The impact of academic rank on teachers' TPACK competence in art education

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ABSTRACT

The Technological Pedagogical Content Knowledge (TPACK) framework plays a crucial role in art education, necessitating an in-depth examination of factors influencing its integration into teaching. Teachers' competencies and their satisfaction with TPACK are key determinants of successful adoption. This study explores the relationship between teachers' competencies, academic rank, and their acceptance or rejection of TPACK, which subsequently affects their satisfaction with the framework. A descriptive survey and self-assessment approach were employed, utilizing questionnaires and interviews with 123 art professors from various universities in Kazakhstan. The findings indicate that higher-ranked professors reported greater satisfaction with TPACK but demonstrated lower competencies in digital technologies and in creatively addressing hardware and software challenges. Instead, they primarily used TPACK to enhance their professional skills. Overall, the results highlight the significant influence of academic qualifications on the development and implementation of technology-based curricula in art education.

1. Introduction

The efficacy of technology-based teaching methods in art education heavily relies on teachers' capabilities and academic ranking. Educators equipped with diverse skills, including technological proficiency, pedagogical expertise, and a deep understanding of art education, play a pivotal role in successfully implementing and integrating technology into the classroom (Siyam et al., 2025). Their competence in navigating digital tools, designing innovative instructional strategies, and adapting content to suit technological platforms significantly influence student engagement and learning outcomes. Moreover, the academic degree of teachers, encompassing their educational background, ongoing professional development, and mastery of subject matter, correlates with their satisfaction and confidence in utilizing technology-based teaching approaches (Li et al., 2022). In the realm of art education, the integration of technology-

based teaching methods has become increasingly prevalent. However, a critical gap remains in understanding how teachers' competencies and academic degrees influence their satisfaction with these innovative pedagogical approaches. While the potential benefits of technology in art education are widely recognized, little is known about the specific factors that contribute to or hinder teachers' satisfaction with these methods. Addressing this gap is crucial for developing effective strategies that enhance teacher engagement and proficiency in utilizing technology for art instruction. As universities across Kazakhstan's curricula move towards a technology-based approach, there is a need for continuous improvement processes. Therefore, this study aims to explore and analyze the intricate relationship between teachers' competencies, academic rankings, and satisfaction levels with technology-based teaching methods in art education (Makhmetova et al., 2025).

This study provides a comprehensive analysis of the development of Technology Pedagogical Content Knowledge (TPACK) among art teachers in universities across Kazakhstan, offering valuable insights into the integration of digital tools in art education. The research emphasizes the importance of teachers' academic rank in the adoption and satisfaction with TPACK in art education,

highlighting the need for a strategic approach in teacher training programs.

1.1. Literature review

The rapid advancements in digital technologies have significantly impacted all areas of life, particularly education. These tools have effectively transformed the traditional education perspective, creating a critical need to prepare teachers for integrating these technologies. The attainment of desired objectives and teacher effectiveness is primarily influenced by their engagement with digital technologies and the development of technology. On the other hand, recent research has shown that the use of technology can enhance students' performance and creativity. Therefore, a comprehensive examination of the impacts of technology and its utilization in art education is of great importance (Mishra and Henriksen, 2018). Teachers' methods or tools to deliver information to students, their knowledge and skills, and the innovative curricula design are fundamental pillars of technology-based education. Some studies have focused on technology-based teaching methods and their role in student learning, demonstrating that digital technologies can enhance students' ability to tackle problems and improve their understanding of various subjects (Ahmed, 2021; Mahmoud, 2021). According to Cavanaugh et al. (2016), altering traditional teaching methods is essential to engaging students' minds with digital technologies. Numerous studies have examined teachers' knowledge, academic degrees, sources of teacher knowledge, and teacher quality improvement to enhance student progress (Angelle and DeHart, 2011; van Schaik et al., 2018; Wolters and Daugherty, 2007).

