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A Study on the Cognitive Level of TPACK and the Differences in Demographic Variables among University Martial Arts Teachers

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ABSTRACT:- This study mainly focuses on the level of awareness of TPACK among university martial arts teachers, as well as the differences in demographic variables such as gender, professional title, professional background, age, and years of teaching. By using SPSS 29.0 to analyze the collected data, the results show that the overall TPACK level of university martial arts teachers is medium to high, with good performance in teaching method knowledge (PK) and teaching integration ability (PCK, TPK), but there is still room for improvement in technical knowledge (TK) and subject content knowledge (CK). At the same time, there are indeed obvious differences between different demographic variables, such as male teachers, lecturers, and teachers with martial arts professional backgrounds perform better, while senior teachers and teachers with insufficient teaching experience are relatively weak in technology integration. Based on these results, the study puts forward some practical suggestions for teachers with different backgrounds, hoping to help improve the TPACK level of university martial arts teachers and provide support for the modernization and high-quality development of martial arts teaching.

Keyword： University martial arts teachers; TPACK; demographic variables

I. INTRODUCTION

Driven by the current educational informatization and teaching reform, the Teacher Technology Pedagogical Content Knowledge (TPACK) framework has become an important theoretical model for evaluating teachers' ability to integrate technology with teaching (GAO Xia, 2016). The TPACK (Koehler et al., 2013) framework emphasizes the integration of technical knowledge (TK), pedagogical knowledge (PK) and subject knowledge (CK). Especially in the field of higher education, its application helps teachers to effectively integrate technology with teaching practice (Zhang, 2021). In the context of technology application and education reform, the TPACK (Technology Pedagogical Content Knowledge) (Harris et al., 2017; Voogt et al., 2012) framework has become an important foundation for connecting teachers' technology with teaching practice.

Martial arts teaching itself is a subject teaching with characteristics (Zhang, Madhubala Bava Harji, et al., 2023), and is a sports project that integrates traditional cultural heritage and sports skills (Wang & Mangaliag, 2024b). However, in the current university martial arts teaching, teachers still have certain limitations in the

application of technology and innovation of teaching methods (Li & Wen, 2023), such as insufficient technical knowledge and weak technical integration ability. In addition, there may be significant differences in the TPACK cognition level among teachers of different genders, professional titles, teaching years and training experiences (Hung-Ying Lee et al., 2020). Exploring these differences will not only help to understand the current status of university martial arts education, but also provide targeted improvement suggestions for teachers' professional development.

This study aims to fill the gap in the current research on TPACK in martial arts education. Through an empirical analysis of the TPACK cognitive levels of university martial arts teachers and their demographic variables, it provides data support for improving the quality of martial arts teaching and technical integration capabilities.

1.2 Research Purpose and Questions

1.2.1 Research Purpose

The research purpose of this paper is to:

1. Explore the overall level of understanding of the TPACK framework among university martial arts teachers.
2. To analyze the differences in the perception of TPACK among university martial arts teachers in terms of demographic variables, i) gender, ii) professional title, iii) major, and iv) age and years of teaching experience.

1.2.2 Research Questions

The research questions addressed in this paper are:

1. What is the level of understanding of each dimension in the TPACK framework among university martial arts teachers?
2. What are the differences in the understanding of TPACK among university martial arts teachers in terms of demographic variables, such as i) gender, ii) professional title, iii) major, iv) age and years of teaching?

1.3 Research significance

With the development of society, information technology teaching has gradually become an important means for teachers to impart knowledge. Introducing the TPACK theoretical framework into martial arts teaching research can not only fill the research gap in this field, but also enrich the application of TPACK theory in the field of physical education. At the same time, by analyzing the current situation and differences in the TPACK cognitive level of university martial arts teachers, it provides empirical evidence for university teacher training programs and helps martial arts teachers better improve their technical integration capabilities (Shu, 2016; Hung-Ying Lee et al., 2020). Therefore, this study analyzes the cognitive level of university martial arts teachers on each dimension of the TPACK framework, and investigates the differences in cognitive levels in terms of gender, professional title, major, and whether they have participated in training. This study is of great significance. In addition, this study provides an important reference for the disciplinary practice of university martial arts teachers in the TPACK framework, thereby promoting the basic design and improvement of martial arts education resources and methods.

