Online-Teaching Space Design Based on the Flow Theory

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Abstract

The development of educational information technology makes the construction and application of online teaching space more and more common. As a field and assistant system, the essential requirement of online-teaching space is to ensure that learners can continuously engage in learning. The goal of the application of flow theory in teaching is to stimulate learners' flow experience, so as to improve the learning effect and achieve the learning goal. Starting from the design of online teaching based on flow theory, this paper puts forward the design requirements and principles of its teaching links, including the analysis of individual chemical situation, hierarchical and classified teaching objectives and tasks, multi scene teaching links and teaching improvement, and then puts forward the corresponding online teaching space framework. This paper argues that online teaching space should be composed of intelligent guidance system, teaching support system, situational intervention system and flow support system. Under such conditions, teaching space is more conducive to the implementation of online instructional design based on flow theory, and can help space constructors and participants achieve continuous improvement of teaching effect.

Keywords: *Flow Theory; Online Teaching Space； Space Design; Space Composition*

I. Background

Teaching space refers to the field in which teaching activities are implemented, aims to provide learners with guidance, aids and intervention while learning. With the rapid development of educational information technology, the connotation of teaching space has been expanding from the traditional physical space to online space, forming a large amount of virtual space based on the technology concept of "Internet plus", that is, online teaching space. The change of teaching space has brought about all-round changes in teaching concepts, teaching behaviors and teaching methods[1]. The innovation booming in teaching models such as MOOC and SPOC have become a symbol of the wide application of online teaching space.

Under the background of corona-virus pandemic, which separated teachers and students in physical space, online teaching space is an important guarantee for the smooth implementation of online teaching. It is characterized as being breaking through limitation of time and space, and being helpful to create diversified teaching scenarios. It can integrate with traditional physical teaching space, and also can be an independent carrier of teaching and learning. For example, Wang Xing and other teachers, based on the concept of space, constructed a teaching mode of flipped classroom teaching space composed of physical, psychological, social and virtual space in the course “Modern Educational Technology”, and has achieved good teaching results by using online and offline integration teaching mode[2]. The cross-border VR teaching experience in Zhejiang University also shows that distance teaching can connect students in different environments on the Internet by constructing virtual learning scenario, real classroom scenario and video conference scenario. Compared with the traditional physical teaching space, it is easier to arouse students ’interest and enthusiasm in learning, and to promote the communication and cooperation

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between students and teachers[3]. Online teaching space ensures the change of teaching from being closed to open, and it is easier to realize the spatial transformation from teaching-centered to learning-centered[4]. On this basis, new models such as the learner-centered autonomous learning, and guided learning can be effectively applied.

However, compared with offline traditional physical teaching space, online teaching space still has some deficiencies in learning scenes, teacher-student interaction and group involvement. For example, the virtual nature of online teaching media can easily lead to the separation between the teachers, learners and the real world, resulting in a sense of loneliness, reducing the degree of attention and participation, making it difficult to maintain students' interest in learning, which is not conducive to their deeper understanding of knowledge. At the same time, it also requires that learners should have a high degree of independence, and also persistence in continuous learning and other quality[5]. Therefore, how to construct online teaching space scientifically and reasonably, and offer learners good online learning experience utilizing effective teaching methods, is the key to helping learners to apply online teaching space for continuous learning.

II. Flow Theory and Online-Teaching

The essential requirement of the construction of teaching space is to ensure that learners could commit to learning continuously and sedulously in the space, so as to help to achieve the teaching objectives. In the year 1975, Csikszentmihalyi, professor of psychology at the University of Chicago in the United States, first proposed the concept of flow, explaining why people are fully involved in certain activities and enter a "flow" state. After the emergence of the Internet, users' behavior and flow experience in the network environment are considered as a new "flow" state, which includes seamless response supported by human-computer interaction, inner pleasure, loss of self-consciousness and self enhancement[6]. Later on, the flow theory is widely applied and studied in sports, leisure, teaching and other fields. As a kind of positive psychology, mental flow can be used in the field of education to increase the function of education and teaching, to shape the positive quality of people, and to tap the inner human interest and motivation.

