



Construction Of Techno-Pedagogical And Content Knowledge Scale (Tpack Scale)

Zoya Javed¹, Dr. Prem Prabha Singh²

¹Research Scholar, Department of Teacher Education, SHUATS, Prayagraj, India

²Associate Professor, Department of Teacher Education, SHUATS, Prayagraj, India

ABSTRACT:

The aim of the study was to construct and standardize a tool called: the techno-pedagogical content knowledge response scale (TPACK) for teachers so that they could evaluate their content, pedagogical, and technological knowledge and upgrade themselves in accordance with future needs. The test was administered to a total of 200 prospective teachers, selected from the urban area of Prayagraj District of Uttar Pradesh State. Data were collected on a total of 79 items constructed. t-test on a total of 79 items of upper 30 and lower 30 students were calculated. Then the items were selected and rejected according to the t-test. 28 items were eliminated, and 51 items got selected for the final draft of the TPACK scale, which was then proceeded for item analysis. The reliability of the tool was taken out through the Cronbach alpha method which is 0.88. The parallel reliability test is .0.8. The construct validity of the test was established through the Pearson correlation method through SPSS software, and content validity through experts.

Keywords: TPACK Scale, Item Analysis, Reliability, Validity, Norms

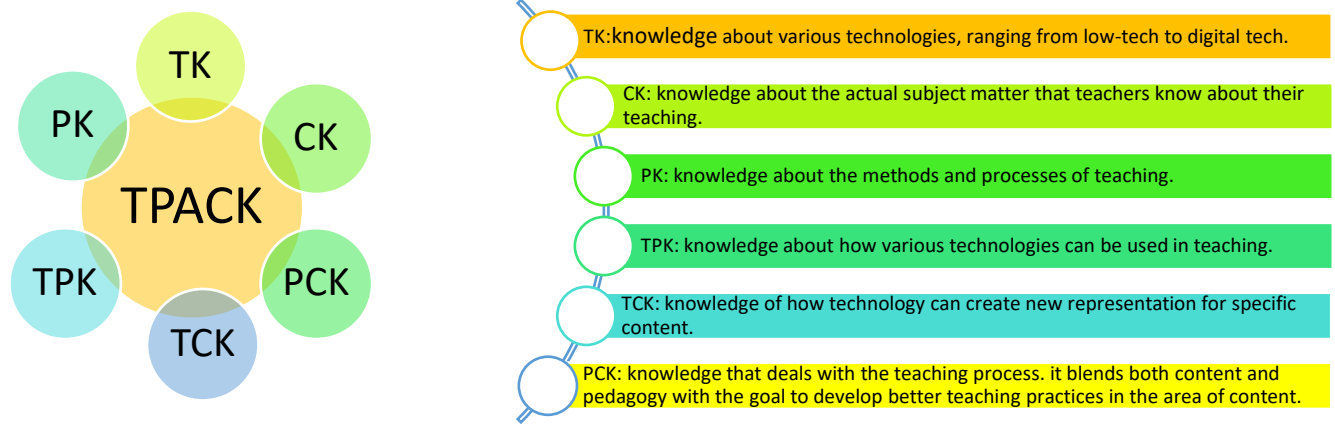
INTRODUCTION

A competent teacher integrates both pedagogical and content knowledge, according to Shulman (1986, 1987), who states that over the previous three decades, pedagogical content knowledge has dominated the conversation. This concept has been proposed earlier, but Mishra and Koehler (2006) expanded it more recently by adding technological proficiency as a third crucial component of successful teaching in the digital age.

According to the transformational approach, TPACK transcends the elements that make up its base rather than being represented as a distinct type of knowledge by simply adding all of its core elements together. One of the most influential frameworks for describing teachers' abilities to use technology effectively in the classroom is the idea of technological pedagogical content knowledge (TPACK). The most popular way for measuring TPACK is self-report questionnaires, although these methods have inherent problems that limit the accuracy, usefulness, or practical applicability of existing tools.

