ISSN(Online): 2319-8753
ISSN (Print) : 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 12, December 2018

Development of a TPACK Instructional Module for Pre Service Economics Teachers

Raju Talreja [1], Dr. Kalpana Kharade[2]

Asst. Professor, Dept. of Education, BTTC, Mumbai, India[1]

Assoc. Professor, Dept. of Education, K.J.Somaiya Comprehensive College of Education, Training & Research,, Mumbai, India [2]

ABSTRACT: Technology integration is rooted in curriculum content and students' content related learning processes, primarily, and secondarily in savvy use of educational technologies. When integrating educational technologies into instruction, teachers' planning must occur at the nexus of standards-based curriculum requirements, effective pedagogical practices, and available technologies' affordances and constraints. (Harris, J. & Hofer, M. J., 2005) Much research has been done in TPACK and it has made its way in India too. Various intervention programs have been successfully tried out in social sciences (History, Geography), science and mathematics. But a TPACK Module has not been developed and tried in Economics Teaching. Hence this paper describes the process of developing a TPACK Instructional Module for pre service economics teachers (PSETs) and implemented it on them successfully.

KEYWORDS: TPACK, Learning by Design, Pre Service Economics Teachers.

I. INTRODUCTION

Successful technology integration is rooted in curriculum content and students' content-related learning processes primarily, and secondarily in savvy use of educational technologies. When integrating educational technologies into instruction, teachers' planning must occur at the nexus of standards-based curriculum requirements, effective pedagogical practices, and available technologies' affordances and constraints. (Harris, J. & Hofer, M. J., 2005)

II. RELATED WORK

Various pathways to integrate TPACK have been reported by researchers.

Alayyar, G. M., Fisser, P., & Voogt, J. (2012) developed an intervention support of two kinds for learning: human support and online support. The human support was provided by three different experts on pedagogy, science content, and ICT respectively. The online support was an online support portal in Moodle, an open source learning management system. Design teams were formed in both learning support environments. The data from 78 per service teachers from science preparation program at PAAET (Public Authority of Applied Education and Training) in Kuwait, revealed that working in design teams led to the development of all domains related to TPACK. ICT skills were developed and the students developed a better attitude toward ICT. The working and learning in Design Teams proved to be an effective approach to develop TPACK for effective ICT integration. The blended learning support condition, showed higher gains in attitudes towards ICT, technological knowledge, and technological pedagogical knowledge.

Hu, C., & Fyfe, V. (2010) studied the impact of new curriculum on pre-service teachers' technical, pedagogical and content knowledge (TPACK). The new curriculum design adhered to four principles of problem centred learning tasks, skill development via learning-technology-by-design approach, collaborative design tasks and reflective practices. The pre-service teachers carried out design tasks via two separate activities: (1) to design and create an

ISSN(Online): 2319-8753
ISSN (Print) : 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 12, December 2018

Interactive Whiteboard teaching/learning resource and (2) to design a multimedia teaching/learning resource. The course made a positive impact on trainee teachers' confidence in all the four curriculum subject areas. Design principles applied to the design of the new curriculum were viable and had the potential to develop pre-service teachers' TPACK.

The positive impact of design approach to learn complex and interrelated ideas such as TPACK have been reported in a wide range of studies (Johnson, 2012; Mishra & Koehler, 2006)

Koehler, M. J., Mishra, P., & Yahya, K. (2007) traced the development of teacher knowledge in a design seminar. They collected field notes over the 15 weeks of learning-by-design seminar for two different groups; The Adams Family group and the Jackrabbits. The data was analysed in both ways quantitatively and qualitatively. This demonstrated the TPACK development through engagement with authentic design tasks. The quantitative analysis, reported that both design teams moved from considering technology, pedagogy and content as being independent constructs towards a more transactional and co-dependent construction that indicated a sensitivity to the nuances of technology integration (though one group did better than the other). The diagrammatic model to represent design talk, mapped the conversation of how the groups developed in their thinking about teaching subject matter with technology. The analysis showed similarities in terms of evolvement of both the groups with time, in terms of the roles played by the participants as well as the nature of meaning making within the groups. They suggested that developing TPACK is a multigenerational process, involving the development of deeper understandings of the complex web of relationships between content, pedagogy and technology and the contexts within which they function.

Koehler, Mishra, Yahya, & Yadav, 2004, looked more closely at the manner in which TPACK develops through participation in a design based activity. Qualitative and quantitative analyses of 15 weeks of field notes for two of the design teams showed that participants moved from considering technology, pedagogy and content as being independent constructs toward a richer conception that emphasized connections among the three knowledge bases. Analyses suggested that developing TPACK is a multigenerational process, involving the development of deeper understandings of the complex web of relationships between content, pedagogy and technology and the contexts in which they function.

Koehler, Mishra, Hershey, & Peruski, 2004, presented a case study of a college faculty member (Dr. Shaker) as she worked with her design team to create an online course. The analysis revealed important changes in Dr. Shaker's technological literacy and her thinking about her personal relationship with technology. In accounting for these changes, the researchers hypothesized that the learning by design approach afforded rich opportunities for Dr. Shaker (and her other team members) to deeply consider the relationships between content, pedagogy, and technology.

III.UNDERPINNING FOR THE DESIGN

A module cannot be designed and implemented until unless the context is taken into account. The following figure indicates the various contexts which the module took into consideration:

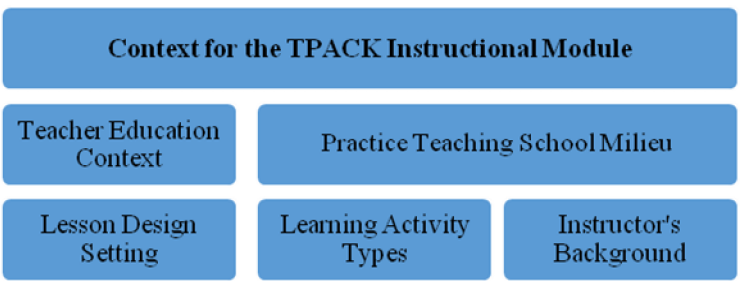

Figure 1 Context Considerations for the Module

ISSN(Online): 2319-8753
ISSN (Print) : 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 12, December 2018

Teacher Education Context

The context for the present study was integrating technology into the teacher education preparation programme at Bombay Teachers' Training College, a grant-in-aid college affiliated to University of Mumbai. The study was carried out with the pre-service economics teachers (PSETs). The institution implements the two years B.Ed. Credit Based Grading System Curriculum of University of Mumbai. This curriculum came into effect from academic year 2015-16 and was implemented for two academic terms. The module was implemented in 2016-2018 (Two academic years) with the pre service teachers who had opted for economics as their first or second pedagogy.