Technology-based teaching methods involve using technologies, software, technical tools, modern communication devices, multimedia, images, and other instruments to convey information to students and communicate with them to achieve educational objectives. It emphasized that providing infrastructure, various technological tools, and advanced devices is crucial for successfully implementing these methods. Changing teaching methods to incorporate technology is crucial for teachers and students who live and study in the digital era (Pusca and Northwood, 2016).

Several studies have focused on investigating the impact of digital technologies within art education and Teachers' performance. These works highlight innovative and emerging technologies while addressing the obstacles and potential strategies for incorporating these tools into teaching practices (Goryacheva, 2022; González-Zamar and Abad-Segura, 2020; Shiri and Baigutov, 2024).

Mishra and Koehler (2006) were among the pioneers who formally introduced the TPACK (Technological Pedagogical Content Knowledge) framework. This theoretical model connects teachers' technological content knowledge (TPACK) with the advancement of professional education.

In the context of the information age, TPACK has been redefined as a knowledge structure for college educators. It is described as the integration of information technology into subject-specific teaching methods, forming a knowledge complex that serves as the foundation for effective teaching and reflects educators' information-based teaching competencies (Zhao and Zhang, 2023; Thompson and Mishra, 2007).

Today, the term "TPACK" (Technological Pedagogical Content Knowledge) is widely used to represent the essential knowledge required by teachers to successfully incorporate technology into their instructional practices.

However, Mishra and Koehler (2006) introduced a framework to examine the complexities of the relationships among the three fundamental components of knowledge: Technology, pedagogy, and content. Based on this framework, TPACK includes three main components: Technological Knowledge (TK), Pedagogical Knowledge (PK), and Content Knowledge (CK), along with four additional derived components: Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), Pedagogical Content Knowledge (PCK), and Technological Pedagogical Content Knowledge (TPACK). This implies that TPACK represents the most advanced and comprehensive knowledge set, aligning with the current knowledge development needs (Fig. 1).

In recent years, numerous researchers have explored the topic of TPACK and its role in art education and the development of art curriculum content (Wang, 2024; Anuar et al., 2016; Çam and Koç, 2024; Koh, 2021). For example, a study conducted in Kazakhstan (Shiri and Baigutov, 2025) examined the TPACK competencies of visual arts teachers. The study reported low levels of digital skills among art teachers. Additionally, it assessed the impact of teachers' academic degrees on the development and effectiveness of TPACK in art education, finding a significant positive correlation. The study suggested that specialized and supplementary training programs be designed for teachers with lower academic ranks to enhance their engagement with digital technologies in educational institutions. However, another study conducted two years later at a different university in the same country reported high levels of observed TPACK competencies among visual arts educators (Gökdemir, 2024). This highlights the crucial role of training and even teacher preparation programs in effectively employing TPACK and aligning it with art curriculum content. In a recent study conducted in China, researchers assessed moderate to strong skills in various domains of TPACK among pre-service elementary art teachers (Jing and Omar, 2024). Some scholars have further extended the TPACK framework, evolving it into TPAACK to better align it with artistic objectives (Clark-Fookes, 2023).

Teachers' academic ranking and capability are two main characteristics of teacher qualification and have been the focus of much research. Some studies

suggest a positive relationship, while others find no significant relationship (Goldhaber and Anthony, 2007).

1.2. Objectives

In line with the educational development program of the Government of the Republic of Kazakhstan, this study aims to assess the competency levels and satisfaction of teachers in utilizing TPACK. Additionally, it examines the influence of academic rank on their competencies and satisfaction. The research was conducted among art educators at various universities across Kazakhstan, employing sampling techniques and network analysis methods.

