

# The Effect of TPACK on Developing 21<sup>st</sup>-Century Teaching Skills: A Pre-Service Teacher's Perspective

Marlyn S. Soncio, Dionabel M. Bairoy, and Jerwin L. Repollo

Bachelor of Secondary Education, Agusan del Sur State College of Agriculture and Technology,  
Philippines

DOI: <https://dx.doi.org/10.47772/IJRISS.2024.8090148>

Received: 21 August 2024; Accepted: 20 September 2024; Published: 09 October 2024

## ABSTRACT

The study aimed to determine the significant effect of Technological Pedagogical Content Knowledge (TPACK) on the 21st Century Teaching Skills among pre-service teachers in Agusan del Sur State College of Agriculture and Technology. Using universal sampling, 233 pre-service teachers from the BSEd-Math, BSEd-Science, and BSEd-English programs and 233 cooperating teachers participated in the study during the academic year 2023-2024. The study used a Predictive Correlational Research Design. The researchers used the data collection instruments created by Schmidt et al. (2014) to gauge the Technological, Pedagogical, and Content Knowledge (TPACK) of Pre-service Teachers. Researchers also utilized the data collection instruments by Zamora and Zamora (2022) to evaluate the teachers' 21st Century Teaching Skills. The researchers utilized Mean, Pearson Product-Moment Correlation, and Multiple Linear Regression as statistical tools to obtain the study's objectives. The study's results revealed that the pre-service teacher's level of Technological Pedagogical Content Knowledge (TPACK) was high which was interpreted as evident. Moreover, the 21st Century Teaching Skills level was very high and was interpreted as always observed. Further, there was a highly significant positive relationship between Technological Pedagogical Content Knowledge (TPACK) and 21st Century Teaching Skills among Agusan del Sur State College of Agriculture and Technology Pre-service teachers. Lastly, it was found that TPACK can significantly affect the 21st Century Teaching Skills of Pre-service teachers and can be summarized by a model  $Y = 0.249X_1 + 0.293X_2 + 1.429$

**Keywords:** TPACK, 21st Century Teaching Skills, Pre-service teachers, Predictive -correlation, ASSCAT, Philippines

## INTRODUCTION

Technological Pedagogical Content Knowledge (TPACK) is an integration of technological knowledge (TK), content knowledge (CK), and pedagogical knowledge (PK) that can help teachers use technology effectively in their teaching and it is a unique form of knowledge that is built from the interaction and transformation of knowledge of content, knowledge of pedagogy, and knowledge of technology (Bilici, Guzey & Yamak, 2016). For educators to effectively utilize information and communication technology (ICT) and promote students' development of 21st-century skills, they need to be knowledgeable about different teaching methods. This highlights the importance of including 21st-century skills in teacher preparation programs (Valtonen et.al., 2017). Also, the study of Peligro (2022) in the CARAGA Region recommends incorporating professional development in preservice teachers' curriculums through capability training and hands-on exposure to integrate technology into classroom instruction within their content areas. Moreover, the study conducted by Burlado, Repollo, and Aoanan (2024) in Agusan del Sur found that teachers' TPACK significantly influenced the students' knowledge and understanding of Mathematics,

especially of plane and solid geometry. Therefore, pre-service teachers must identify technological pedagogical content knowledge (TPACK) to develop their 21st-century teaching skills.

TPACK is a useful frame for describing and understanding the goals for technology use in pre-service teacher education. It provides new perspectives on pre-service teachers' TPACK by shifting the focus to concrete concerns and strengths indicated by pre-service teachers. However, despite several studies related to TPACK, limited researchers have considered Technological Pedagogical Content Knowledge (TPACK) as part of pre-service teachers in the 21st Century Teaching Skills; specifically in Agusan del Sur State College of Agriculture and Technology. Despite the significance of TPACK in pre-service teacher education, there is a lack of research that specifically investigates its role in developing the 21st Century Teaching Skills of pre-service teachers. Further exploration and investigation in this area are needed to fully understand the impact of TPACK on the teaching practices of pre-service teachers in the 21st century.

