Technological Pedagogical Content Knowledge of Secondary Teacher Educators of Jharkhand; An Analysis

Mr. Sandip Kumar

Research Scholar, Regional Institute of Education (NCERT), Bhubaneswar, India

Dr. Elizabeth Gangmei

Assistant Professor, Department of Education, Regional Institute of Education (NCERT), Bhubaneswar, India

Abstract: *This paper focuses on assessing TPACK skills among teacher educators are teaching in secondary teacher education college of Jharkhand in India. The purpose of this study was; to assess Technological Pedagogical Content Knowledge of teacher educators teaching in Secondary Teacher Education College. Descriptive survey method was used and the instrument used in data gathering was questionnaire, observation and interview. This study revealed that; The TPACK of teacher educator was low. The maximum percentage (50%) of teacher educator lie in low, 16% have high level, and 34% have average TPACK.Those teacher educators have less content knowledge they, have not good infrastructure of college, have no attitude towards teaching and didn't take participate in the ICT base orientation program or seminar or workshop. Those teacher educators have high TPACK, their classroom activities were good. The study also found out about 90% of teachers used smartphone but they were not able to use in the classroom for teaching learning process. So it is big challenge for Government and teacher education institution to uplift and enhance the quality of education.*

Keywords: *Teacher Educator, Information and Communication Technology (ICT), Pedagogical Content Knowledge (PCK), Technological Pedagogical Content Knowledge (TPCK)*

1. INTRODUCTION

The advancement of information and communication technology (ICT) in education has been greatly influenced to the teacher education and teaching learning process. It is possible to bring the process of learning beyond the boundaries of classroom by exploring new technology. All over the world, Teacher Education College are being forced to find better pedagogical methods to cope new challenges. The Teacher education needs to acquire the technological skills to use the tools and the pedagogic skills to develop materials and activities. When learning takes place through ICT, it opens new opportunities, like; no limitations of time and place. As an innovative tool, technology has played a central role in improving teaching and learning in light of educational reforms around the globe (Kahveci, Sahin and Genc, 2011).

With an emphasis on preparing teacher for 21st century, it appears to be important for educators to incorporate 21st century skills in teacher education college programme. The National Council for teacher education accepted that the effective usage of ICT in the classroom is correlated to positive academic outcomes, including higher test scores, better attitudes towards school, and better understanding of abstract concept. Teacher educators need to acquire the technological skills to use the tools and the pedagogic skills to develop materials and activities. This requires educators to provide opportunities for their students to experience representations of the content within a technology framework (Crowe, 2004; Keeler, 2008; Moore, 2006). Lee Shulman (1986) proposed the concept of pedagogical content knowledge; Mishra and Koehler's (2006) developed TPACK conceptual framework combines three forms of teacher knowledge; Content, Pedagogy, and Technology. The framework, in which infuse technology with content is called as technological pedagogical content knowledge. Originally TPACK framework is now known as TPCK, or Technology Pedagogy Content Knowledge. The development of TPACK skills among teacher educator is critical to effective teaching with technology. Combination of three forms of teacher knowledge are necessary for effective teaching with technology; Content, Pedagogy, and Technology. The interaction of these bodies of knowledge, both theoretically and in practice, produces the types of flexible knowledge needed to successfully integrate technology use into teaching. The framework for teacher educator knowledge for technology integration

called technological pedagogical content knowledge (originally TPACK, now known as TPACK, or technology, pedagogy, and content knowledge). This framework builds on Lee Shulman's construct of pedagogical content knowledge (PCK) to include technology knowledge. The development of TPACK by teachers is critical to effective teaching with technology.

