International Journal of Innovative Research and Scientific Studies, 8(2) 2025, pages: 1341-1347

ISSN: 2617-6548

URL: www.ijirss.com

Is technological pedagogical content knowledge of history teachers decreasing day by day? A study on history students and current teachers?

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Abstract

The aim of this study is to compare the level of technological pedagogical content knowledge (TPCK) of prospective history teachers (university students) and current history teachers. In this context, 67 history teachers aged between 24 and 36 who are actively teaching history and 80 students aged between 18 and 22 from the Department of History, Faculty of Humanities participated in the study. The TPCK scores of the participants were determined using the 21st Century Skills of Technological Pedagogical Content Knowledge scale for Turkish culture developed by Alpaslan, Ulubey, and Ata (2021). According to the findings obtained in our study, students' TPCK total scores ($p < .001$) and its sub-dimensions: Pedagogical Knowledge (PK) ($p < .001$), Technological Knowledge (TK) ($p < .001$), Content Knowledge (CK) ($p < .001$), Interaction of Pedagogical and Content Knowledge (IPCK) ($p < .001$), Interaction of Technological and Pedagogical Knowledge (ITPK) ($p < .001$), Interaction of Content and Technological Knowledge (ICTK) ($p < .001$), and Interaction of Pedagogical, Technological, and Content Knowledge (IPTCK) ($p < .001$) scores were significantly higher than those of current history teachers. As a result, it has been determined that the history department curricula of universities have been developed and updated within the framework of technological pedagogical and content knowledge, but current history teachers should be more active in TPCK.

Keywords: Education, History, Content, Pedagogy, Technology.

DOI: 10.53894/ijirss.v8i2.5462
Funding: This work is supported by the Science Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan, Kazakhstan (Grant number: IRN - AR19679946).
History: Received: 22 January 2025 / **Revised:** 24 February 2025 / **Accepted:** 1 March 2025 / **Published:** 18 March 2025
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Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: All authors contributed equally to the conception and design of the study. All authors have read and agreed to the published version of the manuscript.
Transparency: The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.
Publisher: Innovative Research Publishing

1. Introduction

The importance of technological content knowledge in history teaching is increasing today. With the rapid development of technology, a variety of digital tools and resources are used to increase students' engagement with history [1]. Technological tools such as interactive maps, virtual tours, simulations, and digital archives are frequently used to teach students historical events and processes more effectively and to encourage their learning [2, 3]. Additionally, students are encouraged to hone their research abilities and consider historical events from several angles by using internet databases and digital libraries. By enhancing the effectiveness and impact of their learning experiences, technological content knowledge deepens students' historical understanding and piques their interest in teaching history [4, 5]. As a result, a productive partnership between educators and learners who possess technology content knowledge when teaching history can enhance the educational experience and reveal previously undiscovered historical perspectives.

There can be a decline in pedagogical and technological topic knowledge once active teaching practice is used [6]. Teachers who spend more time focusing on student management and classroom relationships may experience this. There may be less of a need for teachers to use technology while creating and delivering lesson plans [7]. However, it's critical to refresh and enhance pedagogical and technological material understanding on a regular basis due to the ever-evolving nature of technology and the demands placed on education [8]. This holds significance for teaching history as well. Moving away from abstract concepts and toward a blend of pedagogical and field expertise with technological resources is crucial for the course's sustainability. This differs from the traditional lecture style.

A range of applications are used in history classes to utilize technology subject knowledge to help students learn and comprehend historical topics and events more efficiently. For instance, virtual history tours give pupils the chance to thoroughly examine historical periods [9]. Students can use interactive maps to visually investigate the locations of historical events [10]. By experiencing past choices and occurrences, historical simulators help students understand historical settings more deeply [11]. Furthermore, digital tools and archives make it simple for students to perform independent study and analyze historical materials. These techniques improve the effectiveness and engagement of learning experiences by giving students a more concrete understanding of historical events and processes.

