



The TPACK of Secondary School Teachers in Context to Their Personality and Type of Schools

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Abstract: With the emergence of technologies and digital tools, the role of the teachers has transformed significantly in the classroom. They play multiple roles in order to build a better society and nation in a clear, close, and comprehensive manner. This study aims to investigate the Technological - Pedagogical and Content Knowledge of Secondary school teachers with the aid of descriptive survey method. For this, two standardized tools were administered on a sample of 120 teachers selected randomly from Secondary schools of Bhagalpur city, Bihar state. The collected data was analyzed statistically following one way analysis of variance and t-test. The findings of this study show that teachers differ significantly in the TPACK with respect to their personality and school types. The teachers of Non-Govt. schools indicate a higher level of TPACK as compared to Govt. teachers. Conclusively, teachers, who are the basic pillars of the Indian education systems, have to play a vital role and they still have to serve a lot for the progress and welfare of mankind.

Index Terms: TPACK, Secondary school teachers, Personality and type of schools

INTRODUCTION

In the 21st century, the development of information and communication technology (ICT) influenced all sectors of life, one of which is the education sector. The teachers as key to education sector must pay attention to integrating these advancements into their teaching profession (Astuti, F et al 2019). Research related to teachers has been ongoing for many years, leading to different ways of developing, understanding, and exploring what teachers know and do. To integrate ICT into the teaching and learning process successfully, teachers must have knowledge of technology that is combined with both pedagogical and content knowledge (Astuti, F et al 2019). The combination of content, pedagogy, and technology knowledge, which helps in achieving ICT-integrated learning, is referred to as Technological Pedagogical and Content Knowledge (Koehler & Mishra, 2006). Smart teaching involves three core domains, namely Content Knowledge (CK), Pedagogical Knowledge (PK) and Technological Knowledge (TK) along with the inter-relationships between these domains. These three domains interconnect to form the Pedagogical Content Knowledge (PCK), Technological Pedagogical Knowledge (TPK), Technological Content Knowledge (TCK), and Technological Pedagogical and Content Knowledge (TPACK) (Alenazi, F. (2019).

L. S. Shulman (1986) in his breakthrough paper 'Those Who Understand: Knowledge Growth in Teaching,' introduced the concept of Pedagogical Content Knowledge (PCK), a theoretical framework that outlines the knowledge and skills teachers need. He asked "What are the domains and categories of content knowledge in the minds of teachers?" and "How are content knowledge and general pedagogical knowledge related?" He described PCK as the blend between knowledge of subject matter and knowledge of teaching methods. He further explained PCK as "the blending of content and pedagogy into an understanding of how particular topics, problems, or issues are organized, represented, and adapted to the diverse interests and abilities of learners, and presented for instruction." (Shulman, 1987 and Aygün, B. 2016). It helps teachers understand how to effectively present content to promote student learning, including reducing obstacles and misconceptions. It consists of subject matter knowledge and pedagogical knowledge, or the understanding of how to represent and structure content for teaching (Güler, F. 2015). He emphasized that PCK requires awareness of what makes a topic easy or difficult to understand. According to Shulman, "If those preconceptions are misconceptions, which they so often are, teachers need knowledge of strategies most likely to be fruitful in reorganizing the understanding of learners, because those learners are unlikely to appear before them as blank slates."

The term TPACK stands for Technological Pedagogical and Content Knowledge. Its framework describes the types of knowledge teachers need to effectively use technology in teaching, and how these areas of knowledge interact with one another (Prasad, J. (2018). This builds on the approach work of Shulman (1986). Mastery of TPACK helps teachers recognize their readiness to integrate ICT into learning. Teachers who have a good grasp of TPACK are more likely to successfully integrate ICT into the learning process (Astuti, F et al 2019). Teachers may struggle to integrate ICT if they lack sufficient knowledge on how to use it effectively in teaching. These researchers expanded on Shulman's (1986) work in the area of pedagogical content knowledge (PCK), or the specific knowledge teachers have about their subject (CK) in relation to how they teach it to a particular group of students. Niess (2008) defines TPACK as "the body of knowledge that teachers now need for teaching with and about technology in assigned subject areas and grade levels".

