



Development History and Theoretical Basis of Distance Education

A Discussion on Teachers' Information Literacy Based on the TPACK Model

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Abstract. With the development of modern science and technology, a new type of learning community has emerged, that is, the practical learning community constructed on the platform of network. This community is not limited by time, space, professional age and other factors. Members voluntarily participate in discussions, share information with each other, and build a new learning method with the network as the carrier, which is the connotation of distance education. The research on TPACK will help to improve teachers' ability to master and use information technology, and teachers' TPACK ability is an essential ability for teachers in the future.

Keywords: Distance education · Constructivism · Learning communities · TPACK model · Teachers' information literacy

1 Introduction

Distance education, also known as on-line education, refers to non-face-to-face education in which students and teachers, students and educational institutions mainly use various media means for communication and systematic teaching (Moore 1973). The origin of distance education can be traced back to correspondence education in the mid-19th century. Distance education teaching can be divided into independent learning based on behavior and cognition, meaning construction learning and group learning based on constructivism. According to the survey report on the current situation of online learning in American higher education in 2009, more than 4.6 million students have studied at least one online course since the fall semester of 2008, and at present, more than 25% of college students have studied at least one online course. 73% of colleges reported that online courses and majors are more popular than before.

2 The Development Process of Distance Education

In the development of distance education, it has gone through several stages. As shown in Table 1, the 1st generation of distance education, based on printing technology, and

Table 1. The Development of Distance Education

Development Stages	Emergence Period	Technical Basics	Main Media	Main Education Form
The 1st generation	The mid-19th century	Printing Technology	Correspondence printing materials	Correspondence Education
The 2nd generation	The early 20th century	Electronic and communication technology for one-way transmission	Radio, television, audio, video, CD-ROM	Radio and Television University
The 3rd generation	The end of the 20th century	Two-way interactive electronic and communication technology	Computer multimedia, computer network, two-way TV, etc.	Network College, Virtual University

developed correspondence education by printing teaching materials by correspondence; The 2nd generation of distance education began in the early 20th century, based on one-way transmission of electronic technologies, and taught through radio, television, audio recording, video recording and CD-ROM. In this development stage, radio and TV universities are mainly the mainstream teaching form; The 3rd generation of distance education started at the end of the 20th century, with two-way interactive electronic and communication technologies as its technical basis, computer multimedia, computer network as its main media, and mainly developed network colleges and virtual universities.

3 Features of Distance Education

Distance education is a systematic and organized form of self-study, in which students' consultation, preparation of learning materials and assurance and supervision of students' grades are all undertaken by a group of teachers. Every member of this group has a high sense of responsibility. It is possible to eliminate distance through media means, which can cover a long distance (Dohmen 1967). From another perspective, distance education is also a method of imparting knowledge, skills and attitudes, which is rationalized by the application of the principles of division of labor and organization and the extensive use of technical media. In particular, the reproduction of high-quality teaching materials aims to make it possible to teach a large number of students at the same time and where they live. This is an industrialized form of teaching and learning (Peters 1973).

Some scholars put forward the characteristics of distance education from the interactive process of distance education. It is considered that distance education is a field that education strives to open up, and students and teachers are in a quasi-permanent separation state during the whole learning period; Students and learning groups are also in a quasi-permanent separation state during the whole learning period; Technical media



Fig. 1. The continuum of e-learning in formal education

have replaced conventional, oral and interpersonal communication based on collective learning; Students and teachers have two-way communication. It is an industrialized educational process [3]. Tony Bates (2005) described the continuum of online learning in formal education, which formed a continuum of online learning from “face-to-face teaching”, “class-room aids”, “face-to-face + e-learning (mixed mode)”, to “distance education” (Fig. 1) [8].

