

# TESTING THE EFFECTIVENESS OF TPACK BASED INSTRUCTIONAL MODULE

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**Abstract:** Nowadays, pre-service teachers, as digital natives (Prensky, 2005) who have grown up with technology, are usually competent in using information and communication technology (ICT) in their everyday lives but in most cases they have not a clear idea of how to integrate ICT into teaching and learning. Furthermore, teacher training on ICT usually focuses on either technical skills or background knowledge of ICT rather than pedagogical uses invoked by ICT use (Jung, 2005). In this dynamic technological world, isolated skills of technology and pedagogy cannot be feasible. What seems paramount in teacher training is the interweaving of content, pedagogy and technology. According to Mishra and Koehler (2006), TPACK is an integration of technological, pedagogical, and content knowledge. These integrated forms of knowledge are PCK, technological content knowledge (TCK), technological pedagogical knowledge (TPK), and technological pedagogical content knowledge (TPACK). The purpose was to test the effectiveness of TPACK based instructional module on the development of TPACK among economics pre service teachers. Experimental method was adopted to conduct the study. Eighteen pre service economics teachers' (PSETs) participated. These pre service teachers were from a college of education affiliated to University of Mumbai. Data was collected by TPACK scale in Economics which was administered before and after the implementation of the instructional module. Paired t-test and Cohen's d were used to analyse the data. Findings of the paired t-test was significant. The Cohen's d indicated very large effect size leading to the conclusion that the instructional module based on TPACK was effective.

**Key Words** – Pre service teachers, TPACK.

## Introduction

The rapid technological advancement of the twenty-first century has transformed the ways in which we teach and learn. As a result, student teachers should be equipped to integrate technology into classroom practices, especially for specific subject matter. TPACK is a framework for teacher knowledge, and as such, it may be helpful to those planning professional development for teachers by illuminating what teachers need to know about technology, pedagogy, and content and their interrelationships.

The ability of the teachers to integrate technology into different teaching methods has become essential because of the rapid advancement of technology in the twenty-first century. This advancement has transformed ways in which people teach and learn in the school setting. Researchers have shown a growing interest in studying how teachers incorporate technology into their teaching (Graham et al., 2009; Niess, 2005; Srisawasdi, 2014). Recent studies have shown that teachers need to have a good understanding of how technology can be coordinated with pedagogy and content knowledge in order to integrate technology effectively into classroom instruction (Gess-Newsome, 2002; Graham et al., 2009; Niess, 2005). This requires an expansion in our understanding of the teacher knowledge frame work that is, how teachers relate their pedagogical knowledge to their content knowledge or, as introduced by Shulman (1986), their pedagogical content knowledge (PCK) to a new framework that includes technological knowledge (TK), the so-called Technological Pedagogical Content Knowledge (TPACK) framework (Angeli & Valanides, 2009; Mishra & Koehler, 2006). According to Mishra and Koehler (2006), TPACK is an integration of technological, pedagogical, and content knowledge. These integrated forms of knowledge are PCK, technological content knowledge (TCK), technological pedagogical knowledge (TPK), and technological pedagogical content knowledge (TPACK).

## Need of the study

The researcher felt simply teaching the technological tools to the pre service teachers will be inadequate until unless they can transfer these skills in the teaching learning process and integrate technology into the classroom curriculum with a purpose. The present teacher education curriculum provides little scope to amalgam the compartmentalised courses of pedagogy, content and technology. This research is an endeavour to break these invisible walls between the courses leading to practical implementation of the TPACK. It is observed that preservice teachers born and brought up as digital natives, are merely the consumers of technology. They use the available technology. Hence the need that pre service teachers should turn from the consumer to producer of ICT based instructional resources. When the pre service teachers are producers of digital teaching materials, then only in the true sense will technology be integrated with pedagogy.

### Theoretical Background

Underlying truly effective and highly skilled teaching with technology, we argue, is technological pedagogical content knowledge. TPACK is different from knowledge of its individual component concepts and their intersections. It arises instead from multiple interactions among content, pedagogical, technological, and contextual knowledge. TPACK encompasses understanding and communicating representations of concepts using technologies; pedagogical techniques that apply technologies appropriately to teach content in differentiated ways according to students' learning needs; knowledge of what makes concepts difficult or easy to learn and how technology can help redress conceptual challenges; knowledge of students' prior content-related understanding and epistemological assumptions, along with related technological expertise or lack thereof; and knowledge of how technologies can be used to build on existing understanding to help students develop new epistemologies or strengthen old ones. TPACK is a form of professional knowledge that technologically and pedagogically adept, curriculum-oriented teachers use when they teach. Many aspects of these ideas are not new. As Shulman (1986) and others have argued, teachers' knowledge for effective practice requires the transformation of content into pedagogical forms. What has been overlooked in most cases, we suggest, are the critical roles that technology can play.

### Research Methodology

The researcher used the single group pre-test and post-test experimental design. The cohort of eighteen pre service economics teachers (PSETs) were administered the TPACK scale twice, before and after the completion of the instructional module based on TPACK.