Examining the literature reveals a dearth of research findings linking history education to technology pedagogical subject knowledge. Furthermore, no research has been done to compare the technological topic knowledge of history majors and instructors who are currently teaching history courses. Our study aims to compare the technological pedagogical content knowledge levels of history teacher candidates and practicing teachers in this context, with the goal of drawing conclusions about the content of teacher in-service activities and the use of technology in history education. Given this, the following were chosen as our research's hypotheses:

H_{1a}: The level of technological pedagogical content knowledge of prospective history teachers is higher than that of history teachers.

H_{1b}: As the time spent in teaching increases, history teachers do not prefer current teaching methods and continue their lessons with traditional methods.

2. Literature Review

TPCK enables teachers to establish an effective balance between technology, pedagogical methods, and subject knowledge. In recent years, various studies have been conducted on whether this type of knowledge is decreasing among teachers. The study by Karaduman and Akman [12] examines TPCK research and teaching practices and suggests that the TPCK levels of teachers, especially in-service and pre-service teachers, should be examined Karaduman and Akman [12]. Sonsupap, et al. [13] investigated how teachers' TPCK levels affect students' scientific competence and found higher levels of scientific competence in students of teachers with high TPCK levels Sonsupap, et al. [13]. Masfuah, et al. [14] examined how TPCK and TCK influence pre-service teachers' TPCK competence and found that TCK has a stronger effect than TPCK Masfuah, et al. [14]. The study by Pratami and Ajisuksmo [15] examined the technology integration skills of teachers in the Jabodetabek district and found that the COVID-19 pandemic increased this integration [15]. Finally, the study by Fauziah, et al. [16] investigated the levels of TCK of English teachers in vocational high schools and showed that these teachers were able to use technology effectively [16]. These studies reveal the effects of TPCK on teachers and students and provide important clues on how teachers can develop this type of knowledge.

The benefits of TPCK training in universities have been addressed in many studies emphasizing the importance of technology integration in modern education. Distance education, which became mandatory during the Covid-19 pandemic, has encouraged the effective implementation of the TPCK model. Garrido Abia, et al. [17] stated in her study that the integration of the TPCK framework enhances teaching methods and technologies, and this integration requires teachers to have broader knowledge and strong organizational skills Garrido Abia, et al. [17]. Hanifah, et al. [18] revealed that mathematics education students' TPCK competencies are high, but improvement is needed in the content knowledge component Hanifah, et al. [18]. Nursiah, et al. [19] study showed that pre-service teachers' TPCK knowledge and skills were good, but they could not use this knowledge sufficiently in classroom practices Nursiah, et al. [19]. Guo [20] study emphasizes that the application of the TPCK framework in online education increases teachers' ability to integrate information technologies with pedagogical and content knowledge, which improves student outcomes [20].

3. Methodology

In this study, the questionnaire method was used among quantitative data collection techniques. History department students aged between 18-22 and history teachers aged between 24-36 participated in this research. The minimum sample

size of the research was determined using G-Power 3.9.1.7 software program (Düsseldorf, Germany). In the power analysis performed according to the results of this study (α = 0.05, 1-β (power) = 0.80, actual power = 81.1), and the effect size was taken as 0.53, it was determined that at least 130 participants for each group should be included in the study.

In this study, students who are currently enrolled in the history departments of universities and history teachers who have been teaching for at least two years were included. Absent students, students exceeding the normal education period, and paid teachers were not included in the study. In this context, 80 students studying in the history departments of the Faculty of Humanities at Khoja Akhmet Yassawi International Kazakh-Turkish University and South Kazakhstan State Pedagogical University participated in our research. Sixty-seven teachers actively teaching history at different levels of education in the cities of Turkestan and Shymkent in Kazakhstan participated in the study.

The purpose and importance of the study were explained to the participants by the responsible researcher. Voluntary consent forms were signed by the participants, indicating that they voluntarily participated in the study. This study was conducted in accordance with the principles set out in the Declaration of Helsinki.