3.1 Characteristics of Distance Education Activities

Distance teaching activities based on distance education technology have four characteristics: separation of teaching behavior, asynchronous teaching time, medium technology as intermediary and indirect teaching control [1]. The advantages of distance education activities mainly include three aspects: (1) two-way interaction. Dynamic real-time interaction between information resources and users, users and users. Students can ask questions about the teaching content at any time in the teaching process, and teachers can also give guidance in real time. (2) Content representation based on multimedia. Large information capacity, fast data update, multi-directional demonstration and vivid simulation. Teachers can use multimedia to show teaching scenes according to the needs of teaching content, so as to help students better understand the teaching content. (3) Individualized teaching. Using database management technology and two-way interactive function, students’ status information and learning process are tracked and recorded, and personalized learning guidance is carried out. This kind of personalized teaching is conducive to individual guidance, tracking the situation of each student, and can better understand the learning situation of students and get feedback.

On the design principle of distance education activities, Dale created “Cone of Experience” in 1946. In the second half of 1930s, radio broadcasting, audio movies and tape recorders were used in education one after another. People felt that the name of visual education could not summarize the existing practice, and began to use the terms of audio-visual education in their articles. In 1947, the Visual Education Branch of American Education Association was renamed Audiovisual Teaching Branch. Among many researches on audio-visual education, the representative one is “Audio-visual Methods in Teaching” written by American educator Dale in 1946. The “Tower of Experience” theory put forward in this book became the main theoretical basis of audio-visual education at that time and later. Dell divides the experience gained by people into three categories: the experience of doing, the experience of observing and the experience of abstracting, and divides the methods of acquiring these three categories of experience into ten categories. One is about “doing experience”. The three levels located in the tower base all contain personal “activities”. In these three ways, learners are not only

bystanders of activities, but also participants of activities, so they are called doing experiences. So what you get is the experience of doing it directly. Among them, “doing experience” can be divided into three categories: (1) direct and purposeful experience. It refers to the experience gained by direct contact with real things, and it is the richest concrete experience gained by direct perception of real things. (2) Design experience. Refers to the experience gained by learning indirect materials such as models and specimens. Models and specimens are artificially designed and imitated things, which are different from the size and complexity of real things. They are “real adaptations”, which can make people understand and understand real things more easily. (3) Experience in acting. Assuming students to play a role in a play so that they can gain experience in as realistic a situation as possible. Through acting, acting, feeling emotional and conceptual experiences that cannot be obtained under normal circumstances. Second, the experience of “observation”. The experience of observation includes five levels: (1) observation and demonstration. By watching how others do it, students can know how to make a thing, and then they can imitate it. (2) Trainee travel. Refers to the study trip in the wild, seeing real things and various sights, and gaining experience. (3) Visit the exhibition. By visiting exhibitions, students can gain experience through observation. (4) Film and television. It refers to the experience gained by watching movies and TV. Things on the screen are the representatives of actual things, not themselves. By watching movies and TV, we get alternative experience. (5) Broadcasts, recordings, photographs, slides. It refers to the acquisition of experience by hearing or vision, which is higher in abstraction than movies and television. The third is “abstract” experience. Abstract experience includes two levels: (1) visual symbols. It mainly refers to abstract symbols such as charts and maps that express certain meanings. They can no longer see the real form of things and are abstract representatives. For example, curves on the map represent rivers and lines represent railways. (2) Speech symbols. Including oral language and written language (written symbols), it is an abstract representation of things or symbols of ideas.

To sum up, Dell summarized the main points of the “Tower of Experience” theory into the following six aspects: (1) The experience at the bottom of the tower is the most concrete, and the higher it rises, the more abstract it becomes. But it is not to say that any experience must go through the ladder from the bottom to the top, nor is it to say that the experience at the bottom is more useful than the experience at the top. Hierarchy is only to help explain the concrete or abstract degree of various experiences. (2) Education and teaching should start with concrete experience and gradually advance to abstraction. An effective way of learning should be full of concrete experience. The greatest failure of education and teaching is to make students remember many common laws and concepts without concrete experience as their pillar. (3) Education and teaching should not stop at concrete experience, but develop to abstraction and universality, and form concepts. Concept can be used for reasoning and is the most economical thinking tool, which greatly simplifies and economizes the process of people’s search for knowledge. (4) Various teaching media should be used in school teaching, which can make learning more concrete and create conditions for abstract generalization. (5) The audio-visual teaching materials and audio-visual experiences located in the middle of the “tower” are more concrete and vivid than the speech and visual symbols at the upper level, and can break through the limitation of time and space and make up for the shortcomings of