The state of flow experience consists of three stages and nine dimensions. That is to say, in the antecedent stage, there should be clear goals, clear feedback, and the balance between challenges and skills; in the experiencing stage, we should focus on the activities we are engaged in, the sense of potential control, and the integration of behavior and perception; in the final effectiveness stage, we should include the loss of self-awareness, the sense of time distortion, and the experience for our own purposes. In the network environment, users' behavior can be categorized into task oriented and experience oriented. Although flow experience may occur in both task-oriented and experiential activities, it is more likely to appear in task-oriented activities[7]. This shows that the flow experience of learning can occur in the model with learners' autonomic learning as the core, as well as the model of guidance teaching with communication as the core, in the process of online teaching. The research shows that in online teaching, learners who enter into the "flow" state have stronger learning interest and more sustained willingness, and have better learning sustained willingness and satisfaction.

Wang Wei's research shows that the important factors affecting online learners' flow experience are the balance of skills and challenges, clear goals, timely feedback and sense of immediacy[8]. Among them, the sense of immediacy means that online teaching space can bring to learners a feeling of learning in physical classroom rather than in a virtual classroom. Immediacy helps to maintain learners' satisfaction with the learning process and consequences, also helps to keep a positive attitude towards the teaching platform. This conclusion is a corroboration with previous studies on the reduction of learning participation caused by virtual online teaching space. Therefore, Wang Wei[7] and other researchers also suggested that learners should gradually clarify their learning objectives, adapt to the virtual learning environment, cultivate online learning habits, and improve their learning ability in the virtual environment. Cai Chen took the English listening and speaking course as an example, tried to form a learning cycle using the online and offline integrated teaching mode, so that learners can judge and

execute in the learning process, and they feel happy and satisfied via teaching feedback[9]. Thus, learners are more willing to spend time in this learning cycle, and then achieve the teaching goals or specific learning achievements set by the software. This model is designed by categorized guidance, which guides learners from different starting points to have different learning contents, and satisfies learners' personalized learning needs. Meanwhile, it provides learners with a real language social context through role-plays and other activities, offers learners incentives for learning results, and finally effectively stimulates and maintains learners' learning motivation and willingness to consistent learning.

From the present researches, the learning "flow" experience state puts forward new requirements for the teaching content organization, method application and teaching space construction of online teaching. First of all, it is necessary to meet the individual needs of learners according to their personal characteristics. When learning tasks and challenges do not match with learners themselves, mental flow cannot be realized. This requires the categorized teaching standards in teaching design, and provides various guidance in the teaching space. Secondly, continuous learning feedback is not only the motivation of learners' continuous learning, but also the important basis for teachers to understand the learning dynamic situation. In the traditional teaching space, classroom interaction, assignments, tests and so on form the continuous feedback of teaching, while online teaching space needs to use more abundant content and forms to strengthen the feedback. Third, the establishment of online teaching sense of immediacy. Through the creation and application of a variety of teaching scenarios, learners can get a sense of existence from teachers or other learners, and then actively participate in classroom interaction, communication and other teaching activities. Online teaching space should have the function of supporting the creation and implementation of diverse teaching scenarios[10]. Therefore, the flow experience is expected to work through the whole process of teaching. It is necessary to deeply investigate the root of flow in online teaching, so as to design the corresponding online teaching and teaching space.

III. Requirements of Online Teaching Designing Based on the Flow Theory

Teaching design is the standardized plan of course teaching. The two bases of teaching design are the requirements of course standards and the characteristics of teaching objects, that is, students' analysis. In the teaching plan, the teaching objectives, key points and difficulties, teaching methods and teaching steps should be clarified. In addition to course standards and teaching objects, in the online teaching, online teaching space must also be taken into account, that is, the relationship between online teaching space and space construction, application and participants. For example, as end-users of the teaching space, students' level of using the functions of online teaching space would determine the teaching effectiveness. Teachers would be more efficient in the process of classroom test implementation and guidance using the online teaching platform.