This study is expected to contribute to the literature on teacher education and technology integration by providing insights into the current status and challenges of pre-service teachers' TPACK and 21st-century teaching skills. This study aims to prepare educators to effectively leverage technology as a tool to enhance teaching and learning in the 21st century. By developing TPACK, pre-service teachers are better equipped to meet the evolving needs of their students and navigate the ever-changing educational landscape

### **Problem Statement**

The skills required in the 21st century are advanced competencies that individuals need to adapt to the changes in the information society. These skills include the ability to keep up with technology, select, analyze, and evaluate information from rapidly produced sources, and then use this information to create products for everyday use (Durak & Ozudogru, 2023). Unfortunately, teachers implement 21st-century learning in the classroom but their perspectives and readiness regarding 21st-century learning are not always executed well the study did not practice the 21st-century standards, and their implementation of 21st-century learning in the classroom is very little, even though they strongly believe in the standards (Shafie, Majid & Ismail, 2019). Therefore, it is relevant to investigate how this study can be used for pre-service teachers' feedback, reflective practice, and continuous improvement, the hope is to pave the way toward enhanced 21st-century teaching skills and, in turn, 21st-century learners (Kim, Raza & Seidman, 2019).

### **Research Objectives**

This study aimed to determine the significant effect of Technological Pedagogical Content Knowledge (TPACK) on 21st-century Teaching skills among Pre-Service Teachers in Agusan del Sur State College of Agriculture and Technology. Specifically, it intended to answer the following questions:

1. to describe the level of Technological Pedagogical Content Knowledge (TPACK) in terms of:
  - 1.1 Technology Knowledge;
  - 1.2 Content Knowledge ;
  - 1.3 Pedagogical Knowledge ;
  - 1.4 Pedagogical Content Knowledge;
  - 1.5 Technological Content Knowledge ;
  - 1.6 Technological Pedagogical Knowledge; and

### 1.7 Technological Pedagogical Content Knowledge

2. to determine the level of 21st Century Teaching Skills in terms of:

2.1 Effective Communication Skills;

2.2 Learning and Innovation Skills;

2.3 Life and Career Skills; and

2.4 Information, Media and Technology Skills

3. to determine the significant relationship between Technological Pedagogical Content Knowledge (TPACK) and 21st Century Teaching Skills; and

4. to determine the significant effect of Technological Pedagogical Content Knowledge (TPACK) to the 21st Century Teaching Skills of Pre-Service Teachers.

### **The Significance of This Study**

The study aims to benefit the administrators of Agusan del Sur State College of Agriculture and Technology by ensuring that the curriculum incorporates technology, pedagogy, and content knowledge for 21st-century teaching skills. It will also provide valuable insights for teachers, who can use this knowledge to improve instruction, teacher development, and institutional success. Pre-service teachers with strong TPACK knowledge can create engaging learning experiences, fostering critical thinking, collaboration, and digital literacy skills. The findings will contribute to future research in educational technology and pedagogy.

## **LITERATURE REVIEW**

### **Technological Pedagogical Content Knowledge (TPACK)**

Technological Pedagogical Content Knowledge (TPACK) was introduced as a framework in educational research to comprehend the necessary knowledge that teachers need for integrating technology into their teaching practices (Wang, Crawford & Jin, 2018). It also outlines the specific types of knowledge that teachers need to possess to engage in successful pedagogical practices within a technology-enhanced learning environment (Taopan et.al., 2020). However, the study of Tanjung, Baharuddin, Ampera, Farihah and Jahidin (2022) stated that the TPACK approach is a learning approach that combines materials, pedagogy, and technology that is integrated with a learning model that can train students to discover new knowledge independently but still get guidance from teachers. To address this, the framework of TPACK represents three circles: pedagogical knowledge (PK), content knowledge (CK), and technology knowledge (TK). In the intersections of the circles are pedagogical content knowledge (PCK), technological pedagogical knowledge (TCK), and technological pedagogical knowledge (TPK). At the center, where all three circles intersect, lies the concept of technological pedagogical content knowledge (Lehtinen, Nieminen & Viiri, 2016).

### **Technology Knowledge (TK)**

Technology knowledge refers to the teacher's ability to use technological tools and resources effectively. This requires the teacher to be able to recognize, use, and integrate various technological tools such as computers, smart boards, software, applications, and so on for instructional purposes in the classroom (Ozturk, Kinik, & Ozturk, 2023). In the study of Uluçınar (2021), teachers who possess an extensive

understanding of technology are adept at utilizing various tools such as 14 word processors, worksheets, browsers, and email. They also possess knowledge of computer hardware and operating systems, particularly in the context of advanced technologies. Additionally, with this technological expertise, teachers are capable of accomplishing a wide range of tasks using information technology and can develop innovative approaches to achieve specific educational objectives.