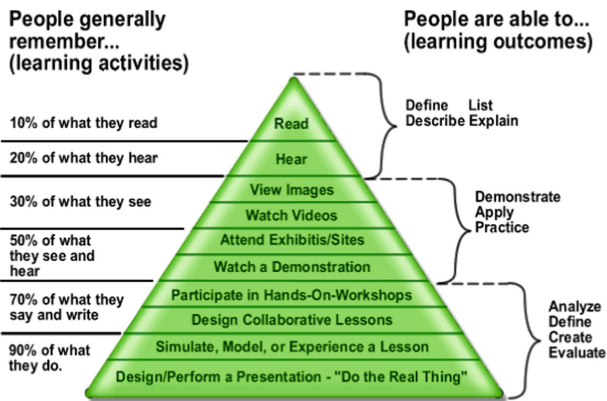


Fig. 2. Dale's Cone of Experience Concept

various direct experience methods at the lower level. (6) If teaching is too specific, it is not to reach a more general full understanding, but now this danger is only theoretical, because people have not yet achieved the specific degree of teaching (Fig. 2).

3.2 Characteristics of Information-Based Teaching Environment

There are three main teaching environments in distance education. First, the curriculum teaching platform, such as Blackboard, Moodle, Claroline and LAMS. Second, teachers' professional development platforms, such as network collective lesson preparation platform, network teaching and research platform and teacher training platform. Third, the platform of sharing teaching resources. Including subject teaching resource library, public service platform of teaching resources and "national public service platform of educational resources" [7]. Mainly with the help of Web2.0 and other tools, the specific ways are forums, blogs, WeChat and so on. The software environment of distance education should be discussed according to the situation. Network course teaching platform is a comprehensive software system based on network architecture, which is the technical core of supporting network teaching environment and can comprehensively support teachers' teaching and students' learning under the network teaching environment. It has the basic functions of presenting and transmitting teaching content, organizing teaching content and activities, cooperating and communicating, tracking and evaluating learning activities, etc. At present, the typical online course teaching platforms in China are Blackboard, Moodle, Sakai and so on. In addition, Web2.0 learning community is characterized by openness, sharing and decentralization, which provides learners with a learning and communication environment across time and space. It has the characteristics of breaking through the limitation of time and space and having good interactivity. Web2.0 technology mainly includes: Blog, RSS, Wiki, Web Pick, SNS, P2P, Instant Message (IM) and so on. Secondly, distance collaborative learning is a network-based learning research method, students can complete common learning tasks through the network platform, in which each person has a clear division of responsibilities for mutual learning. It has the characteristics of remote cooperation and mutual evaluation. Finally, the subject

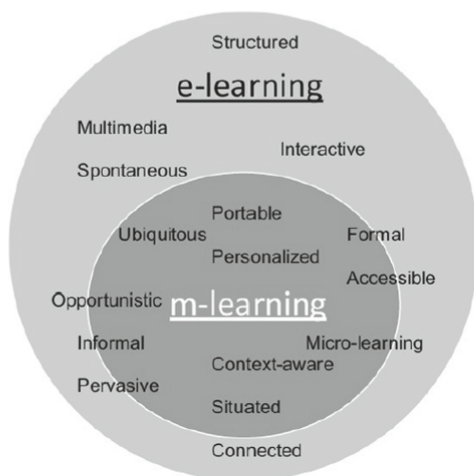


Fig. 3. The features of e-learning and m-learning

resource library is the media materials, test papers, courseware, teaching cases, literature materials, online courses, frequently asked questions, resource directory index and website links related to majors.