The design of online teaching based on the theory of flow has higher requirements on learning dimension of the students. In order to generate flow experience, students must first meet the conditions of flow, and corresponding learning objectives and task challenges meeting each student' personalized needs in teaching design should be set. Traditional teaching design is only designed for the average level of most students deal to the limitation from physical space and time, while online teaching space makes teaching design more flexible, but also increases the complexity of teaching design. Secondly, we should design a teaching procedure that can maintain continuous learning. In addition to the feedback from classroom interaction, homework, test and other teaching activities, online teaching design should also include a set of learning incentive mechanism with online teaching characteristics, such as feedback on the evaluation of learning materials, feedback on the evaluation of learning results, etc. , by utilizing functions in the online teaching space. Third, online teaching design should strengthen the learners' sense of presence in the teaching process by breaking through the limit of traditional teaching space, and create a variety of virtual situations to meet the requirements of teaching content and teaching methods.

Therefore, online teaching design should completely center with the concept of "learning", and combine the characteristics of online teaching space, so that learners can fully feel the immersion experience, so as to making learners generate the flow situation. The design requirements and principles of teaching steps (as shown in Figure 1) shall generally include:

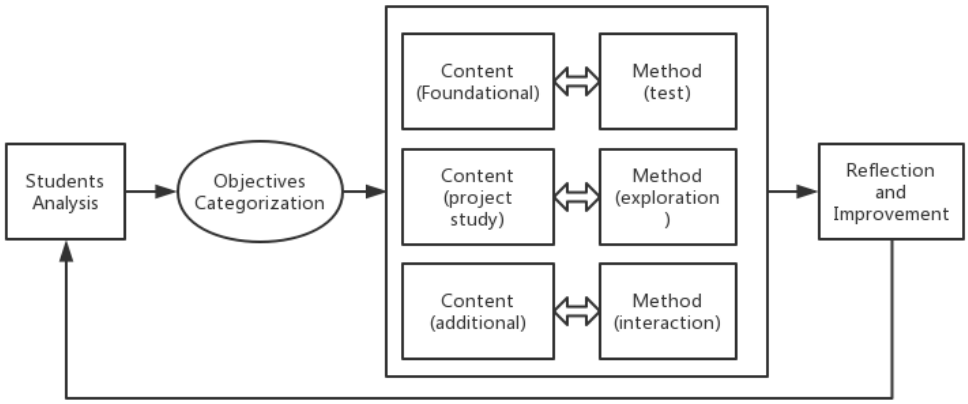

Fig 1: Online Teaching Design Requirements Based on the Theory of Flow

(1). The analysis of students' individual personality. Personalized students' analysis is the basis of online teaching design, and also the fundamental condition to generate flow. The analysis of students in the online teaching design should combine individuality and generality, experience and research, static and dynamic together. In the students analysis, in addition to the common learning basis of learners, such as pre course, etc., we should also pay attention to the individual characteristics of each learner, such as the learning achievements of pre course, the application level ability of online teaching platform, the differences in learning habits and methods, etc., and try to find out the main factors affecting learners' effectiveness through analysis, so as to master the situation of each learner. In terms of analysis method, we should not judge the students only based on the past teaching experience and academic achievement, but explore the reasons that result in current academic performance through studying deeply the levels and differences of each student. At the same time, we should dynamically understand the changes of learners in the teaching process and reflect the changes on the students' analysis. In a word, the students' analysis in online teaching design should include at least 3 parts: the common learning basis of learners, the learners' individual characteristics and reasons leading to the characteristics, and the dynamic changes of students in different stages.