### **Content Knowledge (CK)**

Content knowledge refers to the knowledge that teachers possess about the subject matter they are teaching. It encompasses a deep understanding of the concepts, theories, ideas, organizational frameworks, and established practices related to the specific field of knowledge. CK also includes knowledge about the content that students are expected to learn. In essence, CK is the comprehensive knowledge base that enables teachers to effectively deliver instruction and enhance students' understanding of the subject matter (Absari, Priyanto & Muslikhin, 2020). These skills are related to the content to be taught. It should be noted that teaching and learning processes are enhanced to the extent that teachers present knowledge in meaningful contexts (Paidican & Arredondo, 2022). In the study of Kara (2021), content knowledge is "a thorough grounding in college-level subject matter" or "command of the subject". It may also include knowledge of concepts, theories, and conceptual frameworks as well as knowledge about accepted ways of developing knowledge.

### **Pedagogical knowledge (PK)**

Pedagogical knowledge encompasses the theoretical and ethical dimensions of teaching and learning that guide teachers in making informed decisions about children, teaching methods, and the learning process. It involves specific knowledge base that includes child study, child development, and psychology, which helps teachers understand children as learners and equips them the necessary knowledge to be effective educators (Milewski, 2020). This knowledge alone is necessary but insufficient for teaching purposes. In addition, a teacher requires content knowledge (Kara, 2021).

### **Pedagogical Content Knowledge (PCK)**

Pedagogical content knowledge refers to the knowledge that teachers possess regarding the most suitable learning approaches for specific content. It involves understanding how to organize elements of the content to enhance teaching effectiveness. PCK also includes knowledge about learning strategies that can address students' difficulties and misconceptions, promoting meaningful understanding (Absari, Priyanto, & Muslikhin, 2020). Moreover, the studies of PCK that focus on the relationship and development among PCK components are based on the concept that PCK is an integral part of the integration among components (Dewi, Setyosari, Kuswandi & Ulfa, 2020). A significant aspect of this new model is the differentiation between an instructor's "personal" PCK and their "canonical" PCK. This implies that teachers can develop PCK through self-reflection on their own teaching practices (personal) or acquire it through professional development and other social avenues (canonical) (Hale, Lutter & Shultz, 2016).

### **Technological Content Knowledge (TCK)**

Technological content knowledge (TCK) refers to the understanding that teachers have about how technology can be used to present and teach specific content differently and more effectively. It means that teachers recognize that using technology can transform the learning experience and help students better grasp and apply concepts in a particular subject area (Schimdt, Baran, Thompson, Mishra Koehler & Shin, 2014). Uluçınar (2021), they can also understand that it can be taught and manipulated successfully by technology. Habibi et al. (2022), TCK is knowledge of how ICT is used by content experts. In the study of Absari, Priyanto, and Muslikhin (2019), TCK is a knowledge concerning procedures and content which are

reciprocally-related. The comprehension of procedures of technology and content influence limit each other.

### **Technological Pedagogical Knowledge (TPK)**

Technological pedagogical knowledge is “an understanding of how teaching and learning can change when particular technologies are used in particular ways” depending on the context and the purpose of a lesson (Arya, Christ & Wu, 2020). Ergen, Yelken, and Kanadli (2019), technological-pedagogical knowledge can be put into practice with some teaching methods. Moreover, it also covers the ability to choose an instrument based on its suitability, strategies for employing its affordances, knowledge of pedagogical strategies, and the ability to apply those strategies to use technologies (Uluçınar, 2021). Additionally, the result of the combination of TK and PK, TPK refers to how various technologies can be used and how teachers deliver content (Paidican, & Arredondo, 2022). 20

### **21st Century Teaching Skills**

The 21st century skills are high-level skills and competencies that individuals need to have to adapt the changes by the information society, to keep up with technology, to select, analyze and evaluate information from rapidly produced information stacks, to transform this into a product and use it in daily life (Durak & Ozudogru, 2023). Schools and communities are facing new and challenging demands due to the complexity of society and the fast-paced technology-driven economy. They are being urged to create educational frameworks that prioritize the development of skills, knowledge, and attitudes required for success in the 21st century (Martinez, 2021). Moreover, the skills that teachers need in the 21st century to help students develop 21st century learner skills are referred to as teacher skills. These skills are essential for planning the learning and teaching process and ensuring the success of students (Cosanay, & Karali, 2022).