3.3 Means of Distance Education

As for the realization means of distance education, e-learning, mobile learning (hereinafter referred to as “m-learning”) and distance learning are three important ways with high correlation. Among them, e-learning includes m-learning, while distance learning is related to e-learning [5]. In addition, Moore also summarized the characteristics of e-learning and m-learning (Fig. 3). Specifically, e-learning has the characteristics of structured, Spontaneous, Interactive and so on, which m-learning does not have. M-learning and e-learning share the characteristics of Portable, Personalized, Formal, Accessible, Micro-learning, Opportunistic, Ubiquitous, Situated and so on. According to the empirical research, using distance teaching mode, especially the multi-terminal distance education classroom mode, is helpful to increase the learning interest of learners from different regions and cultures. But at the same time, the frequency of interaction between teachers and learners decreases with the increase of terminals (Akagura ed. 2006).

4 Theoretical Basis of Distance Education

The theoretical basis of distance education mainly includes constructivism theory and group dynamics theory.

Firstly, constructivism has experienced the development of genetic cognition theory, cognitive learning theory and related development in schools and teaching fields. The common point of these theories lies in discovering the cognitive law of human learning process, emphasizing learners’ own active construction, and students’ acquisition of

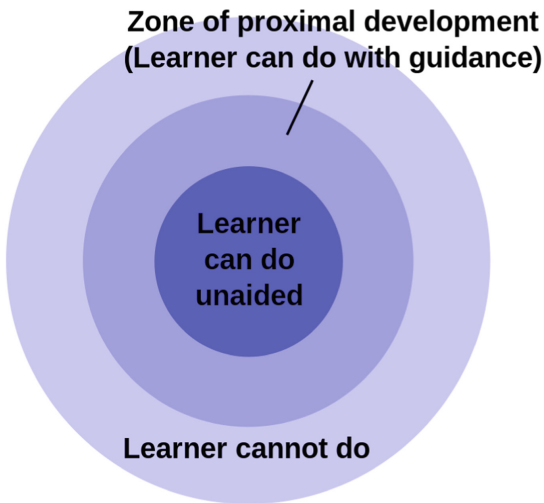


Fig. 4. Vygotsky's zone of proximal development

knowledge depends on themselves to discover, explore and form their own knowledge framework. In this process, the role of teachers has changed from instilling knowledge to guiding. The advantages of constructivism have become increasingly prominent, and it has been applied to the instructional design of constructivist learning environment based on multimedia and Internet. Constructivist view of knowledge holds that: (1) Knowledge is not an objective and pure reflection of the real world. (2) Knowledge is not an unmistakable law that generalizes the world. (3) Knowledge is formed by learners' summarization of their own experiences [2]. Another constructivist view of learning holds that learning is to consciously identify and deal with the phenomena in the objective world on the basis of one's own experience and knowledge, rather than mechanical passive acceptance (Fig. 4). After the repetition and interaction of old and new knowledge, learners reinterpret the new knowledge and form a new knowledge system. Learners construct the connection with the surrounding experience world through cognitive style, and constantly tap their own potential from their own existing experience to realize the construction of learning meaning, which is also called "zone of proximal development" [4].

To explain distance education with constructivism, we must consider the role orientation of teachers and students from the perspective of constructivism. Constructivist learning theory advocates student-centered learning under the guidance of teachers. That is, students are active constructors of knowledge. This requires students to discover, collect and analyze a large amount of data in the learning process. Teachers should strive to create suitable teaching situations, and change from indoctrinators to collaborators and instructors. The teacher-student relationship under constructivism theory is not the traditional relationship between giving and receiving. Besides the role orientation of teachers and students, we must also consider the learning environment of constructivism, which has four main characteristics: situation, cooperation, conversation and meaning construction (Jonassen 1991).

