

Research Article

Cite this article: Zhubi, A. (2025). Teachers' Attitudes Towards the TPACK Model in the Context of Improving Teaching in the Elementary School. *Educational Process: International Journal*, 16, e2025253.
<https://doi.org/10.22521/edupij.2025.16.253>

Received April 14, 2025

Accepted May 18, 2025

Published Online June 15, 2025

Keywords: Teachers' attitudes, TPACK model, teaching, primary school

Author for correspondence:

Arjana Zhubi

✉ arjana.zhubi@uni-pr.edu

✉ Hasan Prishtina University, Kosovo.

Teachers' Attitudes Towards the TPACK Model in the Context of Improving Teaching in the Elementary School

Arjana Zhubi 

Abstract

Background/purpose. This study analyzes teachers' attitudes towards the implementation of the TPACK model in relation to technological, pedagogical, and content knowledge for improving teaching in primary schools. Specifically, the study examines the impact of teachers' age on the use of technology during teaching as an innovative approach in the classroom. The research also identifies whether the level of education of teachers plays a key role in the implementation of this methodology.

Materials/methods. A quantitative research approach was conducted in 11 primary schools in the four largest cities of Kosovo. A total of 363 teachers participated in this study. A sample size determination table using the probability method (95% confidence interval and 5% error) was used to determine this sample size. Quantitative data were collected using the "Survey of Pre-service Teachers' Knowledge of Teaching and Technology," a standardized questionnaire for teachers.

Results. The findings indicate that there is a low correlation between teachers and technological knowledge. Specifically, teachers showed average results for content and very high pedagogical knowledge. Additionally, the age and education level of the teachers were the main factors that hindered the implementation of the TPACK model in the classroom.

Conclusion. They suggest ongoing training for elementary-level teachers so that knowledge related to the TPAC model is sustainable and constructive. At the same time, this data will contribute at both the local and central levels to the development of educational policies, the revision of the curriculum, and the design of training programs. The weak school infrastructure, the lack of school digitalization, and insufficient professional development are some of the challenges that hinder teachers in their efforts to improve teaching in primary schools.



OPEN ACCESS

© The Author(s), 2025. This is an Open Access article, distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>), which permits unrestricted re-use, distribution, and reproduction, provided the original article is properly cited.

1. Introduction

An important role for innovative teaching is teachers' attitudes regarding the possible changes in the educational system (Voithofer & Nelson, 2020). A new approach that connects technology, pedagogy, and content is expressed through the TPACK model (Mishra & Koehler, 2006).

In the context of Kosovo, studies of this nature are lacking, while in many other countries, research on the subject has been conducted (Hermans et al., 2008). In the primary schools of Kosovo, educational policies have not been oriented towards the implementation of the TPACK model (Technological, Pedagogical, and Content Knowledge) as a framework within the Kosovo curriculum. Therefore, the purpose of this study is to demonstrate how teachers' attitudes impact new teaching practices in connection with the model provided, specifically whether or not instructors' professional development and age have an effect on how this approach is implemented.

The implementation of technology not only expresses basic knowledge of technology but is also the process of interdisciplinary integration between content knowledge and pedagogical knowledge (Niess, 2011). Part of the principles of the Curriculum Framework in Kosovo (MASHT, 2016) is integrated and coherent teaching, which is based on promoting learning through curricular areas, within which the teaching unit is interconnected with interdisciplinary issues, contributing to the development of competencies, with a particular emphasis on developing skills for utilizing technology. Koehler & Mishra, 2005 emphasizes that successful technology integration in education necessitates comprehension of the interplay among technological, pedagogical, and content knowledge, referred to as the TPACK framework. In Kosovo, there is a lack of literature based on this model, and teachers need to implement and integrate the three areas of knowledge. As a result, the research highlights teachers' attitudes regarding how they connect the three concepts of knowledge during the teaching process.

The implementation of the TPACK model is closely related to the level of education and the ongoing training of teachers (Bruce, 1997). Specifically, this model contains indicators that reflect teachers' professional competencies and efforts to improve the quality of teachers as the main factors that affect the education system. The training of teachers for the ECDL program, organized by the Ministry of Education (IPK, 2013; MASHT, 2017), has resulted in recommendations to continue with new programs for the advancement of teachers in order to implement new knowledge and skills. In addition to training for the implementation of the TPACK model, the age of the teacher (Kopcha, 2012) plays an important role as a potential factor for (dis)interest and neglect in the use of technology (Richardson-Koehler, 1987). The use of technology among older teachers is very challenging (Crawford, 2020), as are the knowledge, skills, methods, activities, and other technological resources that are increasingly becoming an inseparable part of educational content (Spiteri & Chang Rundgren, 2020). Teachers' attitudes towards the unity between content, pedagogy and technology in primary education learning are not well identified by the instruments that measure their skills (Hermans et al., 2008). For this reason, we picked the TPACK model since it helps us to detect the attitudes instructors express, their actions, and the obstacles they confront during the teaching process.

Finding new practices based on the TPACK framework (technological, pedagogical, and content knowledge) and the teacher's ways to integrate them for a successful teaching outcome is what makes the study important. This study offers a viewpoint on the training and educational initiatives that ought to be created in elementary schools, with a particular focus on the Republic of Kosovo, in order to increase the quality of teaching.