2. RATIONALE OF THE STUDY

Most traditional pedagogical technologies are characterized by specificity (a pencil is for writing, while a microscope is for viewing small objects); stability (pencils, pendulums, and chalkboards have not changed a great deal over time); and transparency of function (the inner workings of the pencil or the pendulum are simple and directly related to their function) (Simon, 1969). Over time, these technologies achieve a transparency of perception (Bruce & Hogan, 1998); they become commonplace and, in most cases, are not even considered to be technologies. Digital technologies—such as computers, handheld devices, and software applications—by contrast, are protean (usable in many different ways; Papert, 1980); unstable (rapidly changing); and opaque (the inner workings are hidden from users; Turkle, 1995).On an academic level, it is easy to argue that a pencil and a software simulation are both technologies. The latter, however, is qualitatively different in that its functioning is more opaque to teachers and offers fundamentally less stability than more traditional technologies. By their very nature, newer digital technologies, which are protean, unstable, and opaque, present new challenges to teachers who are struggling to use more technology in their teaching. Also complicating teaching with technology is an understanding that technologies are neither neutral nor unbiased.

The development of pre-service teachers in terms of their technological knowledge, pedagogical knowledge, content knowledge and the synthesis of such knowledge, i.e., the technological, pedagogical and content knowledge (TPACK). A questionnaire adapted from Schmidt, Baran, Thompson, Mishra, Koehler, and Shin (2009) was validated using factor analyses and the teacher educators'TPACK perceptions before and after their ICT course was examined. The results reveal statistical significant gains with good effect sizes. Regression analysis further reveals that technological knowledge, pedagogical knowledge and content knowledge are all significant predictors of teacher educators'TPACK, with pedagogical knowledge having the largest impact. Many research studies indicate that teachers use computers to support teacher transmission of knowledge (Gao, Choy, Wang, & Wu, 2009; Lim & Chai, 2008; Selwyn, 2008). Preservice teacher education has good potential to influence teachers' future use of ICT (Hammond et al., 2009), it is clear that teacher educators have to constantly design, evaluate and redesign preservice education for effective ICT integration (Goktas, Yildrim & Yildrim, 2009). Strong pre-service education on the use of ICT is also important because it can help to counter the possibilities of transmission-oriented school practices in the assimilation of beginning teachers. Meaningful use of ICT in the classroom requires the teachers to integrate technological affordances with pedagogical approaches for the specific subject matter to be taught (Jonassen et al., 2008; Mishra & Khoeler, 2006).

This integrated form of contextualized knowledge has been recently referred to as the TPACK (Mishra & Khoeler, 2006;Thompson & Mishra, 2007) or other similar notion such as ICT related TPACK (Angeli & Valanides, 2005; 2009). Mishra and Khoeler (2006) argue that many studies examining preservice teachers' development of ICT skills lack a clearly articulated theoretical framework. Building on the notion of pedagogical content knowledge (PCK, Shulman, 1986), Mishra and Khoeler developed TPACK as a possible theoretical framework to strengthen the study of teachers' use of ICT for education.

Mishra and Koehler (2006) posited that TPACK was derived from three key knowledge sources i.e. technological knowledge (TK), pedagogical knowledge (PK) and content knowledge (CK). There are two viewpoints about TPACK's epistemological nature. Gess-Newsome (1999) described the transformative viewpoint as one where TPACK was a synthesis of TK, PK and CK such that the influences of each cannot be extricated. On the other extreme was the integrative viewpoint where TPACK did not exist as a unique body of knowledge; but was a simple combination of TK, PK, and CK that came about during teaching. There is preliminary support for the transformative viewpoint where TPACK exists as a unique body of knowledge (Angeli & Valanides, 2009). Many qualitative studies have also shown TPACK to be developed through design projects (e.g. Angeli & Valanides, 2009; Koehler & Mishra, 2005), microteaching activities (e.g. Cavin, 2008), and participation in communities of practice (e.g. Rodrigues, Marks, & Steel, 2003).

In recent years, the TPACK framework has been used to re-design teacher preparation programmes and teacher development workshops (Niess, 2005; Niess, 2007; Niess, Suharwoto, Lee, & Sadri, 2006; Shoffner, 2007; Burns, 2007). Special emphasis has been given to incorporating ICT design projects as avenues to help teacher educators to develop connections between TK, PK, and CK (e.g. Niess, 2005; Mishra & Koehler, 2006). Qualitative descriptions of student learning behaviours (e.g. Niess et al., 2006) lend considerable insight about their TPACK development in specific programme contexts.

