaching learning process.

PSETs unanimously voiced that the use of a new pedagogy helps in maintaining discipline and getting the students' involved in the lesson.

The PSETs felt that students could get really involved and interested in learning through technology with a well combined pedagogy and in-depth content knowledge.

Another concern that PSETs reflected was that technology may take students' thinking's place. This concern is reflected in the statement given by a PSET, "Technology is good. It helps but I wonder whether students will actually think and answer. Or is it from the support used that they get their readymade answers. Will have to rethink how to effectively use technology for encouraging students thinking capacity." They shared that the use of technology such as Youtube, Wordle, etc. for knowledge building simplifies the concepts and makes it easier for them to teach.

Lesson foundation

PSETs pooled opinion was that accessing websites helped

them to prepare the content in-depth since the content description in the books is limited. This in-depth knowledge aided them to build knowledge base among the students at the same time giving them an extra edge by mastering the content. The knowledge base gave them confidence to deal with the students queries. The above inferences can be supported by a remark of PSET that "I gathered extra information by reading up digitally and sifting the relevant information according to the school and the level of students. For the students in (School's name) I used simple statistics related to Food Security in India, which although is simple but made the students think."

PSETs gathered confidence since they had a hands-on experience in technology which they felt assisted them in preparing the lesson plans.

The PSETs realised that it is not an easy task to align the content, pedagogy and technology. They expressed that they really had to work very hard in order to prepare a TPACK lesson plan as compared to other lesson plans. The PSET voiced that during the workshops it all seemed very easy. They thought it was only a question to integrate the simple technology in their teaching, which they felt they will be easily able to do so. But when faced with reality in classroom setting, they remarked that it was tiring and took a lot of effort and thinking to align all three, the content, pedagogy and technology.

Technology Reworking

Although the PSETs started with an initial inhibition to use technology but they worked their way towards the use of technology to teach economics. Later on the PSETs were comfortable with the use of technology. They realised the intricacies of how to work around with the content. Based on the topic, for which they did not have any choice, the PSETs designed their lessons around the topic with the best suitable pedagogy and the technology which they wanted that it makes their teaching effective and interesting. The assignments allotted gave them the initial exposure to be at ease with the technology. Once being familiar with technology, the PSETs started to explore various other online software to make lesson planning easier and less time consuming for them. They reworked on the technology by utilising online software for creating puzzles like Crossword, Wordsearch, Bingo. They also explored Pinterest in order to get ideas for activities for various topics.

A PSET reported the students' curiosity and increased participation when she used QR Codes. So when she was told to revise the topic of Poverty, she thought of using QR Codes for her revision lesson. She felt that since it was a revision lesson, the same kind of curiosity and participation will be there in her revision lesson. Therefore, she prepared 15 QR Codes, to revise the full topic. She was happy with the lesson since the students' participation and discipline was maintained. She felt that she "could get students really involved and interested in learning through using this technology."

Reconnoitering technological tools

PSETs explored and surveyed on their free will new technology which can be used for economics teaching. The researcher had orally shared that online websites can be used

to create games, puzzles etc. This aspect was reconnoitered by PSETs wherein they browsed sites which can create online puzzles viz. word search, crossword etc. The PSETs made use of various websites to create the puzzles and use them in their lessons. For example, they used <https://worksheets.theteacherscorner.net/make-your-own/crossword/>, https://www.puzzle-maker.com/crossword_Entry.cgi etc. The PSETs expressed that they used Pinterest in order to get ideas for activities which they can incorporate to make their lessons interesting for their students.

PSETs reflection, "In order to save time, I browsed websites where I can easily create Wordsearch or Crossword".

"I searched cipher codes and made use of various cipher codes for my lesson."

