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Enhancing Teaching Practices in the 21st Century an Analysis of University Teachers' TPACK Competency

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Abstract

Introduction: *In the constantly changing 21st century, unified curricula, new technologies, and integrated knowledge define educational paradigms. This requires university teacher to improve their teamwork, digital literacy, critical thinking, problem-solving, pedagogy, and technology skills. These abilities must be integrated to improve education and student success. TPACK is a theory for integrating technology into teaching. This study evaluates university teachers' TPACK and domain comprehension, concentrating on technology integration in teaching and learning.*

Problem Statement: *TPACK is crucial to modern education, yet Sindh public sector university teachers' technology integration skills are not investigated. This study investigates the public sector university teachers' TPACK knowledge of Technology, Content, Pedagogy, and Technology.*

Methodology: *This study used quantitative descriptive method to collects cross-sectional*

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data using purposive sampling and questionnaires. The survey scales participants' replies using Likert scale questions from 1 (strongly disagreed) to 5 (strongly agreed). A mean score of 4.0 or higher indicates high trust in using technology for modern education. The 290 university teachers are 85.9% female and 14.1% male. The analysis considers age, education, and professional goals. Technology Knowledge and pedagogical topic understanding scores are assessed for certain subjects.

Results: *Both male and female public sector university teachers have TPACK expertise, according to the study. However, gender mean scores indicate a statistically insignificant difference. Based on domain-specific educational topic awareness, science has the highest comprehension and mathematics the lowest. Content analysis demonstrates teachers' embrace of classroom technology.*

Recommendations: *Public sector university teachers need targeted professional development to boost their TPACK confidence. Technology pedagogy and topic understanding should be prioritized in lower-comprehension subjects. These proposals aim to fill TPACK knowledge gaps, improving technology integration in teaching and learning.*

Key words: *Educational Technology, Technological Pedagogical Content Knowledge (TPACK)*

Introduction

All improvements to the education system are primarily dependent on the instructor. Teaching has an essential role in the intellectual growth of students. A successful educator has the ability to build a nation, establish ideas, and place an emphasis on learning rather than instruction. The teaching-learning process was impacted by factors such as academic qualifications, material comprehension, competency, pedagogical expertise, and the willingness demonstrated by teachers. Through the adoption of a more holistic perspective of the educational system, which transforms individuals, a competent educator has the ability to bring about societal change (NEP 1998, 2009, 2015). The faculty of a university has to be knowledgeable on their subject matter, techniques of instruction, and management abilities (UNESCO, 2006). Technology is essential for engaging students in learning activities when teachers are required to educate (Ali, et al., 2023). According to Ali, et al., (2020), preparation prior to teaching is essential for ensuring quality and professionalism in the classroom. In comparison to previous centuries, the twenty-first century is

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unique. Technology that is currently available is required for improved communication and information transmission in our environment (Kapici, & Akcay, 2023) as well as for the purpose of teaching. Tee (2022) made a step in the right direction.

On the basis of the concept that digital technology has altered the way we perform our jobs in the majority of professions. Technology is now a part of education as it has transformed. There are technological arguments that support the idea that it is an approach to education that is understandable in general and science in particular, and that it assists in thinking about the environment as an organism. The same line of reasoning applies to the use of technology in education: altering engagement encompasses the basic characteristics of any scheme and makes it possible through a variety of actions that encourage particular learner behaviors over an extended period of time. By utilising the challenge that was issued to educators by the Worldwide Society for information and Education, Tao and Ma (2022) were able to conceptualise the technical abilities and information that children require in the current setting.

Teachers are able to facilitate, advise, or mentor students because to the availability of content made possible by technology. A teacher is responsible for establishing an atmosphere in which he may provide assistance to pupils, which results in the students gaining a great deal of knowledge. All of the researchers are in agreement that trainers need to be able to employ equipment in conjunction with their educational experience and knowledge of the subject matter. A teacher at a university in the public sector handles the most important obstacles and challenges at every given level. According to Zhakata (2022), Darling-Hammond stated that professional teachers accomplish more than their non-professional counterparts, even if they possess specialised abilities to address issues.

