Research and Application of Intelligent Technology in Teaching Knowledge of Basic Subjects in Higher Vocational Colleges

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Abstract. Smart education and education informationization is a national strategy of our country, but the rapid development of artificial intelligence technology is promoting the deep reform of education. In this context, the combination of artificial intelligence technology and teaching activities adds new variables to the professional development of teachers. In the environment of artificial intelligence, what kind of quality teachers should have is an urgent problem to be solved. On this basis, the project intends to conduct an in-depth and systematic investigation of "Intelligent Technology Integrated Curriculum Teaching Knowledge (I-TPACK)" from three perspectives of teacher conception, social context and classroom context by using a variety of research methods, in order to theoretically provide new ideas for the application of TPACK in artificial intelligence environment. In practice, it provides new ideas and methods for "intelligent technology integration of curriculum teaching knowledge" [1].

Keywords: intelligent education · Integrating technical subject teaching knowledge · TPACK · Teacher professional development · Information technology and curriculum integration

1 Introduction

Globally, "intelligent education" has become a major strategy for the development of artificial intelligence [2]. According to the 10-year Development Plan for Education Informatization (2011–2020), "Personalized information environment and services should be provided for every student. TPACK is made up of eight main components. Three elements: teaching knowledge, subject knowledge, technical knowledge, technical knowledge; The three composite elements are composed of three basic elements: subject knowledge of integrated technology (TCK), teaching knowledge of integrated technology (TPK), and subject teaching knowledge (PCK); A combination of three basic elements: TPACK, XK, Topic [3], Economics, Electronics, etc. In this framework, each element has its own uniqueness and important functions, and they are also closely related to each other. They influence each other to form a complex and comprehensive knowledge framework, as shown in Fig. 1.

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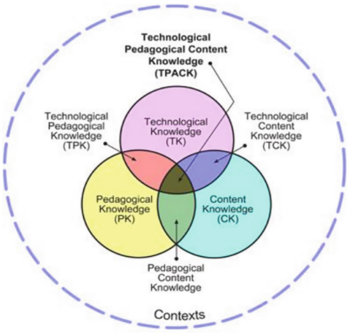

Fig. 1. Mishra and Kohler's TPACK structure diagram

2 Mechanism and Principle of Interaction Between Technology and Teaching Method

A. W. Bates, A distance educator in Canada, said, "Media should be chosen based on the purpose and effectiveness of teaching." Every medium has its own inherent rules, the question is what is the most appropriate medium.

No "super media" can surpass any kind of educational object, and every kind of media has its advantages and disadvantages. Based on this, Bates will construct a decision-making framework of "media selection and combination", which will serve as a practical reference for open and distance education personnel in media selection and use. In a retrospective report, Singaporean scholar CAI Jingxin and other scholars pointed out that in future studies, TPACK should pay more attention to its high situational nature, especially its technical, pedagogical and disciplinary particularities. As shown in Table 1.

The research process is mainly divided into the following steps: (1) Search in WOS database, collect literature sample data, download literature title, country and institution, keywords, abstract and other data information; (2) Refine the data based on the year and field limitation, and eliminate irrelevant literature; (3) Use CiteSpace.

The country and institution of the literature and the co-citation of the author are presented visually. (4) Discuss and analyze the research results [4] (Fig. 2).

Table 1. Laurie Lauder's matching matrix of techniques and pedagogy

Media technology	Teaching method	Specific case
Narrative media narrative	lecture	Print, television, audio, video
Interactive media	investigation	Library and network
Communication media Communicative	discuss	Forums, discussion groups, chat rooms
Adaptive media adaptive	explore	Laboratory, simulation program
Productive media	practice	Papers, products, models, modeling

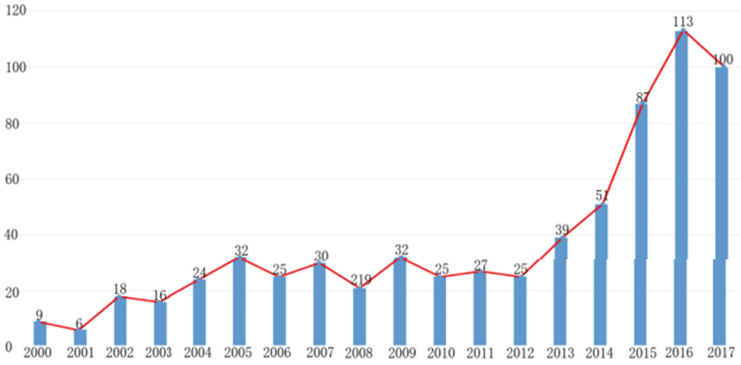

Fig. 2. Trend chart of the annual number of published documents

Fig. 3. Country and Institutional knowledge Map

The left side of Fig. 3 shows the knowledge map of national scientific research (threshold ≥18) [5]. The clustering results show that there are 42 nodes, 73 connections, and 0.6844 network modules on the map. As shown on the left side of Fig. 3, research on intellectual education is concentrated in the following regions: China, the United States, South Korea, the United Kingdom, Canada, China, the United States, and South Korea. The right side of Fig. 3 is a knowledge base from an institutional study (threshold of 2 or greater). The clustering results show that there are 81 nodes in this knowledge base, 35 connections, and a 0.9349 network structure. Table 2 lists the representative countries and institutions [6].