II. LITERATURE REVIEW

2.1 Concept Statement of Technology Teaching and Content Knowledge

TPACK is a technology teaching content knowledge framework that integrates technology, teaching methods and content knowledge to provide theoretical support for the cross-border implementation of teaching and technology. This model was created by Koehler and Mishra (Mishra & Koehler, 2006) based on Shulman's PCK theory. With the increasing application of information technology in education, the reliance on PCK has

restricted the complexity and diversity of modern teaching. Therefore, the TPACK framework brings technology knowledge (TK) into teaching, expands the scope of application of PCK, and demonstrates the unique role of technology in the teaching process (Koehler et al., 2013)

The TPACK framework includes three core knowledge areas: content knowledge (CK), pedagogical knowledge (PK), and technical knowledge (TK). The intersection of the three produces four key knowledge structures: pedagogical content knowledge (PCK), technical content knowledge (TCK), technical pedagogical knowledge (TPK), and technical pedagogical content knowledge (TPACK). These structures guide teachers on how to integrate technology in teaching to support students' knowledge and skill development.

The core idea of the framework is that "in different contexts, knowledge should exist interactively with the environment, and the cross-border of technology, teaching and content jointly realizes the definition of teacher knowledge". Applying the TPACK concept to the teaching practice of martial arts teachers in universitys and universities can further enhance their ability in the cross-border integration of technology and teaching, and achieve efficient teaching. Figure 1 clearly shows the three knowledge areas of TPACK (technical knowledge area, pedagogical knowledge area and subject content area)。

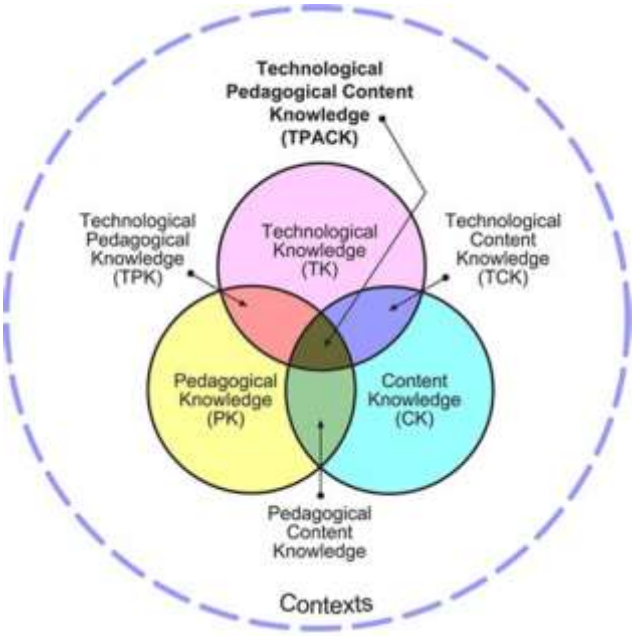

Figure 1. TPACK overlapping teaching framework

The TPACK framework provides more new possibilities for education in the 21st century. The challenge facing teachers in modern classrooms is no longer content delivery, but how to use technology to enhance students' learning experience and understanding. For example, the field of martial arts teaching is trying to integrate information technology into the teaching process, and enhance students' learning interest and participation through video analysis tools, online interactive platforms and other means (Liu & Zhang, 2024). The application of these technologies not only helps teachers better evaluate and adjust teaching methods, but also enables students to more effectively master martial arts skills and the cultural connotations behind them (Chen et al., 2022). This concept has been widely used in various disciplines in many fields. This study will focus on the TPACK concept to examine the level of TPACK technology development of martial arts teachers in universitys and universities. Therefore, it is necessary to define the core of this study in combination with the characteristics of sports disciplines.