2. Literature Review

The TPACK model (The Technological, Pedagogical, and Content Knowledge framework) is applied as a framework for identifying the attitudes that teachers possess regarding the organization of the teaching process (Shulman, 1987). The TPACK model includes three basic types of knowledge:

2.1. Technological Knowledge (TK)

Find out how instructors feel about using technology, other tools that are available, and the abilities required to use them in the classroom. The use of technology as a learning tool cannot bring improvements in teaching if the attitudes and technological knowledge possessed by the teacher are not verified (Liu, 2011).

2.2. Pedagogical Knowledge (PK)

They outline the didactics, teacher strategies, and cross-curricular integration that go into teaching and learning in the classroom.

2.3. Content Knowledge (CK)

This includes developing teaching units, planning in accordance with the curriculum, and developing subject-matter expertise. Technology, pedagogical design, and subject-matter expertise are helpful in comprehending the intricacy of instruction (Rosenberg & Koehler, 2015).

Teachers' attitudes and ideas about new methods and practices in the classroom are critical for adapting to educational reforms and changing times (Schmidt et al., 2009). As a result, in schools where teachers' attitudes are positive, the teaching process and learning outcomes are higher compared to schools where teachers' attitudes are unchanging (Greenhow et al., 2009). In a study with 130 teachers (Shapley et al., 2011), the researchers used rubric analysis with several factors to identify the issues that influence the improvement of teaching. They identified four main factors: attitudes, beliefs, age, and the professional development of the teacher (Fujii, 2019). It is very crucial to study how instructors' attitudes are related to the TPACK model in terms of the arrangement of instruction according to curriculum areas (Angeli et al., 2016). Many lesson plans are written on paper merely as a document and a school argument, while their implementation in practice is hardly discussed because the educational content depends on the skills, knowledge, and attitudes of the teacher (Jang, 2010). In this regard, the TPACK model offers other opportunities for confronting and challenging the previously addressed topics and the new learning units that will be developed (Tabroni et al., 2022).

Voogt et al. (2016) have highlighted difficulties referred to as "primary and secondary." Primary barriers were a curriculum that was not aligned with school textbooks and unsuitable school infrastructure (Snoeyink & Ertmer, 2001). Secondary barriers resulted from teachers' attitudes towards innovative changes (Choi & Young, 2021), followed by age, gender, educational experience, readiness, perceptions, beliefs, convictions, time, fear, professional development (Blau et al., 2014) and training (Koehler & Mishra, 2005).

Other factors influencing how the TPACK model is implemented include the age and educational background of the teachers. Researchers Alqurashi et al. (2016) explain that older teachers do not support this methodology because their educational level does not correspond with the integration of knowledge due to their skills and negative attitudes (Soetan & Cokerb, 2019). Even though they have been part of the training, many of them do not prefer the implementation of this model (Greenhow et al., 2009). Some other data argue that older teachers who are passionate about teaching effectively implement the TPACK model in the classroom, which contradicts the ideas of many researchers that age hinders the use of this model (Ayala-Perez & Joo-Nagata, 2019).

Research on teachers' attitudes toward using technology to improve education, supported by the TPACK framework, suggests that as the knowledge base in each area grows, many challenges in

teaching will be overcome (Sackstein et al., 2019). Mishra et al. (2009) decided to include seven more components linked to the three disciplines of knowledge in the model's construction. In this research, the influence of technological knowledge was also employed as a verification technique for the development of the seven additional knowledge sub-constructs listed in Table 1.

Table 1. Explanation of the fields TPACK

Knowledge	The Abbreviations	Explanation
Knowledge of the content	KC	Awareness of contemporary issues relevant to the subject matter being taught or that ought to be included in the curriculum. Understanding the contents of the curricular areas. Select relevant content for students while considering the connection between subjects and areas of the curriculum.
Pedagogical knowledge	PED.K	Understanding of teaching processes and procedures, strategies, and instructional strategies. Understanding how to plan the educational process.
Technological knowledge	TK	Knowledge of how to use tools and technology to achieve goals.
Knowledge of pedagogical content	KPED.C	Understanding the topic matter and identifying multiple methods/techniques for material adaptation and integration.
Knowledge of technological content	KTC	Understanding technology and content harmonization necessitates knowledge of how they influence and restrict one another.
Technological pedagogical knowledge	TPEDK	Understanding of how to apply technology in specific ways to improve learning and teaching. Understanding the educational advantages and disadvantages of technologies.
Knowledge of technological pedagogical content.	TPACK	Integration of content, pedagogy, and technology Knowledge. To be able to learn specific content with specific techniques and methods and appropriate technology.

These three domains identify knowledge as a prerequisite for effective teaching and have served as a foundation for understanding the research findings. If the teacher is knowledgeable about each of these structures, the outcomes are directly reflected in the enhancement of instruction.

3. Methodology

This quantitative study focused on three knowledge domains, technological, pedagogical, and content, and highlighted teachers' attitudes by determining which aspects of knowledge instructors are most developed in and which knowledge they apply most in their classrooms. Using a quantitative correlation study, focused on three areas of knowledge: technological, pedagogical and content, this study highlighted the attitudes of teachers by determining which aspects of the teachers' knowledge are most developed and which knowledge they apply most in their classes.