3.1. Data Collection Tools

In order to determine the technological pedagogical content knowledge scores of the participants in the study, the scale developed by Valtonen, et al. [21] and updated by Alpaslan, et al. [22] was adapted to the Turkish culture within the scope of 21st Century Skills of Technological Pedagogical Content Knowledge. The scale in question has 38 questions, six Likert-type scales, and six sub-dimensions. Pedagogical Knowledge (PK), Technological Knowledge (TK), Content Knowledge (CK), Interaction of Pedagogical and Content Knowledge (IPCK), Interaction of Technological and Pedagogical Knowledge (ITPK), Interaction of Content and Technological Knowledge (ICTK), and Interaction of Pedagogical, Technological, and Content Knowledge (IPTCK) are the other six sub-dimensions that make up the scale. The item reliability coefficient obtained from the scale was around 0.90 [23].

3.2. Statistical Analysis

In this study, the SPSS package program 25 was used for statistical analyses. Normality analyses of the data were tested using the Shapiro-Wilk test. The Levene test was used for homogeneity of variances. It was determined that the data showed a normal distribution, and the Independent Samples t-test was used to compare the results of technological pedagogical content knowledge between history students and history teachers. The effect sizes of the results of the research were calculated using Cohen [24] d formula. Accordingly, 0.2 = small effect size (ES), 0.5 = medium ES, and 0.8 ≤ large ES [24]. The significance level was set at 0.05 in the study.

Table 1.
Comparison of technological pedagogical content knowledge of history department students and history teachers.

Parameters	Teachers of History M±S.D	Students of History M±S.D.	*t*	Cohen' *d*	*p*	95% CI	
						Lower	Upper
PK	25.10±8.50	31.98±8.08	-5.020	-0.83	< .001	-9.59	-4.14
TK	11.73±5.98	19.08±3.99	-8.886	-1.47	< .001	-8.99	-5.71
CK	13.68±5.60	20.43±4.51	-8.090	-1.34	< .001	-8.40	-5.10
IPCK	22.10±7.56	31.72±7.25	-7.851	-1.30	< .001	-12.04	-7.19
ITPK	15.94±9.88	29.87±8.89	-8.989	-1.48	< .001	-16.99	-10.87
ICTK	11.17±6.14	20.10±5.24	-9.501	-1.57	< .001	-10.77	-7.06
IPTCK	18.35±10.82	35.81±8.32	-11.040	-1.82	< .001	-20.57	-14.32
TPCK Total	118.10±50.53	189.02±36.59	-9.845	-1.63	< .001	-85.15	-56.68

Note: PK: Pedagogical Knowledge, TK: Technological Knowledge, CK: Content Knowledge, IPCK: Interaction of pedagogical and content knowledge, ITPK: Interaction of Technological and Pedagogical Knowledge, ICTK: Interaction of Content and Technological Knowledge, IPTCK: Interaction of Pedagogical, Technological and Content Knowledge.

4. Results

In Table 1, the technological and pedagogical content knowledge of the students studying history and the teachers currently teaching history courses are compared. Accordingly, history students' PK (t = -5.020, d = -0.83, p < .001), TK (t = -8.886, d = -1.47, p < .001), CK (t = -8.090, d = -1.34, p < .001), IPCK (t = -7.851, d = -1.30, p < .001), ITPK (t = -8.989, d = -1.48, p <. 001), ICTK (t = -9.501, d = -1.57, p < .001), IPTCK (t = -11.040, d = -1.82, p < .001), Total Scale Score (t = -9.845, d = -1.63, p < .001) were significantly higher than the current history teachers (Figure 2).