The technological Pedagogical Content Knowledge (TPACK) framework of Shulman and Koehler is built upon the three core components of pedagogical knowledge (PK), content knowledge (CK), and technological knowledge (TK), as well as four hybrid components that were created at the intersections of these three components: pedagogical content knowledge (PCK), technological pedagogical knowledge (TPK), technological content knowledge (TCK).

Figure.1



SELECTION OF ITEMS:

Before the scale's creation, a thorough literature review and discussions with numerous experts were conducted. Following that, 79 questions covering various facets of TPACK RESPONSE were created. Experts in a variety of disciplines were asked for their suggestions. Thus, only the items on which the experts agreed were kept in the scale's final form. Numerous scenarios were chosen for which statements were created, and by the scenarios, assumptions about the responses of the teachers were made and provided in writing.

When constructing these situational statements, the investigator kept the following in mind:

- 1) Every sentence described a situation in clear, uncomplicated words.
- 2) A specific statement only addressed one situation.
- 3) All of the statements were succinct (concise) and accurately described the situation.
- 4) Situations that might be unclear or ambiguous were avoided.
- 5) The investigator envisioned suitable instructor responses for each circumstance statement and offered them in writing.
- 6) Negative doubles were avoided.

TRY-OUT

The try-out was administered to 200 prospective teachers.

ITEM ANALYSIS

Item analysis is the statistical process used to choose the items that will be included in a psychological test in psychometrics. An item analysis is needed to indicate which items are very easy or very difficult and which are not functioning properly.

The Steps Of Item Analysis

- a) Construction of the items under each of the 6 categories namely: TK, CK, PK, PCK, TCK, and TPK
- b) Choose appropriate test elements and discard unsuitable ones as you create the test's final draft.
- c) Consider upper and lower % from the total items drafted,
- d) Calculate the discrimination index in the draft version.
- e) Calculate the t-test from the upper and lower responses.
- f) Accept those items which show a greater calculated value than the table value and reject the vice-versa.
- g) Rectify the distracters.
- h) Simplify the process of calculating the test's validity and reliability.
- i) Offer a rational foundation on which to choose the elements for the final draft version based on reliability, validity, and norms.

STANDARDIZATION OF THE SCALE

Format And Nature Of Statements

Written statements that provided a hypothetical depiction of a circumstance were made. Respondents who were aspiring teachers were invited to respond in writing to these hypothetical instances (questionnaire). The foreness and againstness of the TPACK Scale were measured using positive and negative polarity statements, respectively.

Development And Selection Of Statements

Each statement was constructed using the word form. In each component, there were groups of statements. Each component explained a certain behavior. The investigator assembled a preliminary pool of 79 statements with the help of a review of the literature and guidance from experts. The accuracy of these statements was then checked against each component. Additionally, the grammatical structure of the statements was examined, and it was determined that they represented appropriate behavior.

A pilot test/try-out form using 79 statements for the try-out form was carried out. 51 statements in total were finalized through this process and disseminated across the components. Following is a breakdown of how statements are distributed according to components and polarity:

TABLE 1: Drafted Items Before Applying t-TEST

ITEM. NO	COMPONENTS	TOTAL	NATURE OF THE ITEMS	TOTAL	NO. OF ITEMS
1	TK	28	POSITIVE	24	1,2,3,4,5,6,7,8,10,12,13,15,17,18,19,20,21,22,23,24
			NEGATIVE	4	9,11,14,16
2	CK	8	POSITIVE	7	1,2,3,4,5,6,8
			NEGATIVE	1	7
3	PK	16	POSITIVE	14	1,2,3,5,6,7,8,10,11,12,13,14,15,16
			NEGATIVE	2	4,9
4	PCK	11	POSITIVE	10	1,2,3,4,5,6,7,8,10,11
			NEGATIVE	1	9
5	TCK	9	POSITIVE	8	1,2,3,4,6,7,8,9
			NEGATIVE	1	5
6	TPK	7	POSITIVE	7	1,2,3,4,5,6,7
			NEGATIVE	0	0
TOTAL		79		79	
			TOTAL POSITIVE = 70		
			TOTAL NEGATIVE = 9		

Standardization took the final form of 51 items (Positive and Negative). It was administered to a randomly selected representative sample of 200 prospective teachers (male and female) in Prayagraj, Uttar Pradesh India.

