



EXPLORING AWARENESS FOR TECHNOLOGICAL PEDAGOGICAL AND CONTENT KNOWLEDGE (TPACK) IN PRE-SERVICE TEACHER EDUCATION PROGRAMME

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The purpose of the present study is to explore the prospective teacher's awareness about Technological Pedagogical and Content Knowledge (TPACK) framework in their ongoing teacher education programme. The sample comprised 80 B.Ed. students from two colleges of Jammu division and 20 M.Ed. students from one prominent university of the Jammu division. The investigator employed a self-constructed semi-structured tool as per the objective of the study. The study employed a descriptive exploratory design. The findings revealed that both at UG and PG level, students have individualised knowledge about technology, pedagogy and content but, the least number of students were familiar with this framework. The study included some concrete suggestions and recommendations for meaningful integration of Technology-mediated pedagogy in the ongoing teacher education programme at the regional and national level. The findings of the study help in strengthening the policy formulation for teacher education in the current perspective.

KEYWORDS: Prospective Teachers, TPACK, Teacher Education

INTRODUCTION

After independence, India has made progress in school education in terms of literacy, infrastructure, technology, universal access and enrolment in schools. The prime objective of education is to prepare the child for the competent and global world, which projects the demand of efficient, skilled, adaptable and

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smart teachers within the classroom in order to achieve these broad objectives and goals of education. Thus, it can be said that teacher plays a vital and demanding role in fulfilling the educational goals as per the needs and requirements of the society. We can't imagine the classroom without technology which brings world into the classroom. This means that the knowledge of content and methodology is not sufficient in this era of technological expansion. There is great need among the incoming teaching community to increased professionalism as well as essential competencies so that he/she will be able to tackle the student with a distinct learning style and different needs, as common teaching strategy for all students obviously doesn't work in such a situation. As per NEP (2020), teacher preparation is an activity that requires multidisciplinary perspectives and knowledge in order to raise the efficacy and high quality of the teacher education system.

The Quality of education is directly proportional to the quality of teachers and quality of teachers depends upon preservice teacher education programme for the prospective teachers. In this age of technology, the amalgamation of technology and pedagogy gave rise an important skill called as techno-pedagogical skill. The Techno-pedagogical skill is the influential or effective combination of various technologies and pedagogies which provides new opportunities to support a wide range of learning requirements of children in the classroom. As soon as the approaches to ICT integration are adapted in teacher education, it enables the future teachers to become fluent in the usage of educational technology by going beyond to have mere competence of the latest tools and technologies (Prakash, 2014). It is quite evident that teacher training often isolates technology as a separate discipline and focuses on training for specific computer applications, such as word processing (J. J. Koehler, 2010; Persky, 1990; Shelton & Jones, 1996; Shulman, 1986; Tokmak, Incikabi, & Ozgelen, 2013). While focusing on this skill development, however, is problematic since it offers teachers little opportunity to transfer their learning into their classrooms (Shelton & Jones, 1996).

Technological Pedagogical and Content Knowledge (TPACK) has emerged from Shulman's idea of Pedagogical Content Knowledge (PCK) that elaborates how the knowledge of technology among teachers and PCK intermingle with one another in order to yield effective teaching with technology Shulman (1986) . M. J. Koehler and Mishra (2009) and Mishra and Koehler (2006) were the first amongst others researcher who gave the complete concept of TPACK framework. The TPACK framework was constituted with 3 main components namely: technology, pedagogy and content and rest four emerged as an interaction between and among three main components which are characterized as Technological Pedagogical Knowledge, Pedagogical Content Knowledge, Technological Content Knowledge and Technological Pedagogical and Content Knowledge. The brief description of the TPACK components along with

diagram are given in Figure 1.

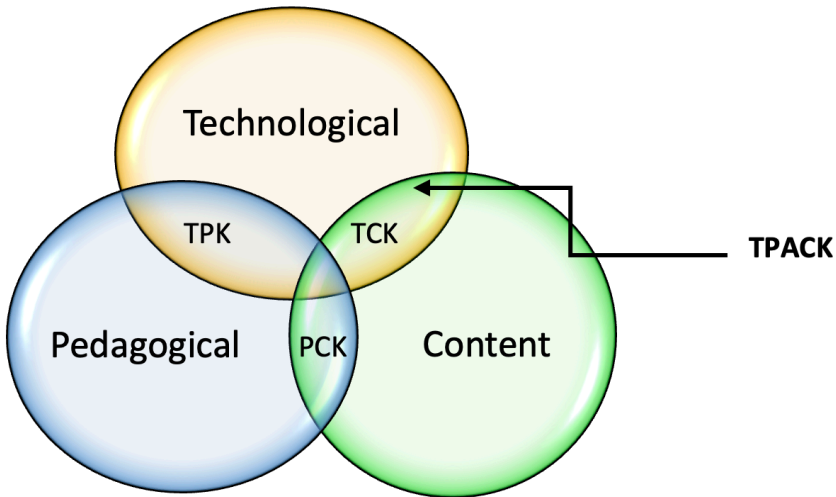


Figure 1. The TPACK components.