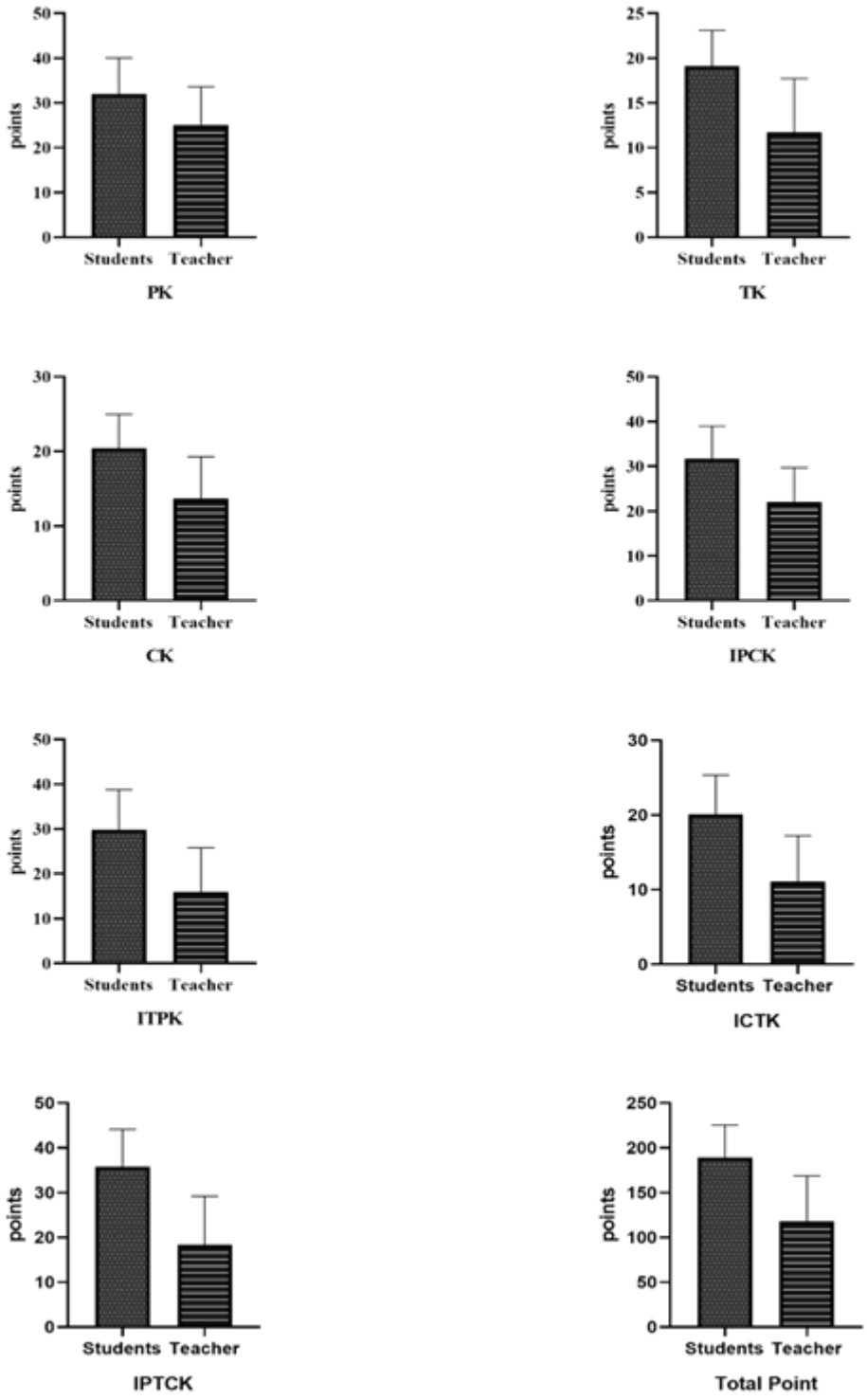

Figure 1.
Comparison of the Scale and its Sub-Dimensions between Groups.

5. Discussion

This study was conducted to compare the TPCK scores of history teacher candidates and current history teachers within the scope of 21st-century skills. Accordingly, history students' TPCK total scores, PK, TK, CK, IPCK, ITPK, ICTK, and IPTCK scores were significantly higher than those of history teachers. In this context, the hypotheses H1a and H1b that we determined in our research were confirmed.