The two-year syllabus offers separate courses for the three primary domains of TPACK. The pre service teachers are offered pedagogy based on their discipline of graduation or post-graduation. The pre service teachers who have graduated or have a master's in commerce discipline are offered economics. The graduate commerce students are offered economics as their first pedagogy and the post graduate commerce students are given an option to select the second pedagogy. Out of the eighteen pre service teachers, eleven pre service teachers were commerce graduates, remaining seven pre service teachers who were commerce post graduate students opted economics as their second pedagogy.

The B.Ed. curriculum does not exclusively cater to the content of the economics as such, but the researcher conducted content enrichment lectures with the PSETs to brush up their content knowledge. As a part of the B.Ed. Syllabus in Semester 1, a content test in economics was conducted. The Economics Content Test was of 25 marks, which indicated the level of content knowledge that the PSETs had.

Along with the content test, the PSETs were simultaneously studying the economics pedagogy in Course 3 Section 1 Pedagogy of a School Subject.

In Semester II, the PSETs learn the different assessment strategies in the course 6 viz. Assessment for Learning. In this semester, the PSETs commence their field experiences by going to schools allotted to them. In this field experience, the PSETs observe the school teachers' lessons and the peer lessons (by the seniors in this research setting). These observations of the school teachers as well as their peers were noted down.

In Semester III, the PSTs were offered an elective course 7 Section 1 of pedagogy. The post graduate commerce discipline students exercised their elective as economics pedagogy. This revised syllabus of B.Ed. offers EPC (Enhancing Professional Competency) course in all its four semesters. The third semester offered EPC – 3 Critical Understanding of ICT. This semester provides the PSETs the hands-on field experiences where they apply their theoretical understanding of the pedagogy courses and Critical Understanding of ICT based on content foundation till the graduate/post graduate level. The PSETs are expected to deliver 26 lessons each of 10 marks. Based on these field experiences the PSETs are supposed to maintain a reflective journal.

The above mentioned B.Ed. syllabus directs that the three domains of the TPACK viz. Content Knowledge, Pedagogy Knowledge and the Technology Knowledge are provided to the PSETs as separate entities. These are offered as three separate courses with little or no connection. The PSETs learn the pedagogical bases in semester II which they apply in semester III in their lesson when they are placed in the field. The technological aspect is offered simultaneously with the field experiences where they have little scope to apply the technology in lesson delivery. This leaves little room for understanding of how these distinct courses should be amalgamated in a unionised manner to give effective lesson using TPACK.

Therefore, the researcher attempted to implement TPACK with the PSETs in order to develop an understanding of the amalgamation of the three primary domains and the intersecting domains of TPACK.

The Practice Teaching School Milieu

The PSETs were randomly allotted schools in South Mumbai area. Seven schools belonging to CBSE and the SSC boards were assigned since these schools had economics as one of the subject in STD IX and X. The schools had English as their medium of instruction. All the schools were co-ed schools.

The Lesson Design Setting

Teachers' knowledge is situated, event-structured, and episodic (Putnam & Borko 2000). Wilson, Shulman, and Richert (1987) describe it in pedagogical content knowledge terms, saying in teaching, the knowledge base is the body of

ISSN(Online): 2319-8753
ISSN (Print) : 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 12, December 2018

understanding, knowledge, skills, and dispositions that a teacher needs to perform effectively in a given teaching situation, e.g., teaching mathematics to a class of 10 year olds in an inner-city school or teaching English literature to a class of high school seniors in an elite private school (p. 10).

Similarly, teachers' planning is situated (Clark & Dunn 1991) and contextually sensitive (Brown 1990). It is also routinized and activity-based (Yinger 1979). Arguably the pre-eminent researcher on instructional planning, Yinger asserts that all of teachers' planning "could be characterized as decision making about the selection, organization, and sequencing" (p. 165) of routinized activities. More recent studies of teachers' planning (e.g., McCutcheon & Milner 2002; Tubin & Edri 2004) have reached similar conclusions, while calling for research into instructional planning that incorporates use of digital technologies.

Use of digital tools and resources can be complex but the decision to use them in planning instruction can be influenced by other aspects of other decisions already made or yet to be made.

Angeli and Valanides (2009) proposed five criteria for assessing TPACK in designing instruction with technology:

(1) identification of topics to be taught with technology in ways that signify the added value of tools, such as, topics that students cannot easily comprehend, or topics that teachers face difficulties in teaching effectively in class;

(2) identification of representations for transforming the content to be taught into forms that are comprehensible to learners and difficult to be supported by traditional means;

(3) identification of teaching strategies, which are difficult or impossible to be implemented with traditional means;

(4) selection of appropriate computer tools and effective pedagogical uses; and

(5) identification of appropriate strategies to be combined with technology in the classroom, which includes any strategy that puts the learner at the center of the learning process.

Mark Hofer Judi Harris, do not suggest that the LAT approach is a planning model per se, but they did suggest that teachers follow a general planning sequence:

1. Identify student learning goals.
2. Consider the classroom context and student learning styles and preferences.
3. Select and sequence appropriate learning activity types to combine to form the learning experience.
4. Select formative and summative assessment strategies.
5. Select tools and resources that will help best students benefit from the learning experience.

Mishra and Koehler also has suggested that lesson planning Based on the above suggestions by Angeli and Valanides, Mark Hofer Judi Harris, the researcher combined, modified and adapted the suggestions to suit the teacher education context in Indian scenario.

- The economics pre service teachers' planning a particular lesson for school students using learning activity type for knowledge building was described as the end result of five basic instructional decisions which were reflected in their lesson planning:
- Choosing learning goals
- Making practical pedagogical decisions about the nature of the learning experience based on learning activity types for knowledge building in economics of secondary school students
- Selecting and sequencing appropriate activity types for knowledge building to combine to form the learning experience
- Selecting summative assessment strategies that reveals what and how well students are learning

Since research on teachers' planning has established it to be activity-based and content-keyed (Wilson et al. 1987), planning for effective instruction in which educational technologies are well-integrated should be similarly curriculum specific and activity-focused. Therefore, for the present study, economics curriculum specific, technology enhanced learning activity types as the building block for the lessons was adopted.

