

Running Head: Exploring Technological Pedagogical and Content Knowledge of Teacher Educators of Nagaland

## **Exploring Technological Pedagogical and Content Knowledge of Teacher Educators of Nagaland**

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### **Abstract:**

Technology has dramatically impacted teaching and learning, especially after the recent global pandemic. It has become central to educational development, opening opportunities to learners and educators like never before. Today's teachers need to integrate technology with content and pedagogical knowledge. Technological Pedagogical Content Knowledge (TPACK) attempts to incorporate teachers' subject knowledge with technology in their teaching practices. Today TPACK is needed for teacher-educators to facilitate the prospective teachers and make them become techno-pedagogues. Hence, the study aimed to capture the TPACK knowledge of teacher-educators of Nagaland, where TPACK is still a very new concept among teacher educators. Examining the TPACK of teacher-educators of teachers' training colleges was much needed as it indicates the demand for the use of technology in classroom practices and training sessions of pre-service teachers while focusing on the theory and skills of effective teaching. The study adopted a descriptive survey method for data collection by the Teachers' Technological Pedagogical and Content Knowledge Scale (TTPACKS) developed and standardized by Prof. Hemant Lata Sharma and Ms. Leena Sharma. The questionnaire was administered to 50 teacher educators in the Kohima, Mokokchung, and Dimapur districts of Nagaland to analyze the TPACK Levels. The descriptive and inferential analysis for the study was performed on the data. The noteworthy findings of the study reveal that the levels of TPACK of teacher educators in Nagaland are majorly above average. In the demographic variable-wise analysis, teacher educators of Nagaland indicated no significant differences in their TPACK. The study concludes that in tandem with high levels of TPACK of teacher educators, the need for in-service training and technological support must be reinforced by the concerned authorities.

**Keywords:** *Technological, Pedagogical, And Content Knowledge; TPACK, teacher educators, Nagaland, teacher's training*

### **INTRODUCTION**

Technology has become a great advantage in the educational process and progress. Its developments and integration in education have also brought about many changes and opportunities in the teaching and learning environment. In the current scenario, the use of ICT has become an important tool for integrating technology with mastery over the content knowledge and pedagogy of the subject matter, as such, the study of TPACK in recent developments. The TPACK model gives a new outline for the integration of technology in education and how the teacher-educators structure and organize the content and pedagogy of the classroom to provide the best educational experiences while incorporating technology.

Lee Shulman first put forward the term Pedagogical Content Knowledge in his presidential address to the American Educational Research Association. Pedagogical Content Knowledge constitutes the integrated knowledge of the teacher educators' mastery of the content and the method of teaching. Shulman's PCK model has been examined, expanded, and elaborated on by many scholars since 1986. However, it was the work of Mishra and Koehler (2006) which expanded the domain of PCK by including technological knowledge, which resulted in the model of Technological Pedagogical and Content Knowledge (TPACK).

Technological Pedagogical Content Knowledge (TPACK) attempts to capture some of the essential qualities of knowledge required by teachers for technology integration in their teaching. At the heart of the TPACK framework, there are three primary forms of knowledge: Content (C), Pedagogy (P), and Technology (T), and their intersections. The proposed intersections are; Content Knowledge (CK), Pedagogical Knowledge (PK), Technological

Knowledge (TK), Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and Technological Pedagogical and Content Knowledge (TPACK).

Content Knowledge (CK) is the knowledge of the teachers about the subject matter to be learned or taught in the classroom and beyond it. Pedagogical Knowledge (PK) is teacher educators' knowledge about the teaching and learning processes and practices. Technological Knowledge (TK) is the knowledge of the teacher educators to accomplish a different task using information technology and develop different ways of teaching and learning environments by applying all types of technological tools and resources. Pedagogical Content Knowledge (PCK) is the transferring of knowledge of the subject matter by adapting different pedagogy. Technological Content Knowledge (TCK) is an understanding of how teaching and learning a subject matter is blended with the specific use of technology in teaching and learning. Technological Pedagogical Knowledge (TPK) can be understood as how teaching and learning can change when different tools and resources of technology are used in particular ways of teaching. Technological, Pedagogical, and Content Knowledge (TPACK) is the knowledge that incorporates all three main core components (Content, Pedagogy, and Technology) which underline meaningful and skilled teaching methods integrating technology in teaching a subject matter.