The objectives of this research are multifaceted, focusing on various factors influencing teachers' satisfaction with the implementation of TPACK. The first phase investigates art educators' current status and competency levels in applying TPACK at universities across Kazakhstan. The second phase includes a survey designed to evaluate teacher satisfaction with the use of TPACK. In the third phase, the study analyzes the data to uncover relationships and correlations between academic rank, competency levels, and teacher satisfaction (Fig. 2).
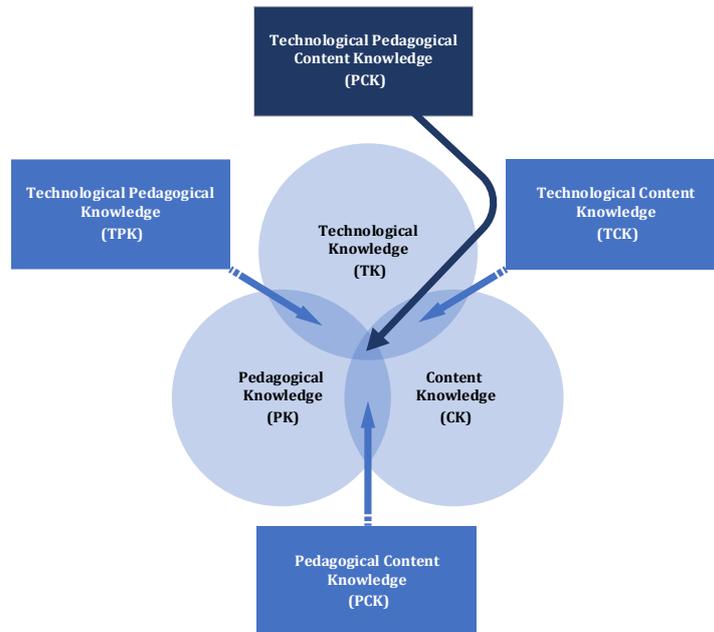

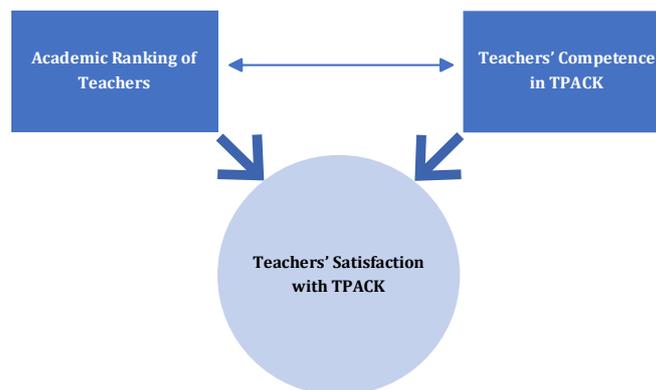**Fig. 1:** The TPACK framework (Mishra and Koehler, 2006)

Fig. 2: Relationship between the art teachers' satisfaction with TPACK, competence in TPACK, and academic ranking of teachers

Specifically, the following vital points guide this study:

- Assessing the competency of art educators in using TPACK at universities across Kazakhstan.
- Examining the role of teachers' academic ranking in their digital competencies.
- Analyzing the interplay between teachers' academic ranking, competency levels, and satisfaction with TPACK.

Ultimately, this study seeks to provide a clear understanding of the competency levels and satisfaction of art teachers. Furthermore, it aims to offer valuable insights that can inform evidence-based policies and innovative approaches to TPACK integration in art education. The findings of this research could significantly contribute to the development of new strategies for encouraging teachers to adopt technology-based teaching

practices and for creating technology-driven curriculum frameworks.

2. Methodology

This study employs a survey research method combined with a descriptive approach. Descriptive methods provide an accurate portrayal of the current situation. This approach offers a survey-based framework to assess teachers' competencies in TPACK, their satisfaction with TPACK, and the correlation between academic rank and their competencies and satisfaction. A 22-question survey was used, and participants were asked to evaluate their own competencies and satisfaction levels. Additionally, after collecting data through questionnaires, interviews were conducted with the participants both in person and online.

Based on previous studies and definitions, the questions were categorized to measure each factor, aiming to create a quick and reliable survey to assess teachers' self-evaluation in the mentioned areas. These areas include:

2.1. Digital competencies in art education

Teachers' digital literacy: Digital literacy among teachers refers to the ability of art educators to utilize TPACK in educational processes. Research has demonstrated that teachers require training programs and technological skill enhancement to implement TPACK effectively. These skills encompass fundamental knowledge of digital tools, the ability to search for information, evaluate digital resources, and create and share content electronically.