The PSETs were allotted a school in which their practice teaching lessons were to be conducted. The PSETs visited the school and collected their unit (economics topic) for the scheduled day and the period planned in the time table framed for practice teaching. For the instructional planning, the PSET had to plan the learning objectives viz. general objective,

ISSN(Online): 2319-8753
ISSN (Print) : 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 12, December 2018

instructional objectives and the specific objectives. Based on the pedagogical decision, the PSET selected the learning experiences to be provided to the school students. The PSETs were free to decide on the choice of learning activity to be combined based on the pedagogy and the content they have. The learning activity type was delimited only to knowledge building types. The lesson plan structure that the PSETs utilised was the five columnar format.

Learning Activity Types

The PSETs were familiarised with the Learning activity types (Knowledge Building Activities). After the PSETs were familiar with the technology-enriched learning activity types in economics teaching, they had the complete freedom to juxtapose the content, pedagogy and the learning activity type (Technology) in alignment with their interpretations of the content and keeping in mind the school milieu, thus building their TPACK in practical way in real life situation.

This was in contrast, from how teachers typically integrate technologies into their teaching. They usually examine out the affordances and constraints and then the objectives of the content are chosen. The technocentric approach is followed; first deciding the technology and then aligning the other aspects around it.

But in activity types approach, the PSETs got content topic from the school teachers, they then decide upon their pedagogy, the learning objectives and finally the selection of the technology is made. Thus the activity design is finalized after taking guidance and discussion with the researcher.

This assured that the most appropriate technology was selected that best aided in realisation of the learning objectives and activities, leading to maximum student involvement and learning. By focusing first and primarily upon the content and nature of students' curriculum based learning activities, teachers' TPACK is developed authentically, rather than technocentrically (Papert 1987), as an integral aspect of instructional planning and implementation.

The taxonomy of 42 social studies learning activity types are proposed by Harris & Hofer, are examined in content areas such as history, geography but the researcher did not come across any study using them for economics teaching. Thus, this study is an attempt to use the knowledge building learning activity types for economics content of Std IX & X of various school boards.

Learning by Design: A Vision for New Learning

Education has seen a transformation in the way it is imparted. Earlier it was the traditional approach where the teachers and students were face to face, teachers were the supreme knowers and the students were the tabula rasa. This approach to education changed gradually and toward the 20th century the learners were the focus and the teachers' facilitators. Now-a-days, the students are the foci point but they take the responsibility of their learning. Students work in groups or individual student collaborates with others to find answers to learning. This need not be confined to the institutional structure but the learning and working can take place wirelessly through chat, email, Google using networked computers. Students are the creators and the designers. In contrast to a standard workshop approach that puts teachers in the role of passive consumers of technology, the learning technology by design approach puts teachers in a more active role as designers of technology. (Koehler, M. J., Mishra, P., & Yahya, K., (2007).

In this study, the PSETs were the creators of the artifacts (design lesson plan) and they decided how to design their plans keeping in mind the broad objectives and guidelines given by the researcher. To design their lesson plans, the PSETs linked the five columnar lesson plan, the learning activity type, content knowledge, technological knowledge, and pedagogical knowledge, the context of the school and the teacher education institution. Based on this interlaced mat created, the PSET noted down their reflection and shared their experiences of involvement in design teams. The PSETs were the creators of their own learning of TPACK in teams.

The Instructor's Background

The course Critical Understanding of ICT was transacted by two teacher educators, but the researcher was the instructor and the implementer of the TPACK Instructional Module. She took special permission from the institutional head to implement the module on pre service economics teacher. She was also permitted to guide the economics TPACK lesson plan, wherein the student teacher planned to incorporate technology based on their understanding of TPACK. The researcher has over thirteen years of teaching experience in ICT teaching and commerce and economics pedagogy. The researcher transacted the pedagogy of commerce and economics. The content enrichment of the PSETs was done in the respective pedagogies, although the PSETs already had a base of the content during their graduation or

ISSN(Online): 2319-8753
ISSN (Print) : 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 12, December 2018

post-graduation in economics or commerce. The other teacher educator who was involved in the transaction of ICT did not cover TPACK and the learning activity types including the technologies. These were oriented by the researcher.

Intertwining the contexts to build the LBD Based Instructional Module

At the heart of TPACK is the dynamic, transactional relationship between content, pedagogy, and technology. Good teaching with technology requires understanding the mutually reinforcing relationships between all three elements taken together to develop appropriate context-specific strategies and representations (Koehler et al. 2007)

Good computer skills are not enough for pre-service economics teachers to give technology-mediated lessons. Some studies showed that pre-service teachers who had good computing skills with specific training in uses of computers designed better technology-mediated lessons than those who also had good technical skills but no specific training in the educational uses of computers (Angeli and Valanides 2005; Angeli 2005; Valanides and Angeli 2006, 2008). They concluded that teacher educators need to explicitly teach how the unique features can be employed to transform a specific content domain for specific learners, and that teachers need to be explicitly taught about the interactions among technology, content, pedagogy, and learners.

The present teacher education preparing teachers for secondary and higher secondary levels, indicates that the content, pedagogy and technology are transacted in a compartmentalized syllabus without discussing the interplay and interconnections between the three domains of content, pedagogy and technology. Hence in order to develop TPACK in economics teaching requires a coursework which would integrate and reveal the complex, multi-dimensional relationships between the three knowledge domains.

The step towards transacting the TPACK was to clarify the content, technology and pedagogy. Firstly, individually and then explicit connections among the content, pedagogy and technology was attempted in this module which could be implemented in a meaningful and realistic context for secondary education.

The context of this training module was teacher education course - B.Ed. designed for Pre Service Economics Teachers, (PSETs) on how to design lesson plan and apply appropriate pedagogies and technology to practice teaching in order to gain teaching experience.

IV. TPACK MODULE

TPACK Instructional Module

TPACK Instructional Module is grounded in the learning by design for development of TPACK among PSETs. It synthesizes guidance prompts to activate relevant knowledge and resources to help teachers in framing the design and facilitating their design decision making. (Angeli & Valanides, 2009; Koh et al., 2015; Kramarski & Michalsky, 2010; Mishra & Koehler, 2006).

The design process first focused on introduction, demonstration, development of design artifacts, implementation of the design product, revisions and reflections.