### **Effective Communication Skills**

Communication plays an important role in our daily life. Through communication, we understand what others around us say of information, and we also express to others what we want to convey to them of information or needs as well (Khasawneh, 2021). Effective communication skills are important in all professions, it is much more important in professions that directly related to human beings (Yavuz, & Guzel, 2020). Filiz (2020), emphasized that teachers play an active role in solving problems depending on their communication levels and that schools are very important for effective communication in terms of improving the quality of education. Therefore, it can be said that having sufficient communication skills facilitates the lives of individuals and increases the quality in bilateral agreements and social context.

### **Learning and Innovation Skills**

Learning and innovation skills are one part of 21st-century skills. The 21st-century skills were first formulated completely and in line with the learning curriculum (Indrawati, 2021). These skills include critical thinking, problem-solving, creativity, innovation, communication, and collaboration (Vasil, Weiss, & Powell, 2018). It is claimed that 21st-century learning and innovation skills or ‘21st century competencies’ named as creativity, communication, critical thinking, and collaboration have been the center of attention and one of the most desired skills since they are the first requirements of the job qualifications (Demirkol-Orak, & Inozu, 2021). They are often used to pave the way to a profound understanding of 21st-century learning and innovation skills. However, the implementation of these skills in actual classrooms is not certain due to the complexity of the definitions (Bedir, 2019).

### **Life and Career Skills**

Life and career skills are the knowledge, skills, and social and emotional competencies that help students

function within today's increasingly complex and diverse social and work environments. These skills include flexibility and adaptability, initiative and self-direction, social and cultural skills, productivity and accountability, and leadership and responsibility (Vasil, Weiss, & Powell, 2018). In the study of Zamora and Zamora (2022), this refers to one's ability to set learning, career, and 24 wellness goals that strive for personal excellence. Furthermore, career and life skills in this era are essential. Developing and promoting skillful people for the 21st century requires a paradigm shift and system-wide development, to help them be well-prepared for the economic and social changes as well as the challenges of those changes (Chaiyama, & Kaewpila, 2022).

### **Information, Media and Technology**

Skills Information, Media, and Technology Skills refers to one's ability of effectively utilize technologies as a tool for teaching (Zamora & Zamora, 2022). In the study of Vasil, Weiss, & Powell (2018), students live in a technology and media-suffused environment with access to an abundance of information, rapid changes in technology tools, and the ability to collaborate and make individual contributions on an unprecedented scale. Information, media, and technology skills can serve as a bridge between real-life experiences and school experiences. Information, media, and technology provide students with unpredictable power to enhance their thinking, learning, communication, collaboration and production skills. However, to use this power, students must first learn the skills needed to understand, manage and use this information, media, and technology (Hazar, Akkutay, & Keser, 2021).

## **METHODOLOGY**

### **Research Design**

This study utilized the quantitative research design using predictive correlation technique to determine if a predictive effect exist in Pre-Service Teacher's Technology, Pedagogy and Content Knowledge (TPACK) on their 21st Century Teaching Skills. Predictive correlation technique is the most widely used in quantitative research studies. It is concerned with forecasting the relationship and effect between or among variables. Therefore, this Predictive correlational technique was appropriate in this study since this study focused on predicting the effect of Pre-Service Teacher's Technology, Pedagogy, and Content Knowledge (TPACK) on their 21st Century Teaching Skills who officially enrolled in the second semester in their internship course in Agusan del Sur State College of Agriculture and Technology.

### **Research respondents**

The respondents of the study were the pre-service teachers of BSEd-Mathematics, BSEd-Science, and BSEd-Science in Agusan del Sur State College of Agriculture and Technology (ASSCAT) who were officially enrolled in the second semester of Academic Year 2023-2024. The names and the number of respondents would be determined after the second-semester enrollment. The researchers used sampling as their sampling technique. According to Avron et al. (2019), universal sampling can help to achieve optimum complexity for any class of signal. It also involves the collection of samples in which members of the population do not have the same chance of being included in the sample and the probability of including one of them is unknown.

### **Research Instrument**

The study utilized two sets of questionnaires as research instruments. The first set was developed based on the Technological Pedagogical Content Knowledge (TPACK) framework by Schmidt et al. in 2014. The second set was developed based on the 21st Century Teaching Skills framework by Zamora and Zamora in 2022. Participants were asked to indicate their level of agreement with the statements using a 4-point Likert

scale.

### Statistical Treatment

To address problems 1 and 2, which involved determining the levels of Technological Pedagogical Content Knowledge and 21st Century Teaching Skills, researchers used the *mean*. For Problem 3, which aimed to establish the significant relationship between Technological Pedagogical Content Knowledge and 21st-century teaching skills of Pre-Service teachers at Agusan del Sur State College of Agriculture and Technology, researchers employed Pearson Product-Moment Correlation. Finally, for Problem 4, which sought to determine the effect of Technological Pedagogical Content Knowledge (TPACK) on the 21st-century teaching skills of Pre-Service teachers, researchers utilized Regression Analysis.