Teachers with high levels of digital literacy can leverage innovative technologies to enhance student learning, utilize interactive tools to boost classroom engagement and motivation, and deliver more appealing and diverse educational content. Digital literacy provides educators with insights into technology-driven teaching methods, supporting the preparation of teachers, teaching materials, and instructional conditions (Wieser, 2016).

In the TPACK framework, digital literacy is situated within the TP (Technological Pedagogical) domain, encompassing educational technology. Furthermore, digital literacy enables teachers to adapt quickly to rapid technological advancements and keep their instructional materials up to date. It involves their knowledge of emerging technologies, exploration of the potential applications of these tools in art education, and the development of curricula that take advantage of these technologies' benefits.

Innovative problem-solving skills: Given the rapid advancement of digital technologies, teachers must adopt creative approaches to address challenges and problems in utilizing TPACK. Innovative problem-solving skills enabled by digital technologies in art education empower teachers to tackle educational challenges creatively and effectively.

Digital tools such as design and simulation software, online educational platforms, and interactive applications allow teachers to solve complex problems using novel and engaging methods. For instance, educators can employ 3D modeling software to teach intricate artistic concepts or leverage augmented reality to provide students with immersive and interactive visual experiences.

To achieve this, teachers must be familiar with various technologies and their potential applications within the curriculum framework (Technological Knowledge, TK). Additionally, they must effectively convey subject content using these technologies (Content Knowledge, CK) and enhance teaching strategies (Pedagogical Knowledge, PK).

Overall, innovative problem-solving skills enhance teachers' capacity to effectively utilize new technologies, improving the quality of instruction and enriching students' learning experiences.

Professional development: Developing teachers' professional skills is critical. In the era of digital learning, teachers must continuously update and self-learn. Competencies can be developed through specialized training or in-service courses. The ultimate goal is for teachers to familiarize themselves with the latest digital tools and techniques and enhance their competencies, given society's rapid changes, teachers must maintain their insights and skills through learning and professional development. Teachers' professional growth is one of the most critical competencies that today's educational community needs. A teacher who can present academic content more engagingly and interactively undoubtedly progresses professionally. Ultimately, the professional development of teachers in TPACK leads to enhancing the quality of art education and increasing the motivation and satisfaction of both teachers and students.

2.2. Teacher satisfaction with TPACK

This component includes a three-dimensional study of TPACK's educational effectiveness, capabilities and support, and institutional factors.

Educational effectiveness of TPACK: The impact of using TPACK on art education encompasses various aspects. These include the influence of TPACK on teaching methods and learning outcomes, the alignment of digital tools with educational objectives and purposes in art education, and the analysis of the effectiveness of digital TPACK in enhancing student interaction and creativity. These technologies, including software, interactive tools, and augmented reality, enable teachers to present educational content engagingly and interactively to students. Moreover, they create various opportunities for experiential and creative thinking in the academic environment. One of the most critical factors contributing to teachers' satisfaction

with technology-based teaching methods is improved feedback and student learning.

Potential and support of TPACK: TPACK offers countless capabilities to users. Exploring the advantages that technology provides to art education and the environment and potential created for ease of teaching are all designed to facilitate convenience and collaboration with teachers. Features such as unlimited access, high speed, and quality, no restrictions on location and time, and the ability to update and adapt to any content type can inspire teachers to utilize TPACK. The highest quality of teaching through innovative features of technologies will lead to the satisfaction of both teachers and students.

Institutional factors: One of the most essential factors in satisfaction with TPACK is undoubtedly institutional factors. This refers to whether educational institutions have provided the facilities and infrastructure for technology-based education. An academic institution that is a pioneer in integrating TPACK with its teaching methods and strives to improve the competencies of its teachers has taken the first step in gaining their satisfaction. Conversely, weak support from educational institutions or a lack of support from teachers in in-service training can lead to teacher dissatisfaction. In addition to initial knowledge and skills, teachers require continuous facilities and support.