However, fewer studies have measured the extent of teachers' TPACK development through pre-post course evaluations; or examined the relative importance of TK, PK, and CK to teachers' overall TPACK development. One impediment to robust examination of TPACK through pre-post course evaluations is that numerous TPACK surveys are currently in their early stages of development such as instrument validation. Existing TPACK surveys have generally been examined for internal reliability (e.g. Schmidt et al., 2009; Lee & Tsai, 2010). But, construct validation of several surveysare still in progress (e.g. Archambault& Crippen, 2009; Schmidt et al., 2009), which could be a factor limiting their use for pre-post course evaluation.

One of the few studies implemented found significant improvement of teacher educators' TPACK after undergoing a professional development programme (Graham et al., 2009). With the increasing use of TPACK to undergird ICT programme development, it is necessary to understand the relationship between TPACK, TK, PK, and CK. Yet, there is a dearth of such studies as much of extant research has been centered on the relevance of technology skills instruction. While some schools of education have proposed that computer skills training are removed from teacher education programmes (e.g. Brinkerhoff, Ku, Glazewski, & Brush, 2001).

Wang and Chen (2006) argued that some level of proficiency in technological skills was needed for teachers to integrate technology effectively. On the other hand, many studies have also found that teachers with high levels of confidence in their computer skills tend to use more technology in the classroom (Zhao, Pugh, Sheldon & Byers, 2002; Littrell, Zagumny & Zagumny, 2005). A high level of TK may be important for developing TPACK. But, the relative influences of PK and CK have not been studied. The relative contribution of TK, PK, and CK to teachers' TPACK development can be statistically modeled and predicted with techniques such as multiple regressions. The derivation of these statistical models can inform the design and evaluation of ICT programmes. Nevertheless, the small sample size in existing TPACK survey studies (e.g. Schmidt et al., 2009; Graham et al., 2009) has limited the application of inferential statistics to the data. Therefore, these relationships have not yet been thoroughly examined. In addition, studies of TPACK surveys have generally been reported for US teachers (e.g. Schmidt et al., 2009; Archambault & Crippen, 2009; Graham et al., 2009). The effectiveness of TPACK-driven ICT programmes have not yet been widely reported in an Asian context.

From the Above Discussion it is foundthat –

Most of the training colleges fulfill ICT resources as per NCTE norms, but does it develop TPCK among the teacher educators?Do the ICT resources provide basic knowledge of technology? Thus; The TPCK is important for teacher educators, because it provides skills for integrating technology with content and pedagogy in teaching. Several researches present the real vision about TPACK all over the world. Researches are showing that teacher educators are no more aware about ICT. Similarly, Indian researches spell out that, teacher education has no sufficient ICT resources for pre-service as well as in-service teacher education programmes. It is a big challenges for preparing technology sound 21th century teachers.

3. OBJECTIVES

- To assess the Technological Pedagogical Content Knowledge of teacher educators of secondary teacher education college.
- To compare the TPACK of male and female teacher educators.

4. DESIGN OF THE STUDY

4.1. Method

For the present study the researcher was adopted the descriptive survey method. Descriptive research studies are designed to obtain relevant and detailed information concerning the current status of phenomenon. The investigator studied the Technological Pedagogical Content knowledge of teacher educators of Jharkhand in India.

4.2. Sample/Participants

The population of the study was consisted secondary teacher education colleges, which is running under different University of Jharkhand state. For the present study, sample was taken of 10teacher education colleges from the different universities (5 colleges from each university) of Jharkhand state. Out of these, equal numbers of teacher educators were selected from each college. This sample was selected by using multistage stratified random sampling technique.