## RESULTS, FINDINGS AND INTERPRETATION

### Level of Technological Pedagogical Content Knowledge (TPACK)

Table 1 presents the level of Technological Pedagogical Content Knowledge (TPACK) as perceived by the pre-service teachers. An overall result obtained a mean value of 3.21, which means that the level of Technological Pedagogical Content Knowledge (TPACK) is high and is interpreted as evident. This high level implies that all indicators are evident in which the pre-service teachers demonstrate their ability to effectively integrate technology, pedagogy, and content knowledge for optimized teaching practices. Furthermore, the study Diamahet.al., (2022) stated that that pre-service teachers exhibit an increase in self-rated TPACK and behavioral orientations after training programs, indicating a positive impact on their technological pedagogical knowledge. Moreover, according to Agustin, Aridah, and Iswari (2023) found a positive result regarding ICT use for teaching and learning and showed that the pre-service teachers had a high level of collegial support.

Table 1. Level of Technological Pedagogical Content Knowledge (TPACK)

Teachers' TPACK	Mean	SD	Description
Technological Knowledge	3.18	0.44	High
Pedagogical Knowledge	3.32	0.46	Very High
Content knowledge	3.03	0.41	High
Technological Pedagogical Knowledge	3.20	0.51	High
Technological Content Knowledge	3.21	0.49	High
Pedagogical Content Knowledge	3.31	0.50	Very High
Technological Pedagogical Content Knowledge	3.20	0.49	High
<b>Overall Mean</b>	<b>3.21</b>	<b>0.35</b>	<b>High</b>

### Level of 21<sup>st</sup> Century Teaching Skills

Table 2 presents the level of 21st Century Teaching Skills as perceived by the pre-service teachers. An overall result obtained an overall mean of 3.48, which means that the 21st Century Teaching Skills is described as very high and interpreted as always observed. This means that pre-service teachers can focus on designing relevant and engaging learning experiences and fostering a classroom environment that promotes the 35 acquisition and practice of these skills among students. These findings indicated that the proficiency and expertise of the teachers are at a considerable level, ranging from high to very high. The study of Zamora and Zamora (2022) stated that the individuals who completed the program were evaluated positively in terms of their adeptness in communication, as well as their abilities in navigating life and

career challenges and foster personal and professional advancement. The educators demonstrated exceptional achievements by these criteria.

Table 2. Level of 21st Century Teaching Skills

Teachers' TPACK	Mean	SD	Description
Effective Communication Skills	3.52	0.42	Very High
Learning and Innovation Skills	3.47	0.46	Very High
Life and Career Skills	3.47	0.43	Very High
Information, Media and Technology Skills	3.46	0.47	Very High
<b>Overall Mean</b>	<b>3.48</b>	<b>0.37</b>	<b>Very High</b>

### Significant Relationship between Technological Pedagogical Content Knowledge and 21st-Century Teaching Skills

Table 3 shows the significant relationship between Technological Pedagogical Content Knowledge and 21st Century Teaching Skills using the Pearson r Correlation. The results reveal an overall r-value of 0.616 which indicates a strong correlation and a p-value of 0.000 which indicates a highly significant positive relationship. The result implies that any variance in the Technological Pedagogical Content Knowledge level correlated with 21<sup>st</sup> Century Teaching Skills. This result is supported by the study of Putri, Susilo and Rachmawaty, (2022) who stated that pre-service educators engaged in a variety of self-assessments while engaging in the process of creating and executing instructional videos guided by the Technological Pedagogical Content Knowledge (TPACK) framework. This discovery underscores the importance for aspiring educators in the 21<sup>st</sup> century to incorporate technology into their teaching practices, emphasizing the need to remain vigilant and adaptable in various teaching scenarios. Furthermore, the investigation focused on scrutinizing the 21<sup>st</sup>-century competencies of instructors through the lens of technological pedagogical content knowledge (TPACK), which centers on teachers' pedagogical, professional, and ICT proficiencies (Mustafa, Ozgur, & Ridvan, 2021).