Technological Knowledge refers to the knowledge of new and emerging various technological applications and software which can be used in the teaching learning process. It mainly includes use of artificial intelligence and knowledge of technical hardware in education so as to make the learning more accessible and effective. Content Knowledge includes the knowledge of an individual about the content or subject matter which has to be learned or taught. Pedagogical Knowledge is defined as the knowledge about teaching methods, teaching techniques, principles of teaching and learning etc. In other words, pedagogical knowledge includes how to use educational theories and methods in application. Pedagogical Content Knowledge denotes the knowledge and understanding of how to blend both content and pedagogy in order to improve the presentation and delivery for instruction. Technological Pedagogical is due to the intersection of technology and pedagogy component and is defined as knowledge of selecting appropriate technological entities for any specific pedagogy to be used in teaching- learning process.

Technological Content Knowledge (TCK) involves the knowledge and skills to integrate technology and content in such a manner that they are reciprocally related to each other. Thus, technologies often afford innovative and more wide-ranging illustration of the content with greater flexibility in across these depictions. Technological Pedagogical and Content Knowledge (TPACK) forms the basis of upright teaching along with technology. The

introduction of the Internet can be seen as an example of a technology whose arrival forced educators to think about core pedagogical issues (Peruski & Mishra, 2004; Wallace, 2004). So, in this context, it is the technology that drives the kinds of decisions that we make about content and pedagogy. So, with this we can say that it essentially involves developing and understanding by using innovative technological tools and techniques along with constructive pedagogical methods in order to build the existing knowledge and new knowledge; the strengthening of the old ones has to be done. Technology enhanced learning should not be seen as 'special' in comparison to other forms of learning in the teacher's profession rather teacher education programme must understand and embrace the role of design in professional competencies if technology mediated learning is ever to be fully integrated into teaching and learning processes (Kirschner, 2015). Marino, Sameshima, and Beecher (2009) explained in their paper that the essential technology skills for pre-service teachers and strategies supporting inclusive educational practice were to be included in their teaching learning process. It was also elaborated that adopting technology into classroom practice depends not only on the amount of training a teacher receives, but also the teacher's philosophy and beliefs about the benefits of technology for the teaching learning process. Pringle, Dawson, and Ritzhaupt (2015) in their study indicated that an increase in essential technology and pedagogy related practice skills for pre-service teachers and strategies supported inclusive educational practice in the classroom, so the focus should be on this which further leads to development of the learning skills. This integration of technology pedagogy and content through innovative ideas leads to foster the creative thinking among the students Tokmak et al. (2013). Bilicia, Guzeyb & Yamak (2016) assessed pre-service science teachers' TPACK over a semester-long Science Methods and results of the study revealed that the TPACK-focused Science Methods course had an impact on pre-service teachers' TPACK to varying degrees. Most importantly, the course helped teachers gain knowledge of effective usage of educational technology tools. The present study also concluded that the teacher education programs should provide opportunities to pre-service teachers to develop their TPACK so that they can effectively integrate technology into their teaching.

Koh, Chai, and Tsai (2013) worked together and depicted that teachers' perceived TPACK to be formulated from the direct effects of technological knowledge and pedagogical knowledge. They also perceived that these knowledge sources to contribute to the development of technological pedagogical knowledge and technological content knowledge, also contributed to their TPACK. This study demonstrated that TK was perceived to have positive effects on TPACK, TPK, and TCK. The latter two constructs were also perceived to have positive effects on TPACK. In their concluding remark,

authors optimized the influence of these variables on teachers TPACK, teacher ICT development programs. It was also emphasized that the need to foster the development of teacher's competence in ICT-related teaching and learning both in initial teacher education and teacher professional development so that our future teachers should be supported for gaining TPK and corresponding cognitive skills during their teacher education programme (Konig, Biela & Glutsch, 2020). Therefore, the ongoing teacher education programme should adopt such strategies that help teachers to develop knowledge related to both the technology and its pedagogical uses. It is evident from the review of the related literature that the limited efforts in terms of research have been found in TPACK in our Jammu & Kashmir region. Thus, there is an immense need of preparing teachers not only pedagogues rather we should make them Techno-Pedagogues which is only possible when prospective teachers and teacher educators have at least enough information as well as awareness about the integration of this framework. This paper is an attempt to explore the awareness of on-going teacher education programme regarding the TPACK framework.