Based on the provided descriptions, a questionnaire was designed and made available to participants. The gathered results were compiled in lists by computer and then analyzed using the SPSS program.

Throughout the development of this tool, the goal was clear: To align the mentioned items with the needs and characteristics of art teachers regarding TPACK.

As a result, the questionnaire consisted of 22 questions designed to assess art teachers' self-evaluation. It included eight questions on teachers' competencies, six questions on their satisfaction with TPACK, and eight questions related to the participants' academic rank and personal information. Participants responded to each question using a five-point Likert scale: 1. Very low 2. Low 3. Moderate 4. High 5. Very high

2.3. Research population

The total number of participants included 123 university professors (77 women and 66 men) from art departments across universities in Kazakhstan. All participants are currently engaged in teaching activities. Most participants were familiar with digital technologies in art classrooms but did not know much about TPACK. The ages of participants ranged from 30 to 60, and their academic rank was classified into three categories (72 instructors (I), 36 assistant professors (A), and 15 professors (P)). This research was conducted by ethical standards to uphold the integrity, transparency, and well-being of all participants, subjects, and data involved. Ethical

approval was obtained from the University of Abai Kazakh National Pedagogical University on February 24, 2023 (Ref. No. 6). Informed consent was secured from all participants before their involvement in the study. Measures were rigorously applied to protect participant privacy and confidentiality, including the anonymization of data and the secure storage of information. Furthermore, the study complies with applicable scientific, ethical, and legal guidelines to ensure responsible and reproducible research practices.

2.4. Validity and reliability tests

The questionnaires were distributed electronically via email to art instructors at the universities being studied. Participants were asked to share personal details such as their name, age, and academic rank to improve the credibility of the responses. The collected questionnaire data were submitted online and stored on a dedicated platform designed for online surveys. The data were then organized in Excel spreadsheets and analyzed using SPSS software. The reliability of the study was assessed through Cronbach's alpha, which measured teachers' competence and satisfaction, yielding a value of 0.82. This value was considered suitable for the study's sample size and the number of questions included.

2.5. Research findings

A preliminary analysis was conducted using the obtained results, and the information was categorized based on the teachers' academic degrees. Cronbach's alpha test yielded a reliability coefficient of 0.82, which is deemed acceptable. However, it is suggested that this questionnaire be repeated in the coming years for further investigation to shed more light on integrating technology into teaching methods.

Referring to Table 1, regarding teachers' digital competencies in using TPACK for art education, Group I, generally characterized by a younger age range, received the highest evaluation in the "Digital Literacy" factor, with an average score of 4. This contrasts with Group P, which recorded the lowest digital literacy among the three groups, with an average score of 3.3. Overall, participants demonstrated lower averages in the "Innovative Problem-Solving Skills". Nevertheless, Group I again achieved the highest average, while Group P recorded the lowest, with an average of 2.8.

However, the trend differed in the area of "Personal Professional development". Despite their lower digital literacy and problem-solving skills, Group P showed a higher inclination toward developing their skills in TPACK. The reasons for this are discussed further in the Discussion section. On the other hand, Group A reported the lowest inclination for "Personal Professional Development," with an average of 3.5. In terms of satisfaction with TPACK, participants from Group P outperformed

their peers in the factors of "Educational Effectiveness of TPACK" and "Potential and Support of TPACK," with averages of 4.3 and 3.9. Conversely, Group I rated the "Potential and Support of TPACK" lower, and Group A reported a lower score for the "Educational Effectiveness of TPACK."

For the "Institutional Factors," both Groups A and P evaluated this aspect less favorably than Group I.