Dimensions of TPACK

- a) **Technological Knowledge (TK):** This includes knowledge of computer hardware and software, presentation tools like projectors and document presenters, and other technologies used in educational settings. The ability to learn and adapt to new technologies is especially important. Computers, for example, can be used for a variety of pedagogical tasks, including research, communication, and the creation and consumption of media. However, computer hardware and software can quickly become out of date.
- b) **Pedagogical Knowledge (PK):** This refers to general knowledge specific to education. It is a collection of skills that educators need to master in order to plan, organize and manage teaching and learning activities to achieve desired outcomes. This knowledge includes, but is not limited to, understanding lesson design, assessment of student learning, and classroom management tasks.
- c) **Content Knowledge (CK):** This relates to expertise or specialization in a particular subject or discipline. It varies across different educational environments, and teachers are expected to be experts in the material they teach. Content knowledge is important because it develops the unique ways of thinking associated with each field.
- d) **Technological Pedagogical Knowledge (TPK):** This highlights the mutual relationship between technology and pedagogy. This knowledge enables teachers to select the most appropriate tools based on how well they fit their teaching style and the goals of their pedagogy. Technology can also enable new ways of teaching and learning, and make some classroom tasks easier to carry out. Instead of in-person meetings, collaborative activities can be conducted over long distances, such as writing using Google Docs or Google Hangouts. Additionally, teachers need to create new teaching strategies that are compatible with available resources, especially with the growth of online learning and the introduction of massive open online courses (MOOCs).

- e) **Technological Content Knowledge (TCK):** This refers to the mutual relationship between content and technology. Technology influences our understanding and creates new opportunities to represent certain material in novel ways that were previously difficult or impossible. For example, using the hands to interact with the screens of portable devices, children can now explore the connection between geometric shapes and angles. Similarly, visual programming tools now allow elementary school students to learn about programming by creating and designing video games. Technology also enables the discovery of new material and representations of content, as seen in the connection between the development of Carbon-14 dating in archaeology and the ability of Google Trends to predict the spread of the coronavirus.
- f) **Pedagogical Content Knowledge (PCK):** This confirms Shulman's (1986) claim that understanding methodology and content alone is not enough for effective teaching. PCK also recognizes that different teaching approaches work well with certain subjects. For instance, a foreign language teacher teaching speaking skills may need to engage students with meaningful, real-life communication tasks through student-centered activities. In contrast, a teacher-centered lecture may be suitable for a professor explaining ways to engage with art in a graduate-level art appreciation class. In this sense, PCK involves more than just knowing broad teaching principles or being an expert in a subject—it means understanding the specific interactions between content and pedagogy.
- g) **Technological, Pedagogical and Content Knowledge (TPACK):** This refers to the comprehensive understanding of all the knowledge areas mentioned above, with a focus on how technology can be specially designed to meet pedagogical needs and teach specific subjects in specific contexts. Each of the domains that make up TPACK represents an essential and important part of teaching. However, effective teaching goes beyond each of these components (TK, PK, and CK). When a teacher uses TPACK, their knowledge of content, pedagogy, and technology is combined to create meaningful learning experiences for their students.

The term "personality" comes from the Latin word "persona," which originally referred to the mask that actors used to portray different characters. In its earliest meaning, personality was associated with the outward appearance or the way someone presents them. Over time, the concept has evolved to include not just the external image but also the internal characteristics that define an individual. Personality is influenced by a variety of factors, both biological and environmental. It is closely linked to individual differences and plays a role in shaping how a person behaves, thinks, and feels. Therefore, personality can be understood as both a psychological and physiological aspect of an individual.

“Personality makes people uniquely themselves”

– H. Friedman and M. Schustack (2016)

“Personality is defined as the characteristic set of behaviors, cognitions, and emotional patterns that evolve from biological and environmental factors.”

– Philip J. Corr and Gerald Matthews (2009)

Jung's typology categorizes people based on psychological characteristics, distinguishing them into two broad types: extroverts and introverts. These types are determined by how individuals regain energy. Extroverts tend to feel recharged by social interactions, while introverts prefer solitude and need time alone to replenish their energy. Extroverts are generally sociable, enjoy engaging with others, and often display leadership qualities. They tend to be optimistic, realistic, and practical in their approach to life. Introverts, on the other hand, are the opposite of extroverts. They are less inclined to socialize and usually have a smaller circle of friends. They often prefer their own company and may find comfort in their internal world. Introverts are often seen as quiet, reserved, and thoughtful. They tend to be cautious and may follow societal norms without questioning their validity. They might take longer to make decisions and can be more anxious about the future.

