



Design of Information Teaching System Platform for University Teachers from TPACK Perspective

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Abstract. From the perspective of information technology, this paper analyzes the development of teachers' and students' competency in TPACK The potential direction of development path. Then, from the perspective of TPACK, combined with the existing problems and development path of University Teachers' information teaching ability, this paper constructs a targeted and systematic development model of University Teachers' information teaching ability. Compared with these problems, this development mode can be realized. In the development mode, it puts forward the specific implementation content and method, in order to provide reference for the development of University Teachers' information ability and the construction of University Teachers' team, and establish the design of University Teachers' information teaching system platform.

Keywords: College teachers · Information teaching ability · TPACK

1 Introduction

1.1 Analysis of College Teachers' Information Teaching Ability Based on TPACK

The knowledge of subject teaching method integrating technology is the necessary knowledge for teachers to combine technology with specific subject teaching, which can be used to guide the analysis of University Teachers' information-based teaching ability structure [1]. TPACK knowledge framework includes three basic elements: TK, PK and CK, and four composite elements: TCK, TPK, PCK and TPCK.

For technology, Koehler and Mishra point out that the technology here includes traditional technology and digital technology. Technical knowledge is not unchangeable. With the development of the times, technical knowledge will be constantly updated. Keeping pace with the times is a typical feature of technical knowledge. According to this knowledge, we can get the specific requirements of teachers to master the application of traditional technology and information technology ability, information technology teaching ability is mainly the ability of information technology. For example, teachers can master the courseware making methods and tools, master the use of multimedia equipment, and use the network to search for materials.

1.2 Analysis of the Standard of Educational Technology Ability for Primary and Secondary School Teachers

There is no uniform document about the standard of College Teachers' information-based teaching ability. Since educational technology ability is the upper concept of information-based teaching ability, we can refer to educational technology ability to guide the analysis of information-based teaching ability structure. For primary and secondary school teachers, the Ministry of Education promulgated the standard of educational technology ability for primary and secondary school teachers in 2004 [2–4]. The standard specifically describes the teaching staff, management personnel and technical personnel. We mainly analyze the educational technology ability standard of teaching staff. The standard points out that the educational technology ability standard of teaching staff includes four modules, namely consciousness and attitude, knowledge and skills, application and innovation, and social responsibility. Under the first mock exam, there are two levels of indicators under each module. Each index has specific criteria for refinement, and specific capacity requirements are proposed. The educational technology capability indicators of primary school and middle school teachers are systematically and comprehensively defined. Through the specific analysis, we can find that “consciousness and attitude” and “social responsibility” belong to the emotional category, some overlap, and can be integrated.

2 Key Technology of Application

2.1 Wechat Public Account

WeChat public platform is a platform for Tencent Inc to provide services to users. The public platform interface is the basis of services. Developers apply and create public numbers on the website, and get permission to explain the WeChat official account on the WeChat public platform, according to the interface document, which helps developers to develop their needs [5, 6]. Through this account, developers can achieve all-round interactive communication with designated people in text, multimedia and other aspects on wechat platform. It has formed a mainstream mobile communication mode.

2.2 Development Interface

2.2.1 Get Interface

Calling credential interface (1) gets the only credential for access token: user application and official account number. When calling the interface to function, the official account must call access token. For security reasons, access token has only 2 h of validity, refreshing every other time, and the newly acquired access token will cause the old failure. The public number uses appid and appsecret to call the interface to get access token. The three parameters that must be input are grant type, appid and type respectively, for obtaining the official account of the customer [7]. Appid represents the unique certificate of the third party, and secret is the secret key of the third party. Usually, it sends the data in JON format to the official account access token ACCESS TOKEN “expires in”: 720012)

obtaining the official account of WeChat server IP: is considered in the network security and other factors, and needs to get the list of IP addresses of WeChat servers, so as to facilitate the restriction of them.