The study also found that instructors' age and education level were the top reasons for not adopting technology in the classroom. The study expands on prior research (Akinoğlu & Tandoğan,

2007), which found that if the three knowledge domains are interconnected during the teaching process, a teacher will know exactly how to design the TPACK model.

This study aims to examine teachers' views on implementing the TPACK model, which is based on technological, pedagogical, and content knowledge, to improve teaching in primary schools. The study focuses on how teachers' ages affect their use of technology when teaching. The study also investigates whether the amount of teacher education has an impact on the implementation of this methodology. The research questions were aimed at examining whether there are any differences or correlations between teachers' ages, degrees of education, and attitudes. By addressing these challenges, the study offers significant insights into the three fields of knowledge as a novel classroom method for improving teaching in elementary schools.

3.1. Research questions

In our research, we aimed to answer these questions:

1. What are the teachers' perspectives on the TPACK model in terms of improving teaching in primary schools?
2. Are there significant differences between teachers regarding technological, pedagogical and content knowledge?
3. Is there a correlation between the age of teachers in relation to the TPACK model for improving teaching in elementary school?
4. Is there a correlation between the education level of teachers in relation to the TPACK model for improving teaching in elementary schools?

3.2. Sample and data collection

The population of this study consists of 363 teachers from 11 primary schools in 4 largest cities of Kosovo: Pristina, Prizren, Mitrovica, and Gjakova. In order for the study results to be more generalizable, we have selected the cities as the largest in the region.

The sample has been determined according to the probability method (Mohajan, 2018) with a confidence level of 95% and a margin of error of 5% (Cohen et al., 2013). The number of primary and lower secondary school teachers in Kosovo is 1742, according to published data for Education Statistics in Kosovo 2021/2022 (MASHTI, 2022). Of the 4 municipalities (11 schools) where the study was conducted, there are 5125 teachers, or 7.02% of the total population (see Table 2).

Table 2. Descriptive Statistics Related to the Sample (n = 363)

Variables		Frequency	Percentage (%)
Schools	Mustafa Bakija	45	12.4
	Kelmend Rizvanolli	25	6.9
	Ibrahim Fehmiu	30	8.3
	Abyl Frashëri	51	14.0
	Emin Duraku	31	8.5
	Naim Frashëri	30	8.3
	Meto Bajraktari	45	12.4
	Xhemajl Mustafa	25	6.9
	Nazmi Gafurri	26	7.2

	Ismail Qemali	25	6.9
	Musa Hoti	30	8.3
Town	Gjakova	70	19.3
	Prizren	112	30.9
	Prishtina	126	34.7
	Mitrovica	55	15.2
Gender	Male	23	6.3
	Female	340	93.7
Qualification	Bachelor 3	40	11.0
	Bachelor 4	217	59.8
	Master	102	28.1
	PhD	4	1.1
Experience	1–5 years	71	19.3
	6–10 years	59	16.3
	11–15 years	81	22.3
	16–20 years	40	11.0
	Over 20 years	112	30.9

The instrument, "Survey of Service Teachers' Knowledge of Teaching and Technology" (TPACK) questionnaire, was adapted and changed to gather data to meet the study objectives. Developed by Schmidt et al. (2009), the TPACK instrument consisted of 30 statements divided into 4 sections according to the Likert scale (5-very much, 4-moderately, 3-uncertain, 2-a little, 1-not at all). The demographic data (school, city, gender, age, education level, work experience) are included in the first part. To verify the teachers' attitudes towards technology, the level "TK – Technology Knowledge" was used. Regarding the attitudes towards pedagogy, the level "PK – Pedagogy Knowledge" was used, and for the attitudes towards content, the level "CK – Content Knowledge" was employed, as presented in the other sections of the questionnaire.

The three levels of knowledge expressed high reliability values (Cronbach's alpha ranging from 0.78 to 0.93), confirming the questionnaire's appropriate reliability.

4. Results

4.1. Descriptive analysis

Descriptive analysis was used to analyze demographic data (age, qualifications, work experience, school, and city) and examine the relationship between the study's main variables (TK, PED.K, and CK). Average differences between variables were also declared using frequencies, means, and standard deviations (see Table 3).

The average of technological knowledge is $M=3.944$ and the standard deviation $SD = 0.958$. This value indicates that teachers' attitudes towards technology are at a low level. The construct of content knowledge is explained by three factors: TP - Technology presentations, LK - Level of knowledge, and KTHC - Knowledge of theories and concepts. The average for technology presentations is $M = 3.729$, with a standard deviation of $SD = 1.093$. This indicates that teachers' attitudes towards technology presentations are also very low. The average level of knowledge

regarding the subject is $M = 4.662$, and the standard deviation is $SD = 0.496$. This average shows that teachers' opinions toward topic knowledge are significantly higher. The average understanding of theories and concepts is 4.286, with a standard deviation of 0.614. Based on this average, it is clear that teachers' views regarding theories and concepts related to curricular disciplines are at a far higher degree of expertise than other fields of knowledge. Finally, the average pedagogical knowledge was estimated as $M = 4.559$, with $SD = 0.506$. This number shows that teachers possess a high level of pedagogical understanding.