Jung's classification has faced criticism because many people do not neatly fit into one category. Some individuals display traits of both extroversion and introversion depending on the situation. In response to this, modern psychologists introduced the concept of "ambiverts" to describe such individuals who

exhibit characteristics of both types. It is natural for student teachers to vary in their traits and characteristics, whether due to inherent differences or the context in which they operate. Psychologists, intellectuals, and educators have consistently emphasized the impact of personality type on academic performance and personal achievements.

REVIEW OF THE LITERATURE

To explore new horizons of knowledge, an attempt has been made to look into the past in order to filter out research available in the current field of investigation. As a result, earlier studies were reviewed to address the areas that have not been addressed yet.

Parkash and Hooda (2018) explored the techno-pedagogical competency of higher secondary school teachers in government and private schools in Haryana, India. The objective of the study was to examine and compare the techno-pedagogical competencies of higher secondary school teachers across different school types (Government vs. Private), genders, and geographic locations (Urban vs. Rural). Using a descriptive survey method with a sample of 200 teachers, the study reveals that private school teachers demonstrate higher techno-pedagogical competency than their government school counterparts, likely due to better facilities in private institutions. Additionally, male teachers exhibited greater competency compared to female teachers, and urban teachers outperformed rural teachers, attributed to greater access to technological resources in urban areas.

The study *"TPACK Mastery of Biology Teachers: A Study Based on Teacher Gender"* by **Astuti et al. (2019)** investigated how gender influences the Technological Pedagogical and Content Knowledge (TPACK) of biology teachers. Using a 40-item validated test instrument and analyzing responses from 29 participants via descriptive statistics and an independent sample t-test, the study found that overall TPACK mastery among biology teachers was good, with an average score of 59.15. However, specific domains like Technological Knowledge (TK) and integrated TPACK scored lower, indicating room for improvement. Importantly, the findings reveal no significant gender-based differences in TPACK mastery ($p > 0.05$), suggesting that both male and female biology teachers possess comparable competencies in integrating technology into their teaching.

Kumar and Gangmei (2019) attempted 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 smart phone 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.

Malik (2020) conducted a study on the relationship of Sense of Humour and TPACK with Professional Commitment of senior secondary school teachers. The objective of the study was to explore the relationship of Sense of Humour and TPACK with Professional Commitment of senior secondary school teachers. The study was conducted on a sample of 600 senior secondary school teachers from various schools situated in Haryana state. This study used a descriptive survey method. The findings of this study established a positive and significant relationship between sense of humour, and TPACK with professional commitment among senior secondary school teachers, regardless of their gender or whether they were teaching in urban or rural areas.

Rao and Jalajakshi (2021) highlighted the critical role of integrating technology with pedagogy in modern education. Emphasizing that technological advancements have revolutionized teaching and learning, the authors argue that techno-pedagogical skills are essential for teachers to make learning more effective, accessible, and engaging. The paper discusses both the challenges teachers face in

adopting technology and the numerous benefits of successful integration, such as enhanced professional development and addressing diverse learner needs. Ultimately, it calls for teachers to actively develop these skills to transform students into productive citizens equipped for the demands of the 21st century.

Kumar and Praveena (2022) explored the level of techno-pedagogical skills among teacher trainees at the University of Mysore in the context of the 21st century's increasing reliance on technology in education. Utilizing a descriptive survey method with stratified random sampling from ten affiliated colleges, the study highlights the importance of integrating ICT with pedagogy and content knowledge for effective teaching. The findings emphasize the need for teacher trainees to develop proficiency in techno-pedagogical skills to enhance instructional delivery and meet modern educational demands. The study also reviews related literature showing varied competency levels among different groups of educators, reinforcing the critical role of such skills in teacher preparation programs.