When it comes to assisting students in achieving their goals, it is often assumed that teachers should combine classroom strategies with an awareness of technology. It incorporates pedagogical, substantive, and mechanical learning within its framework. The PCK concept proposed by Shulman was developed upon by Fahadi and Khan (2022), who included innovation. The amount of advanced pedagogical stuff information (TPCK or TPACK), which is a type of PCK modification, has increased. In order to make elocution more straightforward, the word TPCK was modified to TPACK (Wang, 2022). Knowledge that is required to integrate technology into the classroom is referred to as TPACK. According to Hussain et al. (2023), knowledge is the

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foundation of technology, while pedagogy and content are the factors that improve instruction. A meaningful use of technology is made easier for educators by TPACK. According to the findings of a number of empirical studies (Scherer et al., 2018), the attitudes of teachers towards technology are significant. According to Ali et al. (2022), the concept of new digital encompasses all types of mathematical devices included in machineries that are used for the purpose of educating science. McCrory, 2008 (year). The fact that university professors have a high level of digital and TPACK skills makes it simpler to employ these talents in both practise and research. It is made clear by Manzano (2023) that for practical purposes, the technologies that are mostly considered are concepts that are relatively new in recent study and are difficult to put into practise. According to Hu, Venketsamy, and Pellow (2022), the education system's methodology and content have seen significant development in the past. The educational material information was proposed by Shulman. As a result of this development, Shulman proposes that there is a connection between the academic knowledge of educators and factual data.

Importance of Research study

University teachers' awareness about technology integration in educational erudition is examined through familiarity of instructional technology and training practices with technology. This study also examines university teachers' high-tech TPACK knowledge, its fields, and their technology integration proficiency. In doing so, 350 teachers from three educational institutions were given a survey based on the “Survey of Teachers’ Knowledge of Teaching and Technology” (Lu et al., 2022) to assess their understanding of TPACK concepts. 290 teacher candidates responded. TPACK was examined by Mishra and Koehler (2006) to assess teachers' technological adaptability.

Research Objective

To evaluate university teachers' opinions on TPACK, domain relationships, and technology integration and use in education.

Literature Review

Digital technologies have exerted a substantial influence on the educational domain, affecting the overall landscape and the roles and relationships of various stakeholders, including learners, instructors, managers, paternities, and representatives of policy makers (Razali,2022).

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Digital technologies have brought about significant transformations in the content and methodology of education, as well as the dynamics and interactions among many stakeholders. In contemporary educational settings, institutes are obligated to foster students' technical competencies, practical knowledge, too "critical digital literacy" (UNESCO, 2021, p. 72). This endeavor aims to equip students with the necessary skills and knowledge to participate and effectively contribute to the broader community. Furthermore, using educational technologies has led to expanding and reconsidering instructional and erudition methodologies (Abel, Tondeur, & Sang, 2022). As a result, instruction in the 21st centuries requires university faculty to be somewhat tech-savvy and have a profound appreciative educational prospective built into these outfits. They also need to have the right skills for teaching students effectively through technology (Brianza, et al., 2022), in addition to having the right level of tech-savviness (Imran, et al., 2023).

Most well-known frameworks outlining the familiarity that educators need to teach subjects using technology efficiently is called TPACK, also recognized as technology, pedagogy, and content knowledge (Celik,2023). The given structure adds technology as a new, unique domain of knowledge necessary for teaching in the modern technological era, building on Shulman's (1986, 1987) paradigm for “pedagogical content knowledge” (PCK).

Basic “TPACK” framework is made up of 3 circles that are connected. These circles represent seven different types of knowledge: technological knowledge (TK), pedagogical knowledge (PK), content knowledge (CK), pedagogical content knowledge (PCK), technological content knowledge (TCK), technological pedagogical knowledge (TPK), and technological pedagogical content knowledge (TPCK). The TPACK framework stresses that teaching with technology should be a dynamic rather than a rigid process. It also stresses that teachers should know how the core domains (TK et al.) can best come together to improve learning (Singh & Malik, 2022; Koehler & Mishra, 2009).

In an educational environment, technological knowledge (TK) refers to effectively using various technologies, including computer software, hardware, presentation tools, and other technologies. In light of the ongoing transformation of the technical landscape, represented by the move from personal computers (PCs) to modern notebooks, it encompasses the ability to adjust to new technologies and acquire expertise in various emerging technologies. Computers continue to

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be adaptable for educational objectives, such as research and communication, despite the developments that have taken place (Razali,2022).

The term "Content Knowledge" (CK) refers to the level of comprehension that an individual possesses in a certain field or subject matter. This level of comprehension varies between educational levels, as evidenced by the differences between primary and secondary schools. For teachers to impart knowledge successfully, they are required to master CK. When it comes to the formation of disciplined thinking in any field of study, CK plays a crucial role (Singh & Malik, 2022).