2.2 Research on the application of TPACK in martial arts teaching

TPACK emphasizes the organic combination of these core areas (Koehler & Mishra, 2005), and has gradually become an important tool for measuring teachers' comprehensive teaching ability, thereby supporting teachers' teaching practice in the era of digital education (Dee-Chan, 2020). In recent years, TPACK has been widely used in basic education, higher education and vocational education internationally (Ana Cecilia Aleman-Saravia & Deroncele-Acosta, 2021), becoming the theoretical cornerstone of teacher professional development and teaching innovation.

In the teaching of martial arts in universitys and universities, the potential value of the TPACK framework is particularly significant. Martial arts courses not only focus on students' physical skill training (Tang & Jiang, 2022; Su et al., 2024), but also focus on cultural heritage and comprehensive quality (Yang & Huang, 2020). Since martial arts education involves a deep combination of physical expression, cultural background and practical skills (Wei et al., 2021; Ye et al, 2022), this field has unique needs for the integration of technology. However, domestic research on the application of TPACK in martial arts teaching is still in its early stages, lacking systematic theoretical construction and practical guidance (Sharma et al., 2020). Although some studies have shown the potential of technology tools in improving the efficiency of martial arts teaching and student participation (Wang, 2020). However, there are still many problems in the process of technology integration.

The purpose of this review is to explore the current status of TPACK application in martial arts teaching in universitys and universities, clarify its influencing factors and analyze current strategies, and finally propose future research directions and optimization suggestions to provide theoretical support for the sustainable development of martial arts education.

III. RESEARCH METHODS

3.1. Research Design

This study adopts a quantitative research method and collects data through a questionnaire survey.

3.2. Research Subjects and Samples

The research subjects are Chinese university martial arts teachers. The samples were obtained through stratified random sampling or convenience sampling. The total number of samples is 185, covering teachers of different genders, titles, teaching years and training experiences.

3.3. Research tools

This study adopted a survey research design and used the classic TPACK scale as a research tool. It was developed by Denise A. Schmidt Evrim Baran Ann D. Thompson and Punya Mishra Matthew J. Koehler Tae S. Shin in 2009. The survey subjects were 185 martial arts teachers from 17 universitys and universities in Zhengzhou. SPSS 29.0 software was used to perform statistical tests such as mean, standard deviation, independent sample t-test, and one-way analysis of variance (ANOVA) on the collected data.

IV. DATA ANALYSIS METHOD

4.1 TPACK cognition level of university martial arts teachers

From Table 1, it can be seen that the TPACK cognition level of university martial arts teachers is 3.693 (SD=0.939)

Table 1 TPACK cognition level of university martial arts teachers Descriptive Statistics

	N	Mean	Std. Deviation
TK	185	3.102	.911
CK	185	3.558	.906
PK	185	3.707	.938
PCK	185	4.041	.946
TCK	185	3.741	1.004
TPK	185	4.023	.812
TPACK	185	3.693	.939

Therefore, from the above descriptive statistical results, it can be seen that the overall cognitive level of university martial arts teachers on the TPACK framework is medium to high (M = 3.69, SD = 0.939). Specifically, the subject and teaching method integration knowledge (PCK) scored the highest (M = 4.04, SD = 0.946), indicating that teachers have strong ability in combining subject content with teaching methods. However, the technical knowledge (TK) scored the lowest (M = 3.10, SD = 0.911), indicating that teachers have significant deficiencies in mastering modern educational technology. In addition, the standard deviation of the technology and subject content integration knowledge (TCK) dimension is the highest (SD = 1.004), reflecting that teachers have large individual differences in their abilities in this aspect.

4.2 The impact of demographic variables on the differences in TPACK perceptions among university martial arts teachers

The results of the data collected on the differences in TPACK cognition among university martial arts teachers were analyzed based on demographic variables. The specific contents are as follows:

4.2.1 Differences in TPACK cognition among martial arts teachers of different genders

The results of the independent sample t-test showed that gender had a significant impact on the overall TPACK score of university martial arts teachers (t = 2.335, p = 0.004).