Table 3. Significant Relationship between TPACK 21<sup>st</sup>-Century Teaching Skills

	21 <sup>st</sup> - Century Teaching Skills		
	r-value	p-value	Remarks
<b>TPACK</b>	0.616	0.000	Highly Significant

### Multiple Regression Analysis in determining the Significant Effect of Technological Pedagogical Content Knowledge (TPACK) on the 21st Century Teaching Skills of Pre-Service Teacher

Table 4 presents the predictors of Technological Pedagogical Content Knowledge (TPACK), namely Pedagogical Knowledge and Technological Pedagogical Knowledge has a significant effect on 21st Century Teaching Skills with a p-value of less than 0.05. It means that these indicators can affect the 21st Century Teaching Skills of Pre-Service Teachers in ASSCAT. The equation is summarized as  $Y = 0.249X_1 + 0.293X_2 + 1.429$  where Y is the 21st Century Teaching Skills,  $X_1$  refers to Pedagogical Knowledge and  $X_2$  refers to Technological Pedagogical Knowledge. This implies that if the other variables as constant, the following interpretation will follow. First, every 1 unit in Pedagogical Knowledge will have a corresponding 0.249 unit increase in 21<sup>st</sup> Century Teaching Skills, and for every 1 unit increase in Technological Pedagogical Knowledge has a corresponding 0.293 increase in 21st Century Teaching Skills. Moreover, based on the  $r^2$  - value of the Technological Pedagogical Content Knowledge can only contribute 46.6% to the 21st Century Teaching Skills. This further implies that the remaining 53.4% may come from other variables which are not



covered in this study. This result supports the study of Tampa, Tampa, Said, and Suryansari (2022) stated that teacher professional education program activities are effective in implementing the TPACK model. The TPACK model can improve the skills of teachers' higher-order thinking skills in teaching in schools. Therefore, future research may need to explore and incorporate these other variables to provide a more holistic understanding of the factors contributing to effective teaching practices in the 21st century.

Table 6. Multiple Regression Analysis determining the Significant Effect of TPACK to the 21st Century Teaching Skills of Pre-service Teacher

Indicators	Level of Mathematical Skills			
	Unstandardized Coefficient	t	p-value	Remarks
Constant	1.429	8.288	0.00	Highly Significant
Technological Knowledge	0.045	0.928	0.355	Not Significant
Pedagogical Knowledge	0.249	4.777	0.000	Highly Significant
Content Knowledge	- 0.062	-1.019	0.309	Not Significant
Technological Pedagogical Knowledge	0.293	5.928	0.000	Highly Significant
Technological Content Knowledge	0.027	0.536	0.592	Not Significant
Pedagogical Content Knowledge	0.067	1.347	0.179	Not Significant
Technological Pedagogical Content Knowledge	-0.078	-1.108	0.305	Not Significant
<b>r<sup>2</sup></b>	<b>0.466</b>			
<b>F</b>	<b>103.62</b>			
<b>p</b>	<b>0.000</b>			

## CONCLUSION AND RECOMMENDATION

Based on the findings of the study, the following conclusions were drawn: First, the level of Technological Pedagogical Content Knowledge (TPACK) was evident. Second, the level of 21st Century Teaching Skills was always observed. It was concluded that any variance in Technological Pedagogical Content Knowledge (TPACK) has a corresponding variance in 21st Century Teaching Skills. Furthermore, the Technological Pedagogical Content Knowledge (TPACK) has a significant relationship with 21st Century Teaching Skills. Furthermore, any increase in the level of Technological Pedagogical Content Knowledge (TPACK) has a corresponding increase in the level of 21st Century Teaching Skills. Lastly, it was found out that the Technological Pedagogical Content Knowledge (TPACK) can significantly affect the 21st Century Teaching Skills. It is recommended that administrators should focus on providing comprehensive training programs that emphasize the integration of technology, pedagogy, and content knowledge to enhance teaching skills. They should also support continuous learning among pre-service teachers and facilitate collaboration to share best practices. Additionally, faculties can contribute by integrating the TPACK framework into teacher education programs, offering hands-on training, and promoting reflective practice. Pre-service teachers are encouraged to embrace lifelong learning, seek mentorship, and experiment with innovative teaching methods. Also, future researchers should consider conducting longitudinal studies, exploring cross-cultural perspectives, and collaborating with practitioners to ensure the relevance and applicability of their research findings. By following these recommendations, stakeholders in education can contribute to the development of effective 21st-century teaching skills and the successful integration of technology into teaching practices.