RESEARCH QUESTIONS

The study has the following research questions

1. To what extent pre-service teachers are aware of TPACK framework?
2. What are various factors which act as a hindrance in effective integration of technology pedagogy and content knowledge?

OBJECTIVES OF THE STUDY

The objective of the present research is to study the awareness of the pre-service teachers about TPACK.

RESEARCH METHODOLOGY

For the present study, the investigator employed the Descriptive-Exploratory research. Purposive sampling technique has been used for the selection of the sample.

SAMPLE FOR THE STUDY

The sample of 80 B.Ed. students from two colleges of district Jammu and Kathua and 20 post graduate students from one prominent university of

Jammu division, which satisfied the criteria (having at least five years old history of running education as a discipline, good infrastructure facilities and qualified staff) constituted the sample of the study.

ANALYSIS AND INTERPRETATION

As per the interpretation of Item no. 1 (Table 1), it was found that only 48.75% of the student teachers responded that they were aware of the technological pedagogical and content knowledge (TPACK) framework whereas rest 51.25% of the respondents claimed that they were not familiar about this framework in their teacher education programme. However, they were able to understand the individualized concept of technology, pedagogy and content. This may be due to lack of knowledge among teacher educators themselves about the integration of this framework, unwillingness among the students to read about the current trends in education via journals, magazines, newspapers, research articles in education etc. and no reference of TPACK in the existing curriculum of teacher education programme.

Table 1

Awareness of TPACK Framework Among B.Ed. Students.

Item	Item Description	f	%	
1	Familiarity			
	<ul style="list-style-type: none"> ● Yes ● No 	39 41	48.75 51.25	
2a	Source of Familiarity			
	<ul style="list-style-type: none"> ● Correct ● Incorrect ● Not Mentioned 	26 4 50	32.50 5.00 62.50	
	Mentioned Source of Familiarity			
2b	<ul style="list-style-type: none"> ● Internet ● Computer ● Google sites 	24 1 1	92.30 3.85 3.85	
	3	Full form of TPACK		
	<ul style="list-style-type: none"> ● Correct ● Incorrect ● Not Mentioned 	34 26 20	42.50 32.50 25.00	

In the succeeding item 2, the student teachers were asked to write the source of familiarity of TPACK i.e., to write the source from which they came to know

about this framework then only 32.5% of the student teachers responded for correct source of their familiarity namely internet, computer, Google sites etc. and among these sources' internet was one of the most cited sources. Furthermore, 62.5% of the respondents did not mention any source of their familiarity and rest 5% of the respondents wrote the incorrect source of the familiarity as they cited the exemplifications of technological units which is used in this integration. While talking about awareness point of TPACK, some student teachers in their response sheet wrote their source of familiarity as Internet and in the succeeding question claimed that they got awareness of this framework from their teacher education programme which is a contradiction to the preceding question. In the item 3, only 42.5% of the respondents wrote the correct full form of abbreviation TPACK where rest of the respondents either responded incorrect or didn't mention the fullest form of abbreviation.

As per Table 2, the item number 1 indicated that maximum number of prospective teacher educators were not aware of the term TPACK during their training programme whereas only 20% responded positive in terms of awareness of the TPACK framework. The perceived whys and wherefores related to the awareness among them might be lack of out of curriculum knowledge among them as they were always found busy in curriculum activities, assignments and exams during their course work. Unapproachability of the future teacher educators to view recent trends in the field of teacher training programmes. There is no description of this framework in their curriculum could be another reason for the unfamiliarity among would be teacher educators.

Only 15% prospective teacher educators pointed out the correct source of their familiarity whereas the rest 85% of the respondents didn't mention their source of familiarity (item no. 2a of Table 2). In addition to this, item 2b which is another part of the second item elaborated the mentioned source of familiarity as internet, computer and teacher education programme only. The reason, behind the less mentioned sources, could be the lack of in-depth familiarity about the interdependence of three core components of TPACK.

As per the inference drawn with item no. 3 (refer to Table 2), only 20% of the future teacher educator's responded correct full form of the term TPACK whereas rest 80% of the respondents couldn't mention the full form of the abbreviation which further exposed the fact that the respondents were ignorant about the TPACK framework in their ongoing practices. As per the study there are various barriers which the prospective teachers thought as a challenge for integration which further categorized by researcher in two following main subthemes: material barriers, & non-material barriers and process barriers (Table 3).