Table 3. Descriptive statistics of fields of knowledge

	N	Average	Std.Dev.	Variance
TK	363	3.944	0.958	0.919
TP	363	3.729	1.093	1.196
LK	363	4.662	0.496	0.247
KTHC	363	4.286	0.614	0.377
PED.K	363	4.559	0.506	0.257

TK = Technological knowledge, TP = Technology presentations, LK = Level of knowledge, KTHC = Knowledge of theory and concepts, PED.K = Pedagogical knowledge

4.2. Normality test

The normality test was conducted to assess the data distribution and determine the suitability of parametric tests. In particular, we used the Kolmogorov-Smirnov test to assess whether the study data had a normal distribution. The results showed that the data were normally distributed for the three study variables, as indicated by the p-values greater than 0.05. The value of the Kolmogorov test was 0.38, $p = 0.140 > 0.05$, and the value of the Shapiro-Wilk test was 0.987, $p = 0.758 > 0.05$ (see Table 4).

Table 4. Normality test results

Tests of Normality						
Kolmogorov-Smirnov ^a			Shapiro-Wilk			
	Statistic	df	Sig.	Statistic	df	Sig.
TK_CK_PED.K_mean	.038	540	.140	.987	520	.758

a. Lilliefors Significance Correction

4.3. Correlation analysis

To determine whether there is a significant association between technology, content, and pedagogical expertise, linear correlation analysis was utilized. Table 5 shows the findings of the correlation analysis.

The results show a strong positive correlation ($r = 0.780$, $p < 0.01$) between technological knowledge and technology planning. However, the correlation between technological knowledge and overall level of knowledge, as the second factor of content knowledge, is not significant ($r = 0.095$, $p > 0.05$). Furthermore, there is a negative association between technological expertise and knowledge of ideas and conceptions ($r = -0.152$, $p < 0.01$). In the second scenario, we investigated the association between technological and pedagogical knowledge, which is positive and reasonably robust ($r = 0.358$, $p < 0.01$). There is a positive and relatively high association between teachers' technical

expertise and pedagogical knowledge. However, a negative and minor correlation exists between technological knowledge and subject knowledge in elementary schools. Following that, we analyzed the relationship between content knowledge. Our findings indicate a positive and medium relationship ($r = 0.303$, $p < 0.01$) between technology knowledge and pedagogical knowledge, as well as a positive and moderately strong relationship ($r = 0.493$, $p < 0.01$) between content knowledge and pedagogical knowledge. These statistics show a considerable variation in the link between the three knowledge components. In addition, we examined the link between three knowledge components and demographic factors. Technological knowledge has a positive and significant correlation with qualifications ($r = 0.561$) and a negative correlation with age ($r = -0.574$, $p < 0.01$), the school where one works ($r = -0.155$, $p < 0.01$), and the city ($r = -0.107$, $p < 0.05$). Content knowledge correlates significantly and positively with age ($r = 0.114$, $p < 0.05$). Pedagogical knowledge has a positive correlation with qualification ($r = 0.349$, $p < 0.01$), while it has a negative correlation with age ($r = -0.119$, $p < 0.05$). Thus, from the above results, it emerged that there is a positive correlation between demographic characteristics and teachers' technological, pedagogical and content knowledge in primary school.

Table 5. The results of the correlation analysis regarding the relationship between knowledge.

	1	2	3	4	5	6	7	8	9	10	11
1. TK	1										
2. TP	0.780**	1									
3. LK	0.095	0.091	1								
4. KTHC	-0.152**	-0.204**	0.600**	1							
5. PED.K	0.358**	0.303**	0.493**	0.359**	1						
6. School	-0.054	-0.155**	0.055	-0.013	-0.028	1					
7. City	-0.026	-0.107*	0.026	-0.058	-0.041	0.965**	1				
8. Age	-0.574**	-0.502**	0.114*	0.389**	-0.119*	0.044	0.041	-0.097	1		
9. Lev.edu	0.561**	0.548**	0.094	-0.084	0.349**	-0.128*	-0.131*	0.062	-0.318**	1	

TK = Technological knowledge, PPT = Technology presentations, LK = Level of knowledge, KTHC = Knowledge of theories and concepts. PED.K = Pedagogical knowledge

**The correlation is significant at the 0.01 confidence level. *The correlation is significant at the 0.05 level of confidence.

5. Discussion

The results of this study highlighted the attitudes expressed by primary school teachers in relation to the TPACK model (technological, pedagogical, and content knowledge). The study specifically examined the relationship, influence, and differences between technological, pedagogical, and content knowledge in elementary education. Age and education level were shown to be the most influential components in the TPACK model when compared to other demographics.