According to the data shown in Table 2, as far as intellectual education is concerned, China has the largest number of papers, and Beijing Normal University is the most representative one. In July 2015, the "Internet Plus" strategy released by the Ministry of Education has effectively promoted the in-depth development of education informatization in the 13th Five-Year Plan period. In 2011, South Korea released the Implementation

Table 2. Representative countries and institutions

Serial number	country	Number of publications	proportion	mechanism	Number of publications	proportion
1	China	116	17.05%	Beijing Normal Univ	11	1.6%
2	United States	61	8.97%	Federal University of Santa Catarina (Univ Fed Santa Catarina)	10	1.5%
3	South Korea	46	6.76%	Cropf University (Univ Hradec Kralove)	10	1.5%

Plan of Promoting Smart Education Strategy, which regards smart education as an important information strategy in South Korea, including online classroom, construction and application of teaching resources, teaching service platform based on cloud computing, improvement of teachers' teaching ability, digital teaching and so on.

In Fig. 4, you can see the author collaboration knowledge graph (Threshold ≥15), which includes 127 nodes.

111 wires, 0.0139 network density, 0.967 modularity, 0.6607 contour. In this graph, the number of nodes represents journal publications by authors and research teams, and the number of nodes represents the degree of collaboration between authors and research

Fig. 4. Author collaboration knowledge map

Table 3. Reliability analysis

Cronbach's Alpha	Number of terms
.996	123

Table 4. KMO spherical Bartlett test results

The Kaiser-Meyer-Olkin measure of sample adequacy	.993
Bartlett's sphericity test approximates chi-square	284912.208
Df	3321
Sig	.000

teams. As can be seen from the chart, the representative research groups are Javier Bajo, Kinshuk, Victor Callaghan, Marco Gomes, and the research group of Huang Ronghuai, a professor from Beijing Normal University.

Through the cluster analysis of keywords, we find that, "Monitoring system", "daily learning", "power system operation", "enhancing capability", "semantic-based service quality management", "multi-agent system", "intelligence of learning ecosystem", "environmental monitoring robot" and "south korea" are the current research hotspots in the field of intelligent education. After sorting out relevant literature at home and abroad, representative studies on current hot topics are selected.

3 Measurement and Structural Model of Teacher I-TPACK

As for the research tool, SPSS was used for statistics and analysis of the research data. SPSS17.0 was used to analyze the reliability of the questionnaire, so as to ensure the reliability and consistency of the questionnaire "Investigation on the Status Quo of Teaching Knowledge of Teachers integrating intelligent Technology". The Alpha coefficient of the total questionnaire was 0.996, exceeding 0.9, indicating high reliability of the questionnaire (see Table 3).

In this study, exploratory factor analysis was used to carry out statistical analysis on the recovered questionnaire data. The KMO sphericity Bartlett test results of factor molecules show that the probability p value of Bartlett sphericity test is 0.000. That is, it can be considered that the correlation coefficient matrix is significantly different from the identity matrix. Meanwhile, the KMO value is 0.993. According to the KMO metric, the original variable is suitable for factor analysis (see Table 4).

4 Teachers' I-TPACK in Social Context

Teachers' instructional design mainly includes the analysis of teaching objectives, teaching content, learners, teaching media and other aspects, which are usually combined with teachers' reflective activities, focusing on the problems in the teaching process. On this

basis, using activity theory, grounded theory, word cloud map and other content analysis methods, this paper analyzes the conflicts encountered in the development of teachers' I-TPACK in the realistic social situation, and tries to establish the dynamic mechanism of teachers' I-TPACK development in the realistic environment.

The problem is the life of the class. In Marx's view, contradiction is the fundamental and driving force of the development of all things. On the basis of "action", the concept of "development" based on "action" is put forward, that is, to promote the growth of teachers by constantly resolving various contradictions and conflicts. We find that in the real environment, teachers' TPACK develops in the conflict between the real environment (social environment and classroom environment). Therefore, it is necessary to investigate teachers' TPACK in the real environment.

In this social context, in the activity system of teacher I-TPACK professional development, the subject (teacher) solves the problems between it and the tools (such as HK, XK, TB, PCK,I-TK, etc.).

/ contradiction, so as to deal with the object (own "comprehensive intelligent technology subject teaching knowledge").

An improved Comprehensive Knowledge of Subject teaching.

I-TPACK') to optimize and improve instruction based on integrated knowledge of AI technologies, teaching methods, content, learners, and situations.

In this study, teachers put forward various opinions to technical consulting experts, and expressed their own views and some aspects.

If the tension between the I-TPACK elements can be resolved, the I-TPACK level can be improved by improving the relationship between the elements.

Firstly, the unorganized interview notes are organized and encoded openly for the first time. Label 17 nouns among 28 high-frequency keywords and use them as concept text to form corresponding relationships with the five basic elements in I-TPACK. The corresponding relationships are as follows (word frequency in parentheses):

(XK) Environmental knowledge: In school (557), in class (195).

Knowledge of Students: Students (893).

(CK): 255 for resources, 145 for English, 135 for topics.

(PK) Teaching methods: Teacher 854, Assignment 426, Teacher 308, Exam 209, Question 188, Score 181, rating 175, Classroom 167.

(I) -TK (I-TK): Features 336, Account 209, Platform 204, Report 190, Shelf 141).

5 Conclusion

This paper gives systematic and targeted answers to the five questions in the previous study. First of all, I-TPACK is analyzed theoretically, and I-TPACK is analyzed.

The basic architecture of I-TPACK system is given. Based on Delphi method, factor analysis and structural equation, the structural model of I-TPACK was established, and its components were characterized and measured. On this basis, this study takes "actigraphy" and "grounded science" as the basis, takes the community as the background, and uses the constructed knowledge model of "interactive science" to achieve the expression and measurement of interactive science within the community. Through class observation and data mining, I-TPACK was established.

The experimental model, in intelligent teaching, completes the characterization and measurement of I-TPACK.

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