2.2.2 Receive Event Push

When the official account is exchanged with WeChat users, some operations of the user cause the server to inform the developer server I by way of event delivery, and then get the message. However, whether a developer replies to a message depends on the event description of the push message. Receiving push messages includes cancel and follow events, custom menu events (click menu to pull messages and jump link push events). Cancel and follow the event: wechat sends this event to the URL written by the developer, which is convenient to send binding or unbinding to the user. It includes five parameters: Tour Name: developer wechat account; from user name: sender account; create time: message creation time; msgtype: message type; event: event type (subscribe and unsubscribe). 2) Custom menu event: when the user clicks the custom menu, the developer will receive the user click event sent by wechat server [8–10]. If the secondary menu can pop up, the above situation will not appear. Send and pull message event: including 6 parameters, tour Name: developer wechat account; from user name: sender account; create time message creation time; msgtype: message type; event: event type; eventkey: event key value. Click the menu to jump to the push event of the link: including 6 parameters, tour Name: developer wechat account, from user name: sender account, create time: message creation time, MSG type: message type.

2.2.3 User Group Management Interface

User group management: the interface implements basic operations such as creating, adding, deleting, modifying, and transferring public platform groups. 1) Create group: one account can create up to 100 groups. There are two parameters: oken: call interface voucher; Name: group name. The return value also has two parameter groups ume: group name. Query grouping: only one parameter, access token: call interface voucher. However, the return value has four parameters: groups: group information table group ID; Name: group name; count: number of users in the group. 3) Query user group: query user group ID according to user ID. There are two parameters in total, access to call interface credentials; openid: user openid. The return value only needs group I, groupid: the group ID of the user. 4) Modify group name: three parameters in total, access token: call interface credential ame group name.

2.3 Data Format

XML technology XML (Extensible Markup Language) is a subset of SGML (Standard Generalized Markup Language). Its purpose is to allow general SGML to be served, received and processed in the way of current HTML on the web, and to design ml as a bridge between HTML with limited functions and SGML with complex standards, and it is easy to implement [11]. XML is regarded as a set of rules based on semantic and syntactic tags, through which the document is divided into several parts. Different from

HTML, it is a meta markup language, and developers define tags according to the actual situation. XML tag describes the structure and meaning of text information.

3 JSON Technology

JSON is a lightweight data exchange format, stored in the array, which is conducive to the data exchange between different languages. The text format is completely unrelated to the programming language. JSON is written in JavaScript. Therefore, JSON is defined in the JavaScript file. Because the data format of JSON is simpler than that of XML, there is no need to consider nodes and other issues, so the transmission efficiency is greatly improved. It will also reduce the compatibility problems caused by XML parsing. So far, JSON has supported many mainstream computer programming languages.

3.1 JSON Sequence Mechanism

All kinds of data are stored in the computer, and the transmission time of data in the network is the longest. Therefore, storing the data in JSON format can avoid the complexity of data conversion, and can be read in many languages. JSON sequence mechanism is divided into forward serialization mechanism and reverse serialization mechanism. Forward serialization mechanism: convert the object stored in the server into JSON format, which is convenient for data transmission to the client [12–14]. If you do not have special permission, you cannot access the data of the instance object. The reverse serialization mechanism is the reverse process of the forward serialization mechanism. It reads the serialized data in the data store and creates a new object. That is to say, after the data in JSON format is parsed by the client, it will be displayed on the web. The combination of forward and backward serialization completes the data transmission in the network. If serialization technology is not used, the client cannot receive the data sent by the server. The purpose of serialization is to store the instance object persistently in a certain format, transfer it between the server and the client, and read the information of the instance object stored in the data cache layer.

3.2 Advantages and Functions of ECS

Compared with physical servers, ECS has incomparable advantages, as follows: (1) disaster recovery backup: each data will save multiple copies, once the original data is damaged, it can be quickly recovered in a short time. Support downtime migration, data snapshot backup and rollback, system performance alarm. It will also enable users to timely alarm when they do not operate the data, so as to avoid losses. (2) Cost saving: according to the needs of the purchase, flexible response to changing business needs. Cloud storage can be flexibly expanded according to the number of users and the storage capacity required. It can start or release 100 ECS instances within 10 min. It supports online bandwidth upgrade without downtime. It can also upgrade CPU and memory within five minutes [15]. At the same time, the enterprise does not need to build an additional platform, and all hardware devices are supported by service providers, thus saving the cost of investment.