A framework was designed with a view, of teachers as designers of innovative content, working individually and/or collaboratively, discussing and interacting with the instructor, technology and their peers. In such a context, a challenging issue was the content and structure of appropriate activities for cultivating various types of synthetic knowledge combining technology, pedagogy and content through asynchronous collaboration. The PSETs played multiple roles, including technology designer and developer, content provider and course instructor during their practice teaching. These roles were carried out before the lesson keeping in mind the context of the practice teaching school, its technological affordances and hindrances.

The TPACK module was designed and implemented in three phases:

1. The Exploratory Phase
2. The Intercession Phase
3. The Closure Phase

ISSN(Online): 2319-8753
ISSN (Print) : 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 12, December 2018

An overview of the TPACK Instructional Module represented in the following figure.

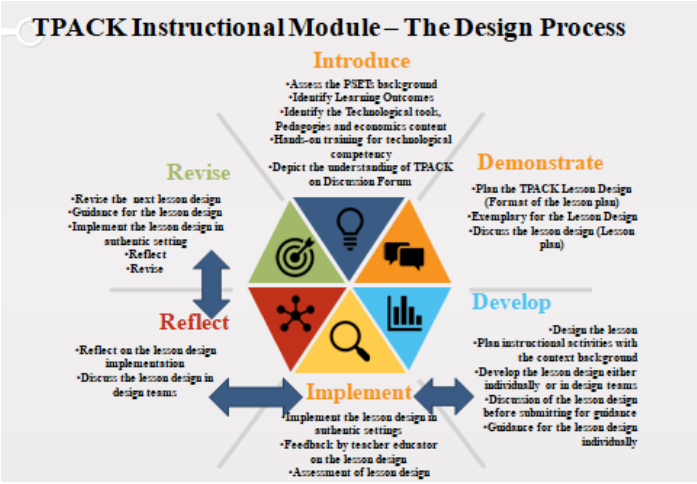

Figure 2 TPACK Instructional Module- The Design Process.

Chia-Jung Lee and Chan Min Kim developed the TPACK-IDDIRR (Introduce, Demonstrate, Develop, Implement, Reflect, and Revise) model. The IDDIRR model served as a practical framework that embodies the afore-mentioned design guidelines and illustrates practical procedures that were used for economics teaching.

V. DESCRIBING THE DESIGN PROCESS

- **Phase 1 – The Exploratory Phase**
  This phase endeavoured to set the base for TPACK Instructional Module.

- **Objectives of Exploratory stage**

1. To ascertain pre intercession TPACK of PSETs.
2. To ascertain pre intercession economics teaching efficacy belief scores of the PSETs.
3. To ascertain pre intercession beliefs about instructional use of ICT in teaching Economics.

The phase achieved the above mentioned objectives. The scores for PSETs TPACK, Economics Teaching Efficacy Beliefs and Beliefs about Instructional Use of ICT were ascertained by administering aforementioned variable instruments.

- **Phase 2 – The Intercession Phase**

The most crucial phase of the study – The Intercession Phase. The phase describes the design of TPACK Instructional Module. The phase was designed keeping in mind the contextual background mentioned earlier in the chapter. The module is grounded in learning by design approach for the development of TPACK among PSETs.

- **Objectives for Intercession Phase**
- To implement the TPACK Instructional Module using IDDIRR model.

- The IDDIRR Model
- **I – Introduce TPACK**

ISSN(Online): 2319-8753
ISSN (Print) : 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 12, December 2018

- **Objectives of the Introduce stage**

1. To introduce TPACK to PSETs.
2. To develop an understanding of Learning Activity Types for knowledge building in economics.
3. To orient PSETs to learning by design.

The Introduce stage was encapsulated for 4 weeks. Before introducing the concept, PSETs completed a self-reported TPACK survey, Beliefs about instructional use of ICT in teaching Economics and Economics Teaching Efficacy Beliefs.

Applying the TPACK-IDDIRR model in economics teaching, the instructor started at the Introduce (I) stage to help PSETs understand TPACK (Jang and Chen 2010). The purpose of this stage was to build pre-service teachers' knowledge base of TPACK to facilitate their learning in the design activities later on. The instructor explained the meaning of the seven domains of TPACK viz. Technological Knowledge (TK), Content Knowledge (CK), Pedagogical Knowledge (PK), Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK) and Technological Pedagogical Content Knowledge (TPACK). Examples were provided for each domain. However, this stage focused mainly on familiarizing pre-service teachers with CK, PK, and TK because the mastery of these three domains is the basis for integrated understanding of TPACK.

The orientation of PK simultaneously took place in the pedagogy class. The theoretical procedural knowledge of the pedagogy along with the advantages and limitations were discussed. The teaching methods were a part and parcel of the pedagogy course. The instructor went beyond the pedagogies mentioned in the pedagogy syllabus. For example, Computer assisted presentation, additional cooperative learning techniques (Find the Fib, Circle of Speakers, etc), were discussed.

Following is a brief description of the elements, as oriented by the instructor and how it was used to guide the development of a coherent curricular module for PSETs.

- **Content Knowledge (CK):** Was the subject matter of Economics that is to be transacted by pre-service economics teachers in various practice teaching schools. The practice teaching schools were affiliated to different educational boards. The following content concepts were brushed up and revised with the PSETs:

Story of the village of Palampur, Factors of production - Land, capital, labour, entrepreneur, Characteristics of Industrial Economics, Food Security in India, Need of food Security, Flaws in food security, Trade, Poverty as a Challenge, Inflation, Inflation control, Inflation effects, Public Distribution System, People as Resource , Unemployment, Corruption, Tourism

- **Technological Knowledge (TK):** Technological knowledge (TK) was deliberated upon with the PSETs in EPC - Critical Understanding of ICT. The following technological tools and software were discussed:

Prezi, Wordle, EdPuzzle, Quick Response Code (QR Code), MS Office (MS Word, MS Excel, MS PowerPoint), Hot Potatoes , Digital Archives, Data sets, Image sharing sites, Open Educational Resources

To expose the students with hands-on-experience, the student teachers were asked to submit an assignment on the above mentioned technologies. For the assignment they had the freedom to choose any economics content.

- **Pedagogical Knowledge (PK):** Describes the collected practices, processes, strategies, procedures, and methods of teaching and learning. It also includes knowledge about the aims and objectives of instruction, assessment, and student learning.

