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The Interconnection Between Technological, Pedagogical and Content Knowledge in Primary School Lesson Planning

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Abstract

The technological, pedagogical and content knowledge model (TPACK) explains how these knowledge components interact to foster more innovative teaching and learning processes. The purpose of this research is to analyse the relationship between technological, pedagogical and content knowledge in primary school lesson planning. Furthermore, this study also intends to determine which of the TPACK model constructs are used by teachers in lesson planning. 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. This sample size was determined based on a sample size determination table that follows a probability method (95% confidence interval and 5% error). The standardised questionnaire for teachers, ''Survey of Pre-service Teachers' Knowledge of Teaching and Technology'' was used to collect quantitative data. The results indicated that lesson planning was mostly organised in terms of content and pedagogy, without integrating technology into teaching strategies. The findings of this research showed that the use of technology in the teaching process belongs to the technological knowledge context and requires the development of a deeper understanding of the complex network of relationships that exist between pedagogy and teaching content. These data will contribute at the local and central levels to the formulation of educational policies, curriculum revisions and the design of training programs focused on technological, pedagogical and content knowledge constructs.

Keywords: content knowledge, lesson planning, pedagogical knowledge, technological knowledge

Introduction

Educational reforms in the last decade in Kosovo have encouraged teachers to use technology in the classroom because one of the goals of Pre-University Education is to develop ideas, skills, attitudes and values using technology (Ministry of Education, Science and Technology [MEST], 2016). The early stages of technological advances in education, the so-called digital divide, were

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more associated to access to technology and equipment (Williams et al., 2021). Accessing and using a wider range of online resources will prevent students' routine and memorising learning, change the lesson planning process and provide other opportunities to apply technology in the classroom (Voithofer & Nelson, 2020).

The use of technology in the teaching process is not determined *only* by the technological knowledge of the teacher (Baturay et al., 2017) and should be related to the pedagogical aspect of the field/subject and to the teaching contents therein (Krauskopf et al., 2012). Thus, technology-related teaching planning depends on the teacher's technological skills and knowledge of the field/subject (Jang, 2010). In this context, technology planning in primary schools raises many issues for Kosovar teachers.

The way teachers make plans and the extent of technology used by teachers in the teaching process are usually described in a generalised form. Many planning models are recorded on paper, only for purposes of school documentation and argument, being rarely implemented in practice or discussed when analysing the pedagogical and content knowledge, which are the points of connection between them. However, having prior pedagogical and content knowledge using technology in the classroom, applied by modifying different methods and strategies throughout the units, is a prerequisite for effective teaching (Schmid et al., 2021).

Studies have shown that to expand the use of technological activities, intentional emphasis should be placed on transferring teachers' knowledge from theory to practice (Gjelaj et al., 2020; Kalimullina et al., 2021). However, for most teachers, the link between technology, pedagogy and content is complex and difficult to plan, especially when confronted with technology (Voogt & McKenney, 2016). Researchers evaluated in which field of knowledge teachers need to develop more and change the teaching approach, and analysed the connections, interactions, opportunities and existing limitations between content, pedagogy and technology. They emphasise the importance of beginning with the development of technological knowledge, to then making the connection with the pedagogical and content approaches, therefore reaching the main goal of learning development (Voogt & McKenney, 2016).

In the context of Kosovo, education policies are not yet oriented to implement the technological, pedagogical and content knowledge (TPACK) framework as part of the Kosovo Curriculum. Therefore, efforts have been made in this study to analyse and verify the correlations between these three knowledge components (content, pedagogy and technology) so that they become

integrated for an effective teaching outcome in addition to the reports in educational documents. In addition, this study made it possible to determine which aspects of the knowledge in the catalogue of programs accredited by the Ministry of Education, Science and Technology (MEST) should be developed, so that their practices increase the teaching quality.