Augmenting economics content knowledge base

The design lessons strengthen the content base of the PSETs. The PSETs unanimously voiced that the preparation of these lesson did help them in making their economics content knowledge stronger. They felt that by planning the design lessons, they got an in-depth knowledge about the topic. At the beginning, they were at a loss of how to cover the topics, since the topics were few, and the PSETs allotted to a school were at least three to four of them. They voiced their concern that the topics were very less and if they repeated the same topic in the same class, the students will not pay attention and create disturbance which might affect the markings of the lessons. For example, the chapter Factors of Production covers all the four factors in a single chapter. The PSETs also felt that the text books had limited coverage of the topics. Therefore, in consultation with the guide they decided that they would go beyond the text books and gather extra information so that each of them get enough content information to give a single lesson of 30 to 35 minutes. In this process, the PSETs gathered extra information related to topic allotted to them by the school teacher. This augmentation of economics knowledge base can be understood by the following comments: "initially I was really afraid how will three of us deal with the same topic of factors of production in the same class. But I decided that I will at least require five periods to deal with the topic. First lesson on introduction of factors of production, the four factors individually in each period i.e. one period per factor like one period for land, one period of labour and so on. But to do so, I had to get extra information online. I also had to decide which matter will be suitable for students in (School's name) since the students are not so smart."

Usage of learning activity types

The teacher's fundamental task is to get students to engage in learning activities that are likely to result in achieving [the intended learning] outcomes. It is helpful to remember that what the student does is actually more important than what the teacher does. (Schuell, 1986, p.429). In this study, the LATs were explored by the PSETs to achieve their design decisions of achieving instructional objectives and engaging students in teaching learning process. The use of learning activity types seemed to be easy when the PSETs underwent the TPACK Instructional Module. But when they faced the real classroom settings, they faced difficulties in planning those. But with practice and sharing of experiences the PSETs

gradually learnt the usage of learning activity types. They felt stressed initially but the experiences eventually made things stress-free for them. The LAT in the design lessons were intentional, meaningful and useful. They were intentionally aligned with the instructional objectives and specific objectives. The activity was meaningful and useful so that it engages the students in the learning process and make them participate in the process. Achievement of the instructional objectives ensures that the LATs were useful for the students. PSETs felt that the LATs should be incorporated with a purpose. It should be in alignment with the instructional objectives, technology and pedagogy selected and also how one intends to use the LAT for knowledge building among students.

Skill building

The fieldwork placement and giving lessons in authentic settings honed the PSETs technological and planning skills. They build the knowledge necessary for becoming a technology expert, where they are able to justify the use of technology for achieving instructional objectives. The chance to see and apply the technological knowledge and technological pedagogical knowledge in actual teaching setting was a forceful part of PSETs experience. It enriched the PSETs with the how their content base can be enhanced with appropriate pedagogical and technological planning. The PSET stated, "the actual lesson delivery has imparted me the requisite skill of incorporating technology not for namesake but it has actual use to engage students in the learning process."

Shift in education viewpoint to use technology

The analysis definitely showed a shift in the PSETs viewpoint about instructional use of technology. The PSETs are now confident that technology can be used in the classroom for teaching learning purpose. Even the social media and the mobile apps can be utilised for teaching learning process, although not a part of the current study. But the PSETs made an attempt to use mobile app while scanning QR Code in the classroom is reflected, "...students' enjoyed my lesson, when they scanned the QR Code. The oral questioning as assessment can now be made innovative by creating a QR Code for questions which I did for teaching Inflation. The students were enthused to participate. Everyone wanted to scan the code and read the question aloud to the class. Others equally wanted to answer the scanned question."

Pedagogical Practices

Effective pedagogical practices are how teachers can best use the various digital technologies in teaching to create a conducive learning environment for students. . The interaction of PSETs with the real classroom learning environment gave them insights the affordances and the restrictions in the pedagogical practices with the contextual background in mind. The PSETs kept the context in mind while designing their lessons for a particular school. A PSET wrote, "I knew that I cannot use the jigsaw method of cooperative learning in (School's name) because the students over there are not used to read the matter on their own and comprehend the matter. They have to be explained everything." PSETs perception of the level of intelligence of

school students was one of the factor for pedagogical decisions. If the PSET perceived students of particular schools to be smart the choice of pedagogy differed for the students whom they perceived to be less interactive and participative.

Minor Research Question 2: What did PSETs experience during the implementation of ICT integrated lessons in Economics?

Personal credence PSETs shared the experience that using technology and various pedagogies helped them to stand confidently in front of the students. This rise in confidence was due to diverse reasons such as more concentration on the content and the pedagogy since technology helped them to save time. The time saved was due to the online use of various software's viz. to prepare Wordle, Prezi, wordsearch, crossword, puzzles, and even the simple MS Office. PSET remarked, "Using online software's makes my work easier. Just search the appropriate software/website, put in the correct content and voila the output is ready." Whereas one of the PSET stated that "Double planning is required when technology is used. Because the computer can conk off anytime."