Various pedagogies were transacted: Survey, Project, Problem solving, Seminar, Workshop, Discussion, Case study, Educational Games, Co-operative Learning Techniques.

Pedagogical Content Knowledge: The PCK economics included pedagogical strategies and techniques, representation and formulation of concepts, knowledge of what makes those concepts difficult or easy to learn, knowledge of misconceptions, prior knowledge or cognitive difficulties, etc. PSETs understanding of the best practices for teaching economics content to Std IX/X students in the school context.

ISSN(Online): 2319-8753
ISSN (Print): 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 12, December 2018

Technological Content Knowledge: The TCK in economics incorporated issues of how economics is transformed by the use of specific technological tools. PSETs knowledge of how the digital tools available can enhance or transform the content, how it's delivered to students, and how the students can interact with it.

Technological Pedagogical Knowledge: The TPK in economics included the knowledge of how technology can support specific pedagogical strategies in the classroom; for example, fostering inquiry or collaborative and cooperative learning. PSETs understanding of how to use digital tools as a vehicle to the learning outcomes and experiences they planned.

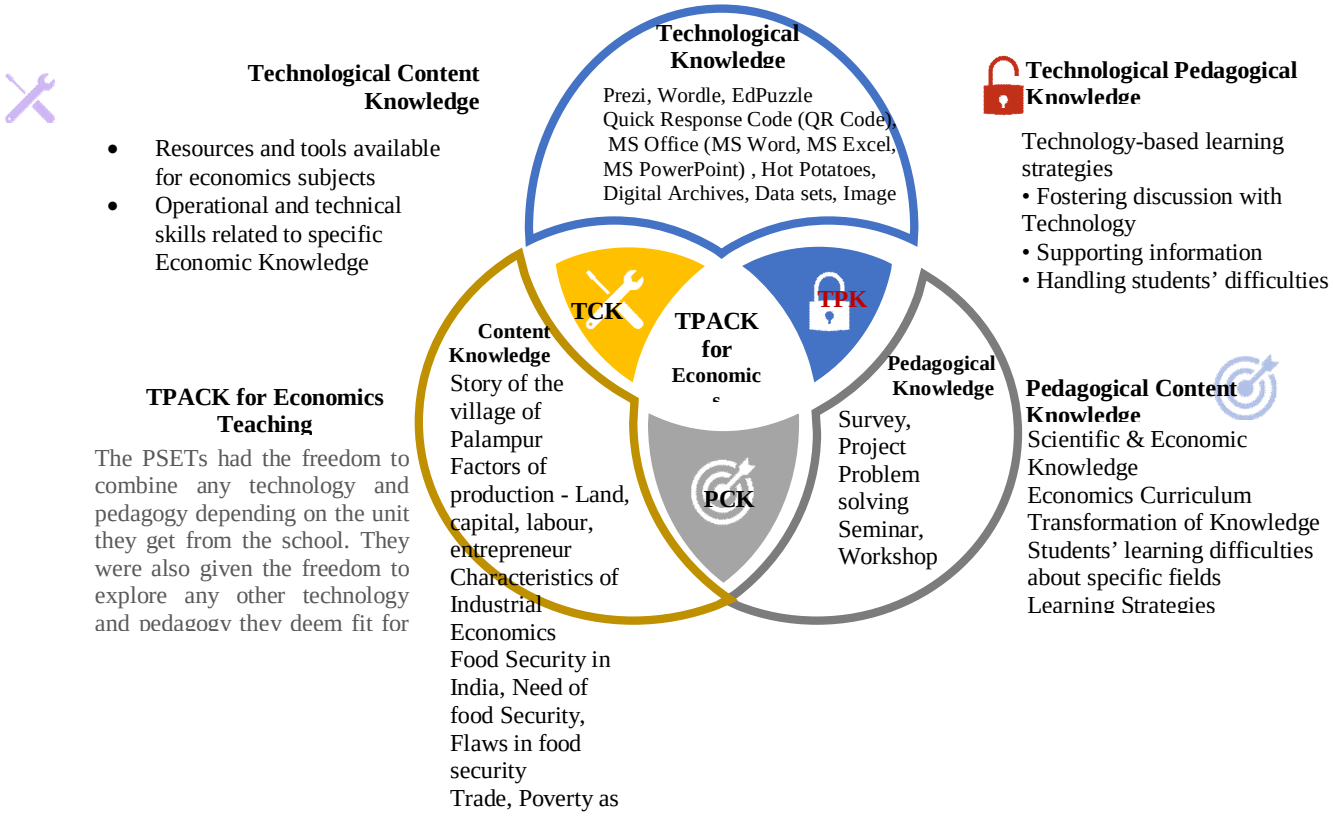

Figure 3 TPACK for Economics Teaching in the module

Once the PSETs were familiarized with TPACK, they participated in a discussion forum created on http://bttc.shiksha/moodle/course/view.php?id=28 based on Moodle platform. The discussion forum was a platform wherein the PSETs expressed their understanding of TPACK.

ISSN(Online): 2319-8753
ISSN (Print): 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 12, December 2018

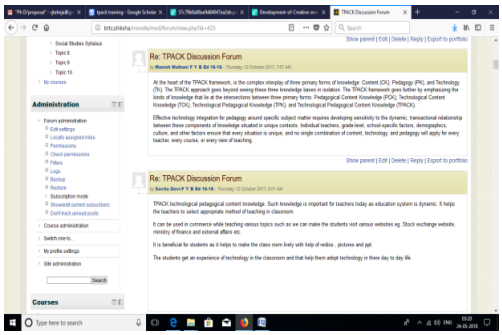

Figure 4 Screen shot of the Discussion Forum

The TPACK groundwork being laid down, the researcher proceeded to orient the PSETs to Learning Activity Types for knowledge building and Learning by Design. The PSETs can perform any activity type for knowledge building mentioned below. The possible technologies that can be integrated is discussed with the PSETs in the technological knowledge session.

- Read text, View presentation, View Images, Listen to Audio, Group Discussion, Field Trip, Simulation, Debate, Research, Conduct an Interview, Artifact-Based Inquiry, Data-Based Inquiry

For example, a PSET can choose read text activity type wherein s/he can access websites, electronic books, digital archives, data sets in order to align with economics content and pedagogy chosen.