Literature Review

Teachers who fail to incorporate pedagogical and content knowledge into their teaching will not achieve effective teaching (Harvey & Caro, 2017). Based on this fact, Shulman (1987) managed to combine pedagogical and content knowledge arguing that proper planning of the learning process carried out accurately through content and pedagogical approach creates confidence, professionalism and yields the right results. Koehler et al. (2013) pointed out that in addition to pedagogical content and knowledge, technological knowledge should be included as a third essential teaching component and be considered a tool to assess the impact of technology on lesson planning. However, many studies (Koehler et al., 2013; Mishra & Koehler, 2006; Rahmadi et al., 2020) have identified connections, interactions, opportunities and limitations between content, pedagogy and technology based on the TPACK framework. We chose the TPACK model because it allows us to specifically identify teachers' knowledge and actions during teaching. Technological knowledge (TK) corresponds to the technological skills of teachers and the resources available used in their planning. Pedagogical knowledge (PK) refers to the way teaching and learning takes place, including didactics, learning assessment and classroom management. Content knowledge (CK) refers to the knowledge of the subject defined in the school curriculum. The interaction between technological knowledge (TK), pedagogy (PK) and content (CK) is essential for the development of innovative teaching.

Individual profiles for TPACK fields were created for three professors in a study conducted with Midwestern University professors through interviews and observations (Benson & Ward, 2013). The profiles illustrate how content, technology and pedagogical knowledge levels interact, such that when one aspect is less advanced, teaching does not progress properly. When knowledge of technology is defined only as their ability to use many technological tools, a profile balanced and integrated with the other two areas of knowledge is unlikely to be accomplished (Benson & Ward, 2013). In contrast, professors who can explicitly articulate the meaning and application of pedagogical knowledge (PK) are are more likely to demonstrate TPACK integration (Benson &

Ward, 2013). In another perspective, Sylvestre et al. (2018) studied 144 teachers of 8 primary schools and reported that the level of technology use was very low because teachers were focused only on technological knowledge (TK) and the teaching process resulted in poor student achievement. The authors recommend that the government not only equip all schools with technological tools, but also foment the pedagogical side (PK) and revision of textbooks (CK) to reach an efficient teaching process (Sylvestre et al., 2018). A study conducted with elementary school teachers from Singapore analysed the relevance and validity of pedagogical knowledge (PK) through a 12-week course on the TPACK framework and identified five of the seven constructs of the TPACK model, which were more appropriate than other existing TPACK survey studies (Koh & Chai, 2016). Pedagogical knowledge (PK) showed a direct impact on the development of the TPACK model according to the questionnaire data, leading to the conclusion that PK comprises the purpose and goal of the entire learning process because the topics and lesson planning become adapted to the interests and abilities of students (Koh & Chai, 2016). Pedagogical knowledge (PK) must be a primary concern, followed by the integration of technology (Koh & Chai, 2016). Hence, technology is used not only to demonstrate and present facts, experiments, concepts, figures, figures, etc., but also as a process of building new knowledge between pedagogy and content (Murphy, 2019). In a comprehensive study of 24 different schools in 16 states, students performed better when content and instruction knowledge (PCK) were integrated among curricular areas through technology than when the content of the book material was elaborated only when teaching related pedagogical knowledge and content (Voithofer et al., 2019; Martin, 2018).

Shapley et al. (2011), deepening in this field, identified through a multi-factor rubric analysis several issues that influenced the use of technology. They defined four pillars with key elements: technological knowledge, pedagogical content, planning and training. Based on this model, Grainger (2021) who is known as the developer of the teaching framework currently adopted by 33 countries, argued the importance of these elements quite simply by stating that ‘’One person cannot teach the other person if he/she does not have the basic skills and knowledge in technology’. As the knowledge base in each area grows, many other issues involved in technology integration will be resolved (Lim & Chai, 2008). Moreover, as the level of technological knowledge and skills (TK) increase day by day, the demand for the classroom application of technology will increase as well (Spiteri & Rundgren, 2018). If the teacher has knowledge in each of these areas (technology,

pedagogy and content), the evidence directly indicates that effective teaching and high student outcomes are expected (Russell, 2011). In addition, other studies have reported that training and professional development positively affect the coherent interconnection among the three areas of knowledge (TK, PK and CK; Alhashem, 2021; Oda et al., 2019; Alqurashi et al., 2016; Blau et al., 2014). Teachers need to stay up to date with the new technological developments in the collection, selection, planning and integration of teaching content, and with the implementation of innovative applied ideas (Onuyi, 2021). Teachers have an important role in designing and delivering lessons that use technology accordingly (Erbilgin & Şahin, 2021; Evans-Amalu, & Claravall, 2021).