5.1. Teachers' attitudes towards technological knowledge

According to the study's results based on descriptive characteristics, frequency distribution, and response alternatives, teachers' attitudes toward technological knowledge were expressed at a very low level due to many factors: the lack of technological equipment, the absence of computer labs, internet connectivity issues, teachers being overwhelmed with pedagogical documentation, the lack of professional development and training in technology, inadequate school textbooks, lack of collaboration etc. Our findings align with the results of researchers Kafyulilo et al. (2015) who stated that the primary factors hindering teachers from using technology were the lack of laptops in

classrooms, internet connectivity, and professional development. According to the findings in the field of technological knowledge, teachers avoid using technology since it is tough. They stated the reasons for not implementing technology in education, including a failure to shift their perspective about technology and stay up with innovative skills. As a result of all of this, pupils bear the brunt of the consequences. Based on this data, we discovered studies from numerous researchers (Ghiațău & Măță, 2019) who argue that teachers are resistant to using technology in their classrooms since students overuse it and does not produce learning outcomes. These findings are comparable to those of Winter et al. (2021), who performed a study with primary school teachers and reported on the instructors' perspectives toward the abilities, competencies, and obstacles encountered when using technology. Regarding age, teachers above 50 years old had higher average levels of pedagogical knowledge than those aged 31-40 and 41-50. Regarding qualifications, teachers with a 3-year Bachelor's degree expressed a lower level of pedagogical knowledge than those with a 4-year Bachelor's degree, Master's, and Doctorate, while teachers with a 4-year Bachelor's degree achieved a higher average of pedagogical knowledge. Thus, the pedagogical knowledge of teachers in the context of Kosovo fulfills the component of the TPACK model. The technological knowledge of teachers aged 23-30 was higher than that of those aged 41-50, as well as those above 50. Teachers above the age of 50 demonstrated lower levels of technological competence. Regarding disparities in technology knowledge based on education level, it was discovered that teachers with a 3-year Bachelor's degree have a lower level of technological understanding than those with higher levels of education.

5.2. Teachers` attitudes towards pedagogical knowledge

Teachers demonstrated an extremely high level of pedagogical understanding. In their classes, they use a more pedagogical and conventional approach rather than technology-based instruction. This condition reflects their qualifications, as the majority of instructors hold Bachelor's degrees, and programs at this level are more geared toward pedagogical understanding. The findings of authors Szeto and Cheng (2016) supported this aspect, as teachers' pedagogical models fluctuate based on their educational decisions, which are influenced by individual preferences, diverse topic cultures, and individual school environments. The achievement of learning objectives according to the curriculum, classroom management, lesson preparation based on the students' learning styles, and the forms, methods, and strategies used during teaching are the pedagogical strengths that Kosovo teachers have developed the most. The findings of this study are compatible with those of other authors from various nations, which may be interesting and relevant to the setting in which the research was conducted (Mouza et al., 2022). They confirmed that educational issues are fundamental to their study curricula.

5.3. Teachers` attitudes towards content knowledge

From the averages of content knowledge, teachers' attitudes were expressed with a high average for the level of knowledge-LK according to the subjects taught, and with a very high level regarding knowledge of theories and concepts according to curricular fields-KTHC. Therefore, teachers possess higher knowledge about the concepts, theories, and chapters they plan for their lessons than about technological knowledge. In this regard, the researchers Lefebvre et al. (2017) examined the characteristics of subject-specific teaching and its fundamental epistemological dimension. These authors emphasize that content knowledge depends on the subject being taught, the nature of the content, and the level of education; therefore, taking into account specific subjects and grade levels can shed more light on the interconnection between the three domains of knowledge in the planning of the teaching process. Thus, in order to achieve the realization of content knowledge, the teacher is obliged to be well-versed in the subject they teach, to understand the concepts and facts of the subjects they instruct (Klein et al., 2019). In another study, Liu (2013) emphasized that in order to

transform technology during teaching to achieve the learning objective, the teacher must first operate the skills of content and planning multiple learning activities. As for age, teachers over 50 years old have a higher level of content knowledge compared to those aged 23-30, 31-40, and 41-50. According to the qualifications, it was found that teachers with a 3-year Bachelor's degree exhibited a lower average of content knowledge compared to those with a 4-year Bachelor's degree, Master's, and Doctorate. Regarding this topic, Harding (2011) shares similar views, stating that older teachers with lower levels of education have more access to content, books, and traditional forms than younger teachers with higher levels of advancement. This happens due to the unprofessional training that is developed solely based on subject content, pedagogical aspects, and existing programs during undergraduate studies (Kaushal Kumar Bhagat et al., 2016). Research findings, including those by Soetan and Coker (2019), indicate that teachers must comprehend the interconnections among technological, pedagogical, and content knowledge.

6. Conclusion

The results of this study highlight the need for intervention regarding the concepts of technological, pedagogical, and content knowledge at the school, municipal, and regional levels as a priority issue and challenge for the entire educational system in Kosovo, so that these three areas can be integrated to improve teaching in primary schools. Based on the final findings, teachers do not exactly know what the three areas of knowledge entail, concepts that need to be further developed through teaching practices rather than through theoretical writings on paper, which are unnecessary during the teaching process. This is a process in transition towards drafting and strengthening in practice.