It has become a vital part for teacher educators to understand the concepts of TPACK, as the present teaching and learning process has become more and more technologically advanced. Technology is becoming an imperative aspect of classroom learning as well as online learning for teachers and students. TPACK serves as a useful conceptual framework for thinking, analyzing and evaluating what teachers must know to integrate technology into teaching, but eventually, it must be understood as a framework for ways in which teachers might best develop this integrated knowledge (Baran et.al.,2011).

Today TPACK is important as it is needed for teacher-educators to facilitate the prospective teachers and make them become techno-pedagogues. Hence teacher-educators should be provided with scope and opportunities to get practical and use pedagogical skills by using recent technologies during their teaching-learning process (Yurdakul, 2011). Therefore, a need was felt to study the impact and knowledge of TPACK among the teacher-educators in the context of Nagaland. In the context of Nagaland, the study of TPACK is still very new among educators and learners as such the geographical area of Nagaland was chosen for the present study.

## **REVIEW OF LITERATURE**

Various studies reveal that teachers are more confident in their pedagogical knowledge as compared to their technological knowledge. They felt an even higher level of confidence in the pedagogical knowledge when integrated with technology in teaching. Therefore, there is an urgent need for higher levels of TPACK competencies in teacher educators and the necessary integration of technology into modern contemporary teaching practices (Hill. & Uribe-Florez, 2020; Goradia, 2018; Beri & Sharma; Lalit, 2019). There is wide use of technology with a high level of content knowledge in mathematics, as supported by Kim Somin (2018). Contemporary teachers are more open to the use of technology in teaching and try to integrate emerging technology in teaching. Hardisky (2018) highlights the need for more available resources and infrastructural facilities to integrate technology in teaching and the need to instruct on the use of technology as there is a lack of experience in integrating technology in teaching effectively (Ersanli & CeylanYangin, 2016; Kumar (2021); Chand et. al., 2020; Kumar & Gangmei, 2018). It is also confirmed by various studies that there is no significant difference between the dimensions of TPACK and no significant difference in the knowledge of TPACK between the gender, college, and types of college its location and also among various streams (Lalit, 2019; Kumar, 2021). In light of the review, the study conducted in Nagaland has the following

objectives:

## OBJECTIVES OF THE STUDY

1. To study the levels of Technological Pedagogical and Content Knowledge of B.Ed. Teacher Educators in Nagaland
2. To study the difference in Technological Pedagogical and Content Knowledge of B.Ed. teacher educators of Nagaland with respect to the following demographic variables:
  - Gender (male and female)
  - Type of college (government and private)
  - Qualification (Post-Graduate and Ph.D.)
  - Experience (0-5 years, 5-10 years, and 10 above years)
  - Subjects taught (Science, Mathematics, Social studies, and Language)

## METHOD OF THE STUDY

The present study is aimed at studying the Technological, Pedagogical, and Content Knowledge of Teacher educators of Nagaland. In tandem with the objectives of the study, the descriptive survey method was employed. An appropriate tool sample and tool were chosen to get information from the teacher Educators of Nagaland. A sample of 53 Teacher Educators from 120 population teaching in the 8-teacher education institution in Nagaland was taken by bifurcating the population according to the subject taught, such as, Social Science, Mathematics, Science, and Language, in order to collect the data accurately.

## TOOL USED FOR THE STUDY

For the present study, in order to collect the data accurately, the investigator employed the research standardized tool on the Teachers' Technological Pedagogical and Content Knowledge Scale developed by Prof. Hemant Lata Sharma and Ms. Leena Sharma.

### Standardization of the scale:

The Teachers Technological, Pedagogical, and Content Knowledge Scales final draft have 55 items which are distributed into seven dimensions. The Scale is a Likert Scale type of five alternative answers to the scale, they are Strongly Agree, Agree, Undecided, Disagree, and Strongly Disagree.

Types of Items	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
Positive	5	4	3	2	1

**Table-1: Scoring system**

Sr. No.	TPACK Raw Score Range	Z-Score Range	Grade	Level of TTPACKS
1	270 and above	+ 2.01 & above	A	Extremely High
2	232 to 269	+ 1.26 to + 2.00	B	High
3	195 to 231	+ 0.51 to + 1.25	C	Above Average
4	144 to 194	-0.50 to + 0.50	D	Average
5	107 to 143	-1. 25 to – 0.51	E	Below Average
6	69 to 66	-2.00 to -1. 26	F	Low

7	68 & below	-2.01 & below	G	Extremely Low
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**Table-2:** Norms for Interpretation of the Level of Technological, Pedagogical and Content Knowledge, Source- TTPACK Manual

## SCORING PROCEDURE OF THE TOOL

The tool was prepared as a questionnaire in hard copy. The questionnaire consists of 55 items which are further distributed into Seven Dimensions as per given in Table 2. The scale is a Likert type of five alternative answers scale such as, Strongly Agree, Agree, Undecided, Disagree and Strongly Disagree. For the collection of data, teacher educators from all the teacher education colleges were chosen from the eight-teacher education institution in Nagaland for a sample of 50. After the collection of all the required data, the analysis was done.