Pedagogical Knowledge (PK) is a generic term that describes the overarching objective of having specialized knowledge to be a good educator. It is a collection of abilities necessary for managing and organizing teaching and learning activities congruent with the learning outcomes sought. Management of the classroom, comprehension of the factors that motivate students, development of lesson plans, and evaluation of student learning are all included in this expertise (Brianza, et al., 2022). In addition to this, it requires expertise with a variety of instructional approaches and the ability to ensure that classroom activities encourage positive student learning.

According to Shulman (1986), Pedagogical information Knowledge (PCK) emphasizes that effective teaching necessitates integrating topical information and instructional methodology. PCK recognizes that different methods of instruction are required for different types of educational content. It is possible, for instance, that the most effective method for teaching language skills in English is through a student-centered approach, which promotes meaningful learning. On the other hand, art appreciation seminars require a teacher-centered approach. By emphasizing the dynamic relationship between material and pedagogy, PCK goes beyond the concept of content expertise or generic pedagogical principles.

Technological Content Knowledge (TCK) is a term used to define the knowledge derived from the mutually beneficial interaction between content and technology. In addition to influencing our comprehension of content, technology also enables the introduction of fresh approaches to presenting previously unimaginable material. The relationship between geometric shapes and angles, for instance, can now be investigated by students through the use of portable devices that allow them to engage with concepts displayed on a monitor screen.

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The term "Technological Pedagogical Knowledge" (TPK) refers to understanding the interdependent link between pedagogy and technology. Teachers can select the most appropriate equipment based on its feasibility for a certain pedagogical approach because it enables an understanding of the appropriateness of technology for attaining pedagogical goals. Additionally, technology introduces new instructional strategies that are simpler to use in the classroom (Schmid et al., 2021). This is seen in the increase of online learning, which necessitates the development of new instructional strategies that are pedagogically sound.

TPACK, which stands for Technological Pedagogical Content Knowledge, is a synthesis of knowledge from the earlier domains: Technological Knowledge, Content Knowledge, Pedagogical Knowledge, PCK, Total Content Knowledge, and Total Pedagogical Knowledge. It emphasizes how technology can fulfill pedagogical requirements, delivering appropriate information within a particular setting (Yeh et al., 2021), Through integrating technological knowledge, pedagogy, and content, learning experiences for students can be effectively designed using TPACK. As TPACK demonstrates, effective teaching goes beyond the individual components that make up the whole. It demonstrates the synergistic integration of technology, pedagogy, and content to produce meaningful student learning experiences.

From the beginning, the TPACK framework has been beneficial in the fields of education to design (Schmid et al., 2021), educator learning (Yeh et al., 2021), and teacher knowledge (Scherer, et al., 2021). However, TPACK research has been criticized and limited ((Hafeez, Iqbal, & Imran, 2021, Zinger et al., 2017). Additionally, despite conceptual and empirical gaps in the area, recent papers indicate a certain standstill (Brianza, et al., 2022).

The contextual character of teachers' knowledge is a crucial factor that deserves consideration (see, for example, Koehler & Mishra, 2008). One reason for the ambiguity around the framework in TPACK research is the lack of systematic examination of context (Kimmons, 2015, p. 58). According to research (Chai et al., 2011; Wang et al., 2018), contextualized evaluation tools help evaluate TPACK, so taking context into account is important. Furthermore, in practice, incorporating educational technologies into classrooms emphasizes the importance of considering context (Zinger et al., 2017).

Mishra (2019) recently emphasized the importance of expanding the TPACK framework by adding context as a new area of teachers' knowledge (contextual knowledge or XK). In addition

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to making the framework more consistent, this view of context as a knowledge domain emphasizes contextual knowledge as a concept that helps teachers teach and as a quality that can be tested and improved. This highlights how important contextual knowledge is to expanding knowledge about teachers' expertise and preparation.

Research Methodology

The descriptive method of quantitative research design was used in this study. A sample of 50 university teachers, separate from the target population, was studied to determine the study's feasibility and viability. Three educational institutions include for the research. Except for pilot study, Shah Abdul Latif University Khairpur (SALU) fourty forms were spread and 29 forms collected. Shaheed Benazir Bhutto University Shaheed Benazirabad (SBBU SBA) 80 forms issued and 65 were collected. Sukkur IBA University distributed 220 forms and 196 of which were returned. The study was survey-based. This study used purposive sampling to address the study population's shared features, such as skills, knowledge, teaching, and technology. For ethical reasons, the researcher notified participants of informed permission, confidentiality, and privacy. The study allowed participants to quit at any time. The individuals were also assured that their identities would not be disclosed for other purposes.