7. Suggestion

The results of this study outline several suggestions on how to improve practices related to knowledge areas, starting from:

a) School level

Prioritizing the provision of technological equipment in classrooms/schools, internet network, and the establishment of a cabinet with technological devices. All of this is aimed at providing teachers with a better opportunity to apply this knowledge in practice, as well as for meetings and other activities in the school.

b) Class level

The teacher's awareness of change and innovative approaches. In this regard, another suggestion will be the ongoing collaboration between classes and professional activities, so that teachers' practices can be elaborated, modified, improved, and implemented in other classes. The exchange of experiences could be a primary option, starting with their attitudes and beliefs about the three types of knowledge, as the study results refer to the TPACK model.

c) Municipal level

Schools should fulfill recurring MED and MESTI staff training requests at the same time, as a lack of technology competence leads to low averages. Schools should take the initiative to conduct school-based training as a criterion for executing the quality area in the school development plan.

d) Demographic suggestions: Age: Older teachers should help and encourage younger teachers in terms of access to technology.

e) Demographic suggestions: Educational Level: To make it easier to understand the relationship between pedagogy and content, primary school teachers should be required to participate in both school-based and technology-based training. Depending on the areas where

instructors are needed, schools should implement measures to improve their understanding of technology, pedagogy, and material.

The preceding proposals can be beneficial not only to teachers as a new teaching style, but also at the school and regional levels, as well as for new educational programs in faculties, trainings and discussion sessions, and beyond. Using this standardized test to design teacher competencies can lead to more successful training and development programs based on three knowledge categories.

This study's limitations and recommendations for future research include the possibility of expanding it to different educational levels, both urban and rural, in order to precisely identify each teacher's TPACK expertise and to address problems at the local and national levels. As a result, policymakers will be able to urgently influence the design of teacher training programs and take the required actions in the places where our results are lower.

Declarations

Author Contributions. Dr. Arjana Zhubi: Conceptualization, design, data analysis, drafting of the manuscript, critical review of the study, editing, supervision. Preparation of the original manuscript from the topic of the doctoral dissertation.

Conflicts of Interest. The author declares that there is no conflict of interest.

Funding. The author has no financial support for this study.

Ethical Approval. All data collection and storage procedures were approved by the Ministry of Education, Kosovo, and school principals through "Request" at each institution. Participant identifiers were removed to ensure anonymity.

Data Availability Statement. I declare that the study data is true, conducted in Kosovo, in the respective schools where I have also obtained prior permission to carry out the research.

Acknowledgements. The author, during the preparation of this paper, used the program quillbot.com to improve the grammar, language, and structured content.

The author declares that she has carefully reviewed and edited the finalization of the study, taking full and transparent responsibility regarding the published article.

References

- Akinoğlu, O., & Tandoğan, R. Ö. (2007). The Effects of Problem-Based Active Learning in Science Education on Students' Academic Achievement, Attitude and Concept Learning. *Eurasia Journal of Mathematics, Science and Technology Education*, 3(1), 71–81. <https://doi.org/10.12973/ejmste/75375>
- Alqurashi, E., Gokbel, E. N., & Carbonara, D. (2016). Teachers' knowledge in content, pedagogy and technology integration: A comparative analysis between teachers in Saudi Arabia and United States. *British Journal of Educational Technology*, 48(6), 1414–1426. <https://doi.org/10.1111/bjet.12514>
- Angeli, C., Voogt, J., Fluck, A., Webb, M., Cox, M., Malyn-Smith, J., & Zagami, J. (2016). A K-6 Computational Thinking Curriculum Framework: Implications for Teacher Knowledge. *Journal of Educational Technology and Society*, 19. <https://hdl.handle.net/11245/1.547418>
- Ayala-Perez, T., & Joo-Nagata, J. (2019). The digital culture of students of pedagogy specializing in the humanities in santiago de Chile. *Computers & Education*, 133, 1–12. <https://doi.org/10.1016/j.compedu.2019.01.002>
- Blau, I., Peled, Y., & Nusan, A. (2014). Technological, pedagogical and content knowledge in one-to-one classroom: teachers developing "digital wisdom." *Interactive Learning Environments*, 24(6), 1215–1230. <https://doi.org/10.1080/10494820.2014.978792>