Learning by Design is an approach to learning TPACK. The design created is the lesson plans. The complex designs are a result of the pursuit of synergistic energy created by the design teams in helping each other, sharing tasks and tools as inputs (Goodyear & Retalis, 2010). The key to high quality designs is possible only when PSETs keep an open minded stance to value the views expressed by others during design conversations. (Schon, 1887). These lesson designs which are to be implemented in real-school context were supervised. PSETs were assessed on their lesson designs implementation through Practice Teaching Observation Rubric and Technology Integration Assessment Rubric filled by the supervisor (teacher educator). In addition, oral and written descriptive feedback on the design lessons was given. The PSETs were instructed that lesson designs should be created keeping the context in mind. Sharing and building upon each other's ideas is the thumb rule to be kept in mind.

D- Demonstrate TPACK

Objective of Demonstrate stage

1. To demonstrate a TPACK lesson in economics.

   Second, the instructor demonstrated (D) a TPACK-based teaching example to pre-service teachers in the third week. Pre-service teachers were expected to enhance their understanding of TPACK by observing the demonstrated teaching example (Bandura 1977; Jang and Chen2010; Merrill 2007). It was necessary to present an exemplary curriculum material to inspire PSETs to learn and collaborate better in their teams; the affordances and hindrances of various technology for economics, because it was readily available and user friendly with the potential of supporting students' higher-order thinking in economics (Agyei & Voogt, submitted).

   The basic lesson design was deliberated upon with PSETs. The instructor discussed the five columnar lesson design which the institution followed and how it was adapted for TPACK. The TPACK components were inbuilt and in alignment with the lesson design. The three major domains of TPACK viz., Content knowledge, Pedagogical Knowledge and Technological Knowledge were reflected as the Content Analysis Column, Teacher-Student Activities and Resources respectively. The column of Teacher-Student Activities suggested how the PSET utilised technology for building economics knowledge among students, the interplay of technological pedagogical knowledge and pedagogical content knowledge. Please see Appendix J for the instructor's lesson plan.

ISSN(Online): 2319-8753
ISSN (Print): 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 12, December 2018

To familiarize the PSETs with the lesson design, the instructor explained in detail the columns and how it reflects the TPACK components. The first page of the lesson plan takes into account the previous knowledge of the students, planning for the instructional objectives, choosing the pedagogy for the particular content topic given by the economics school teacher, time duration of the lesson, core element (according to National Policy of Education, 1986) and planning for the set induction, concluding with the statement of aim of the lesson.

The next page is divided into five columns viz., Content Analysis, Specifications, Presentation (Teacher's Activities and Student's Activities), Resources utilized and Assessment.

The economics pre service teachers' planning a particular lesson is the end result of five basic instructional decisions which is reflected in the lesson planning:

• Choosing learning goals (First page- Instructional Objectives)

• Making practical pedagogical decisions about the nature of the learning experience based on learning activity types for knowledge building in economics of secondary school students (Column 3 and 4, Presentation)

• Selecting and sequencing appropriate activity types for knowledge building to combine to form the learning experience (Column 3 and 4, Presentation)

• Selecting summative assessment strategies that will reveal what and how well students are learning (Column 5- Assessment)

• Selecting tools and resources that will be chosen from learning activity types for knowledge building in economics which best help students to benefit from the learning experience being planned. (Column 4- Resources)

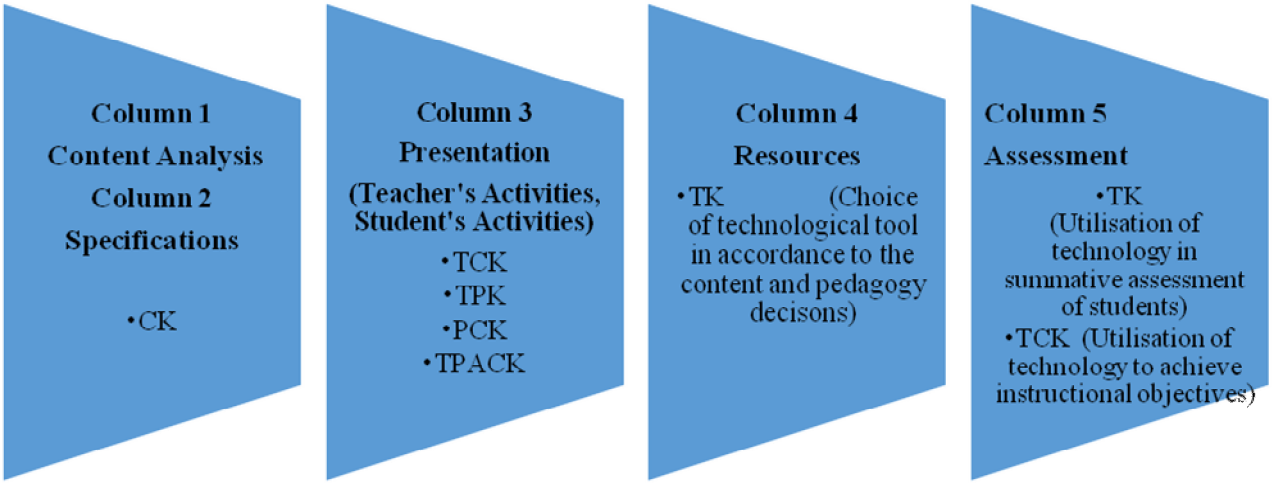

Figure 5 Lesson Design and TPACK

The DT's learned the technologies they needed to as they made decisions about what content to include and with what appropriate instructional strategy, what activities and assignments they wanted their students to engage in, how their students would be assessed, and how the lesson would appear visually. (Agyei, D.D. & Voogt, J. (2011).

D- Develop TPACK

Objectives of Develop Stage

1. To develop the skill of designing TPACK based lesson plan in economics.
2. To equip the PSETs for ICT integrated lesson planning for teaching Economics curriculum.

Pre-service teachers were divided into small groups and each student developed (D) a TPACK-based lesson plan based on what they had learnt in the previous two stages. Development of lesson design was done in design teams. Design teams of 2 to 3 PSETs were formed and allotted a school. Although the nature of the design teams was fixed,

ISSN(Online): 2319-8753
ISSN (Print): 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 12, December 2018

possibility of reforming the design team cannot be ruled out. The design team was rotated only on unavailability of the school due to some activities/examination/inspection/any other reason stated by the school.

Once the schools were allotted to the design teams, the PSETs approached the economics school teacher after drawing up a practice teaching time table wherein the team members were given the class and division. The topic for the practice teaching lesson, day and date, school and the timings were pre decided in accordance with the practice teaching and the school time tables. Accordingly, PSET approached the economics school teacher and collected economics topic to be taught during practice teaching.