Result of the Study

This study incorporated a sample of 290 teachers who willingly consented to participate in the research. Among the total sample size of 290 individuals, perceived that 249 persons (85.7%) recognized as females, while 41 individuals (14.1%) identified as men. The ratio of females to males was 1:0.17. Based on the distribution of age groups, it can be observed that a significant majority, specifically 59.6%, fell within the age range of 18 to 26 years. A mere 3.1% of the participants fell into the age category of 37 years and beyond. In relation to the marital status of the subjects under consideration, it was found that a majority (70.7%) were not married, while the remaining participants were married. Among the total sample size of 290 participants, a significant majority of 76.6% were found to possess a graduate degree. Furthermore, the study revealed that a substantial proportion of 64.8% of the participants were actively engaged in pursuing a Bachelor of Education (B.Ed.) degree.

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Table 1 Demographic of the participants

Demographic Information	Number (n)	Percentage %
Female	249	85.9
Male	41	14.1
Age Groups		
23-26 years	85	29.3
27-32 years	88	30.3
33-37 years	76	26.2
37-40 years	32	11.0
41 > years	9	3.1
Marital Status		
Married	205	70.7
Unmarried	85	29.3
Qualifications		
Master 16 Years	68	23.4
M.Phil/M.S	127	43.8
PhD.	95	32.8

In order to conduct the analysis, the researchers evaluated all of the participants using a set of six-point scales. These scales measured the participants' levels of "Technology Knowledge (TK), Content Knowledge (CK), Pedagogical Knowledge (PK), Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), and Technological Pedagogical Knowledge (TPK)". Finally, the assessment has been conducted by integrating the four processes, resulting in the amalgamation of the final assessment using the framework of (TPACK).

Technology Knowledge

The assessment consisted of six questions, which were categorized by gender and analyzed using the mean ± standard deviation of the participants' Likert scale scores. The average scores for participants' Technology knowledge ranged from 3.61 to 3.63, with standard deviations of 0.960 to 1.049. The mean technology knowledge score for females ranged from 3.58 to 3.69, while the mean technology knowledge score for males ranged from 3.62 to 4.22. This finding suggests that males have a greater inclination towards acquiring technological knowledge in comparison to females. The next bench, labeled as Table 2, presents the relevant data.

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Table 2

Sexual category	**Woman**		**Men**		**Over-all**	
Technology knowledge Items	Mean	SD	Mean	SD	Mean	SD
1	3.60	1.052	3.89	.851	3.64	1.049
2	3.58	1.012	4.22	.490	3.69	.970
3	3.62	.962	3.88	.787	3.60	.960
4	3.63	.967	3.62	.952	3.61	.968
5	3.61	.996	3.66	1.019	3.63	1.012
6	3.72	.955	3.76	.943	3.72	.952

Pedagogical Knowledge

This finding was derived from the evaluation of pupils conducted by an instructor. The question of whether educators are able to adapt their teaching method to accommodate diverse learners remains inconclusive. The majority of the respondents expressed a strong commitment to maintaining a high level of professionalism in their teaching style and promoting appropriate student behavior. The average value throughout this time period ranged from 3.92 to 4.20. However, it was shown that males exhibited greater dynamism and adaptability in response to varying situations. The majority of participants expressed significant agreement with the statement. The average value for males ranged from 4.10 to 4.32, while the average value for females ranged from 3.88 to 4.25. The following table, labeled as Table 3, presents the relevant data.

Table 3

Sexual category	**Woman**		**Men**		**Over-all**	
PK Items	Mean	SD	Mean	SD	Mean	SD
PK 1	3.98	.820	4.32	.704	4.20	.807
PK2	3.94	.838	4.30	.771	3.89	.831
PK3	4.14	.762	4.19	.663	4.10	.749
PK4	4.10	.837	4.27	.690	4.01	.821
PK5	3.88	.857	4.10	.790	3.95	.851
PK6	3.91	.853	4.20	.880	3.92	.857
PK7	4.25	.865	4.12	.664	4.12	.839

Technological Content Knowledge (TCK) refers to the understanding and proficiency that individuals possess in utilizing technology to effectively engage with and comprehend subject matter in many academic disciplines. The instrument utilized in this study consisted of four distinct