But on the contrary, there was a couple of PSETs who voiced that preparing TPACK plans was double the work. They had to keep a back-up plan ready in case the technology did not support. Also, there was a fear of losing marks if the execution did not go according to the design lesson. Both the PSETs felt that it was time consuming.

Other opinion was the lesson planning was easier. They reported that the planning and the guidance helped them to infuse all the three domains without great difficulty. The Learning Activity type also guided the planning of TPACK.

It increased their level of confidence since they made sure that in case technology hitches surfaced they can back up on the other pedagogy.

School rejoinder

PSETs shared that a lot of TPACK implementation and planning depended on the school and the students. The type of school and the level of students charted their lesson planning and technology integration. Some school teachers were helpful while in some schools the teachers did not support the use of technology. This is the PSETs keeping the contextual factor in mind while design planning.

Classroom Contemplations

Majority of the PSETs contemplated difficulty in availability of technology in the classroom. Many schools did not support the software used by the PSETs. The above statement is justified by these reflections, "I was frustrated when the computer did not start even when the school technical person helped me." "I wanted to use Prezi, but due to non-availability of wi-fi in the schools, I used Prezi only once."

Lack of technical help in the school led to frustration in the PSETs. Another PSET reflection's, "Technical support staff not available at that particular moment when my lesson is there."

In spite of these experiences, the PSETs were enthusiastic and eager to infuse technology in their lesson. They made prior

technological arrangements in the school or they took their own laptops to the schools. The above experience is reflected in this statement as given by PSET, "QR codes generated interest and the students answered the question because they were more curious to read the QR code and then answer."

Student Comprehension

Overall the PSETs felt that the use of technology did create an interest in the students. They were more attentive and participated in the interaction. Technology imbued interest and curiosity in the students. The students were eager to answer. They were more disciplined and quiet since they were interested to play with the technology and learn. The above experiences are reflected by the following remarks made by the PSETs: "Students answered when a new pedagogy with the support of technology was used." Which indicated that the use of pedagogy with effective support of technology has an impact on students learning. The PSETs final reflection reported that their technology experiences during their practice teaching have changed for the better. It has aided them to teach effectively.

Pedagogical Challenges

The new instructional techniques are different from teacher-centered, delivery focused conventional teaching methods. The new techniques involve students to take responsibility for their own learning. To quote a PSET, "... the technique of case study was very fulfilling. The students tried to analyse the case and develop an understanding of the concept of tourism. I had given them the case of tourism of Jharkhand, which they read and then I just facilitated their understanding of the term." One of the PSETs viewpoint was very interesting to note when she told that possibly the use of technology learning may motivate the students so much that they might feel the traditional way of teaching as less interesting and boring.

Knowledge Centred Interaction

The remarks by the PSETs reflect that the interaction and engagement was more on discussion of the knowledge learnt or explained. The PSETs included definitions, extra information on the content, developmental and assessment questions centred around the instructional objectives in order to engage the students in the learning of the knowledge of economics delivered by them. This is reflected in the following comments, "I tried to engage the students to build their knowledge when I introduced the term economics to them. I had browsed and planned at least three definitions of economics. Next I asked them to identify the key words in these definitions and build upon the meaning of economics according to them".

Minor Research Question 3: What challenges did the PSETs face while integrating ICT in the teaching of Economics for knowledge building?

Technological Provisions

Lack of technology in the schools is indicated as absence of sound system, smart board, projector, and desktop computer. The PSETs reported that the schools lacked the basic technology. The classrooms were not equipped with the basic desktop computer, dearth of appropriate free softwares, absence of internet connection etc. The PSETs also face

hardware barriers non-functional equipment, incompatibility between school PC and some programs uploaded on their pen drive, and out of date and slow hardware. Few PSETs stated that the start-up/shut down time of the PC was too long leading to loss of class time and they simply do not want to use the technology for that reason. "In some schools we had to take our laptop even to do simple presentations. Schools did not have the projector in some of the classes."