## REFERENCES

1. Absari, N., Priyanto, & Muslikhin (2020). The Effectiveness of Technology, Pedagogy and Content Knowledge (TPACK) In Learning. *Jurnal Pendidikan Teknologi dan Kejuruan*, Vol. 26, No.1, 43-51.
2. Agustin, K., Aridah, A., & Iswari W. (2023). The Relationship among Attitudes toward ICT, Collegial Support and TPACK of EFL Teachers. *Journal of English as a Foreign Language Teaching and Research*, 3(1):71-86.
3. Arya, P., Christ, T., & Wu, W. (2020). Patterns of Technological Pedagogical and Content Knowledge in Preservice-Teachers' Literacy Lesson Planning. *Journal of Education and Learning*; Vol. 9, No. 5.
4. Bedir, H. (2019). Developing a framework for the integration of 21st century learning and innovation skills into pre-service ELT teachers' practicum. *International Online Journal of Education and Teaching (IOJET)*, 6(4). 828-843.
5. Bilici, S. C., Guzey, S. S., & Yamak, H. (2016): Assessing pre-service science teachers' technological pedagogical content knowledge (TPACK) through observations and lesson plans. *Research in Science & Technological Education*.
6. Burlado, J. C., Repollo, J. L., & Aoanan, G. O. (2024). TPACK and Computer Literacy as Predictors of Knowledge and Understanding in Plane And Solid Geometry. *Ignatian International Journal for Multidisciplinary Research*, 2(7), 11021114.
7. Chaiyama, N., & Kaewpila, N. (2022). The development of life and career skills in 21st century test for undergraduate students. *European Journal of Educational Research*, 11(1), 51-68.
8. Coşanay, G, Karalı, Y. (2022). Examination of classroom teachers' 21st-century teaching skills. *International Online Journal of Education and Teaching (IOJET)*, 9(1), 432-448.
9. Demirkol-Orak, S. & İnözü, J. (2021). Teachers' awareness and actual practices of 21st-century learning and innovation skills. *International Online Journal of Education and Teaching (IOJET)*, 8(2). 975-997.
10. Dewi, M. S., Setyosari, P., Kuswandi, D., & Ulfa, S. (2020). Analysis of kindergarten teachers on pedagogical content knowledge. *European Journal of Educational Research*, 9(4), 1701-1721.
11. Diamah, A., Rahmawati, Y., Irwanto, I., Paristiowati, M., & Fitriani, E. (2022). A survey to investigate pre-service teachers' perceptions of technological pedagogical content knowledge (TPACK) in Indonesia. *Nucleation and Atmospheric Aerosols*.
12. Durak, D., & Ozudogru, G. (2023). School Principals' Technological Leadership Self-Efficacies and 21st Century Teacher Skills. *Journal of Ahmel Kelesoglu Education Fault*.
13. Ergen, B., Yelke, T. Y., & Kanadli, S. (2019). A Meta-Analysis of Research on Technological Pedagogical Content Knowledge by Gender. *Contemporary Educational Technology*, 10(4), 358-380.
14. Filiz, B. (2020). The relationship between effective communication skills and verbal intelligence levels of faculty of sport sciences students. *International Journal of Educational Methodology*, 6(3), 603-612.
15. Habibi, A., Razak, R. A., Yusop, F. D., Muhaimin, M., Asrial, A., Mukminin, A., & Jamila, A. (2022). Exploring the factors affecting pre-service science teachers' actual use of technology during teaching practice. *South African Journal of Education*, Volume 42, Number 1, Art. #1955, 11 pages.
16. Hale, L. V. A., Lutter, J. C. & Shultz, G. V. (2016). The development of a tool for measuring graduate students' topic-specific pedagogical content knowledge of thin layer chromatography. *Chemistry Education Research and Practice*.
17. Hazar, E., Akkutay, U., & Keser, H. (2021). Information, media and technology skills in terms of curricula, process and product in middle and high schools. *International Journal of Technology in Education and Science (IJTES)*, 5(3), 288-310.
18. Indrawati, C. D. S. (2021). The Effectiveness of Archiving Videos and Online Learning on Student's Learning and Innovation Skills. *International Journal of Instruction*, 14(4), 135-154.
19. Kara, S. (2021). An investigation of Technological Pedagogical and Content Knowledge (TPACK)