Table 1: Assessment of art teachers' competence and satisfaction with TPACK in art education

Factor	Variable	Educational degree			Standard deviation	Cronbach alpha
		Instructor (I)	Assistant professor (A)	Professor (P)		
Teacher's competence in TPACK	Teachers' digital literacy	4	3.5	3.3	0.85	
	Innovative problem-solving skills	3.5	3.2	2.8	0.73	
	Professional development	3.6	3.5	4	0.67	0.82
Teachers' satisfaction with TPACK	Educational effectiveness of TPACK	3.6	3.5	4.3	0.71	
	Potential and support of TPACK	3.4	3.6	3.9	0.83	
	Institutional factors	3.5	3.3	3.3	0.81	

By categorizing the data presented in Table 1 and summarizing, the average competencies and satisfaction levels of participants across all three groups were calculated. As shown in Table 2, Group I assessed their average competencies at 3.7 and their satisfaction at 3.5. While Group A rated both their average competencies and satisfaction equally at 3.4.

In contrast, Group P reported an average competency score of 3.3 but a higher satisfaction level of 3.8. These results indicate that Group P had the highest satisfaction level, while Group A reported the lowest. Conversely, Group P rated their competencies the lowest, while Group I reported the highest competency levels.

Table 2: Comparative average of art teachers' competence and satisfaction with TPACK by academic ranking

Factor	Educational degree			Mean
	Instructor (I)	Assistant professor (A)	Professor (P)	
Teacher's competence in TPACK in art education	3.7	3.4	3.3	3.4
Teachers' satisfaction with TPACK in art education	3.5	3.4	3.8	3.5

During in-person and online interviews, teachers were asked to express their inclination to use TPACK based on their competencies. The majority of participants in Group P, despite their lower digital literacy and dissatisfaction with their educational institutions, demonstrated a clear enthusiasm for utilizing TPACK, with an average willingness score of 4 (Table 3). They also expressed eagerness to participate in training sessions and academic gatherings to enhance their expertise and skills in technology-driven teaching practices.

This enthusiasm was comparable among participants in Groups A and I, who often stated during interviews that technology offers limited capabilities for teaching art in the classroom and does not significantly align with the creative and innovative nature of art. Nevertheless, both groups assessed their willingness to adopt TPACK at an average score of 3.5. These findings were anticipated, given the results in Table 2, which measured the satisfaction levels of teachers in Group P as higher.

Table 3: Art teachers' inclination to TPACK according to academic ranking

Art teachers' inclination	Mean	Standard deviation
Instructor (I)	3.5	0.71
Assistant professor (A)	3.5	0.64
Professor (P)	4	0.21

3. Discussion

The findings of this study indicate that teachers' academic qualifications significantly influence their acceptance or rejection of TPACK as well as their satisfaction levels. This implies that teachers with higher academic backgrounds (Group P) more readily integrate technology into their teaching methods. Moreover, they exhibit greater enthusiasm for using TPACK.

For instance, although they may have lower digital literacy compared to their peers or less capability in creatively addressing challenges when engaging with TPACK, they still utilize technology more extensively for professional skill development. While this aspect lies outside the scope of this study, it appears that as teachers' academic rank, teaching experience, and specialized knowledge increase, their inclination toward technology-driven teaching practices also rises. Overall, they demonstrate higher satisfaction with TPACK compared to their peers. Although they rated Institutional Factors lower, this may highlight their pressing need for TPACK readiness programs or skill enhancement through personalized and self-directed learning strategies. As indicated, they ultimately expressed a higher willingness to adopt TPACK compared to their peers.

On the other hand, teachers with lower academic qualifications (Group I), despite being native Digital who grew up in the digital age, demonstrate higher digital literacy and innovative problem-solving skills. Yet, their evaluation of using TPACK for professional skill development is lower than that of their counterparts in Group P. This clearly underscores the crucial role of teaching experience and higher academic competence in leveraging the potential of technology-driven teaching practices. While they are well-acquainted with various technologies, they face challenges in adapting and aligning TPACK with art-related subjects in the classroom and in identifying its capabilities. This, coupled with a lack of progress and self-improvement, results in their satisfaction

with TPACK remaining moderate—a phenomenon less evident in Group P. Meanwhile, teachers in Group A, with intermediate academic qualifications, appear to be caught between traditional teaching methods and TPACK-based approaches. They have moderate digital literacy but, like Group I, exhibit limited ability to harness the potential of technology in the classroom. Compared to their peers, they report lower satisfaction levels with TPACK.