With the current era of globalization, the world of education is facing a number of challenges as a result of the development of information and communication technologies. The use of traditional approaches in teaching is gradually decreasing due to the rapid modernization of teaching methods [25]. This situation leads to a significant focus on the concept of 21st-century skills, which has been increasing in popularity recently. Numerous national and international organizations, institutions, and academic studies have defined 21st-century competencies [26-28]. The Partnership for 21st Century

Learning (P21), ATC21S skills framework, OECD skills framework, and International Society for Technology in Education (ISTE) skills framework are a few examples of these. There are 17 subheadings for these talents, including teamwork, communication, critical thinking, and creative thinking. These subjects include English, language arts, foreign languages, art, math, science, economics, geography, history, management, and citizenship in this context [7]. Ninety-three percent of the students in Kamarga [29] research on the creation of a 21st-century history education model stated that this strategy increased their knowledge and information about the technological advancements they were discussing in the knowledge work dimension [29]. This is an indication of the importance of the impact of current reforms in the training of history teachers [30]. In this context, according to the findings of our research, the reason for the superiority of history students in all scores is thought to be the effectiveness of the reforms carried out by Kazakhstan's higher education institutions and universities in the field of history education.

In most academic research on the training of trainers, the inadequacy of teachers' technological pedagogical content knowledge has been emphasized. Voogt, et al. [7] mentioned the historical development of technological pedagogical content knowledge and the purposes for which this view was developed [7]. Another point emphasized by this study is Koehler and Mishra's TPCK framework (Figure 2) [31]. According to this framework, they argued that teaching with technology does not happen in isolation. It was emphasized that teachers need to combine students, schools, existing infrastructure, and the environment in order to carry out effective teaching and learning activities with technology. Angeli and Valanides [32] argued that TPCK is a unique type of knowledge depicted at the heart of the Venn diagram, or can be considered as knowledge that evolves from three contributing domains [32]. In this case, the low TPCK scores of current history teachers can be thought to be due to many underlying factors. As seen in Figure 2, since TPCK is a combination of all factors, it can be said that history teachers' pedagogical and content knowledge will not solve the problems in adapting current technological methods to the educational process unless they are combined with technological content knowledge.