Qurashi and Jan (2022) examined the techno-pedagogical competence of secondary school teachers in Kashmir, comparing private and government school educators. The study employed a descriptive survey design, using a standardized techno-pedagogical competence scale to collect data from a sample of 600 secondary school teachers across private and government schools in Kashmir. Statistical techniques were applied to compare competence levels between the two groups. They found that private school teachers generally demonstrated higher levels of techno-pedagogical skills than government school teachers. The significant difference between the two groups suggests disparities in access to training, resources, or support. The findings underscore the importance of tailored professional development programs to enhance technology integration skills, especially within government schools, to promote equitable and effective teaching in digitally evolving class rooms.

Aksin (2023) presented a robust and timely examination of the factors influencing Technological Pedagogical and Content Knowledge (TPACK) levels among pre-service social studies teachers in Turkey. Grounded in the widely accepted TPACK framework, the research investigates how various socio-demographic variables—such as gender, year of study, type of high school attended, home computer ownership, technical computer skills, and weekly computer use—correlate with TPACK competencies. Drawing on data from 368 participants, the study employs MANOVA and ANOVA to reveal significant relationships between these factors and subcomponents of TPACK, such as Technological Knowledge (TK), Pedagogical Knowledge (PK), and Pedagogical Content Knowledge (PCK). Findings show that male pre-service teachers and those with higher technical computer skills, home computer access, or more weekly screen time consistently scored higher in multiple TPACK domains. Interestingly, graduates of nonselective high schools showed stronger technology integration skills than their selective school counterparts—an unexpected outcome attributed to differing academic pressures and opportunities for skill development.

Biswas and Sankar (2024) explored secondary school teachers' intuition toward Transformative Techno Pedagogy (TTP) in Arunachal Pradesh, focusing on how gender and qualification influence this perception. Using a descriptive survey design with 200 teachers, the study found that teachers generally possess an average level of intuition regarding TTP. Notably, a significant difference exists between male and female teachers' intuition levels, while qualification does not appear to affect their perceptions. The study underscores the importance of integrating transformative techno-pedagogical strategies in 21st-century classrooms to foster critical and analytical thinking among students.

The study *"Implementation of Artificial Intelligence in Teachers' Technological Pedagogical and Content Knowledge in EFL Context"* by **Sari, et al (2024)** explored how Indonesian EFL teachers perceive the role of AI within the TPACK framework and its influence on their teaching practices. Using a narrative inquiry method and interviews with three teachers of different experience levels, the research highlights teachers' recognition of AI's potential to personalize learning and boost student engagement. However, it also identifies significant barriers such as limited access to resources and insufficient training, which hinder effective AI integration in classrooms. The findings underscore the need for enhanced support and infrastructure to enable teachers to leverage AI tools confidently, ultimately fostering more innovative and effective technology-enhanced language teaching.

Li and Su (2025) investigated the Technological Pedagogical Content Knowledge (TPACK) abilities of teachers across different teaching stages and educational levels, analyzing data from 1,342 participants. The objective of the study was to assess teachers' TPACK abilities across various teaching stages and educational levels, and identify differences in specific TPACK sub-domains. A quantitative research design was used, collecting data from 1,342 teachers. Statistical analysis was conducted to compare TPACK levels across teaching stages and educational qualifications, highlighting areas for targeted ICT training. Their study reveals that overall, teachers possess a high level of TPACK, but significant differences exist depending on the teaching stage and level of education. Specifically, variations were found in content knowledge, pedagogical knowledge, and multiple TPACK subdomains, except technological knowledge and pedagogical content knowledge, which remained consistent. The findings emphasize that teachers' TPACK abilities improve with higher educational attainment and suggest tailored ICT training for educators with lower qualifications to boost their technological confidence and instructional effectiveness.

The study *"The Application of TPACK Model in Teachers' Teaching Practices: A Study on Integration and Effectiveness"* by **Vijayatheepan (2025)** explores how Tamil-medium school teachers in the Jaffna Educational Division of Sri Lanka integrate technology into their teaching using the TPACK framework. A mixed-methods approach was employed, combining survey responses and classroom observations from 142 teachers to evaluate their TPACK components and identify correlations with teaching effectiveness, as well as barriers to technology integration. The study reveals strong pedagogical (PK) and content (CK) knowledge among teachers, but only moderate levels of technological knowledge (TK) and integration abilities (TPK, TCK). Notably, strong positive correlations between TPACK components and teaching effectiveness were found, with PCK and TPK emerging as the most influential. Barriers such as insufficient resources, lack of training, limited preparation time, and language-related challenges unique to Tamil-medium schools hinder effective technology use. Despite these obstacles, teachers with higher TPACK competency demonstrated more engaging, tech-integrated classroom practices. The study concludes that targeted training, localized digital tools, and institutional support are vital to overcoming challenges and advancing effective ICT integration in resource-constrained educational settings.