Scoring Procedure

The investigator followed the Dichotomous scales (“yes” or “no”) scoring procedure for the positive and negative polarity of the statements. For each positive(yes) response, 1 mark was given to the statement and for positive(no) 0 marks have been allotted and for negative (yes), 0 marks have been allotted, and negative(n0) 1 mark has been given. After administration the scoring was done as depicted in the below-given table:

SCORING SYSTEM			
S.NO	Marking		
	TYPES OF ITEM	YES	NO
1	POSITIVE	1	0
2	NEGATIVE	0	1

The maximum score attainable on the scale was 78 and the minimum score attainable was 45 on an administration of 79 items. But after rejecting the 28 items from the total of 79 items, the min and max scores changed to 51 and 24 respectively.

SELECTION OF STATEMENTS FOR TPACK SCALE THROUGH (t-TEST)

As per Likert (1932), the investigator used the difference between the high and low groups for the final selection of items.

The investigator's first stage involved taking into account the frequency distribution of scores based on all the statements' responses. The individuals with the highest total scores (NH = 30) and with the lowest total scores (NL = 30) were then selected for item analysis at a rate of 30 % each. They were divided into two groups: high and low. t-values were computed to evaluate the responses of the high and low groups for each statement.

Following the procedures provided by Likert (1932), the following criteria were used to choose the statements for the TPACK Scale's final format:

The value of t is an indicator of how well a statement distinguishes between high and low groups. As a crude and approximate thumb rule, any t value at df 58 that is equal to or higher than 2.00 indicates a significant difference between the average responses of the high and low groups.

Thus, to conclude, the investigator rejected 28 statements and selected 51 statements for the final format of the TPACK scale.

ACCEPTED RESPONSE	REJECTED RESPONSE	TOTAL
51	28	79

FINAL FORMAT OF TPACK SCALE**TABLE 2: Component Wise Distribution Of The Items (after applying t-test)**

ITEM. NO	COMPONENTS	TOTAL	NATURE OF THE ITEMS	TOTAL	NO. OF ITEMS
1	TK	21	POSITIVE	17	1,2,3,4,5,7,8,9,10,12,14,15,16,17,18,19,20,21
			NEGATIVE	4	6,8,11,13
2	CK	7	POSITIVE	6	1,2,3,4,5,7
			NEGATIVE	1	6
3	PK	5	POSITIVE	3	1,2,4
			NEGATIVE	2	3,5
4	PCK	6	POSITIVE	5	1,2,3,4,5
			NEGATIVE	1	5
5	TCK	8	POSITIVE	7	1,2,3,4,6,7,8
			NEGATIVE	1	5
6	TPK	4	POSITIVE	4	1,2,3,4
			NEGATIVE	0	0
TOTAL		51		51	
			TOTAL POSITIVE =42		
			TOTAL NEGATIVE =9		

PSYCHOMETRIC PROPERTIES OF THE TPACK SCALE

In the present study, the investigator has established reliability, validity, and percentile norms for establishing the psychometric properties of the TPACK scale. The details are discussed below:

➤ RELIABILITY

A measure of reliability means how consistently a test, questionnaire, observation, or other measurement process yields the same results across time. The questionnaire's reliability is typically tested with a pilot test. In general, questionnaires are believed to have high reliability.

1. CRONBACH'S ALPHA INTERNAL CONSISTENCY RELIABILITY

The computed result of Cronbach's Alpha Internal consistency of the TPACK SCALE for 51 items is **0.88301** which is good as per Cronbach's Alpha Internal Consistency table.

2. PARALLEL RELIABILITY

The computed result of the Parallel reliability test of the TPACK SCALE for 51 items is: **r=0.86** which is **high** as per the interpretation of the table.