In the material barriers, 53.75% of the student teachers found that proper infrastructure availability is one of the most imperative factors that lead to

Table 2**Awareness of TPACK Framework Among M.Ed. Students.**

Item	Item Description	f	%
1	Familiarity		
	• Yes	4	20
	• No	16	80
2a	Source of Familiarity		
	• Correct	3	15
	• Incorrect	-	-
	• Not Mentioned	17	85
2b	Mentioned Sources of Familiarity		
	• Internet	1	33.33
	• Computer	1	33.33
	• Teacher Education Programme	1	33.33
3	Full form of TPACK		
	• Correct	4	20
	• Incorrect	4	20
	• Not Mentioned	12	60

effect the integration of technology with pedagogy and content in the teaching learning process. This may be due to the unavailability of technological units within the classroom in most of our Indian school system whereas about 50% of the respondents educated their guess on lack of financial resources in education that can be evidenced in many ways including: insufficient classrooms, lack of management and supervision, lack of poor-quality textbooks and other learning materials and insufficient attention to standards and quality assurance. Each and every one of these results of insufficient funding can act as a barrier to any level of education.

The barriers related to the human resources or non-material resources and process barrier include lack of competent teacher and experts, attitude of teachers, aptitude of teachers, technology fear, lack of skills and knowledge of pedagogy, availability of time, lack of practice or training, specificity of subject matter and lack of knowledge of teaching methods. 46.25% of the student teacher reflected that the most prominent barrier in the path of this integration was lack of competent teacher and experts who effectively integrate technology with the pedagogy and content, which is due to the reason that teaching, is not by choice profession rather it only taken as by chance and for granted

Table 3

Factors Acting as a Barrier in the Implementation of TPACK Framework as Perceived by B.Ed. Students.

Item	Item Description	f	%
A	Material Barriers		
	• Infrastructure barrier	43	53.75
	• Electricity barrier	11	13.75
	• Financial barrier	40	50
	• Poor computer assisted technology	6	7.5
B	Non-Material Barrier/ Human Barrier and Process Barriers		
	• Attitude of teachers	3	3.75
	• Aptitude of teachers	13	16.25
	• Lack of competent teachers and experts	37	46.25
	• Technology fear	5	6.25
	• Lack of skill and knowledge of pedagogy	25	31.25
	• Availability of time	19	23.75
	• Lack of practice or training	9	11.25
	• Specificity of subject matter	12	15
	• Lack of knowledge of teaching methods	5	6.25

profession in our country. The attitude and aptitude of the educators also affect the effectiveness of technology integration as some of them have made a preconception about digital tools and their instructional purpose which can serve as a significant barrier to their integration into the curriculum.

For many educators, particularly those who didn't grow up with computer or internet, technology can be a frightening concept for them. It may be easier to pass up the use of a tool rather than to admit that he/she have an inadequate knowledge. Another hindrance in the integration of TPACK is availability of time and inflexible scheduling which doesn't allow the teachers to experiment with different types of teaching tools, digital or otherwise. Even when the proper resources are present, teacher often struggle with an inadequate knowledge of specific technology, technology-related pedagogy and technology related classroom management etc.

The pre-service teacher educators have numerated various factors which have been consolidated by the researcher under two main subcategories namely material barriers and human and process barriers (Table 4).

While talking about material barrier, about 55% of the pre-service teacher

Table 4

Factors Acting as a Barrier in the Implementation of TPACK as Perceived by M.Ed. Students .

Item	Item Description	f	%
A	Material Barriers		
	• Infrastructure barrier	11	55
	• Electricity problem	3	15
	• Financial barrier	3	15
	• Regional barrier	2	10
	• Poor computer assisted technology	1	5
B	Non-Material / Human and Process Barriers		
	• Attitude of teachers	2	10
	• Aptitude of teachers	4	20
	• Lack of competent teachers and experts	5	25
	• Lack of student teacher interest	3	15
	• Technology fear	2	10
	• Lack of skills and knowledge of pedagogy	8	40
	• Availability of time	4	20
	• Lack of practice or training	5	25
	• Specificity of subject matter	2	10
	• Lack of knowledge of teaching methods	3	15
	• Less opportunities	1	5
	• Cooperation	1	5

educators responded lack of availability of proper infrastructural facilities have considered the most vulnerable factor responsible for this integration, some other perceived barriers are financial barrier, Regional barrier and Poor computer assisted technology. Digital media has the potential to transform learning environments and empower learners to become active in shaping their own education and this is possible only if we have proper financial supply which acts as a supplement to the infrastructure barrier, electricity barrier and poor computer assisted technology.