These elements are important given that the primary purpose of school learning is for the teacher to transform the learning process, and not merely to increase the use of technology in the classroom (Al-Abdullatif, 2019). The need for a study that aims to combine three complex areas of knowledge in lesson planning from primary school forward has been shown as necessary and important given the review of the literature and other scientific articles.

Methodology

Purpose and Research questions

The purpose of this research is to analyse the relationship between technological, pedagogical and content knowledge in lesson planning. The study also intended to determine which of the constructs of the TPACK model teachers use in primary school.

The study addresses the following questions:

1. What is the relationship between technological, pedagogical and content knowledge in primary school lesson planning?
2. Are there significant differences between teachers in achieving technological, pedagogical and content knowledge?
3. Which construct of the TPACK model is used by teachers in lesson planning?

Research Design

The quantitative method was used to conduct this study. This method is defined as a database that can help explain and analyse different types of questions even when they are not appropriate for a sample or population and is known as a process which creates and analytically exploits a particular relationship between research groups (Creswell & Creswell, 2018). The design applied was

phenomenological (Creswell & Clark, 2017) because the technological, pedagogical and content knowledge of Kosovar teachers in their planning is considered a current phenomenon in primary school. The authors emphasised that the phenomenological design aims to systematically, critically and comprehensively examine the approach by describing the participants involved in a phenomenon. Researchers use the phenomenological design to examine the perspective of participants concerning a phenomenon by assessing their experiences, opinions, attitudes and beliefs related to technological, pedagogical and substantive knowledge.

Participants

A total of 363 teachers from 11 primary schools in the four largest cities of Kosovo (Prishtina, Prizren, Mitrovica and Gjakova) participated in this research study. We selected these cities to make our research results more general. According to Brand (2010), generalisation refers to a phenomenon that has been previously identified, but can be re-identified elsewhere provided that the population, environment and context are similar. The sample was determined following the probability method (Mohajan, 2018) and its size was calculated according to the 95% confidence interval equation, with an error margin of 5% (Cohen et al., 2017). The data from Education Statistics in Kosovo (MEST, 2020) were used for sampling. Descriptive data from the four largest cities of Kosovo and 11 schools were obtained to accurately identify the age of teachers, gender, qualification and experience in teaching (see Table 1).

Table 1
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
Age	23–30 years	58	16.0

	31–40 years	97	26.7
	41–50 years	117	32.2
	Over 50 years	91	25.1
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

A total of 45 from the 363 participant teachers are from the school Mustafa Bakija, 25 from Kelmend Rizvanolli, 30 from Ibrahim Fehmiu, 51 from Abdyl Frashëri, 31 from Emin Duraku, 30 from Naim Frashëri, 45 from Meto Bajraktari, 25 from Xhemajl Mustafa, 26 from Nazmi Gafurri, 25 from Ismail Qemali and 30 from Musa Hoti (Table 1). One hundred and twenty-six teachers were interviewed from schools in Prishtina, 112 from schools in Prizren, 70 from schools in Gjakova and 55 from schools in Mitrovica (Table 1). Most of the teachers interviewed (340) are female, and only 23 teachers are male. Most teachers (117) were aged 41–50, most (217) have completed their bachelor studies within a 4-year period and another significant part (102) hold master degrees. The frequencies of experience in education are differently distributed; however, the largest number of teachers (112) has over 20 years of experience in education.

Instruments

Instrument tool form ‘’Service Teachers Knowledge Survey on Teaching and Technology-TPACK’’, proposed by Schmidt et al. (2009) was used to analyse the study questions. The TPACK questionnaire comprises 58 questions divided into eight sections, based on 5 points of the Likert scale (1- Not at all, 2- Little, 3- Uncertain, 4- Medium and 5- Very). The first section contains questions that provide demographic information: school, city, gender, age, qualification, technology training and work experience. The ‘’TK (Technological knowledge)’’ scale comprised seven statements and was used to identify the technological knowledge of the teachers, consisting of the second section of the questionnaire. In the third section, the four-factor ‘‘CK (Content Knowledge)’’ scale is used, and includes the curricular areas of the primary level, with 16 statements. In the fourth and fifth sections, the ‘’PK (Pedagogy Knowledge)’’ and ‘’PCK (Pedagogical Content Knowledge)’’ scales were used, drafted with seven statements each. In the sixth and seventh parts of the questionnaire, the ‘’TCK (Technological Content Knowledge)’’ scale consisting of seven statements, and ‘’TPK (Technological Pedagogical Knowledge)’’ scale

with nine statements were used. In the eighth section, the ‘‘TPACK (Technological Pedagogical Content Knowledge)’’ scale was used, consisting of 5 statements related to the interrelationship between knowledge of technology, pedagogy and content.