## ANALYSIS OF THE DATA

For this study, the analysis and interpretation of data were performed as descriptive analysis and inferential analysis. To fulfill the objective of the study, the data collected from the sample group were analyzed and interpreted by the researcher using various statistical formulae such, Mean, Standard Deviation, T-test and One-Way ANOVA. Hence, the statistical analysis and interpretation are discussed in the next section.

## DESCRIPTIVE ANALYSIS

**Objective:** To study the levels of Technological Pedagogical and Content Knowledge of B.Ed. Teacher Educators in Nagaland.

Percentage distribution of B.Ed. teacher educators of Nagaland according to different levels of Technological Pedagogical and Content Knowledge is given below:

TPACK levels	Range of Scores	Total Numbers in each level	Percentage
Extremely High	270 and Above	00	-
High	232 to 269	13	25%
Above Average	195 to 231	34	64%
Average	144 to 194	06	11%
Below Average	107 to 143	00	-
Low	69 to 106	00	-
Extremely Low	68 and Below	00	-
Total B.Ed. Teacher Educators =		53	100%

**Table 3** Levels of TPACK of B.Ed. teacher Educators in Nagaland

The Levels of TPACK of teacher educators of Nagaland show the highest TPACK Raw Score Range at 274 with a +2.10 z-score range and the lowest at 55 with a -2.28 z-score range, as shown in Table 3. The Level of TTPACKS among the Teacher Educators in that 25% of the Respondents have a high level of TTPACKS Knowledge, 64 % of the Respondents were Above Average level, and 11% of the Respondents have an average level of TTPACKS knowledge. There are 7 levels of TTPACK however the sample response to only 3 level of TTPACK that is High, Above Average and Average. Thus, it can be seen from the data obtained that 64 % has above average of the level of TTPACKS which has the highest percentage as compared to that of the other levels of TTPACK.

## INFERENCE ANALYSIS

TPACK of Teacher Educators of Nagaland in relation to demographic variables.

**Objective:** To study the difference in Technological Pedagogical and Content Knowledge of B.Ed. teacher educators with respect to Gender (male and female).

**Hypotheses-1:** There is no significant difference between Technological Pedagogical and Content Knowledge of male and female B.Ed. teacher educators.

Variable	Group	N	Mean	SD	T-Value	N/NS@
Gender	Female	36	216.75	20.57	0.57	NS@
	Male	17	212	31.10		

Note: @ indicates not significant at 0.05 levels

**Table- 4:** Gender-wise Mean, SD and Significant Difference of Technological Pedagogical and Content Knowledge of B.Ed. teacher educators

**Interpretation:** It can be seen from table 4 of the Technological Pedagogical and Content Knowledge of Teacher Educators of B.Ed. with regard to Gender is that Females has Mean=216.75 and SD=20.57 which is higher than Male Mean=212 and SD=31.10. Therefore, from the table, we can see that the computed t-value (0.57) of Technological Pedagogical and Content Knowledge of Teacher Educators with regard to Gender (Female and Male) is lesser than the table value (2.007) for 51df at 0.05 level of significance, so we fail to reject the null hypothesis 1. It is concluded that gender has no significant influence on the Technological Pedagogical and Content Knowledge of teacher educators in Nagaland.

**Objective:** To study the difference in Technological, Pedagogical and Content Knowledge of B.Ed. teacher educators with respect type of college (government and private).

**Hypotheses-2:** There is no significant difference between Technological Pedagogical and Content Knowledge of B.Ed. government and private colleges' teacher educators.

Variables	Group	N	Mean Scores	Standard Deviations	T-Value	N/NS@
Management	Private	33	214.82	27.87	0.17	NS@
	Government	20	215.9	17.28		

Note: @ indicates not significant at 0.05 levels.