In human and process related barriers, the respondents listed good number of barriers which includes attitude of teachers, aptitude of teachers, lack of competent teachers and experts, lack of student teacher interest, technology fear, lack of skills and knowledge of pedagogy, availability of time, lack of practice or training, specificity of subject matter, lack of knowledge of teaching methods, less opportunities and cooperation. Educators and policymakers believe that information and communication technologies are of supreme

importance to the future of education and, in turn, for the country at large. The aim of teacher education is to develop skills and appropriate knowledge among teacher trainees for using and integrating the correct technology in an appropriate manner. The possible reasons behind above mentioned barriers could be incompetency of teachers' preparation programme in developing the cognitive, social, and physical environments that will help pre-service teachers to feel self-efficacious and in control of learning to teach with technology.

FINDINGS OF THE STUDY

The findings of the study are as follows:

1. As per the study, the awareness of preservice teachers regarding TPACK, revealed that nearly half of the student teachers were familiar about the technological, pedagogical and content knowledge individually but didn't aware about the integration of TPACK and their source of familiarity was other than their teacher education programme.

2. The present study also revealed least number of pre-service teacher educators were familiar about the TPACK framework, and most of the respondents could not mention their source of familiarity.

3. The comparison of the data obtained on awareness of TPACK of UG and PG students shows high percent of familiarity amongst the UG students. This may be due to the reason that the extensive curriculum and increased duration of the UG programme of teacher education have provided them with the chance to have at least information of TPACK in contrast to PG students out of which a substantive number of students belonged to 'One-Year B.Ed. programme'. However, as far as the indication of source of familiarity was concerned, both, the students of UG and PG classes were not unable establish the same. Most of the UG students as well as PG students didn't mention the source of their familiarity as they might be not able to locate their actual source of awareness about TPACK framework whereas some of the students in both UG and PG classes wrote correct full form of the abbreviation TPACK while most of them either responded incorrect or didn't mention the full form.

4. Almost all the UG and PG pre-service teachers were able to pen down the various obstacles in human and process barriers like technology fear, aptitude and attitude of the teachers, lack of skill and pedagogy, availability of time, specificity of the subject matter, lack of competent teachers and experts.

EDUCATIONAL IMPLICATIONS

There is a great need to increase awareness among the future teachers regarding the TPACK framework, as the future of the whole nation is in the hands

of these prospective teachers and teacher educators. Following educational implications or recommendations have evolved as an outcome of the present research work:

- The findings of the study revealed that in spite of the compartmental knowledge in technology, pedagogy and content knowledge, our ongoing teaching practices should make the preservice teachers familiar about the integration of technology, pedagogy and content knowledge.

- Teacher educators should be made familiar about this framework by having periodical faculty development programme so that teachers have the knowledge about this integration.

- There should be provision in new curriculum of the teacher education programme for continuous updating of the syllabi of the course as per changing needs and demands of the learners as well as society.

- The objective at preservice level is not to prepare technocrats, but to develop techno-pedagogues. This objective can be achieved only if we have trained skilled and competent teacher trainers who provide hands on experience about how to integrate technology along with effective pedagogy with respect to nature of the content. Hence, our teacher education programme shouldn't confine itself as an introductory programme rather it must be full fledge training and practice programme to encounter real problems. Nevertheless, it is also evident that pre-service teachers' TPACK competencies have been associated with their attitude and usage of technology, along with digital literacy skills, and online reading comprehension strategies (Altun, 2019).

- It has also been found that teachers' attitudes and aptitude play an important role in the teaching learning process thus, vision should be developed by our teacher training programmes to motivate and direct their teaching and learning with the help of technology and using related instructional methods. Using technology in teaching should not be confused with technology driven approach rather how technology has been integrated pedagogically in the specific content. Study revealed that students who have taken a computer course have higher self confidence in all dimensions of TPACK (Acarli, 2020).

CONCLUSIONS

The role of modern teacher in 21st century is very different from the teachers in the past where main motive was only to deliver wisdom to the individuals. While today individuals can access content on search engines, where knowledge is being digitized or openly accessible, and where jobs are changing rapidly, teachers need to enable people to become lifelong learners, to manage

complex ways of thinking and complex ways of working that computers cannot take over easily. Thus, teacher should not only be aware of technology, pedagogy and content knowledge but to be efficient enough in doing integration of these three important aspects in the teaching learning process. There is a great need for our teacher preparation programmes to prepare graduates who are ready to teach in a 21st century classroom.

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