The PSETs discussed the topic they receive from the school Economics teacher. Every one prepared the lesson design keeping in mind the five basic instructional design decisions. The five columnar lesson plan was written. Autonomy was given to the PSETs to integrate the pedagogy and technology in alignment with the content depending on the school board and the profile of the learner. The lesson artifacts were submitted to the researcher. The researcher anticipated that the PSET may encounter multi-faceted difficulties such as selecting technological tools accompanied with pedagogical methods, and practice teaching school environment. Accordingly, guidance and discussion with the PSET took place. Revisions if necessary were done. A fair lesson plan was written incorporating the suggestions.

The researcher during the guidance session, often asked the PSETs the basis of their decisions for the combination of learning activities used in their design lessons. The opinions of the PSETs were grounded in assumptions. For example, few of them placed a high value on activity based learning and decided upon learning activity type which lend for more interaction and doing by school students. Few other chose learning activity type based on the needs of their students they presumed. The researcher then discussed how all these approaches may be appropriate and that in reality multiple selections are used in various combinations. The key focus here was to design lesson with best possible integration of content, pedagogy and technology which decides the learning activity type combination. These combinations were purposeful and varied according to the contextual factors such as school environment, prior knowledge the PSETs perceive, the grade level, etc.

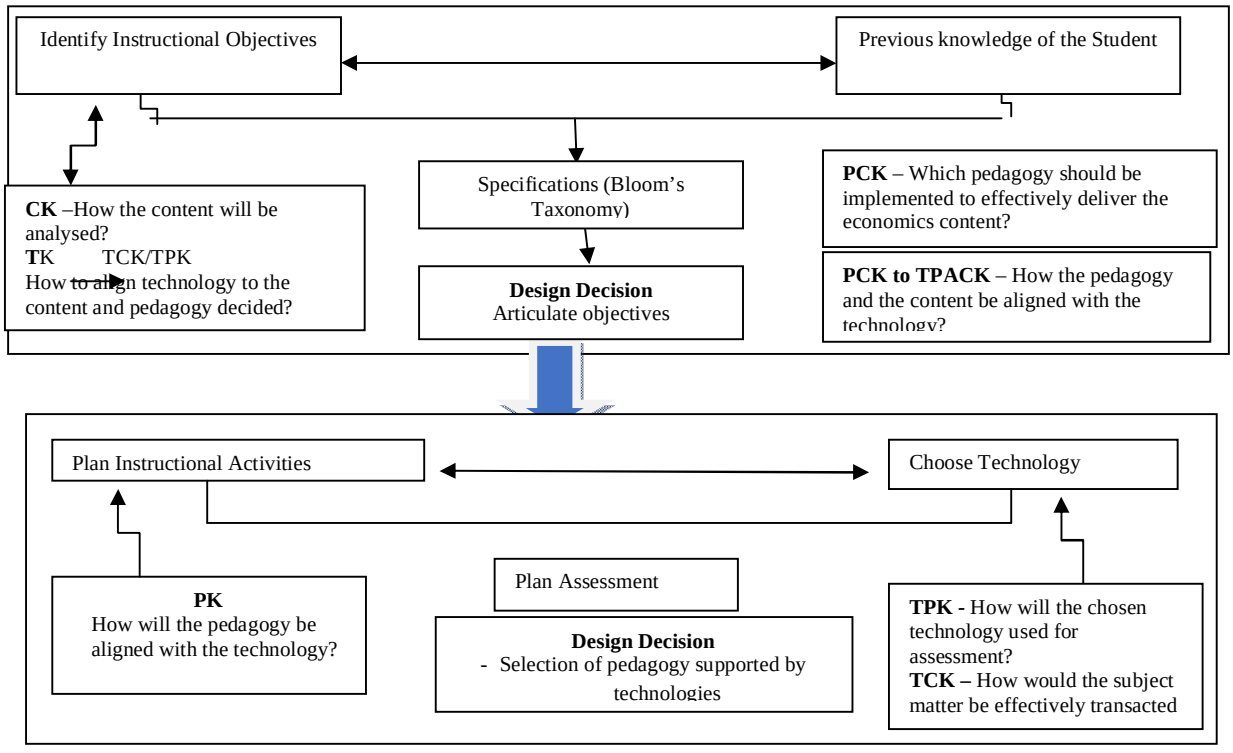

Figure 6 Design Decisions taken by PSETs (Adapted from Chai & Koh, 2017)

ISSN(Online): 2319-8753
ISSN (Print): 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 12, December 2018

I - Implement TPACK

Objective for Implement stage

1. To implement the TPACK based lesson plan in real classroom setting.

The pre service teacher implemented the lesson in the school allotted to them. Teacher educators from the institution went to supervise the lessons. In order to bring in objectivity, the teacher educators went in rotation to the practice teaching schools. The supervisor (teacher educator) provided oral and written feedback to the student.

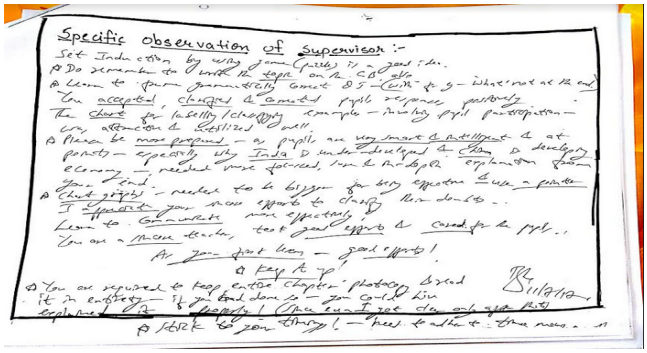

Figure 7 Sample of Teacher Educators' Feedback

The stages of develop and implement went up to the eleventh week, when the PSETs finished their practice teaching. Although the Reflect and Revise stages followed this, but it went concurrently along with Develop and Implement stages.

R- Revise the TPACK

Objective for Revise stage

1. To make revisions in the lesson design based on sharing of experiences in design teams.

PSETs TPACK designs revisions took place at various steps viz., before planning (discussion in design teams), after guidance from the instructor, after implementation of the lesson, based on feedback by supervisor, personal reflection and sharing of experiences in the design teams. Based on this, the next pre service teacher, revised(R) the TPACK in lesson design. The PSET reflects on each lesson after implementation. The IRR stages work iteratively until all the members of each group have a chance to implement the lesson (Fernandez 2005, 2010). Reflections and revisions goes hand in hand, albeit the written reflection is after the implementation of the lesson.