### Population and Sample

This study revolves around PSETs from a particular teacher education institution affiliated to Mumbai University. Purposive Convenient Sampling Technique was adopted. The sample consisted of all economics pre service teachers' who are admitted to a particular B. Ed college affiliated to University of Mumbai. PSETs were enrolled in the 2 years B.Ed. (Credit Based Grading System). Pre Service Economics Teachers (PSETs) opted for Economics Pedagogy as their first or second pedagogy. PSETs who had graduated from Commerce stream opted for Economics Pedagogy as their first pedagogy whereas those who had a post-graduation in Commerce opted for Economics pedagogy as their second pedagogy. Hence, eleven PSETs had their first pedagogy as Teaching of Economics and seven PSETs were offered Economics teaching as their second pedagogy. Except for one male, remaining seventeen participants were female.

### Data and Sources of Data

TPACK scale in Economics was developed by the researcher. The researcher adapted the TPACK survey of Denise A. Schmidt, Evrim Baran, and Ann D. Thompson. The adapted tool had 77 items to be rated on a five-point scale by the respondents.

### Variables

**TPACK for this study:** In the study, pre-service teachers' knowledge and skills which are needed to teach and plan lessons to teach economics is operationalized as their TPACK, and consists of the following specific knowledge and skills:

- Content knowledge (CK): the knowledge about economics concepts of SSC and CBSE schools.
- Pedagogical Knowledge (PK): knowledge and skills about planning and implementing lessons in economics.
- Technological Knowledge (TK): knowledge and skills about use of learning activities for knowledge building in economics.
- Pedagogical content knowledge (PCK): the knowledge and skills of how to apply knowledge building learning activities technology to teach particular economics content.
- Technological content knowledge (TCK): the knowledge and skills of using technology for teaching economics concepts with the help of learning activity types for knowledge building.
- Technological Pedagogical Knowledge (TPK): The knowledge and skills of pre service economics teachers of how to use technology in lesson planning for teaching of economics for secondary school students.
- Technological pedagogical content knowledge (TPACK IN ECONOMICS): the knowledge and skills of representing economics concepts with learning by design approach using knowledge building activities for economics.

### Developing the Interacting Components of TPACK

How are teachers to acquire an operational understanding of the complex relationships among content, pedagogy, technology, and context? The run-of-the-mill approaches for exposing pre service teachers to technologies are based on the assumption that just the orientation and a few practical in the computer laboratory are sufficient. There is a bridge between this exposure to technologies and the practical implementation in the field. The pre service teachers are at a loss to what to do with the technologies instructionally and how to adopt them for the teaching-learning purpose.

Thus, the development and demonstration of teachers' TPACK knowledge requires flexibility and fluency—not just with curriculum based content, but also with pedagogy, technology, and context—remembering that each influences the other in pervasive ways. In speaking of Shulman's notions of PCK, Beyer, Feinberg, Pagano, and Whitson (1989) suggested that PCK

“implicitly denies the legitimacy, even as a matter of conceptual convenience, of the forced disjuncture between thought and action and content and method” (p. 9). The divide between the thought and action, the content and the method is true of TPACK as well is hindering the practical implementation of the fused technology, content and pedagogy in the field. Thus, it becomes imperative that hands-on-training of TPACK should be developed.

**Instructional Module based on TPACK:** 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 were 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.

Before starting the training sessions, the pre service economics teachers self-reported the TPACK scale. The training sessions 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 training sessions were 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. Post the training sessions, the pre service economics teachers filled the TPACK scale.

**Statistical tools:** The scale was administered to the eighteen pre service economics teachers' before and after the instructional module based on TPACK.

**Table 1 Relevant Statistics of Pre-test and Post-test scores on TPACK**

| Variable | Test | N  | df | Mean   | SD    | Obtained Value | t    | Table Value |
|----------|------|----|----|--------|-------|----------------|------|-------------|
| TPACK    | Pre  | 18 | 17 | 291.89 | 18.92 | 8.92           | 8.92 | 2.11        |
|          | Post |    |    | 338.72 | 8.63  |                |      |             |

**Inferential Statistics:** A paired-samples t-test was conducted to compare the pre-test and post test scores on TPACK. There was a significant difference in the pre-test ( $M=291.89$ ,  $SD=18.92$ ) and post-test ( $M=338.72$ ,  $SD=8.63$ ) scores on TPACK;  $t(17) = 8.92$  at 0.05 level. These results suggest that there is a significant difference in the TPACK of PSETs. Therefore, the null hypothesis is rejected. Further, Cohen's effect size value ( $d = 3.18$ ) suggested a high practical significance of TPACK Module.

**Conclusion:** There is significant difference in pre and post scores of Pre Service Economics Teachers TPACK.

### Results and Discussion

The results indicate that the instructional module based on TPACK proved to be effective since the Cohen's  $d$  effect size was very large. This study offered findings on the integration of TPACK into teacher education contexts that could help to shape subsequent pre-service and in-service teacher education programs in deliberate ways to combine technology, pedagogy and content to produce robust and high impact teacher education professional experiences. Teacher education programs should focus on guiding pre-service teachers in appropriate uses of technology particularly on preparing them to use technology in such a way that their own students will use technology for learning. The study has thrown light upon the rapidly evolving technological landscape which can be tapped by the prospective teachers to develop not only their knowledge base but also of their students.

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