The reliability of the questionnaire (Cronbach’s alpha) ranged from 0.78 to 0.93. Reliability values for each construct were greater than 0.7, indicating that they are all reliable. Similarly, all Cronbach’s alpha values were also greater than 0.7, indicating that all the constructs are dependable.

Data Collection

The researchers adapted the questionnaire to the context of the Kosovo education system, before finalising and distributing it to the target group of respondents. Also, after translation and adaptation, a pilot questionnaire was distributed to 50 teachers to ensure it was valid, reliable, clear and appropriate to proceed further. The questionnaire was distributed in physical form to the participants of nine schools (cities of Prishtina, Gjakova, Prizren), and in the online form (Google Forms) to the other two schools (city of Mitrovica) due to the closure of schools consequent of the Covid-19 pandemic.

The researchers initially sought permission from the school principals by e-mail presenting the title, purpose and requirements of the research questionnaire. After confirmation by the principals of each school, we set the date to distribute the questionnaires. At the same time, the researchers became acquainted with the teachers in person to provide explanations concerning the questionnaire such as title, purpose and time of submission. One week later, all completed questionnaires were collected for data analysis by the researcher to obtain the result and findings of the research. The questionnaire on Google forms was distributed to the two remaining schools within a period of 10 days. Participating schools in physical and online form are described in Table 2.

Table 2
Participating Towns and Schools in Physical and Online Forms

Town	School	Number of teachers	Physical form	Google forms
Gjakova	Mustafa Bakija	45	√	
	Kelmend Rizvanolli	25	√	
	Emin Duraku	31	√	
Prizren	Ibrahim Fehmiu	30	√	
	Abdyl Frasheri	51	√	
	Xhemajl Mustafa	25	√	
Prishtina	Nazmi Gafurri	26	√	
	Meto Bajraktari	45	√	
	Naim Frasheri	30	√	
Mitrovica	Ismail Qemali	25		√
	Musa Hoti	30		√

Data Analysis

The design of this study is based on the TPACK model, a framework originally developed by Shulman (1987b), who combined pedagogical and content knowledge. Koehler and Mishra (2009) proposed extending this model to include technological knowledge as a third component essential to teaching and as a tool to assess the impact of technology on lesson planning. The extended framework highlights the connections, interactions, opportunities and limitations of content, pedagogy and technology knowledge (Koehler & Mishra, 2009). In this model, the interaction between technological knowledge, pedagogical knowledge and content are essential to develop innovative teaching. In this regard, we identified the interconnectedness of these three knowledge in the Kosovar context, significant differences among teachers in achieving technological, pedagogical and content knowledge, and in which field our teachers are more prepared. Furthermore, the data were analysed following the current phenomenological process to analyse the interrelationship between technological, pedagogical and content knowledge of the primary school teachers who plan their teaching.

The collected data were analysed using the Statistical Package for Social Sciences (SPSS) version 22. The researchers used descriptive analyses to evaluate the demographic background (percentage of the total population). Mean, standard deviation and regression analyses were also used to identify the relationship with descriptive variables. Paired-Samples T-tests were used to test the differences between technological, content and pedagogical knowledge of primary school teachers. We created knowledge pairs to extract the most accurate differences between teachers in achieving technological, pedagogical and content knowledge and to answer the question of

whether there are significant differences. A Paired Sample T-test was used to test the differences between three knowledge.

In this paper, data normality was evaluated with technological knowledge, pedagogical knowledge and content knowledge to test the relationship between a normality phenomenon and population size. To evaluate whether the baseline population is normally distributed, the Kolmogorov-Smirnov and Shapiro-Wilk statistics were used. These tests have been shown to be robust and informative.

The data were interpreted by the researcher by describing the meaning of the participants' experiences and organising the data to respond to the research problem. Researchers critically analysed the data and linked them to previous research theories and studies that are relevant to the problems faced by this process of interconnection between technological, pedagogical, and content knowledge.