Table 2 Independent T-test of martial arts teachers of different genders

	Gender	N	Mean	Std. Deviation	T	Sig
TPACK	Male	93	3.851	.792	2.335	.004
	Female	92	3.533	1.047	2.331	

As can be seen from Table 2, the average score of male martial arts teachers (M = 3.851, SD = 0.792) is significantly higher than that of female teachers (M = 3.533, SD = 1.047). Therefore, the results show that male martial arts teachers may have certain advantages in technical knowledge and technical integration ability, while female martial arts teachers have greater individual differences in TPACK levels.

4.2.2 Differences in TPACK cognition among martial arts teachers of different ages

A detailed analysis was conducted using one-way analysis of variance (ANOVA), with the F value being 6.532 and the Sig value being $p < 0.001$. This shows that there are significant differences in TPACK

cognition among martial arts teachers of different ages.

Table 3 One-way ANOVA of different ages

	N	Mean	Std. Deviation	F	Sig.
28-32 years old	46	3.80	.898	6.532	<.001
33-37 years old	41	3.90	.847		
38-42 years old	56	3.82	.832		
43-47 years old	36	3.37	.928		
Over 48 years old	6	2.19	1.296		

From the results in Table 3 above, there are significant differences in the overall TPACK scores of university martial arts teachers in different age groups ($F = 6.532$, $p < 0.001$). From the descriptive statistics, the highest score was in the 33-37 age group ($M = 3.90$, $SD = 0.847$), while the score of the group over 48 years old was the lowest ($M = 2.19$, $SD = 1.296$). Post hoc tests further showed that the differences between the group over 48 years old and all other groups were significant ($p < 0.05$), while the differences between middle-aged and young teachers (28-42 years old) were not significant ($p > 0.05$).

4.2.2 Differences in TPACK cognition among martial arts teachers of different professional titles

A detailed analysis of the cognition of TPACK among martial arts teachers of different professional titles showed that the F value was 4.573 and the Sig value was $p = 0.004$, indicating significant differences.

Table 4 One-way ANOVA of different job titles

	N	Mean	Std. Deviation	F	Sig.
Teaching assistant	33	3.346	.693	4.573	.004
Lecturer	90	3.940	.940		
Associate professor	42	3.544	.996		
Professor	20	3.464	.919		

From the analysis in Table 4, it can be seen that there are significant differences in the overall TPACK scores of martial arts teachers in different professional groups ($F = 4.573$, $p = 0.004$). From the descriptive statistics, the lecturer group has the highest average score ($M = 3.940$, $SD = 0.940$), and the assistant teacher group has the lowest score ($M = 3.346$, $SD = 0.693$). The scores of the associate professor group ($M = 3.544$, $SD = 0.996$) and the professor group ($M = 3.464$, $SD = 0.919$) are close, but still not up to the level of the lecturer group.

4.2.3 Differences in TPACK cognition among teachers of different majors

When analyzing the differences in TPACK cognition among martial arts teachers of different majors, the F value is 3.526 and the Sig. value is .031, which means that there are differences among martial arts teachers of different majors.

Table 5 One-way ANOVA of different majors

	N	Mean	Std. Deviation	F	Sig.
Physical education	69	3.654	.888	3.526	.031
Martial arts	113	3.752	.936		
Retired athletes	3	2.333	1.459		

The analysis results in Table 5 show that there are significant differences in the overall TPACK scores of martial arts teachers in different professional background groups (F = 3.526, p = 0.031). From the descriptive statistics, the martial arts professional group scored the highest (M = 3.752, SD = 0.936), followed by the physical education group (M = 3.654, SD = 0.888), and the retired athlete group scored the lowest (M = 2.333, SD = 1.459). This shows that professional background has a significant impact on teachers' TPACK cognition level, especially the retired athlete group is significantly insufficient in technical integration ability.

4.2.4 Differences in TPACK cognition among martial arts teachers with different teaching years

Due to different teaching years, the cognition of TPACK among university martial arts teachers may also be different. According to the analysis, the F value of university martial arts teachers with different teaching years is 4.508, and the Sig. value is p = 0.002, indicating that there are indeed differences.