(2). The teaching objectives and content setting are mainly centered with learning, and classified and multi-level teaching. Teaching objective is the direction and driving force of teaching. The teaching objective of online teaching design should be featured with learning oriented and classification and multi-level teaching. The traditional classroom teaching objectives often reflect the subjective will of teachers, and seldom consider the objectives of learners of their own. On the contrary, in order to highlight the dominant position of learners, online teaching should fully consider learners' own goals in design, that is, to design an objective that learners can clearly understand what they should achieve in the process of learning, rather than an objective only similar to the requirements of teachers for students in traditional teaching. Therefore, the teaching objective setting should fully reflect its task requirements, attach learning achievements or quantitative indicators to sub-objectives. For example, requirements for learners to complete the discrimination or discussion of a concept should be added in the description of teaching objective besides merely mastering the concept. According to the individual learner's characteristic, the teaching objective setting should also take classified and multi-level teaching into account, and form a group of objectives at all levels. For example, the same knowledge point can be classified and multi-level objective description can be set according to the Bloom's Taxonomy of Educational Objectives. Different levels of teaching objectives correspond to different levels of teaching content. In terms of teaching content, firstly, the basic knowledge, principles or skills that learners must master can be taught according to the low-level objectives, and

then the depth of teaching content can be extended by adding additional content or topic discussion, so as to achieve the high-level teaching objectives.

(3). In the process of teaching, teachers, students and spatial multi-situation form the teaching steps. The teaching steps combine teaching content and teaching methods in the teaching design to achieve the teaching objective. Because of the uniqueness of virtual space, the design of online teaching is more diversified. The multiple interactive relationship of teaching space can form a variety of situations, which greatly expanded the range of choices used in the teaching steps. For example, interaction can be formed between learners and teachers, between learners and teaching space, and among learners, which can be further developed into materials for teaching interaction, independent testing, group discussion and other activities. Online teaching design is to make full use of a variety of scenarios in the process of teaching implementation, and to ensure that learners enter into the state of flow and maintain the momentum of continuous learning in this process. The design of teaching steps should pay attention to the differences between individual learning and group learning. The teaching process of individual learning will not affect the learners' multi-level objectives and contents, while the multi-level differences of different learners in the group learning must be considered and balanced, such as using heterogeneous cooperative grouping to achieve mutual assistance between learners or using homogeneous grouping to ensure that learners at the same level have the ability to complete learning tasks without taking off the flow channel.

(4). Teaching reflection and continuous improvement. The reflection part of teaching design is to study and analyze the problems involved in the teaching process, and it is also the basis for continuous optimization of teaching design. Compared with traditional teaching, online teaching has natural advantages in recording and analyzing teaching data and behaviors. On the one hand, online teaching design should find out the existing teaching problems from the data of online teaching. And more importantly, the design should put forward the scheme of data collection and application, that is, what data is needed and what results are presented, so as to continuously improve teaching. The data collection should include the report of learners' learning status, the analysis of learners' behavior at all stages, the analysis of continuous learning willingness, assignments scores, test scores, etc., as well as the feedback of teaching space utilization and various log data. On the basis of data collection, optimization scheme of the next stage of online teaching design can be analyzed and planed, and the teaching design and implementation can be improved.

Combined with the requirements of online teaching design based on the theory of flow, positioning of online teaching space has been upgraded from the implementation field of online teaching to the intelligent learning system adaptive to learners, thus putting forward higher requirements for its framework design and construction.

IV. Construction of Online Teaching Space Framework Based on the Flow Theory

The function orientation of online teaching space determines the framework of online teaching space. According to the requirements of online teaching design based on the theory of flow, the function of online teaching space is to offer the field and resources for online teaching, ensuring the normal implementation of online teaching process, and to provide sufficient support centered around the generation and maintenance of learners' learning flow experience. The online teaching space framework based on flow is composed of four subsystems that perform different functions, namely, intelligent learning guidance system, teaching support system, situational intervention system and flow support system. These four subsystems face different objects of online teaching space and connect with each other to complete the teaching procedure jointly (as shown in Figure 2).