Findings

The relationship between technological, pedagogical and content knowledge

Based on the teachers' data, we have detected a strong significant relationship between pedagogical knowledge (PK) and content (CK), and research variables (age, gender, qualification and experience). The data presented are described in Table 3.

Table 3

Descriptive Statistics and Correlation Analysis Related to Research Variables

No.	Items	Mean	STD	1	2	3	4	5	6	7	8	9
1.	TK	3.63	0.68	1								
2.	CK	3.96	0.46	.54**	1							
3.	PK	4.5	0.52	.42**	.62**	1						
4.	Schools	5.66	3.11	-.10	-.09	-.04	1					
5.	Town	2.46	0.96	-.07	-.08	-.06	.96**	1				
6.	Gender	1.94	0.244	.09	.16**	.11*	.09	.08	1			
7.	Age	2.66	1.02	-.46**	-.17**	-.14**	.04	.04	-.09	1		
8.	Qualification	2.19	0.63	.54**	.37**	.38**	-.12*	-.13*	.06	-.31**	1	
8.	Experience	3.17	1.50	-.41**	-.15**	-.09	.07	.08	-.08	.80**	-.29**	1

**. Correlation is significant at the 0.01 significance level (2-tailed).

*. Correlation is significant at the 0.05 significance level (2-tailed).

Table 3 summarizes the mean, standard deviation, and regression analyses conducted with the descriptive variables. There was a significant and average correlation between TK, and CK ($r = .54$, $p < .01$), PK ($r = .42$, $p < .01$) and qualification ($r = .54$, $p < .01$). TK was negatively correlated with age ($r = - .46$, $p < .01$) and experience ($r = - .41$, $p < .01$). CK was positively correlated with

PK (r = .62, p < .01), gender (r = .16, p < .01) and qualification (r = .37, p < .01), and negatively with age (r = - .17, p < .01) and experience (r = -.15, p < .01). PK was positively correlated with gender (r = .11, p < .05) and qualification (r = .38, p < .01), and negatively with age (r = -.14, p < .01).

Normality Test Results

The results of the normality test using the Kolmogorov-Smirnov and Shapiro-Wilk tests are shown in Table 4. The Kolmogorov test (.36, p = .130 > .05) and Shapiro-Wilk results (.998, p = .749> .05) show that our data follow a normal distribution after obtaining the mean of the three variables. For normally distributed data, the observed data are statistically equal to the expected data.

Table 4

Normality Test Results

	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
TK_CK_PK_mean	.036	520	.130	.998	520	.749

a. Lilliefors Significance Correction

Testing the differences between technological, content and pedagogical knowledge

We verified the statements of teachers to assess which aspect of knowledge Kosovar teachers are better prepared to plan the learning process. From the summary of the pairs of knowledge we identified that pedagogical knowledge is much more developed than technological and content knowledge (Table 5).

Table 5

T-test Results Regarding the Differences Between Technological, Content and Pedagogical Knowledge

		Mean	STD	t-test	Sig. (2-tailed)
Pair 1	TK	3.6302	0.68264	-11.033	.000
	CK	3.9656	0.46465		
Pair 2	TK	3.6302	0.68264	-25.616	.000
	PK	4.5207	0.52291		
Pair 3	CK	3.9656	0.46465	-24.455	.000
	PK	4.5207	0.52291		

Notes: TK-Technological knowledge, CK-Content knowledge, PK-Pedagogical knowledge

Table 5 summarises the results of the t-test in relation to the differences between technological, content and pedagogical knowledge. Technological knowledge was first compared with content knowledge. The average technological knowledge of primary school teachers (3.6302) is significantly different from the average content knowledge (3.9656; $t = -11.033$ and $p < .01$; see Table 5). According to this difference, teachers have higher content than technology knowledge. The technological and pedagogical knowledge of the teachers were also compared. The average of the pedagogical knowledge (4.5207) is significantly higher than the average technological knowledge (3.6302; $t = -25.616$, $p < .01$; see Table 5). Finally, we compared the content and pedagogical knowledge of teachers and recorded a higher pedagogical than content knowledge ($t = 24.455$, $p < .01$). Three averages are high (above 3). Nonetheless, we can say that teachers, in general, have higher pedagogical, lower technological, and average content knowledge.