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points, with each question statement corresponding to a certain issue as outline. Integrating technology and subject matter content by an instructor is essentially a combination or amalgamation. The observed trend indicates a rather low rate of teacher acceptance when considering integrating technology into the specific subject's curriculum. At this stage, males and females scored below 4.0, indicating a lack of confidence and agreement. Additionally, several individuals expressed uncertainty. According to Table 5,

Table 5

Sexual category	**Woman**		**Men**		**Over-all**	
PK Items	Mean	SD	Mean	SD	Mean	SD
TCK 1	3.49	1.036	3.85	1.014	3.54	1.039
TCK 2	3.56	.953	3.76	.888	3.59	.945
TCK 3	3.63	.867	3.83	.834	3.66	.864
TCK 4	3.70	.933	3.73	.975	3.71	.938

Technological Pedagogical Knowledge (TPK) refers to the understanding and integration of technology within the context of teaching and learning. The statement mentioned above consisted of nine points that were designed to evaluate the level of technological proficiency and pedagogical knowledge exhibited by a teacher in terms of their utilization of various learning and teaching methodologies. In this manner, we may evaluate individuals' level of motivation to enhance their teaching methodology by incorporating relevant technologies into their subject-specific performance. The average score of the responses ranged from 3.72 to 4.10, indicating a positive inclination among teachers to incorporate contemporary technologies into their instructional practices, as suggested by the content analysis. In addition, it is observed that males tend to outperform girls, as seen by their mean scores predominantly being 4.0 or higher. The mean score for females is 4.11 at one specific point, whereas for all other points it ranges from 3.7 to 3.98. According to Table 6.

Table 6

Sexual category	**Woman**		**Men**		**Over-all**	
PK Items	Mean	SD	Mean	SD	Mean	SD
TPK 1	3.78	.898	4.12	.721	3.87	.941
TPK 2	3.89	.901	4.09	.587	4.00	.807
TPK 3	4.02	.873	4.10	.851	4.10	.859

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TPK 4	3.88	.845	3.92	.892	3.89	.841
TPK 5	4.01	.856	4.11	.758	3.97	.835
TPK 6	4. 02	.891	3.89	.805	3.98	.874
TPK 7	3.79	.889	4.01	.837	3.83	.884
TPK 8	3.81	.909	3.91	.812	3.72	.904
TPK 9	3.90	.920	4.10	.866	3.88	.911

Discussion

The topic at hand for deliberation and analysis is the subject of discussion. This study puts a lot of weight on the education of teachers about 21st centuries skills, showing how this is closely linked to the basic technological needs needed to meet current demand in the era. To enhance their pedagogical approach, educators ought to incorporate specific technological subjects into the curriculum of every instructional session. Isler's (2018) study found strong links between how teachers felt about their Technological Pedagogical Content Knowledge (TPACK) skills and how they felt about their interests, experiences, and knowledge of TPACK. It is recommended that courses designed for university teachers incorporate knowledge about technology, about content, and pedagogy knowledge while ensuring effective education in the specific subject area that the university teachers would be responsible for teaching. Ultimately, our investigation yielded identical findings. The researchers concluded that an integrated approach is necessary for teaching and modeling content-related, technological, and pedagogical abilities based on the findings of a previous study conducted by Chai et al., (2018). During their tenure in faculties of education, prospective educators did not receive adequate instruction in technological education, a prerequisite for their professional roles. To enhance effectiveness and efficiency, adopting a pragmatic approach to managing resources beyond human labor and capabilities is imperative. Koehler and Mishra (2009) argue that integrating the latest technology should be incorporated into the teaching process as an additional component while considering specific classroom situations. These diverse elements are equally present in our investigation.

Conclusion

The study's results showed that the university teachers who participated in the research have a better understanding and view of the Technological Pedagogical Content Knowledge (TPACK) ingredients. The statistical analysis reveals that the observed disparity lacks statistical

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significance despite distinct individual variations. Based on the data gathered, it is evident that among the 290 educators surveyed, 249 individuals, constituting approximately 85.9% of the total, identified as female, while the remaining 41 individuals, accounting for approximately 14.1% of the total, identified as male. The male-to-female ratio was approximately 1:1.17. According to the distribution of age groups, it was observed that a significant proportion of participants, specifically 59.6%, were in the age range of 26 to 29 years old. Among the participants, a significant proportion of 76.6% possessed a Master's degree qualification.