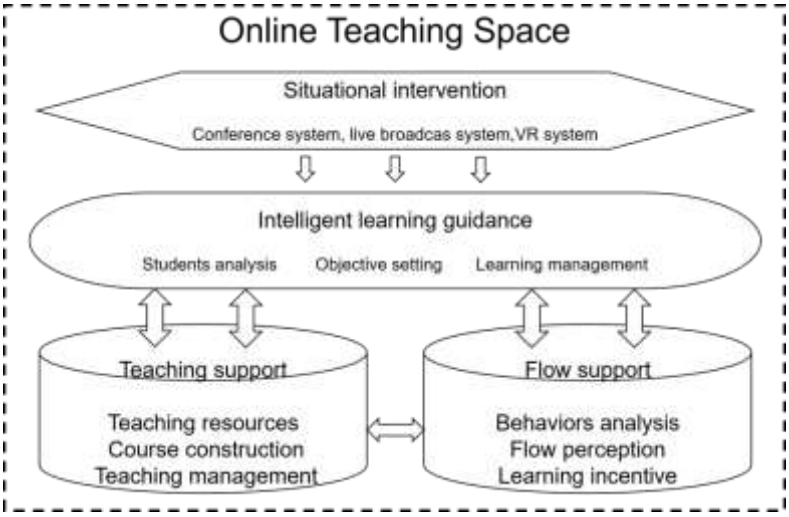

Fig 2: spatial framework of online teaching based on heart flow theory

(1). Intelligent learning guidance system. Serving the learners in the online teaching space, the intelligent learning guidance system is to help learners choose the appropriate learning path and achieve the corresponding teaching objectives. The function of learning guidance system mainly includes students' analysis, objectives setting and learning management. The students' analysis function module mainly concerns learners' mastery level of knowledge or skills and their willingness to learn. Through the systematic questionnaire, the analysis of students gives the feedback and the judgment of learning ability of the learners, and puts forward suggestions for the learning objectives of the learners. The objective setting function module is actually a learning guide set of specific learning objectives and series of learning contents, that is, learners enter the learning guide path corresponding to their chosen learning objectives, complete the learning tasks required by the learning guide path in the learning process, and finally achieve the learning objectives through the learning guide test. Learning management function module enables learners to manage themselves conveniently in the learning process, such as the interruption of learning process, the preview or review, reset of learning tasks or steps, etc. As an important teaching auxiliary system of online teaching space, intelligent learning guidance also has an important application in realizing the automatic interaction between teaching space and learners by means of intelligent teacher agent, so as to intelligently provide learners with auxiliary functions such as question answering, process reminding, evaluation and motivation in the learning process.

(2). Teaching support system. The constructors of online teaching space need to use the teaching support system to set up and arrange the space and the management contents for the course construction and implementation, including teaching resources, course construction and teaching management. First of all, teaching support is to back up the arrangement of teaching resources. Space constructors introduce teaching resources into teaching space, such as videos, exercises texts, external links, etc., and organize them into an orderly resources system according to the needs of teaching. Course construction is an organizational module that combines course resources with classroom teaching content to create a learning guidance procedure in accordance with the online teaching design. According to the past experience and results of students' analysis, the course constructors can set up classified and multi-level teaching objectives and assign them to the corresponding teaching contents. Here, the learning of each knowledge point can be directed to the combination of multiple objectives and content, so as to ensure the smooth implementation in the process of learning guidance. At the same time, the constructors should also pay attention to the setting of intelligent teacher agent, such as setting answers to questions through keywords or text semantic analysis results, setting learning progress assistance according to learners' progress, etc. Teaching management embodies other management functions that the constructors need to carry out besides course construction, such as spatial role allocation, restrictive condition setting, data backup and recovery and other management functions.