4 On the Structure of Information Teaching Ability of University Teachers from the Perspective of TPACK

Through relevant analysis, referring to the connotation of information-based teaching ability, and referring to the opinions of relevant experts, this paper refines the structure of College Teachers' information-based teaching ability from the perspective of TPACK, as shown in Fig. 3.2. The structural model takes information technology as technical support, TPACK knowledge framework as theoretical basis, and information technology as the bottom. The three aspects respectively represent the core elements and basic components of TK, CK and PK, namely technical knowledge, subject content knowledge and teaching method knowledge. The intersection of TK and CK represents TCK, that is, subject content knowledge of integrated technology. Similarly, the intersection of CK and PK represents the PCK formed by the integration of PK and CK, that is, subject pedagogy knowledge. The intersection of TK and PK is TPK, which is the teaching method knowledge of integrated technology. The vertex of the model is the intersection of TK, CK and PK, which is the fusion TPACK of the three, that is, the subject teaching method knowledge of integrated technology [16]. TK, CK, PK and information technology support each other and form a TPACK perspective of University Teachers' information teaching ability structure.

The structure is divided into five layers from bottom to top: attitude and responsibility, foundation and skills, design and development, application and evaluation, integration and innovation. Each module is the fusion of TK, PK and CK, based on these three elements, but each module has its own emphasis [17]. The structure changes step by step from bottom to top, from low to high capacity, and the ability requirements are gradually improved.

5 University Education Informatization Based on Cloud Model Data Mining Algorithm

Among these massive data, there are some dynamic data which have special requirements for the calculation process of judgment criteria, which has higher requirements for the environment of data mining. Data mining is to mine useful information from massive data, find the relationship between data, and promote the application and transmission

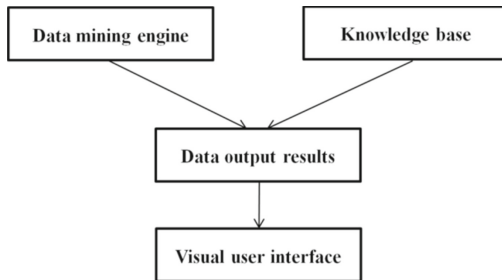


Fig. 1. Cloud model data mining algorithm calculation process

of information. The calculation process of cloud model data mining algorithm is shown in Fig. 1.

In the case of known first mining probability and class conditional probability, the classification result of data samples to be mined depends on all samples in each category. Let the sample set of data mining have m class, which is recorded as $C = \{c_1 \dots c_i \dots c_M\}$. The first mining probability of each class is $P(c_i)$.

$$P\left(\frac{c_i}{x}\right) = p\left(\frac{c_i}{x}\right) \cdot \frac{P(c_i)}{P(x)} \quad (1)$$

In all the teaching platforms, we use TPACK to design the teaching platform, as shown in Fig. 2. In this cloud teaching platform, we mainly have the following functions: teaching project and process, how much time is spent, and the error rate of students in this class. These are displayed in the form of curves, which can not only more intuitively see the learning situation of students, but also more intuitively know whether the class is successful or not [18]. If students do not understand in the process of class, they can also suspend real-time learning. In this way, students can achieve the best teaching effect in the shortest time.

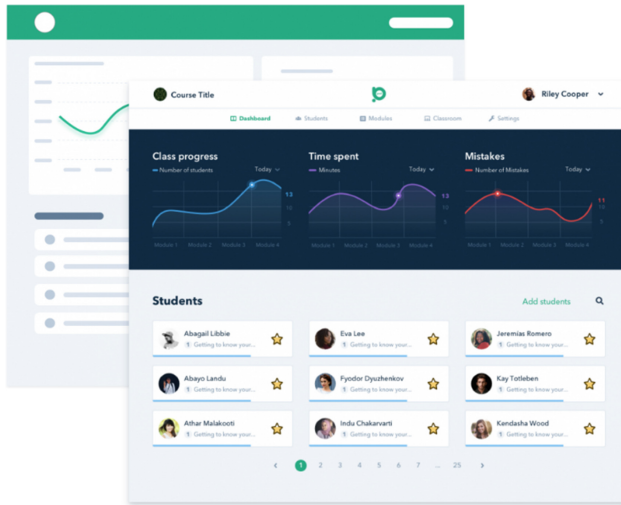


Fig. 2. Cloud teaching platform

6 System Design of University Teachers' Information Teaching Ability Structure from TPACK Perspective

Next, we make a detailed analysis of the various levels of University Teachers' information-based teaching ability structure from the perspective of TPACK. From the perspective of TPACK, University Teachers' information-based teaching ability structure