Discussion

This research has focused on three areas of knowledge (TK, PK and CK), the impact of interconnection and the differences that exist between the research variables. Other researchers (Voogt & McKenney, 2017; Arcueno et al., 2021) have evaluated the interaction among other subcomponents (PCK, TCK, TPK and TPACK). However, such in-depth and very specific approach to knowledge has not yet been implemented in Kosovo. The results of this study show a correlation between the pedagogical and content knowledge, and an unsatisfactory level of technological knowledge during teachers' planning. This is due to the professional training that is focused only on the subject content, pedagogical aspect and existing programs.

Pedagogical knowledge was significantly higher than content and technology knowledge. This situation reflects their qualification, once the most teachers have Bachelor's degree, which prioritise pedagogical knowledge. These results are consistent with the findings of other authors who report that pedagogical subjects are the primary concern in their study programmes (Crawford, 2000; Mohamad, 2021; Li, 2022).

Content knowledge was average (to some extent), which reflects a low knowledge of the subject being taught, the teaching process, concepts, theories and of the chapters being taught. Therefore, intervention in this direction is required in the education system of Kosovo. In contrast, other authors have recorded a higher level of content knowledge due to a variety of training in this field (Shulman, 1987; Mishra & Koehler, 2006).

Technological knowledge was very low among Kosovar teachers, which may be due to many factors, for example, a lack of technological equipment, computer cabinets and internet network, teachers being overloaded with pedagogical documentation, lack of training in technology, etc. Technology was not planned at all by teachers but was implemented in the classroom in an unplanned approach. This approach to technological knowledge was observed for both highly qualified teachers (Master) and those with normal qualification (Bachelor). These results contrast with than the others researchers, where increasing the level of technological knowledge is primary in the education system (Ifinedo et al., 2020).

Technological knowledge was very low among teachers over the age of 40 and with over 20 years of work experience, indicating that older teachers, with more experience in education, fail to develop and change their approach to technology However, other research studies recommend that age and experience are the factors that most cause teachers not to plan their teaching approaches using technology (Roussinos & Jimoyiannis, 2019; Lavidas et al., 2021).

Younger (up to 30 years old) and inexperienced teachers (up to five years) had very little preparation in terms of content and pedagogy knowledge, and were more technology-oriented. Similarly, other authors have claimed that young and less experienced teachers could fill the gap in development of pedagogical knowledge and content through professional courses and training (Nazari et al., 2019).

This research showed significant differences between pairs of technological, content and pedagogical knowledge among primary school teachers (TK and CK, TK and PK, CK and PK). Teachers reported having higher knowledge of subject content than on technology, and should treat the content of the course from a didactic and epistemological point of view. In this perspective, Tzavara and Komis (2015) investigated the peculiarities of subject area teaching and its underlying epistemological dimension and suggested changing the ‘P’ in the TPACK model to a ‘D’ (TDACK), including didactics as part of pedagogy. Therefore, a promising path for future research would be to explore the didactic dimension proposed by Lefebvre et al., (2016) along with the TPACK model. These authors believe that content knowledge depends on the subject matter being taught as well as on the nature of the content. For example, a biology teacher does not apply subject knowledge in the same way as a physics teacher. Similarly, a first grader does not use the same subject knowledge as a fifth grader. Therefore, consideration of specific subjects

and class levels can shed more light on the interrelationship between the three areas of knowledge in the learning process planning.

The research also highlights the differences between the second pair (TK and PK), where teachers apply more pedagogical and traditional approaches in their classrooms than technological ones. The differences between the pedagogical and the content knowledge were higher because the teachers stated that they are more proficient in teaching methods and strategies. However, the pedagogical models followed by teachers vary depending on their learning decisions, which in turn are influenced by individual preferences, different subject cultures and individual school environments (Szeto et al., 2017).

The research of technological, pedagogical and content knowledge in the education system of Kosovo is a priority issue and a common challenge that is discussed every day. Investments in the infrastructure of schools providing educational technology equipment, required didactic tools, and strong institutional support are more than necessary (Ismajli & Krasniqi, 2022).