Table 6 One-way ANOVA of different teaching years

	N	Mean	Std. Deviation	F	Sig.
0-5 years	59	3.748	.882	4.508	.002
6-10 years	41	3.826	.837		
11-15 years	34	4.055	.661		
16-20 years	16	3.455	1.158		
More than 20 years	35	3.200	1.080		

Therefore, from the data in Table 5 above, we can draw the corresponding conclusion that there are significant differences in the overall TPACK scores of university martial arts teachers with different teaching years (F = 4.508, p = 0.002). From the descriptive statistics, the highest score is in the 11-15 years group (M = 4.055, SD = 0.661), which is significantly higher than the group with more than 20 years (M = 3.200, SD = 1.080). In addition, the scores of the 0-5 years group (M = 3.748) and the 6-10 years group (M = 3.826) are similar, while the score of the 16-20 years group (M = 3.455) has decreased.

V. DISCUSSION

According to Nummally (1978) and Chaos et al. (2016), the mean score level is divided into five ranges: i) very low (1.00-1.80); ii) low (1.81-2.60); iii) medium (2.61-3.40); iv) high (3.41-4.20); v) very high (4.21-5.00). This study conducted an in-depth analysis of the TPACK (Technical Pedagogical Content Knowledge) level of university martial arts teachers and explored the impact of demographic variables such as gender, professional title, professional background, age, and years of teaching on TPACK level. The following is a detailed discussion of the main findings.

5.1 Overall performance of TPACK level of university martial arts teachers

The results show that the overall cognition of university martial arts teachers in TPACK is at a high level, especially in the dimensions of pedagogy knowledge (PK), subject and pedagogy integration knowledge (PCK), and technology and pedagogy integration knowledge (TPK). The scores are all at a "high" level. This shows that most university martial arts teachers are able to effectively integrate technology and pedagogy in their teaching practice. However, the scores of technical knowledge (TK) and subject content knowledge (CK) are relatively low, at the lower end of the "medium" or "high" level, respectively. In particular, the deficiency of CK may be related to the lack of in-depth understanding of the cultural connotation and theoretical knowledge of the martial arts discipline by some teachers. This result shows that although university martial arts teachers can flexibly apply the TPACK framework, the improvement of subject content knowledge is still the key to future development.

5.2 Analysis of differences in TPACK cognition among university martial arts teachers in demographic variables

First, in the analysis of martial arts teachers of different genders, male martial arts teachers had significantly higher TPACK levels than female martial arts teachers ($p = 0.004$), which indicates that male martial arts teachers showed higher proficiency in technical knowledge (TK) and technical integration ability (TPACK core), which may also be due to their strong mastery of technology (TK) and their willingness to actively try to use technical knowledge for teaching. In contrast, female martial arts teachers may face problems such as lack of confidence and fewer technical training opportunities, which may lead to their relatively weak ability in integrating technology with teaching methods (TPK) and integrating technology with subject content (TCK). Therefore, in order to narrow the gender gap, it is recommended to design special technical training courses for female teachers in future teacher training, provide them with more resource support, and improve their technical application ability through experience sharing and case teaching;

Second, in the analysis of differences among martial arts teachers of different professional titles, the study showed that there were significant differences in TPACK levels among different professional title groups, with the lecturer group scoring the highest and the assistant group scoring the lowest. The advantage of the lecturer group may be due to the fact that they have undertaken more teaching tasks in their careers, which has prompted them to actively explore ways to integrate technology and subject content in teaching. The lower score of the teaching assistant group may be related to their lack of teaching experience and weak technical integration ability. In addition, although the scores of the associate professor and professor group are higher than those of the teaching assistant, they are slightly lower than those of the lecturer group. This may be because senior professional teachers focus more on academic research or administrative management in the later stages of their career development, and have insufficient time and energy for technical learning. Therefore, it is recommended to help the teaching assistant group master basic technical integration capabilities through graded teacher training, and provide senior professional teachers with higher-level technical innovation project support to encourage them to better combine experience with technology.