**Table- 5.** Management-wise Mean, SD and Significant Difference of Technological Pedagogical and Content Knowledge of B.Ed. teacher educators

**Interpretation:**

It can be seen from table 5 of the Technological Pedagogical and Content Knowledge of Teacher Educators of B.Ed. government and Private college, Private has Mean=214.82 and SD=27.87 which is lower than Government Mean= 215.9 and SD=17.28. Therefore, from the table, we can see that the computed t-value (0.17) of Technological Pedagogical and Content Knowledge of Teacher Educators in government and Private is lesser than the table value (2.007) for 51df at 0.05 level of significance. It is concluded that the type of management has no significant influence on the Technological, Pedagogical, and Content Knowledge of teacher educators in Nagaland. Therefore, hypothesis, 2 stands accepted.

**Objective:** To study the difference in Technological, Pedagogical and Content Knowledge of B.Ed. teacher educators with respect to qualification (Postgraduate and Ph.D.)

**Hypotheses-3:** There is no significant difference between Technological Pedagogical and Content Knowledge among B.Ed. teacher educators with respect to qualification (postgraduate and Ph.D.).

Variable	Group	N	Mean Scores	Standard Deviations	T-Value	N/NS@
Qualification	PG	34	211.55	24.87	1.54	NS@
	PhD	19	221.78	22.19		

Note: @ Indicate not significant at 0.05 level

**Table-6:** Qualification-wise Mean, SD and Significant Difference of Technological Pedagogical and Content Knowledge of B.Ed. teacher educators.

**Interpretation:**

Table 6 shows the mean scores of the qualification of the teacher Educators base on PG and



Ph.D. As can be seen from the table, Teacher Educators with PG have a 211.55 mean score of

Subject Taught	N	Mean	Standard Deviation	Source of Variation	SS	df	MS	F-Value	N/NS@
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TPACK with a standard deviation (S.D.) of 24.87, and Teacher Educators having Ph.D. has a 221.78 mean score of TPACK with a standard deviation (S.D.) 22.19. The difference in mean values of TPACK of postgraduate teachers and Ph.D. has been tested for statistical significance with the help of an independent sample t-test. As shown in the table, t-value 1.54, we can see that the computed t-value of Technological Pedagogical and Content Knowledge of Teacher Educators with respect to qualification (PG and Ph.D.) is lesser than the table value (2.007) for 51df at 0.05 level of significance. The result indicates that there is no significant difference in Technological Pedagogical and Content Knowledge among B.Ed. teacher educators with respect to qualification (postgraduate and Ph.D.) therefore, the null hypothesis stands accepted.

**Objective:** To study the difference in Technological, Pedagogical, and Content Knowledge of B.Ed. teacher educators with respect experience (0-5 years, 5-10 years, and 10 above years)

**Hypotheses-4:** There is no significant difference in Technological, Pedagogical, and Content Knowledge among B.Ed. teacher educators with respect to experience (0-5 years of experience, 5 -10 years of experience, and 10 above years of experience).

Years of Teaching Experience	N	Mean	Standard Deviation	Source of Variation	SS	df	MS	F-Value	N/NS@
0-5 Yrs.	23	212	28.60	Between Group	1072.78	2	536.39	0.90	NS@
5-10 Yrs.	18	221.5	19.89	Within Group	29484.5	50	589.69		
10 Above	12	212	20.79	Total	30557.28	52			

Note: @ Indicate not significant at 0.05 level

**Table 7:** Years of Teaching Experience wise Mean, SD, and Significant Difference of Technological Pedagogical and Content Knowledge among B.Ed. teacher educators

**Interpretation:**

It is clear from table 7 that the mean scores of the Technological Pedagogical and Content Knowledge of Teacher Educators of B.Ed. institution Years of teaching experience in regard to 0-5 yrs. is 212 and standard deviation is 28.60, 5- 10 yrs. is 221.5 and standard deviation is 19.89 and 10 yrs. The above mean score is 212, and the standard deviation is 20.79. The computed F-value is 0.90 is lesser than the 0.05 level. Hence, there is no significant difference, and hypothesis 4 stands accepted.

**Objective:** To study the difference in Technological, Pedagogical, and Content Knowledge of B.Ed. teacher educators with respect to subjects taught (Science, Mathematics, Social Science, and language)

**Hypotheses-5:** There is no significant difference in Technological, Pedagogical, and Content Knowledge among B.Ed. teacher with respect to subjects taught (Science, Mathematics, Social Science, and language).