- Bruce, B. C. (1997). Critical Issues Literacy Technologies: What Stance Should We Take? *Journal of Literacy Research*, 29(2), 289–309. <https://doi.org/10.1080/10862969709547959>
- Choi, B., & Young, M. F. (2021). TPACK-L: teachers' pedagogical design thinking for the wise integration of technology. *Technology, Pedagogy and Education*, 2, 1–18. <https://doi.org/10.1080/1475939x.2021.1906312>
- Cohen, L., Manion, L., & Morrison, K. (2013). *Research Methods in Education*. Routledge.
- Crawford, R. (2020). Information technology in secondary schools and its impact on training information technology teachers. *Journal of Information Technology for Teacher Education*, 9(2), 183–198. <https://doi.org/10.1080/14759390000200082>
- Fujii, T. (2019). Designing and adapting tasks in lesson planning: a critical process of Lesson Study. *ZDM*, 48(4), 411–423. <https://doi.org/10.1007/s11858-016-0770-3>
- Ghiațău, R. M., & Măță, L. (2019). Factors Influencing Higher Education Teachers' Attitudes towards Unethical Use of Information Technology: A Review. *Revista Romaneasca Pentru Educatie Multidimensionala*, 11(1), 287. <https://doi.org/10.18662/rrem/111>
- Greenhow, C., Robelia, B., & Hughes, J. E. (2009). Learning, Teaching, and Scholarship in a Digital Age. *Educational Researcher*, 38(4), 246–259. <https://doi.org/10.3102/0013189x09336671>
- Harding, D. J. (2011). Rethinking the Cultural Context of Schooling Decisions in Disadvantaged Neighborhoods. *Sociology of Education*, 84(4), 322–339. <https://doi.org/10.1177/0038040711417008>
- Hermans, R., Tondeur, J., van Braak, J., & Valcke, M. (2008). The impact of primary school teachers' educational beliefs on the classroom use of computers. *Computers & Education*, 51(4), 1499–1509. <https://doi.org/10.1016/j.compedu.2008.02.001>
- Instituti Pedagogjik i Kosoves, I. (2020). *Mësimi në distancë/e-mësimi në arsimin parauniversitar në Kosovë, nërrethanat e krijara nga pandemia*. <https://ipkmasht.rks-gov.net/wp-content/uploads/2021/02/Mesimi-ne-distance-E-mesimi-ne-arsimin-parauniversitar-ne-Kosove-ne-rrethanat-e-krijara-nga-pandemia-covid-%E2%80%9319-2020.pdf>
- Jang, S. J. (2010). Integrating the interactive whiteboard and peer coaching to develop the TPACK of secondary science teachers. *Computers & Education*, 55(4), 1744–1751. <https://doi.org/10.1016/j.compedu.2010.07.020>
- Kafyulilo, A., Fisser, P., & Voogt, J. (2015). Factors affecting teachers' continuation of technology use in teaching. *Education and Information Technologies*, 21(6), 1535–1554. <https://doi.org/10.1007/s10639-015-9398-0>
- Kaushal Kumar Bhagat, Chang, C., & Chang, C. (2016). The Impact of the Flipped Classroom on Mathematics Concept Learning in High School. *Journal of Educational Technology & Society*, 19(3), 134–142. https://www.jstor.org/stable/jeductechsoci.19.3.134?seq=4#metadata_info_tab_contents
- Klein, C., Lester, J., Rangwala, H., & Johri, A. (2019). Technological barriers and incentives to learning analytics adoption in higher education: insights from users. *Journal of Computing in Higher Education*, 31(3), 604–625. <https://doi.org/10.1007/s12528-019-09210-5>
- Koehler, M. J., & Mishra, P. (2005). What Happens When Teachers Design Educational Technology? The Development of Technological Pedagogical Content Knowledge. *Journal of Educational Computing Research*, 32(2), 131–152. <https://doi.org/10.2190/0ew7-01wb-bkhl-qdyv>
- Kopcha, T. J. (2012). Teachers' perceptions of the barriers to technology integration and practices

- with technology under situated professional development. *Computers & Education*, 59(4), 1109–1121. <https://doi.org/10.1016/j.compedu.2012.05.014>
- Sackstein, S., Spark, L., & Turner, B. (2019). Technology in the Classroom: Teachers' Technology Choices in Relation to Content Creation and Distribution. *Issues in Informing Science and Information Technology*, 16(2), 235–254. <https://doi.org/10.28945/4316>
- Lefebvre, S., Samson, G., Gareau, A., & Brouillette, N. (2017). TPACK in Elementary and High School Teachers' Self-reported Classroom Practices with the Interactive Whiteboard (IWB) | Connaissances abordées dans les pratiques déclarées d'enseignants du primaire et du secondaire qui exploitent le tableau numérique interactif (TNI) en classe. *Canadian Journal of Learning and Technology / La Revue Canadienne de l'Apprentissage et de La Technologie*, 42(5). <https://doi.org/10.21432/t2jk63>
- Liu, S. H. (2011). Factors related to pedagogical beliefs of teachers and technology integration. *Computers & Education*, 56(4), 1012–1022. <https://doi.org/10.1016/j.compedu.2010.12.001>
- Liu, S. H. (2013). Exploring the Instructional Strategies of Elementary School Teachers When Developing Technological, Pedagogical, and Content Knowledge via a Collaborative Professional Development Program. *International Education Studies*, 6(11). <https://doi.org/10.5539/ies.v6n11p58>
- MASHT (2016). Korniza Kurrikulare eArsimit Parauniversitar të Republikës së Kosovës. Retrieved from <https://masht.rks-gov.net/uploads/2017/03/korniza-kurrikulare-finale.pdf>.
- MASHTI (2017). Korniza strategjikepër zhvillimin e mësimdhënësve në Kosovë. Prishtinë: Mashti. Gjetur në masht.rks-gov.net/korniza-strategjike-per-zhvillimin-e-mesimdhenesve-ne-kosove/
- MASHTI (2022). Shenimet statistikore. Te dhena mbi arsimin parauniversitar. MASHT. Prishtinë: Ministria e Arsimit dhe Shkencës (MASH). Gjetur në <https://masht.rks-gov.net/uploads/2021/06/katalogu-web.pdf>
- Mishra, P., & Koehler, M. J. (2006). Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge. *Teachers College Record*, 108(6), 1017–1054. <https://doi.org/10.1111/j.1467-9620.2006.00684.x>
- Mohajan, H. K. (2018). Qualitative Research Methodology in Social Sciences and Related Subjects. *Journal of Economic Development, Environment and People*, 7(1), 23–48.
- Mouza, C., Coddling, D. M., & Pollock, L. (2022). Investigating the impact of research-based professional development on teacher learning and classroom practice: Findings from computer science education. *Computers & Education*, 186(2), 104530. <https://doi.org/10.1016/j.compedu.2022.104530>
- Niess, M. L. (2011). Investigating TPACK: Knowledge Growth in Teaching with Technology. *Journal of Educational Computing Research*, 44(3), 299–317. <https://doi.org/10.2190/ec.44.3.c>
- Richardson-Koehler, V. (1987). What happens to research on the way to practice? *Theory into Practice*, 26(1), 38–43. <https://doi.org/10.1080/00405848709543247>
- Rosenberg, J. M., & Koehler, M. J. (2015). Context and Technological Pedagogical Content Knowledge (TPACK): A Systematic Review. *Journal of Research on Technology in Education*, 47(3), 186–210. <https://doi.org/10.1080/15391523.2015.1052663>
- Schmidt, D. A., Baran, E., Thompson, A. D., Mishra, P., Koehler, M. J., & Shin, T. S. (2009). Technological Pedagogical Content Knowledge (TPACK). *Journal of Research on Technology in Education*, 42(2), 123–149. <https://doi.org/10.1080/15391523.2009.10782544>