In addition, in the field of professional teaching, the TPACK level of teachers with martial arts background is significantly higher than that of teachers with physical education background and non-physical background. The advantages of teachers with martial arts background in subject content knowledge (CK) and subject and teaching method integration knowledge (PCK) are particularly obvious, thanks to their systematic training in university and long-term martial arts practice experience. In contrast, although teachers with a physical education background have strong pedagogical knowledge (PK), they are slightly lacking in martial

arts subject content knowledge (CK) and technical integration ability (TPACK core). Teachers with non-physical backgrounds have limited knowledge of martial arts subject content, and their TPACK level is significantly lower than that of the other two groups.

Therefore, for teachers with non-martial arts backgrounds, intensive training can be used to help them supplement their martial arts subject knowledge (CK), while providing teachers with physical education backgrounds with in-depth learning resources on martial arts culture and skills.

Finally, when analyzing the differences in TPACK ability and other aspects of the age and teaching years of martial arts teachers in universitys and universities, the results show that martial arts teachers aged between 28 and 37 perform better than older teachers aged over 48 years old in terms of TPACK level. This result may reflect that young teachers are more receptive to new technologies and are more likely to try to apply technology to classroom practice. Older teachers may be more inclined to traditional teaching methods in teaching, and pay more attention to the teaching methods and knowledge content, thus neglecting the application and improvement of technology teaching, and have low interest and acceptance of new technologies, resulting in low TPACK levels; in terms of teaching years, teachers in the 11-15 year group scored the highest. Teachers at this stage have rich teaching experience and can flexibly integrate technology with teaching. However, due to lack of experience, teachers with less than 5 years of teaching experience are still exploring their ability to integrate technology in actual teaching despite having received systematic technical training in the academic stage. Teachers with more than 20 years of teaching experience have the lowest TPACK level, which may be related to the weakening demand for technology updates in the later stages of their careers.

In response to these situations, it is recommended to provide more teaching practice guidance for young teachers to help them accumulate experience; design targeted technology update courses for teachers with longer teaching years to make up for their lack of technology integration capabilities.

5.3 Analysis of influencing factors

Through the above research, it is found that the TPACK level of university martial arts teachers is affected by many aspects, such as the technological development environment, teaching experience, professional background, and education policy. The degree of influence of these factors varies in different groups, which can be summarized as follows:

5.3.1. The impact of technological development

In recent years, it has been found that the application of technology teaching is developing rapidly, especially the popularity of online teaching during the epidemic, which provides teachers with many opportunities to learn and use new teaching tools. In particular, young teachers engaged in physical education generally benefit more from it because they are more receptive to technology, while senior teachers may perform relatively poorly because they are unfamiliar or unaccustomed to technology. This shows that changes in the technological environment are of great help to the improvement of TPACK levels, but more support is needed to help senior teachers keep up with the pace of technological development.

5.3.2. The influence of teaching experience and professional background

Although teaching experience and professional background have always been considered important factors in evaluating teaching ability, research shows that senior teachers with more than 20 years of teaching experience have relatively low TPACK levels. The possible reason is that these teachers have fewer opportunities to contact modern technology in the early stages of their careers, or they pay more attention to

competitive performance rather than the combination of technology and teaching. Therefore, although the accumulation of experience is important, the combination with modern technology cannot be ignored.

Therefore, it is recommended to provide personalized support for different groups, such as providing technical update training for senior teachers, designing special courses for female teachers and teachers with non-martial arts professional backgrounds; helping senior teachers combine traditional experience with modern technology to achieve innovation in teaching methods. In this way, it also plays a vital role in improving the influencing factors of university martial arts teachers in TPACK.

5.4 Limitations of the study

Although this study conducted a detailed analysis of the TPACK level of university martial arts teachers, there are some limitations that need to be explained, which are mainly reflected in the following aspects: First, the data of this study mainly come from university martial arts teachers in Zhengzhou, Henan Province, and the coverage is relatively small, failing to include teachers at other educational levels, such as martial arts teachers in primary and secondary schools or vocational universitys. The teaching needs and technological environments at different educational stages may lead to differences. In the future, the sample range can be expanded to make the research results more universal.