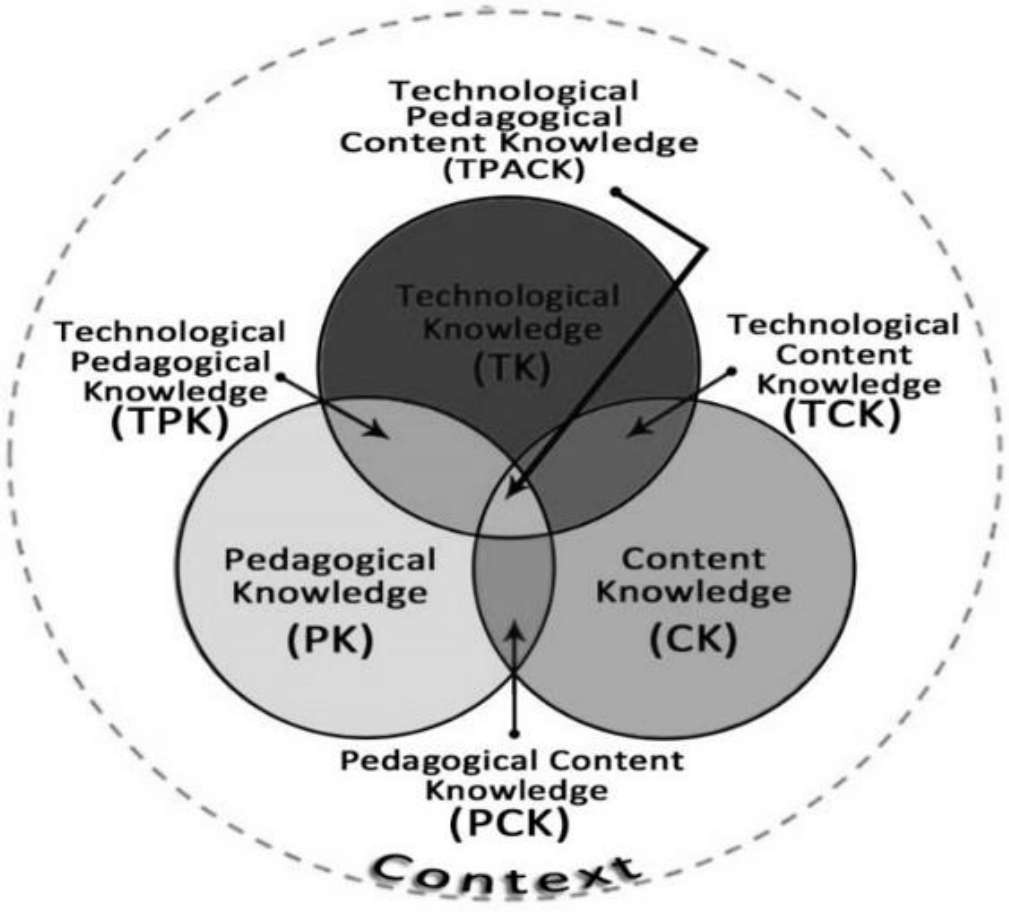

Figure 2.
TPACK model [31].

The results of a recent study by Harris and Graham [30] have provided important findings in analyzing the underlying reasons for teachers' low TPCK scores. This study explored the extent to which secondary school history teachers in England voluntarily engage in a series of concurrent curriculum formats and the factors that shape their level of engagement. The results of a large longitudinal study of over 1,100 individual responses, conducted annually from 2015 to 2017, suggest that teachers are generally reluctant to participate in the reform process. There were also differences between teachers in different types of schools [30]. This is one of the main obstacles to the operationalization of new curricular programs that are built on the triangle of technology, pedagogy, and content knowledge. And the results of our research confirm this. A possible reason

for the reluctance to adopt change may be the wholesale and comprehensive nature of these changes and the resulting increase in teacher workload. The fact that school test scores in public schools are under greater public scrutiny suggests that this is among the factors inhibiting the adoption of change [33]. There is also some indication that new teachers or more junior teachers are slightly more open to change. The reasons for this are not entirely clear, but it may be that experienced teachers have taken many initiatives over the course of their careers and seemingly tire of constant change [34].

There are some limitations in the implementation of this research. This research was conducted on university students and history teachers in the Turkestan and Symkent provinces of Kazakhstan. It is thought that analyzing students and teachers in different regions will provide important findings in terms of the generalizability of the research. In addition, the school level of the teachers was not analyzed as a variable. In studies that address this issue, it can be concluded whether TPCK is a general problem or only in some school levels. Furthermore, no analysis of the status of children at various grade levels was done as a variable. Studies that examine the TPCK outcomes of history teachers at various grade levels might provide valuable insights into how students' TPCK processes have developed and how well the curriculum is working.

6. Conclusion

These findings suggest that students have more knowledge about technology pedagogy than history teachers. However, the underlying causes and consequences of this situation need to be analyzed in more depth. Firstly, it is imperative to understand the reasons for history educators' insufficient competence in using technology as a teaching tool. This may be the result of inadequate technological training for teachers, their inexperience with technology as a teaching tool, or a combination of other problems. Furthermore, it is critical to assess how history teachers' lack of expertise in technology pedagogy affects students' historical learning experiences. This may result in less interaction between students and technology, lower student motivation, or a failure to fully achieve learning goals. These findings suggest the need to increase history educators' technological pedagogical subject knowledge. In this context, programs that support technology-based professional development for teachers, as well as programs that encourage collaboration and sharing of best practices among educators, can be advantageous. Thus, improving history teachers' technological pedagogical subject matter knowledge can enhance the quality and effectiveness of students' historical learning experiences.

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