- competencies of pre-service visual arts teachers. *International Journal of Technology in Education (IJTE)*, 4(3), 527-541.
20. Khasawneh, M. A. S. (2021). The Degree of Practicing Effective Communication Skills among Teachers of Learning Disabilities in English Language from their Point of View. *Journal Educational Verkenning*.
  21. Kim, S., Raza, M., & Seidman, E. (2019). Improving 21st-century teaching skills: The key to effective 21st-century learners. *Research in Comparative & International Education* 2019, Vol. 14(1) 99–117,
  22. Lehtinen, A., Nieminen, P., & Viiri, J. (2016). Preservice teachers' TPACK beliefs and attitudes toward simulations. *Contemporary Issues in Technology and Teacher Education*, 16(2), 151-171.
  23. Martinez, C. (2022). Developing 21st century teaching skills: A case study of teaching and learning through project-based curriculum. *Cogent Education*, 9:1, 2024936.
  24. Milewski, P. (2020): Pedagogical knowledge as a distinct object in the history of education: the example of Ontario, Canada, *Paedagogica Historica*.
  25. Mustafa, A. M., Ozgur, U. & Ridvan, A. (2021). Adaptation of Technological Pedagogical Content Knowledge Scale into Turkish Culture within the Scope of 21st Century Skills. *Psycho-Educational Research Reviews*| Vol. 10, No. 1.
  26. Ozturk, M.S., Kinik, M., & Ozturk, M.U. (2023). Investigation of Technological Pedagogical and Content Knowledge (TPACK) competencies of university students. *International Journal of Technology in Education (IJTE)*, 6(3), 418-433.
  27. Paidican, M. A., & Arredondo, P. A. (2022). The Technological Pedagogical Knowledge for In-Service Teachers in Primary Education: A Systematic Literature Review. *Contemporary Educational Technology*, 14(3), ep370.
  28. Peligro, V. C. (2022). Technological Pedagogical and Content Knowledge (TPACK) of the Pre-service Science Teachers in Caraga Region. *International Journal of Research and Innovation in Social Science*, 6(12), 816-820.
  29. Putri, I., Susilo, S., & Rachmawaty, N. (2022). Efl pre-service teachers' experiences in designing tpack -based instructional videos. *IJEE*, 9(2):347-357.
  30. Shafie, H., Majid, F. A., & Ismail, I. S. (2019). Technological Pedagogical Content Knowledge (TPACK) in Teaching 21st Century Skills in the 21st Century Classroom. *Asian Journal of University Education*, v15 n3 p24-3.
  31. Schmidt, D. A., Baran, E., Thompson, A. D., Mishra, P., Koehler, M.J.,& Shin, T. S. (2014). Technological Pedagogical Content Knowledge (TPACK). *Journal of Research on Technology in Education*, 42:2, 123 149.
  32. Tampa, T., Tampa, A., Said, M., & Suryansari, K. (2022). Exploration the skills of teachers: Implementation technological pedagogical content knowledge. *Cypriot Journal of Educational Sciences*, 17(12):4713 4733.
  33. Tanjung, S., Baharuddin, Ampera, D., Fariyah, & Jahidin, I. (2022). Problem Based Learning (PBL) Model with Technological, Pedagogical, and Content Knowledge (TPACK) Approach. *International Journal of Education in Mathematics, Science, and Technology (IJEMST)*, 10(3),740-752.
  34. Taopan, L. L., Drajadi, N. A., & Sumardi, (2020). TPACK Framework:Challenges and Opportunities In EFL Classrooms. *Research and Innovation in Language Learning* Vol. 3(1)January 2020 pp. 1-22.
  35. Uluçınar, U,. (2021). The Associations Between Learning Teaching Conceptions and Technological Pedagogical Content Knowledge: A Structural Equation Modeling Study. *Psycho-Educational Research Reviews* | Vol. 10, No. 2.
  36. Vasil, M., Weiss, L., & Powell, B. (2018). Popular Music Pedagogies: An Approach to Teaching 21st Century Skills. *Journal of Music Teacher Education*.
  37. Valtonen, T., Sointu, E., Kukkonen, J. & Kontkanen, S. (2017). TPACK updated to measure pre-service teachers' twenty-first century skills. *Australasian Journal of Educational Technology*, 2017, 33(3).
  38. Wang, W., Schmidt-Crawford, D., & Jin, Y. (2018). Preservice Teachers' TPACK Development: A

Review of Literature. *Journal of Digital Learning in Teacher Education*, 34:4, 234-258.

39. Yavuz, S., & Guzel, U. (2020). Evaluation of teachers' perception of effective communication skills according to gender. *African Educational Research Journal* Vol. 8(1), pp. 134-138, March 2020
40. Zamora, J. T. & Zamora J. J. M. (2022). 21st Century Teaching Skills and Teaching Standards Competence Level of Teacher. *International Journal of Learning, Teaching and Educational Research* Vol. 21, No. 5, pp.220-238