R- Reflect on TPACK

Objectives for Reflect Stage

1. To reflect on the implementation of the TPACK lesson plan.
2. To incorporate the feedback given by teacher educators.

The PSET wrote her/his reflection(R) in the journal. Next, when the PSETs were in the institution, they shared their reflective experiences, affordances and hindrances in TPACK faced in the particular school.

Phase 3 – The Closure Stage

This phase endeavoured to conclude TPACK Instructional Module.

Objectives of Closure stage

1. To ascertain post intercession TPACK of PSETs.
2. To ascertain post intercession economics teaching efficacy belief scores of the PSETs.
3. To ascertain post intercession beliefs about instructional use of ICT in teaching Economics.

ISSN(Online): 2319-8753
ISSN (Print): 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 12, December 2018

The phase achieved the above mentioned objectives. The scores for PSETs TPACK, Economics Teaching Efficacy Beliefs and Beliefs about Instructional Use of ICT were ascertained by administering aforementioned variable instruments again at the end of the module.

V. CONCLUSION

The coursework lasted for 28 sessions of 50 minutes each spread over three months inclusive of theory, discussion and practical. The pre service economics teachers (PSETs) were provided extra practical sessions. Participants included a single instructor and a total of 18 PSETs. The instructor, who was the primary researcher, specializes in Economics and Commerce pedagogy teaching. PSETs were pursuing their Two year B.Ed. Course from a teacher education institution affiliated to Mumbai University.

The sessions were conducted before the PSETs went in for practice teaching. The period of training was from 23.06.17 to 28.09.17. The training sessions was followed up by practical sessions wherein the PSETs were given hands-on-training related to technological tools and TPACK. At the end of the training period the PSETs articulated their understanding of TPACK on a Discussion Forum created on http://bttc.shiksha/moodle/course/view.php?id=28 based on Moodle platform. They received instruction in combination to extended individual and collaborative coursework in the computer laboratory. After PSETs developed the knowledge about TPACK, they prepared practice teaching lessons which was guided and reviewed by the instructor. Equipped with the knowledge and lesson plans, the PSETs implemented the economics TPACK lessons in the designated schools. They were supervised by a teacher educator and feedback on their lesson implementation was provided. Keeping the feedback and the written reflections about the lessons, the PSETs made revisions in the artifacts in design teams before writing the next lesson. The design teams discussed the school milieu, hindrances and affordances of technology in a particular school, learning outcome, management of the students, organisation of the content. Accordingly, the next lesson plans were revised and submitted for again. This iterative process of implementation, reflection, revision took place for all the lessons for all the PSETs.

The researcher implemented this TPACK Instructional Module successfully wherein the results indicated the effectiveness of the module when analysed quantitatively with large effect size. The results of this effectiveness is discussed in another paper.

REFERENCES

1. Agyei, D.D. & Voogt, J. (2011). Determining Teachers' TPACK through observations and self-report data. In Proceedings of Society for Information Technology& Teacher Education International Conference 2011 (pp. 2314-2319)..
2. Alayyar G. M., Fisser P. and Voogt J. (2012). Developing technological pedagogical content knowledge in pre-service science teachers: Support from blended learning. *Australasian Journal of Educational Technology* 2012, 28(8), 1298-1316
3. Bower, Matt (2017). *Design of Technology-Enhanced-Learning: Integrating Research and Practice*. Bingley, UK, Emerald Publishing Limited
4. Ching Sing Chai & Joyce Hwee Ling Koh (2017) Changing teachers' TPACK and design beliefs through the Scaffolded TPACK Lesson Design Model (STLDM), Learning: *Research and Practice*, 3:2, 114-129, DOI: 10.1080/23735082.2017.1360506
5. Goodyear, P., & Retalis, S., (2010). Learning, technology and design. In P. Goodyear & S. Retalis (Eds.), *Technology-enhanced-learning – Design patterns and patterns languages* (pp 1-28). Rotterdam: Sense Publishers
6. Hu, C., & Fyfe, V. (2010). Impact of a new curriculum on pre-service teachers‟ Technical, Pedagogical and Content Knowledge (TPACK). *In C.H. Steel, M.J. Keppell, P. Gerbic & S. Housego (Eds.), Curriculum, technology & transformation for an unknown future*. Proceedings ascilite Sydney 2010 (pp.185-189).
7. Harris, Judi and Hofer, Mark J., "Instructional Planning Activity Types as Vehicles for Curriculum-Based TPACK Development" (2009). Book Chapters. 5. https://scholarworks.wm.edu/bookchapters/5
8. Hall, Jacob, (2018). *A Mixed Methods Comparison of the First Principles of Instruction in Flipped and Face-to-Face Technology Integration Courses*. Doctoral Dissertations - ALL. 918.
9. Hofer, Mark J. and Harris, Judi, "Differentiating TPACK Development: Using Learning Activity Types with Inservice and Preservice Teachers" (2010). Book Chapters. 7. https://scholarworks.wm.edu/bookchapters/7
10. Jang, S. J., & Chen, K. C. (2010). From PCK to TPACK: Developing a transformative model for preservice science teachers. *Journal of Science Education and Technology*, *19*(6), 553–564.
11. Koehler M. J., Mishra P, Yahya K. (2007). Tracing the development of teacher knowledge in a design seminar: Integrating content, pedagogy and technology. *Computers & Education* 49 (2007) 740–762

ISSN(Online): 2319-8753
ISSN (Print): 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 12, December 2018

12. Koehler, M.J., Mishra, P., Yahya, K., & Yadav, A. (2004). Successful teaching with technology: The complex interplay of content, pedagogy, and technology. In C. Crawford et al. (Eds.), *Proceedings of Society for Information Technology and Teacher Education International Conference 200*4 (pp. 2347-2354).
13. Koehler, M.J., Mishra, P., Hershey, K., & Peruski, L. (2004). With a little help from your students: A new model for faculty development and online course design. *Journal of Technology and Teacher Education, 12*(1), 25-55.
14. Uygun E. (2013). *Learning by Design: An Integrated Approach for Technological Pedagogical Content Knowledge Development*. Masters Dissertations - The Graduate School of Social Sciences of Middle East Technical University