This research has analyzed the significance of the relationship between technological, pedagogical and content knowledge which must be intertwined while the lesson is planned by the teacher. Whereas, educational policies in Kosovo are mostly focused on the pedagogical and substantive approach, without taking into account the interconnection of technology in the teachers' training programs and professional development. Correspondingly, the current study presents a methodological innovation as it uses a phenomenological design to investigate the strong link between technology, pedagogy and teaching content. This paper adds a theoretical framework as a novelty in the context of Kosovo that identifies which of the variables have an impact on the development of technological, pedagogical and content knowledge of teachers. Therefore, the research brings new data to show that the three areas of knowledge which have been studied separately so far, should be an integral part of lesson planning as such compound indicates a high impact on improving learning outcomes.

Conclusions and Recommendations

The results of this research study provided answers to the research questions. The research identified significant average correlations between technological, pedagogical and content knowledge in primary school lesson planning. However, lesson planning was mostly organised in

terms of content and pedagogy and did not integrate technology into their teaching. However, we have analysed which of the existing variables represent the highest interrelationship in the three areas of knowledge for more precise verification of this interrelationship.

Kosovar teachers have completed many training on technology. Still, statistical data showed that age and work experience play a key role in the development of technological knowledge. However, in practice, the results were satisfactory for the application of technology in teaching. The content knowledge of teachers from 4 schools in Kosovo, were higher than expected. From the data extracted, we concluded that teachers plan their teaching approach according to the content knowledge depending on age and work experience. Furthermore, it can be concluded that teachers have sufficient knowledge of each curricular area and are better acquainted with the concepts of the subjects than with the technology approach. The pedagogical knowledge was more developed than the other two (technological and content), regardless of the gender and qualification of the teachers. However, our data showed that primary school teachers were able to meet curriculum learning goals, and implement teaching methods and strategies, regardless of their age. These data show that educational policies are mostly focused on the pedagogical approach.

The researchers first analysed the knowledge pairs to obtain more accurate statistical data. Teachers expressed a much higher knowledge of the content of the subject, curricular area, and of theories and concepts, than technological skills. In addition, teachers have much higher knowledge in pedagogy than in technology, which may be because teaching practices are planned giving greater importance to methods, strategies and classroom management. The differences between pedagogical knowledge and content showed that traditional teaching based on the realisation of the purpose of the curriculum continues. Pedagogical knowledge was higher because teachers focused more on applying learning methods, techniques and strategies. Furthermore, it can be concluded that teachers have higher pedagogical knowledge and lower technological knowledge, while average knowledge of the content being taught.

The recommendations presented below were formulated to address the issue supported by participants' responses to primary school lesson planning that technological, pedagogical and content knowledge is not (but should be) an integral part of the education system. Therefore, it is recommended:

1. To review the existing programs in the Faculty of Education that prepare future teachers and to be developed in accordance with the accreditation programs of the Ministry of Education, including in each document the digital competence (which does not exist) to prepare teachers for the skills of the 21st century. Curricular reform through the development of the TPACK model in teaching, will not only develop innovative teaching, but also prepare students to face global technological challenges.

2. To design training programs focused on the three areas of TPACK knowledge, without such extensive separation between technology, pedagogy and content. It would be very necessary to verify the findings between the factors affecting the three areas of knowledge for policymakers to take the necessary steps in the areas where our results are lower and to urgently influence the design of training programs for teachers. Thus, to restructure advanced training to improve teaching methods and approaches, to promote effective learning and to meet the requirements of teaching skills for integration in the digital age is of utmost importance.

3. To equip schools with technological tools that will facilitate the development of practices according to the TPACK model. The connection between technological knowledge, pedagogy and content in teaching cannot be reached within a short period of time. This means that cooperation and the adoption of effective practices of other countries are necessary. Teaching based on the three areas of knowledge, requires the cooperation and commitment of all educational factors at the school, municipality, region levels.

Limitations of the study and suggestions for future research

Due to pandemic-related constraints, data collection was limited to distributing the questionnaire online. In two schools, we continued in the online form, while in the other nine schools the questionnaire was completed in physical form. Future research could be extended to each school, to specifically identify TPACK knowledge for each teacher and address issues at the local and central levels. Therefore, policymakers will be able to take the necessary steps in the areas where our scores are lower and urgently influence the design of teacher training programs.

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