Name of university	No. of Teacher Education College	No. of Teacher educators (belongs to social science)	No. of Teacher educators (belongs to science)	No. of Teacher educators (belongs to literature)	Total No. of Teacher educators
Ranchi University	5	2×5= 10	2×5= 10	1×5= 5	25
Nilamber Pitamber University	5	2×5= 10	2×5= 10	1×5= 5	25
Total	10	20	20	10	50

4.3. Tools

The researcher used multiple choice questions on TPCK in education and class observation of teacher educator as a tool. The researcher was developed standardized tools on TPCK in education with the consultation of expert for assessing Technological Pedagogical Content Knowledge of teacher educators of Jharkhand. The content of the test was drawn from B.Ed. curriculum which is running under different universities of Jharkhandstate. Theresearcher was constructed 35 questions on TPCK, out of 35 items / questions were edited to find out its suitability. After piloting, Finally 25 questions were retained for final draft. The content validity of the tools was assured by incorporating annotations and suggestions of experts and The Cronbach reliability of tool was 0.69. The researcher also developed scoring/ answer key for questions, for making evaluation objectives.

4.4. Procedure of the Data Collection

The researcher collected data by visiting sampled college about technological pedagogical content knowledge of teacher educator. The researcher administered 50 teacher educators in Secondary Teacher Education College of Jharkhand

5.   ANALYSIS AND INTERPRETATION

The present study is quantitativein nature, collected data was analysed by using quantitative techniques. The quantitative data was analysed by using statistical techniques such as; Mean, Percentage, Frequency, Graph etc. The researcher analysed the collected data according to objectives. The answer scripts were evaluated on the basis of scoring key. Then all scores were converted into percentage, Mean value of whole group and sub-groups were calculated for interpretation.

The first objective of this research was to assess technological pedagogical content knowledge of teacher educators. The researcher categories, teacher educators into three categories such as Level-1, teacher educators have less than 40%; Level-2, between 40-60%, and Level-3, above 60% technological pedagogical content knowledge. The table-1 presents the frequency and percentage of teacher educators having different level of technological pedagogical content knowledge.

Table No 1: *Frequency and Percentage of Teacher Educators having Different Level of Technological Pedagogical Content Knowledge*

| Categories	Level	Frequency	Percentage
More than 60% scores	Level 1	8	16
Between 40-60% scores	Level 2	17	34
Less than 40% scores	Level 3	25	50
Total		50	100

The table 1; reveals that out of 50 teacher educators, 16% teacher educators got or secured more than 60% scores, 34% teacher educators secured 40-60% scores and 50% teacher educators secured less than 40% scores. It can be said that majority of teacher educators have less than 40% of technological pedagogical content knowledge in the

area of education. The Figure No.1 shows graphically the percentage of teachers having different level of content knowledge.
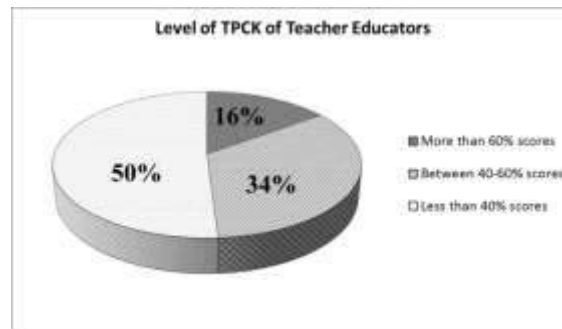
Figure No-1: *Technological Pedagogical Content Knowledge of Teacher Educators*

The figure No. 1.1 shows graphically the total numbers of teacher educators lies under different level such as; 8 teacher educators lies under the level- 1; 17 teacher educators lies under the level-2; and 25 teacher educators lies under the level-3.
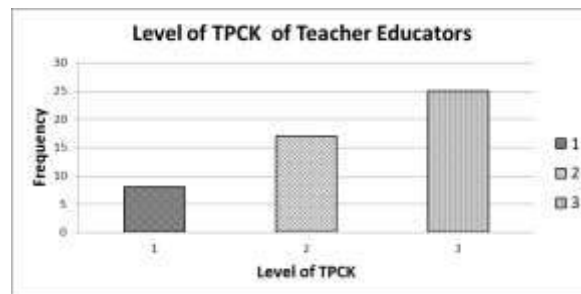
**Figure No – 1.1:** *Total Number of Teacher Educators in Different Level*

6. TECHNOLOGICAL PEDAGOGICAL CONTENT KNOWLEDGE OF MALE AND FEMALE TEACHER EDUCATORS

The second objective was to compare the technological pedagogical content knowledge of male and female teacher educators. For this, researcher calculated t-value which is presented in table2.