In addition, constructivism is highly consistent with the purpose of distance education and is the theoretical basis of distance education, which can be summarized as follows: First, distance education is student-centered learning, and students are the main body of information processing and the initiative of meaning construction. Second, distance education emphasizes the importance of situation, and learners provide the same vivid and rich learning situation as the actual situation. Third, distance education not only emphasizes situation, but also pays attention to the key role of collaborative learning in meaning construction. In the virtual learning community formed by distance education, managers provide learners with various possibilities for collaboration. Fourth, distance education emphasizes the design of learning environment. Learners use information exchange tools such as blogs, group discussion areas, instant messages and information resources such as documents, databases, multimedia courseware and network libraries to learn independently and cooperatively.

5 Teachers' Information Literacy Under TPACK Model

TPACK (Technical Pedagogical Content Knowledge) was put forward by American scholars Koehler and Mishra. Since 2005, scholars at home and abroad have carried out a lot of theoretical and practical research on TPACK. Through the research, everyone agrees that the research on TPACK will help improve teachers' ability to master and use information technology. Distance education, which takes network as its environment and technology as its support, must put forward higher requirements for teachers' literacy. Teachers, as instructors of teaching activities, must carefully design the learning environment in order to effectively promote learners' learning process. As shown in Fig. 5, TPACK framework contains three core elements, namely, subject content knowledge (CK), pedagogical knowledge (PK) and technical knowledge (TK); There are four compound elements, namely, subject teaching knowledge (PCK), subject content knowledge integrating technology (TCK), teaching method knowledge integrating technology (TPK) and subject teaching knowledge integrating technology (TPACK).

With regard to teachers' literacy in the information age, some scholars put forward a framework for the integration of information technology and classroom teaching-TPACK development level model based on the observation of front-line teachers and the innovation promotion model of E.M. Rogers. The model holds that (1) cognition (knowledge): teachers can use technology and realize that they can combine technology with subject teaching content, but they cannot integrate technology in subject teaching; (2) Acceptance (persuasion): Teachers agree or disagree with the use of appropriate techniques in teaching; (3) Adaptation (decision-making): teachers participate in some activities, from which teachers begin to accept or refuse to use appropriate technologies in teaching; (4) Exploration (implementation): Teachers actively use appropriate techniques in subject teaching; (5) Promotion (confirmation): Teachers evaluate the effect of integrating appropriate technologies in the teaching and learning of disciplines.

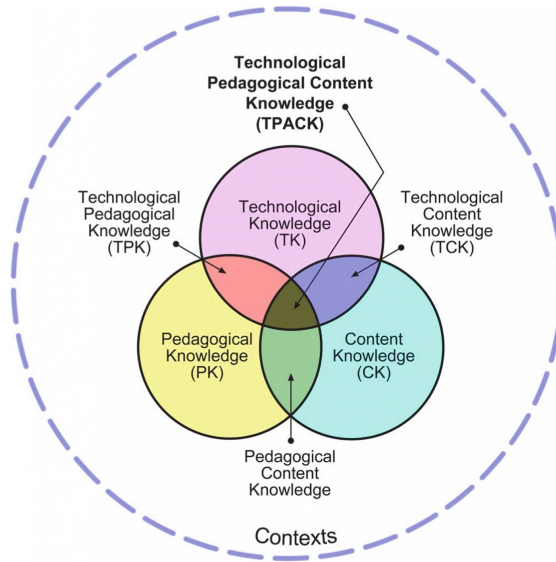


Fig. 5. The contexts of TPACK

6 Conclusion

The three functions of education are inheritance, awakening and empowerment. Teaching in the information age is to use remote technology to transform the knowledge, methods and laws that human beings have mastered into technologies, tools and software [6]. However, it must be noted that any technology has its limitations, and distance education cannot be completely offline, especially in some courses that need offline interaction. Learning in the information age should realize the transformation from resources to knowledge, including resource knowledge, knowledge systematization and personalized supply, and seek and learn knowledge from resources to sublimate personalized learning guided by knowledge system. Distance education is a systematic and organized form of self-study, in which students' consultation, preparation of learning materials and assurance and supervision of students' grades are all undertaken by a group of teachers. In this mode, teachers must have information literacy and basic understanding of distance education theory, so as to adapt to the future development trend of distance education.

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