Physical Provisions

An overall observation of the PSETs was that the schools lacked the physical technological resources. They remarked that almost all the schools did not have Wi-Fi facility. A PSET remarked, "I had to really think hard what technology to use. Since I already knew which school I am giving the lesson I more or less knew the technological resources available in that school. I knew that Wi-Fi is not available in [school's name]. therefore, I had to use something else other than Prezi which I wanted to use." They pointed out that the schools did not have the computers in place. Many of the desktops were non-functional.

Technical glitches

It was evident from the reflections that the PSETs during their college days were exposed to teaching approaches which were lecture focussed and although they knew how to use computers and mobile phones, they were not aware how to handle the basic technical glitches faced during the lesson implementation. But gradually the PSETs figured out how to handle a few of the technical glitches. One of the PSET's resolved her glitch of using technology in the class.

School Belief System

Few schools still believe in the traditional approach of lecturing in the class. They have apprehensions about the use of technology. The teachers were not ready to explore and use technology. The school teachers still used PowerPoint only that too only few teachers. Most of the school teachers followed lecture method. The school teachers in their informal talk with the PSETs stated that they were hard pressed for time. They had limited periods of economics and had to complete their portion for the examinations. Initially as reported by the PSETs the school teachers were apprehensive about the use of technology for teaching of economics since they felt it takes a lot of their time and many periods of theirs are wasted because the PSET cover a limited subject matter in a period. One of the PSET wrote that, "The school teachers did not permit us to use technology for the teaching-learning process except for PowerPoint."

Time factor

Most of the PSETs felt that initially it took double the time for planning with technology. They gave reasons that they had to look into the school provisions, the level of students, the availability of technology in the school, the content allotted by the school teacher, as well as pedagogy which would work with those particular students. One PSET wrote, "It takes a lot of time to think of an appropriate technology which fits according to the school, the students' level, the content and the pedagogy. But once it is decided, it makes my work simple."

Technological Access

The PSETs voiced their trepidation about the limited technological access in the schools. They told that they had limited access to the technology in the practice teaching schools. The schools did give them access to technology but not fully. One of the PSET remarked that, "I wanted to use their smartboard but the school denied it. I wanted to try it out but then..." The school gave them access to the computer laboratories under the supervision of the teacher educator and/or the computer instructor.

Minor Research Question 4: What are the perceptions of PSETs of the LBD approach to developing TPACK?

An instructional design (ID) model built on the TPACK framework in which the learning by design approach is integrated can be useful in promoting preservice teachers' TPACK. An ID model could amplify the effectiveness of the learning by design approach and promote TPACK learning because it can offer explicit and systematic directions for instructors (Gustafson and Branch).

Although the number of members in a team was not fixed, all eighteen PSETs worked together in a team of 2 to 4 depending on the school allocation. Thus they teamed up almost with everyone and shared their experiences. They indicated that they enjoyed the experiences of using technology to teach a dry subject like Economics.

Peer support

The use of technology made it simple for them to write lesson plans. PSETs were of the opinion that they became less dependent on the guide, as their problems could be solved with peer support. The peer support and technology used by the team mates helped them to easily prepare lesson plan. Since the topics were limited and almost all schools gave the PSETs the similar topics. One of the remarks is, "The simple use of MS Word made my work easy. I didn't have to rewrite the whole lesson plan again, since I already had a soft copy, and easily just made the changes suggested by the guide at the requisite place."

Classroom Bolster

Practice teaching not only gave them an opportunity to prepare lesson in teams but they also got a chance to observe their peer lessons. These observations also helped them to work in teams, solve technical, methodological or content difficulty. The PSETs supported each other during observations also. The following comments support the above mentioned inferences of the researcher: "Whenever I ran into difficulties in the classroom, especially in relation to software utilization the peer observer helped me." PSETs reported that the discussion and the sharing of experiences were fruitful and enriching for their design lessons. PSETs observations of the lessons of their peers also contributed in their design lessons.

Knowledge Process Awareness

The PSETs were encouraged to use the learning activity types for knowledge building of economics concepts but LBD provided them a space to be aware about their own distinct way of making knowledge and of learning.