It follows from the review of related literature that researchers carried out diverse research works in the field of TPACK. In this context, the investigator organized the related studies and the factors that determine the level, namely gender, location of their residence whether rural or urban. Some of the authors identified the social aspects as the most affecting factor and whereas some authors indicated the personal traits of the concerned showing a marked difference in the TPACK.

OBJECTIVES OF THE STUDY

- To compare the TPACK of teachers in context to their personality types.
- To compare the TPACK of teachers in context to their type of schools.

HYPOTHESES OF THE STUDY

H₀₁: -There will be no significant difference in the TPACK of teachers having introvert, ambivert and extrovert personality.

H₀₂: -There will be no significant difference in the TPACK of teachers of Govt. and Non-Govt. schools.

METHODOLOGY OF THE STUDY

- **Method of study:** A descriptive survey method was followed in the present study with the aid of standardized tools.
- **Sample and sampling technique:** The investigator in the present study used random sampling technique to select a sample of 120 teachers from 10 secondary schools of Bhagalpur city in Bihar state.

- **Tool of the study:**

1. Introversion Extroversion Inventory (IEI) developed by Dr. P. F. Aziz and Dr. (Prof.) Rekha Gupta (Meerut).
2. Teachers' Technological, Pedagogical & Content Knowledge Scale developed by Prof. Hemant Lata Sharma and Ms. Leena Sharma (Rohtak).

- **Statistical Techniques:** Parametric statistics like Mean, Standard Deviation, t-value, and F-value were used to analyze the data.

DATA ANALYSIS AND INTERPRETATION

Analysis of data and interpretation for findings were carried out in view the objectives of the study. The scores obtained from the administration of the tools were classified, tabulated and processed.

Ho₁: -There will be no significant difference in the TPACK of teachers having introvert, ambivert and extrovert personality.

Table no.-01

TPACK scores of teachers having introvert, ambivert and extrovert personality

Source of Variance	Sum of Squares	df	Mean Square Variance	F-value	Remark
Between Group	698.17	2	349.085	4.46	Significant at 0.01 level
Within Group	9157.4	117	78.267		

Interpretation-

Since the calculated F-value (4.46) is greater than the table value (3.98) for 2 Between Group df and 117 Within Group df at 0.01 level of significance, therefore, it proves to be significant.

Result: - As F-value is significant, therefore, the hypothesis Ho₁ is discarded.

Ho₂: -There will be no significant difference in the TPACK of teachers of Govt. and Non-Govt. schools.

Table no.-02

Mean, Standard Deviation and t-value for the TPACK scores of teachers of Govt. and Non-Govt. schools

School type	N	Mean	S.D.	df	t-value	Remark
Govt.	60	162.84	22.05	118	4.08	Significant at 0.01 level
Non-Govt.	60	179.69	23.17			

Interpretation:

It is evident from the above table that the calculated t-value is greater than the statistical table value (2.63) for 118df at 0.01 level of significance; therefore, it proves to be significant.

Result: - As t-value is significant, therefore, the hypothesis Ho₂ is not accepted.

FINDINGS OF THE STUDY

The present study documents the following conclusions:

- There is a significant difference in the TPACK of teachers having introvert, ambivert and extrovert personality.
- There is a significant difference in the TPACK of teachers of Govt. and Non-Govt. schools.
- The teachers of Non-Govt. schools possess higher TPACK in comparison to Govt. teachers.

IMPLICATIONS OF THE STUDY

- This study will help in undertaking future research.
- Findings of the present study will provide an opportunity to explore the measures for removal of the associated barriers of.
- The performance and achievement of the students will be improved.
- It will help in developing the technological aspect in addition to social, educational and moral aspects of the students.

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