➤ VALIDITY

The extent to which an assessment assesses what it is intended to measure is referred to as validity. A test cannot be valid unless it is reliable.

1. CONTENT VALIDITY

For content validity, the 6 categories namely TK, CK, PK, PCK, TCK, and TPK of the TPACK Scale were selected and clearly defined for the purpose of measuring the specific aspects of TPACK. These definitions were also subjected to the judgement of various experts.

2. CONSTRUCT VALIDITY

To check the validity of the present scale, Pearson correlation on a total of 60 prospective teachers' responses (upper and lower 30%) of 51 selected items was calculated on a total of

item scores by using the analysis of bivariate correlation on SPSS. The item correlation with the total score indicates the construct validity.

VALIDITY OF 51 ITEMS	Pearson Correlation	N	DF (DEGREE OF FREEDOM) (N-2)	CRITICAL VALUE AT 0.05	SIGNIFICANCE	VALIDITY
	1	60	58	0.250	SIGNIFICANT (OBTAINED VALUE>CRITICAL VALUE) (1>0.25)	VALID ITEMS

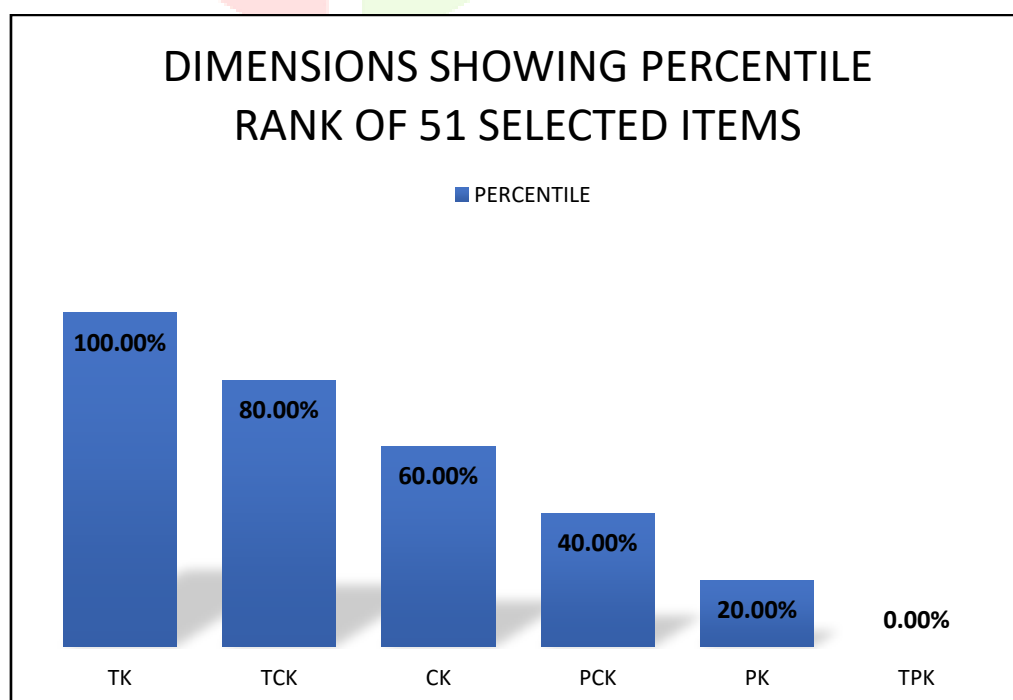
- As shown in the table, the Pearson correlation is 1(calculated value) for 51 accepted items and the number of prospective teacher's responses taken was 60 (including upper and lower30%).
- Critical value for Pearson's correlation coefficient at 0.05 at 58 df is 0.250, which is smaller than the calculated value 1 and hence it shows a highly significance and therefore our 51 items constructed for TPACK Scale are valid.