is constructed under the core guidance of TPACK knowledge framework. Each level is the integration of TK, CK and PK, and covers TCK, PCK and TPK composite elements [19]. Combined with relevant standards, it is divided into attitude and responsibility, foundation and skills, design and development, application and evaluation, integration and innovation from bottom to top. The level of ability is constantly increasing, and the requirements for teachers are also gradually improved. Each capability level has specific capability index. In the two levels of application and evaluation, integration and innovation, each capability index is divided into different ability requirements, including basic requirements, advanced requirements and objective requirements, which further refines the ability. Next, we analyze and interpret the specific indicators of University Teachers' information-based teaching ability structure from the perspective of TPACK.

6.1 Information Teaching Design

In the information environment, college teachers can determine and write teaching objectives according to the curriculum standards, and master the compiling methods of common teaching objectives. Be able to analyze and process the teaching materials, determine the teaching content, and clarify the key and difficult points of teaching. It can analyze the characteristics of learners, select appropriate teaching strategies according to teaching content and learner characteristics, select teaching media according to teaching needs and students' needs, help learners improve learning efficiency, design teaching structure in information environment, complete teaching scheme in information environment, and combine with new mode in information environment. Such as flipped classroom, blended teaching, project-based learning, innovative teaching design, restore the essence of learning, optimize teaching, improve learners' ability, and help learners to improve their core literacy.

6.2 Resource Design and Development

In the information-based teaching environment, college teachers can design and develop teaching resources according to the teaching content and teaching objectives. For example, college teachers can develop multimedia courseware and learning website according to the characteristics of learners, complete the teaching design of micro class, complete the development of micro class and other resources, and can modify and update the resources, it is helpful to improve the learning interest and learning efficiency of learners. Teaching evaluation is the evaluation of students' learning process, learning method and learning effect, which can be divided into process evaluation and summative evaluation. In the information environment, on the basic requirements, college teachers can use technical means to collect data and evaluate students. In the advanced requirements, college teachers can complete process evaluation and summative evaluation according to students' learning characteristics and learning content, and provide feedback for teaching [20, 21]. In terms of objectives and requirements, college teachers can integrate technology with classroom teaching, establish electronic portfolio for students, comprehensively record the learning situation of learners, and provide comprehensive evaluation for students.

The specific teaching effect simulation is shown in Fig. 3. From Fig. 3, we can see that both students' satisfaction and recommendation have achieved good results. From another aspect, we can see that our teaching platform has achieved satisfactory results.

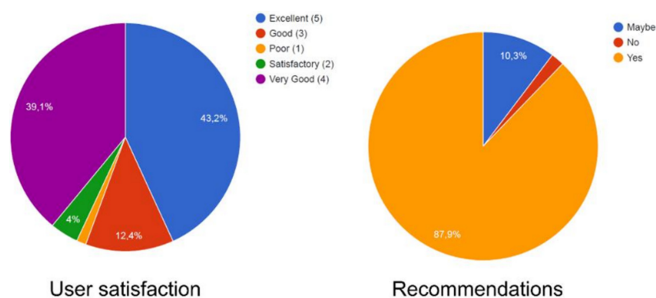


Fig. 3. Student satisfaction survey

7 Conclusion and Prospect

Based on TPACK knowledge framework, combined with the analysis of relevant competency standards, this paper analyzes the structure of College Teachers' information-based teaching ability from the perspective of TPACK, and compiles the questionnaire of College Teachers' information-based teaching ability, and conducts a survey on students respectively to understand the status quo of teachers' ability from the third perspective, and fills in the questionnaire through expert lectures, From the perspective of experts to understand its development status, and interviews with some university teachers, from the first perspective to understand the status of information-based teaching ability training and teachers' subjective needs. Then through data analysis to understand the current situation of the development of University Teachers' information ability [22–24]. Through the analysis, it is found that college teachers have strong awareness of information-based teaching, good mastery of basic subject knowledge and skills, but in actual teaching, teaching methods are relatively simple, resource development ability is weak, teaching evaluation ability needs to be strengthened, and innovation ability is not enough.

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