Furthermore, it was observed that 43.8% of the participants were enrolled in M.Phil. or Ph.D. programs at the time the survey was conducted. Regarding technical proficiency, the average score for women ranged from 3.58 to 3.69, whereas the average score for men ranged from 3.62 to 4.22. This variable did not affect the overall mean of the result, even though the range of means for men was between 3.54 and 3.80. This is because no men participated in our study.

Regarding how well participants understood the pedagogical topic, the percentage of those who agreed or strongly agreed with positive approaches in their areas of study varied. The highest percentage was in science, while the lowest was in mathematics. The mean scores of the responses to the technological pedagogical knowledge question ranged from 3.72 to 4.10. This suggests that the teachers have a favorable disposition towards using contemporary technology in their instructional practices, as the survey data indicates. The average score for technological pedagogy and topic understanding at this stage varied between 3.52 and 3.75. The outcome obtained is remarkably deficient. This suggests that there may have been a lack of confidence in effectively integrating all the aspects or clarity in utilizing technology within each parable, particularly in portraying female characters.

The following suggestions are proposed

Incorporating Technological Pedagogical Content Information (TPACK) within teacher education programs is crucial, as it serves as a fundamental element in equipping university teachers with the essential information and competencies required for proficient technology integration.

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The curriculum design should incorporate a constructive and proactive methodology in instructing courses utilizing technology, focusing on the pragmatic implementation of Technological Pedagogical Content Knowledge (TPACK) principles.

The alignment of technological pedagogical content knowledge (TPACK) with learning objectives is crucial to enhancing student learning outcomes effectively. TPACK must be carefully processed and implemented to directly contribute to improving these outcomes.

The primary objective of integrating technology in education should be to optimize the whole learning process, and educators should be directed in harmonizing TPACK (Technological Pedagogical Content Knowledge) methodologies with distinct learning goals.

Contextual research plays a crucial role in informing practical applications. By examining the specific context in which a certain phenomenon or problem occurs, researchers can better understand the factors that influence it. This understanding then serves as a foundation for developing practical solutions.

It is suggested that a thorough study be conducted in both urban and rural areas in order to fully grasp the complex factors that affect the actual use of Technological Pedagogical Content Knowledge (TPACK).

Need to examines the differences in applying Technological Pedagogical Content Knowledge (TPACK) between public and private sectors, focusing on recognizing the unique problems and opportunities within each setting.

Potential Areas for Further Investigation:

Longitudinal studies should be conducted to evaluate the enduring effects of incorporating Technological Pedagogical Content Knowledge (TPACK) into teacher education programs.

Future studies must assess the efficacy of Technological Pedagogical Content Knowledge (TPACK) strategies in improving teaching methodologies and student achievements over time.

Global Comparative Studies: Engage in global comparative studies to evaluate and assess the implementation of Technological Pedagogical Content Knowledge (TPACK) across various countries and educational systems.

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Study in future also conduct for identify and analyze best practices and lessons learned from various situations to provide valuable insights for enhancing the integration of Technological Pedagogical Content Knowledge (TPACK) globally.

The dynamic adaptation of Technological Pedagogical Content Knowledge (TPACK):

Acknowledge the ever-evolving nature of technology and its impact on education. It is imperative to consistently revise TPACK frameworks to effectively respond to the emergence of new technology and instructional techniques.

Promote establishing a culture that prioritizes ongoing professional development among educators to remain up-to-date with the growing demands of Technological Pedagogical Content Knowledge (TPACK).

Research on Technological Pedagogical Content Knowledge (TPACK) has increasingly recognized the need for inclusivity.

It is imperative to broaden the scope of research endeavors to foster inclusion within studies on Technological Pedagogical Content Knowledge (TPACK). This entails considering a wide range of demographic aspects, including but not limited to age, gender, and socio-economic backgrounds, to ensure a comprehensive understanding of the subject matter.

Further study examines how Technological Pedagogical Content Knowledge (TPACK) procedures can be customized to effectively meet the educational requirements of a wide spectrum of learners.

Engage a diverse range of stakeholders, encompassing educators, learners, caregivers, and educational leaders, in researching and developing Technological Pedagogical Content Knowledge (TPACK) projects.

Collect feedback to ensure that the implementation of Technological Pedagogical Content Knowledge (TPACK) aligns with all stakeholders' overarching objectives and expectations.

These suggestions and plans for the future are to contribute to the ongoing improvement of TPACK integration, encouraging a broader and more adaptable way of using technology in education.

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