Table No-2: *t-value of Content Knowledge of Male and Female Teacher Educator*

Gender	N	Mean	SD	t-test	df	Result
Male	31	21.15789474	7.403176179		48	Not Significant
Female	19	19.87096774	8.639992035	0.475144157		

The table 2; indicates that the calculated t-value (0.475144157) is smaller than the table value (2.10).So, the Null hypothesis is accepted. It can be concluded that there is no significant difference in the Technological Pedagogical content knowledge of male and female teacher educators. The difference in means is graphically presented in the Figure No. 2.
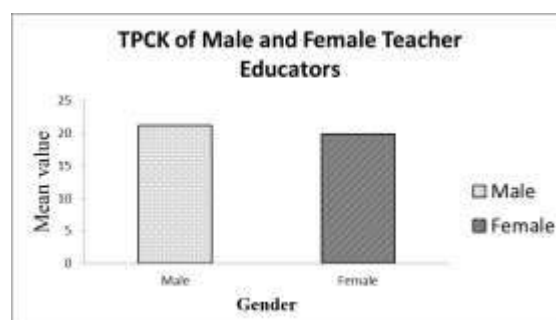
7. MAJOR FINDINGS

The major findings of the study are...

I. The Technological pedagogical content knowledge of teacher educator is low. The maximum percentage (50%) of teacher educators lie in the low technological pedagogical content knowledge, 16% of the teacher educators have high level of Technological pedagogical content knowledge and 34% have average technological pedagogical content knowledge in education. This situation is alarming and calls for an immediate action to improve Technological pedagogical content knowledge of teacher educators at secondary teacher education College.

II. Those teacher educators (50%) have less Technological pedagogical content knowledge (below 40% marks obtained). These colleges have not good infrastructure such as: library facilities, computer, internet, educational magazines etc; have no attitude towards integration of ICT in teaching and did not take participate in the orientation program that emphasized Technological pedagogical content knowledge.

III. Those teacher educators (16%) have high Technological pedagogical content knowledge (obtained more than 60% scores), they belong to those teacher education colleges, having good infrastructure of the schools, such as: library facilities, ICT Lab; computer, internet, educational journal, magazines etc. and have own books related to educational subjects.

IV. Male and female teacher educators teaching at secondary teacher Education College have similar Technological pedagogical content knowledge, no difference was found between them.

8. RESULT AND DISCUSSION

Regarding the Technological pedagogical content knowledge of teacher educator was low; the study revealed that, teacher educators in this sample do not bring a well-developed understanding of the essential concept of Technological pedagogical content knowledge. The results support the findings of previous studies, which are reported that prospective teacher educators often have insufficient depth Technological pedagogical content knowledge. The investigator also found out that, the Technological pedagogical content knowledge is not depends on the gender differences; it depends on the interest and attitudes of the teacher educators (Lee et al., 2007).

Educational Implications

⇒ Teacher educator need to learn a basic concept of integrating technology, pedagogy and content in education.

⇒ Teacher educators need a deep and robust understanding of the nature of education; thinking and reflect on their experience as students what they have learned about the nature of education.

⇒ The government should arrange education with ICT based orientation program for teacher educators to develop Technological pedagogical content knowledge.

⇒ Government should prepare effective programs time to time for teacher educator require collaboration among science or social science or literature educators, professors, and education faculties.

⇒ Teacher education Colleges, Department and universities need to provide all prospective with significant opportunities to learn how to integrate or infuse TK, PK and CK.

Suggestions for Further Research

➢ The similar study may be taken up on a large sample.

➢ The study can be conducted on all subjects of pre-service teachers teaching at elementary as well as secondary level.

➢ The study can be conducted on all subjects of teachers teaching at secondary level.

➢ The study can be conducted between rural teacher educators and urban teacher educators teaching at same level.

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