Second, in the dynamics of the technological environment, the TPACK level will change with the development of technology and changes in the application environment, but this study is a horizontal study and cannot track the long-term impact of technological changes on the TPACK level. In the future, long-term follow-up studies can be carried out to understand the continuous impact of technological progress on teachers' teaching ability.

Although this study has certain limitations, these findings provide useful inspiration for improving the TPACK level of university martial arts teachers, and also provide a reference for the design of future teacher training strategies. These results lay the foundation for further promoting the modernization and high-quality development of martial arts teaching.

VI. CONCLUSION AND SUGGESTIONS

This study found that the TPACK level of university martial arts teachers was good overall, especially in teaching method knowledge and teaching integration ability, but there was still room for improvement in technical knowledge and subject content knowledge. The study also found that male teachers had higher TPACK levels than female teachers, and teachers with 11-15 years of lecturer and teaching experience performed best, while assistant teachers, novice teachers and senior teachers were relatively weak. At the same time, teachers with a martial arts background had an advantage in TPACK levels over teachers with a physical education or non-sports background. The popularity of online teaching during the epidemic played a significant role in improving the overall TPACK level.

Based on these findings, targeted support can be provided based on the background of teachers, such as designing technical training courses for female teachers, providing more practical opportunities for assistant teachers and novice teachers, and providing technical update support for senior teachers. Teachers with non-martial arts backgrounds can focus on supplementing martial arts subject knowledge, while teachers with senior professional titles can play a leading role by participating in technology innovation projects. In addition, it is necessary to optimize resource allocation to ensure that all teachers have fair training opportunities, and to establish a dynamic evaluation mechanism to continuously track changes in teachers' TPACK levels. These

measures will help to further improve the teaching ability and technical application level of martial arts teachers in universitys and universities, and promote the better development of martial arts teaching in universitys and universities.

REFERENCES

[1]. Koehler, M. J., Mishra, P., & Cain, W. (2013). What is Technological Pedagogical Content Knowledge (TPACK)? *Journal of Education*, *193*(3), 13–19. https://doi.org/10.1177/002205741319300303

[2]. Harris, J. B., Koehler, M. J., Koehler, M. J., & Mishra, P. (2017). *What Is Technological Pedagogical Content Knowledge*. Contemporary Issues in Technology and Teacher Education Journal. https://www.semanticscholar.org/paper/What-Is-Technological-Pedagogical-Content-Knowledge-Harris-Koehler/5003b7a25d4580359da56255c12b5fd2171c1db3?utm_source=direct_link

[3]. GAO Xia, W. L. (2016). An Empirical Study on university English Teacher's TPACK: Theory and Application. *IOSR Journal of Engineering*, *06*(04), 01–04. https://doi.org/10.9790/3021-06410104

[4]. Voogt, J., Fisser, P., Pareja Roblin, N., Tondeur, J., & van Braak, J. (2012). Technological pedagogical content knowledge - a review of the literature. *Journal of Computer Assisted Learning*, *29*(2), 109–121. https://doi.org/10.1111/j.1365-2729.2012.00487.x

[5]. Zhang, Jin-E. (2021). Integrative Analytics for Technological Pedagogical Content Knowledge. *Complexity*, *2021*, 1–10. https://doi.org/10.1155/2021/5774789

[6]. Zhang, Y., Madhubala Bava Harji, Jia, S., & Zhang, Y. (2023). Technological Pedagogical and Content Knowledge: Tai Chi teachers in higher education. *Environment-Behaviour Proceedings Journal*, *8*(25), 87–93. https://doi.org/10.21834/e-bpj.v8i25.4860

[7]. Li Qingbo, & Wen Fenqin. (2023). Research on the current situation and development path of high school martial arts education. Physical Science, 3(6), 18. https://doi.org/10.33142/jscs.v3i6.10823