- Shapley, K., Sheehan, D., Maloney, C., & Caranikas-Walker, F. (2011). Effects of Technology Immersion on Middle School Students' Learning Opportunities and Achievement. *The Journal of Educational Research*, 104(5), 299–315. <https://doi.org/10.1080/00220671003767615>
- Shulman, L. (1987). Knowledge and Teaching: Foundations of the New Reform. *Harvard Educational Review*, 57(1), 1–23. <https://doi.org/10.17763/haer.57.1.j463w79r56455411>
- Snoeyink, R., & Ertmer, P. A. (2001). Thrust into Technology: How Veteran Teachers Respond. *Journal of Educational Technology Systems*, 30(1), 85–111. <https://doi.org/10.2190/ydl7-xh09-rlj6-mtp1>
- Soetan, A. K., & Cokerb, A. D. (2019). University lecturers' readiness and motivation in utilizing online technologies for instructional delivery in Kwara state, Nigeria. *World Journal on Educational Technology: Current Issues*, 10(4), 165–181. <https://doi.org/10.18844/wjet.v10i4.4080>
- Spiteri, M., & Chang Rundgren, S. N. (2020). Literature Review on the Factors Affecting Primary Teachers' Use of Digital Technology. *Technology, Knowledge and Learning*, 25(1), 115–128. <https://doi.org/10.1007/s10758-018-9376-x>
- Szeto, E., & Cheng, A. Y. N. (2016). Pedagogies Across Subjects. *Journal of Educational Computing Research*, 55(3), 346–373. <https://doi.org/10.1177/0735633116667370>
- Tabroni, I., Husniyah, H., Sapitri, L., & Azzahra, Y. (2022). Impact of Technological Advancements on The Establishment of Characteristics of Children. *East Asian Journal of Multidisciplinary Research*, 1(1), 27–32. <https://journal.formosapublisher.org/index.php/eajmr/article/view/41>
- Voithofer, R., & Nelson, M. J. (2020). Teacher Educator Technology Integration Preparation Practices Around TPACK in the United States. *Journal of Teacher Education*, 72(3), 002248712094984. <https://doi.org/10.1177/0022487120949842>
- Voogt, J., & McKenney, S. (2016). TPACK in teacher education: are we preparing teachers to use technology for early literacy? *Technology, Pedagogy and Education*, 26(1), 69–83. <https://doi.org/10.1080/1475939x.2016.1174730>
- Winter, E., Costello, A., O'Brien, M., & Hickey, G. (2021). Teachers' use of technology and the impact of COVID-19. *Irish Educational Studies*, 40(2), 235–246. <https://doi.org/10.1080/03323315.2021.1916559>

About the Contributor(s)

Arjana Zhubi, Hasan Prishtina University, Faculty of Education. Arjana has completed her doctorate in Education Sciences, specializing in Teaching and Learning. She is currently engaged as a Collaborator at the Faculty of Education in Pristina, as a lecturer. She also works as a teacher in an elementary school, for 28 years. Her focus is on the development of training for teachers and the implementation of new methodologies, as she is also a licensed facilitator in several educational programs. Her motto is lifelong learning.

Email: ariazhubi@hotmail.com ; zhubiarjana@gmail.com

ORCID: <https://orcid.org/0000-0003-0778-8796>

Publisher's Note: The opinions, statements, and data presented in all publications are solely those of the individual author(s) and contributors and do not reflect the views of Universitepark, EDUPIJ, and/or the editor(s). Universitepark, the Journal, and/or the editor(s) accept no responsibility for any harm or damage to persons or property arising from the use of ideas, methods, instructions, or products mentioned in the content.