Language	9	217.33	18.78	Between Group	647.68	3	215.89	0.35	NS@
Math	8	217.87	32.26	Within Group	299.96	49	610.4		
Science	11	208.45	24.45	Total	30557.28	52			
SS	25	216.6	23.99						

Note: @ Indicate not significant at 0.05 level

**Table 8:** Subject Taught wise Mean, SD and Significance Difference of Technological Pedagogical and Content Knowledge among B.Ed. teacher educators

### Interpretation:

It is clear from table 4.7 that the mean scores of Technological Pedagogical and Content Knowledge among B.Ed. teacher educators with respect to subjects taught Language have 217.33 and the standard deviation is 18.78, Mathematic mean score is 217.87 and the standard deviation is 32.26, Science mean score is 208.45, and the standard deviation is 24.45, and Social Science mean score is 216.6, and the standard deviation is 23.99. The computed F value is 0.35. Hence, the hypothesis is accepted for the variable of the subject taught opted at 0.05 level of significance. It can be concluded that the TPACK of teacher educators with respect to the subject taught has no significance. Therefore, the Hypothesis stands accepted.

### FINDINGS OF THE STUDY

The findings of the present study conducted derived from the analysis of the data are as follows: The study revealed that the Levels of TPACK of B.Ed. teacher Educators in Nagaland have 25% of high level, 64% above average level, and 11% average level. As such, it can be concluded that the level of TPACK of B.Ed. teacher educators fall under the Above Average level, which has the highest % as compared to other levels.

In terms of demographic analysis, the study confirms that Gender (Male and Female) and government and private institution teacher educators have no significant difference in the Technological Pedagogical and Content Knowledge of B.Ed. teacher educators in Nagaland though mean scores (215.9) of teacher Educators from Government institutions have been higher than the mean scores (214.82) of the teacher educators from Private institutions.

There has been found no significant difference in the study of TPACK of teacher educators with respect to their educational qualification i.e., PG and Ph.D. Also, the study conducted it is found that there is no significant difference in Technological, Pedagogical, and Content Knowledge among B.Ed. teacher educators with respect to experience (0-5 years of experience, 5 -10 years of experience, and 10 above years of experience) and Methodology or Teaching subject, namely Methodology of Teaching Science, Methodology of Teaching Social Science, and Methodology of Teaching Mathematics and methodology of teaching Language.

### EDUCATIONAL IMPLICATIONS OF THE STUDY

The study reveals that not all the teacher educators of Teacher Education of Nagaland have high levels of TPACK, as the majority of the teacher educators fall under the above-average level. Therefore, is a need to improve and provide information and integrate TPACK more into the teaching and learning process in order to achieve effective teaching and learning. It is revealed by the study Technological Pedagogical and Content Knowledge of Teacher Educators with regard to Gender (Female and Male) that the mean of females is higher than the mean of males. The findings also indicate that teacher educators of government teacher education institutions have a higher mean on the TPACK teachers than that of the private teacher education institution. Though the institution and management have no significance in the two, it can be said that



various important resources, materials and programmes should be developed and provided for the successful integration of TPACK.

Another important educational implication of the present study is that with respect to qualification viz., PG and Ph.D. Ph.D. has a higher mean score therefore there is a need for gaining more knowledge on the integration of TPACK and also acquiring requisite training by the Teacher educators having only PG.

The experience of the teacher educators in the field of the education system has a huge impact on the deliverance and knowledge of the subject as such, the teacher educators who are more experience ranging from 5-10 years of experience have higher mean as compared to that of the others. As such, TPACK of teacher educators with more teaching experience is more effective.

Overall, the Implementation and importance of TPACK is still a very new concept in the education system; however, the teacher educators teaching various subjects taught in the teacher education institution should be aware of it and implement it for effective teaching and learning.

## CONCLUSION

Thus, based on the findings of the present study and the literature reviewed, TPACK is essential and has a positive impact on teacher educators. It can improve the quality of learning and also make learning interesting when the right pedagogy and integration of technology in teaching are used while delivering the content knowledge of the subject matter. Therefore, the need to study TPACK among teacher educators in Nagaland is justified. Hence, it can be concluded from the present study that it was indeed successful research conducted as it raised awareness and knowledge of TPACK among various Teacher Educators of Nagaland and presented a demographic picture of teacher educators about TPACK.

As various studies indicated TPACK that teacher educators are willing to integrate technology with content knowledge and pedagogy. The same has been reaffirmed by the present study that TPACK can facilitate the correct implementation of the technologies and facilities in the classroom for the effective delivery of content through proper pedagogy. To conclude, there is a need for proper development of infrastructure and facilities for the implementation of the knowledge of TPACK in the education system in the state.

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