[8]. Wang, X., & Mangaliag, A. D. (2024b). The Present State and Future Direction of Teaching Tai Chi in universitys and Universities. *International Journal of Education and Humanities*, *13*(1), 63–69. https://doi.org/10.54097/sgyrts68

[9]. Hung-Ying Lee, Ching-Wei Chang, & Cai-Ling Wu. (2020). A study on the relationship between physical education teacher training and technology teaching content knowledge (TPACK). Chinese Journal of Physical Education, 34(2), 89–97. https://doi.org/10.6223/qcpe.202006_34(2).0002

[10]. Shu, X. (2016). An Action Research on TPACK's Influence on Teachers of National Open University: Exemplified with an English Teacher of Zhejiang Radio and TV University. *OALib*, *03*(01), 1–6. https://doi.org/10.4236/oalib.1102336

[11]. Zhang, W., & Tang, J. (2021b). Review of Teachers' Technological Pedagogical Content Knowledge (TPACK) in China. *Creative Education*, *12*(07), 1726–1743. https://doi.org/10.4236/ce.2021.127131

[12]. Mishra, P., & Koehler, M. J. (2006). Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge. *Teachers university Record: The Voice of Scholarship in Education*, *108*(6), 1017–1054. https://doi.org/10.1177/016146810610800610

[13]. Liu, X., & Zhang, Z. (2024). Research on teaching models and development strategies for university physical education. Ice and Snow Sports Innovation Research, (20), 85–87. https://doi.org/10.20155/j.cnki.issn2096-8485.2024.20.029

[14]. Chen, C., Wu, Z., Chen, Q., & Li, X. (2022). Building Campus Sports Information Learning Platform Based on Intelligent Sensor Network. *Wireless Communications and Mobile Computing*, *2022*(https://doi.org/10.1155/2022/2535819), 1–12. https://doi.org/10.1155/2022/2535819

[15]. Dee-Chan, R. (2020). Introducing the Technological Pedagogical Content Knowledge (TPACK) framework to the University of Santo Tomas Faculty of Medicine and Surgery. Journal of Medicine, University of Santo Tomas, 4(1). https://doi.org/10.35460/2546-1621.2019-0054

[16]. Aleman-Saravia, A. C., & Deroncele-Acosta, A. (2021). Technology, pedagogy and content (TPACK framework): Systematic literature review. Proceedings of LACLO 2021. https://doi.org/10.1109/LACLO54177.2021.00069

[17]. Tang, Y., & Jiang, X. (2022). Applications of Artificial Intelligence and IoT in the Development of Sports Training Education Management. *Wireless Communications and Mobile Computing*, *2022*(10.1155/2022/1061461), 1–8. https://doi.org/10.1155/2022/1061461

[18]. Su, Z., Ge, S., Li, L., & Su, Y. (2024). Review Study Of Integrating Ai Technology Into Sports Training System. *10.53555/Kuey.v30i5.1649*, *10.53555/kuey.v30i5.1649*(10.53555/kuey.v30i5.1649). https://doi.org/10.53555/kuey.v30i5.1649

[19]. Yang, J., & Huang, K. (2020). Analyzing the foothold of reform in the popularization of martial arts education in schools. Journal of Beijing Sport University, (1), 106–113. https://doi.org/10.19582/j.cnki.11-3785/g8.2020.01.011

[20]. Wei, S., Huang, P., Li, R., Liu, Z., & Zou, Y. (2021). Exploring the Application of Artificial Intelligence in Sports Training: A Case Study Approach. *Complexity*, *2021*(10.1155/2021/4658937), 1–8. https://doi.org/10.1155/2021/4658937

[21]. Ye, W., Li, S., Liu, S., & Zhou, Y. (2022). Application of artificial intelligence technology in the governance of martial arts education. Discrete Dynamics in Nature and Society, 2022(1), Article 5606280.

[22]. Wang, Y. (2020). Analysis of problems and countermeasures in university martial arts teaching. Contemporary Sports Science and Technology, (30), 150–151, 154. https://doi.org/10.16655/j.cnki.2095-2813.2003-5110-2852

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