PSETs were exploring their own knowledge base and using technological tools to create and present their own information. The researcher just them a nudge in the form of guidance but they were the ones coming up and saying, "What about this?" I found this extra information online. Is it alright if I use Find the Fib." One of the PSET was so enthusiastic and wanted to try all the technologies and pedagogies they were exposed to. She was the one who conducted all her lessons in both the pedagogies under the guidance of the instructor. She was for guidance for Commerce with the instructor but she was passionate about the use of pedagogy and technology therefore in Economics pedagogy also she made it a point to integrate technology and align the pedagogy in relation to the concept given by the school teacher.

Changed Perception

PSETs working in teams and creating lesson plans, developed a positive perception towards technology, methodology and the content. They expressed that now they are more adept at making plans which can integrate technology, method and content but the help from the guide and peers made them more confident in delivering the content. This can be reflected from the following comments by PSETs: "Technology is not only for saving time and creating interest, but can be effectively utilized in economics."

Building Learning Community

The LBD provided a platform to the PSETs to learn from the experiences from other PSETs which technology worked in which school for which content. The sharing made them aware about the challenges that were in a particular school. The experiences of using the different methods and the various technologies helped them to build a common platform of learning from each other successes and challenges, the things which did not work out for them. The experiences made them to learn from each other mistakes also. This is well reflected by the quote from PSETs: "One of my team member shared that Wordle and QR Codes are a hit in (School's name) and (School's name) when she gave lessons. Therefore, when I also used I found that yes, the students do like these and interact more when I used technology especially the Wordle and the QR Codes." Sharing of experiences in teams made the PSETs a better learner. They learnt from the mistakes and the successes of their team mates. The continuous sharing in the teams helped them to reflect in a better manner.

VI. CONCLUDING REMARKS

Majority of the PSETs expressed positive experiences, varied in nature when they implemented ICT integrated lessons through collaborative design teams. The PSETs articulated that ICT integrated lessons does help in knowledge building of the students. Overcoming their initial apprehensions of desing lessons, the PSETs worked ttheir way through to better student engagement. It made them realise that when technology is integrated into lessons, it makes their teaching interesting and substantial. Technology provides different opportunities to make learning more interesting and enjoyable in terms of teaching same things in a new way. For

instance, the PSETs had got more or less the same topics to be taught in different school contexts. TPACK design lessons compelled them to think beyond the routine and explore to teach the same content by analysing the content according to the school and students context and needs, taking design decisions about the instructional objectives, usage of technology, deciding the learning experiences and assessment. These design decisions made their lesson foundation more strong and developed the skill of lesson planning for TPACK.

It encouraged the PSETs to rework on their technological decisions. The PSETs reconnoitered technological tools. They went beyond what was delivered to them in TPACK Instructional Module. The module covered MS Office, Wordle, EdPuzzle, QR Codes, digital archives, data set, images etc but PSETs reconnoitered Pinterest, Cipher Codes, Puzzles online etc. These technologies were not demonstrated nor did they submit any assignment on it. It was purely the initiative taken by the PSETs to make their design lesson engaging and meaningful for their students. Planning for TPACK lessons reinforced the economics content foundation of the PSETs stronger. They were able to elaborate more on the content with the help of the extra information they accessed using web archives. They developed the skills of a researcher wherein they hunt for the relevant information according to the grade level of the students, sorting and sieving information, deciding the extent of information to supplement the text content, blending the researched information with the text information and presenting it to the students. This process expanded the content knowledge base of PSETs. They were not only aware of the LATs but effectively utilised LATs for optimum learning in the students. The experiences about development of ICT integration in design lessons honed their lesson planning and technological skills. They were better equipped to face the 21st century learners. The experiences created a viewpoint shift of technology usage from entertainment to educational purpose. The pedagogical practices improved.

Working in teams made them a community learner generating and sharing knowledge not only for their own knowledge building but also made them enthusiastically work for knowledge building in the students. The learning activity types were found to be easily incorporated in the lesson plans. All the PSETs worked with MS Office viz. MS Word, MS Excel and MS PowerPoint. They also worked with technologies like the Wordle, accessing Digital archives, Prezi, and many more which they explored on their own free will. Paradoxically, none of them used Edpuzzle, Hot Potatoes, due to extrinsic barrier to technological integration faced during the implementation of the lessons in the school.

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