(3). Situational intervention system. Situational intervention is a specific environment created for learners in online

teaching space. Through the joint participation of teachers and learners, it can create a specific learning environment, a relaxed learning atmosphere and group collaborative interaction. It mainly relies on conference system, live broadcast system, VR classroom and other functions. Similar to the discussion learning in the real teaching space, the conference system can help teachers, learners and other roles to enter the conference scene, discuss a specific topic, and help learners improve their cognitive level of knowledge or topics through various interactive forms, and enhance corresponding communication skills, and improve critical thinking. Through this system, teachers can also be the guides of thematic inquiry, and help learners to make appropriate induction and self-examination. The live broadcast system helps teachers and learners to carry out corresponding teaching presentation, such as the teachers' demonstration of a skill or experiment process, learners' speech delivery, skills display, etc. VR classroom creates a closer feeling to the sense of presence in physical space for learners. In VR classroom, learners can complete independent learning or group collaboration in a more realistic way with the aid of VR equipment, which can be flexibly applied to teaching, discussion, testing, demonstration and other teaching steps.

(4). Flow support system. Flow support is the core function of online teaching space to create learners' flow experience. As flow experience is the psychological state of learners, it can only be grasped accurately with the aids of certain software and hardware environment. Therefore, flow support consists of three functional modules: behavior analysis, flow perception and learning motivation. Behavior analysis is to observe the learning state of learners with the help of hardware and software tools, and to know the degree of focus on the current learning content of learners with the help of eye tracker, EEG detection and other tools. Meanwhile, with the help of the questionnaire system and behavior record of learners in online teaching space, it can also record the learning behavior data. In terms of application, hardware tools are often used in pretest in the the teaching process, while questionnaires or behaviors can be used to analyze the state of specific learners, so as to provide support for optimizing the flow experience process. As a monitoring and analysis system of flow experience, flow perception can help learners to adjust their flow, such as providing reports of flow experience, and planning learners; learning programs in the space, etc. As a form of feedback, learning motivation pays more attention to learners' psychological state feedback. The learning motivation module provides positive motivation to the learners who enter into the flow experience through various forms of non-teaching feedback, such as credits earning and star rating, etc., and cooperates with other functional modules to promote the learners' flow maintenance in the teaching space.

In addition to the above four subsystems, online teaching space should also provide auxiliary modules of non-guidance system, such as non-real-time interactive communication, evaluation, FAQ, etc. for participation and communication in the space, as well as corresponding entertaining and time-limited game functions. These functions not only restore the real scene in the traditional real teaching space, but also meet the other needs of learners in the non-learning process. And they play a role in promoting learners to complete the psychological adjustment in the online teaching space.

V. Conclusions and Suggestions

A large number of studies show that flow experience can promote learners' effective learning. As a virtual space, in order to play a better role, it is a good way for online teaching space to stimulate and maintain learners; flow experience. In order to achieve this goal, this paper built a framework of online teaching space through the discussion of online teaching design. This framework centers on learners, taking the needs of space constructors, users and other participants into account, takes two sub-systems, i.e. teaching and the flow, as the basic environment support, and helps learners to complete the learning process with flow learning experience under specific learning objectives, with the help of learning guidance and intervention system. On the basis of this framework, the constructors or teachers can implement more targeted and flexible online teaching strategies in this teaching space.

In order to strengthen learners' flow experience in space and improve learning effectiveness, this paper puts

forward the following suggestions for the construction and application of online teaching space under the corona-virus pandemic background: (1) online teaching space is an auxiliary system for teaching design and implementation. The specific content and steps of teaching design not only put forward requirements for space construction, but also fully consider the full application of space functions. (2) The stimulation and maintenance of flow experience in online teaching space for learners are based on the interaction between space and its participants. Besides helping learners to complete their learning tasks, more attention should be paid to the fun of learning process, so as to gradually cultivate active learning awareness. (3) Improving the effectiveness of teaching is a continuous improvement process. The construction and implementation of online teaching space should form a closed loop, and the teaching design should be constantly improved with the help of learners' learning feedback so as to enrich the spatial functions.

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