Overall, the willingness of Group I and Group A to utilize TPACK was lower than that of Group P. This discrepancy may be influenced by various factors such as academic rank, age, experience, and teaching tenure. In this study, the direct impact of academic qualifications on teachers' competence, satisfaction, and willingness to adopt TPACK was examined.

4. Conclusion

The results of the data analysis clearly highlight the impact of teachers' academic qualifications on their acceptance or rejection of TPACK in art education. Notably, participants in Group P reported higher potential for professional development despite being assessed as less competent compared to their peers. Additionally, they demonstrated the highest level of satisfaction with TPACK. This underscores the potential role of teaching experience, tenure, and research background in facilitating their interaction with and adaptation to digital technologies, warranting further extensive studies. Nevertheless, within the scope of this research, it became evident that teachers' academic qualifications, regardless of factors such as age and digital literacy, significantly influence their ability to expand their innovative horizons. It is worth noting that participants categorized in Group I are generally younger and often considered native Digital, belonging to the technology and digital age. However, compared to other participants, they rated themselves as having higher digital competencies but lower satisfaction with TPACK relative to Group P. Although their digital literacy and problem-solving abilities surpass those of their counterparts, they face stagnation in developing professional skills. Meanwhile, participants in Group A, with average age and academic rank, appear to be caught between TPACK-based methods and traditional approaches. They lack both the digital literacy and innovative problem-solving skills of Group I and the motivation and enthusiasm for professional development observed in Group P.

As a result, this study clearly underscores the influence of teachers' academic qualifications on enhancing their engagement with technology-based approaches, which in turn leads to increased satisfaction. Teachers with higher academic and educational backgrounds tend not to struggle with new technologies but rather strive to align them with their teaching methods. Consequently, discovering the potential of TPACK in art education and its effective implementation fosters satisfaction among both teachers and students with technology-based teaching. An important factor emphasized during this study is Institutional Factors, which significantly affect teachers' satisfaction with using TPACK. The data highlight a clear need for improving and enhancing organizational facilities to better support teachers in integrating technology into their teaching practices.

4.1. Suggestions and future implications

As this research focuses on Teachers' academic rank, and various other factors also play a role in increasing or decreasing teachers' interaction and satisfaction when using TPACK, it is suggested that future studies should investigate other factors, such as teachers' age range, gender, teaching experience, and the duration of in-service training courses, support, and institutional factors. Furthermore, to bridge the gap between teachers' academic degrees and their level of interaction with TPACK and to improve their satisfaction, the following measures are proposed:

- Development of professional development programs: Implementing professional and targeted development programs can significantly enhance teachers' competencies. These programs can be designed for different educational and experiential levels and ensure that all teachers can effectively integrate TPACK into their art education methods, regardless of their starting point.
- Enhancement of collaborative learning environments: Studies have shown that teachers learn more and better from their peers. By strengthening learning environments where teachers can share their teaching methods and experiences, younger or less experienced teachers can be encouraged to use TPACK methods in art education.
- Institutional support and advocacy: Educational institutions are among the most influential factors in teachers' growth. Developing support systems that cater to teachers' needs can encourage them to use TPACK. Providing technical support to address teachers' specific challenges can increase their confidence and self-assurance.

These measures can significantly increase teachers' interaction with TPACK, thereby improving their satisfaction levels.

Compliance with ethical standards

Ethical considerations

This study was conducted in accordance with ethical guidelines and approved by the Ethics Committee of Abai Kazakh National Pedagogical University (Approval Ref. No. 6, dated February 24, 2023). Informed consent was obtained from all participants prior to data collection. Participants'

privacy and confidentiality were ensured through data anonymization and secure information handling. The research complies with all applicable institutional, national, and international ethical standards.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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