FIXING THE NORMS FOR TPACK SCALE

After the tool is constructed and administered, scoring is done, providing information to the individual who is tested, here in this case- prospective teachers. Only after the score is understood does it become significant. A score on the tool is meaningful when compared to the average of the group. To evaluate the degree to which an individual's score deviates from the average of the general population or from the average of the group, norms must be established for every standardized tool. Norms are the levels attained by a particular group of a person on a set. As a result, norms can be thought of as a standard of reference, which is why the investigator created norms for the TPACK scale.

PERCENTILE NORMS:

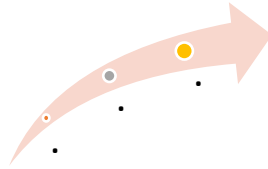
Figure 2



This graph is obtained by analyzing the data in excel by using the rank and percentile options. The sequence/rank of the dimensions changed from (TK,CK,PK,PCK,TCK,TPK) to (TK, TCK,CK, PCK,PK,TPK). The percentile rank was calculated dimension-wise from the average scores of 200 prospective teachers enrolled in B.Ed.

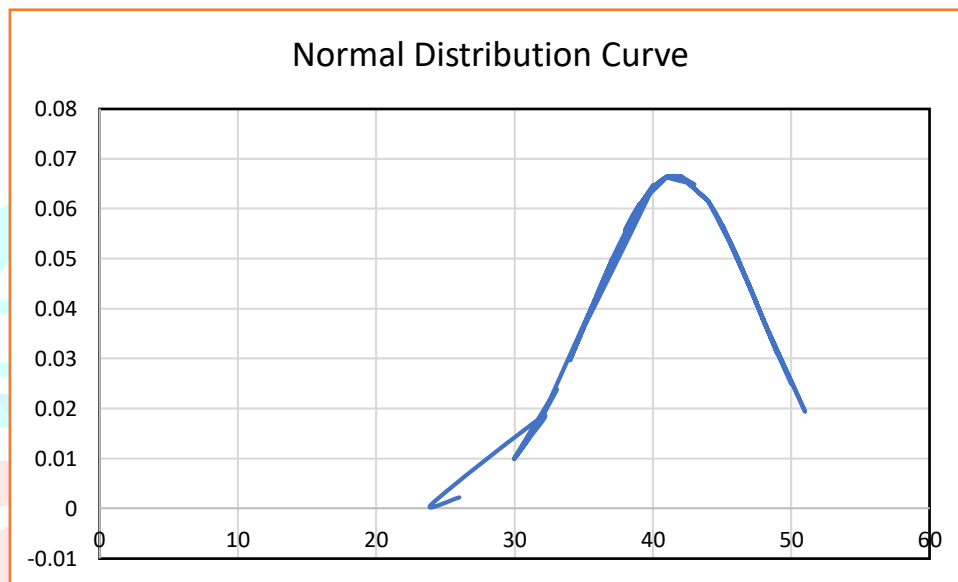
FIXING NORMS FROM QUARTILE DEVIATION AND ITS NPC:

Highest	51
Lowest	24
Q1	38
Q2	42
Q3	47
Mean	41.60784
Sd	5.983735



LOW	24-37
AVERAGE	38-41
HIGH	42-51

Figure 3



CONCLUSION

The major objective of this study is to build and standardize a TPACK RESPONSE SCALE- a tool for teachers, assessing already-present characteristics and features, offering a comparison point or another equally accurate indicator of TPACK (6 dimensions). To put it another way, the goal of the study is to create a scale or standardized data that accurately depicts the scenario at hand and offers a broad framework for comparing the results. The standard score norms have been applied in this study to make it easier to interpret the results.

REFERENCE

Glen S (2021) "Z-Score: Definition, Formula and Calculation" from Statistics How to come: Elementary Statistics for the rest of us. <https://www.statisticshowto.com/probability-and-statistics/z-score/>

Assessment of Pre Service Teacher's Perceptions on Technological Pedagogical and Content Knowledge (TPACK) in Karachi Pakistan Zahid Ali¹, Dr. Martin Thomas², Nazir Ahmed³, Imran Ahmed⁴, Ishtiaq Ahmed