

## Instructional Interaction Design for Smart Classrooms

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**Abstract:** Information technology and education are continuously integrating in both directions. Learning-centeredness is the main trend of future classroom teaching development. On the basis of elucidating the connotation of the concept of smart classroom, we analyze the problems in the teaching interaction of smart classroom, based on the constructivism theory and the perspective of interaction between the subject of smart classroom and the elements. We point out the key ways for teaching interactive classroom teaching to achieve the expected teaching goals, and discuss the design problems of teaching interaction in smart classroom further.

**Keywords:** Smart Classrooms, Instructional Interaction

### 1. Introduction

With the rapid development of information technology and its wide application in school teaching, information technology and subject teaching are constantly integrated and connected. The future development trend of classroom teaching will shift towards student learning as the center. Classroom teaching supported by emerging information technology gradually gets rid of the teacher-centered situation, and transforms into a situation where teachers rely on teaching software to understand students' knowledge structure and comprehension ability, and determine the teaching design based on the analysis of the learning situation.

Smart classroom is the core carrier to realize the transformation of traditional education into smart education. As the core driver of the new round of technological revolution and industrial change, artificial intelligence is constantly affecting social development and human life. With the rapid development of cloud platforms, online learning spaces, big data and other advanced technologies, smart

education has entered people's vision. The construction of a smart classroom in the information technology environment has thus seen a new opportunity. In order to better cope with the challenges of this industrial change, the state has issued a series of policy documents, emphasizing that smart education will become a new wave that promotes another round of innovation and development of education informatization. Classroom teaching is the main battlefield of education informatization, using information technology to build a smart classroom, whether its educational methods can be innovative and put into practice will directly determine the success or failure of education reform. As the micro layer of education informatization, the classroom is the main position of the school to achieve the educational goals, and it is the starting point and landing point of whether the value of education informatization can be realized. The construction of smart classroom is the core component of realizing smart education and a new demand under the environment of smart education. Smart education is to complete the two-way integration of technology and education through the construction of smart classroom so as to cultivate students' wisdom ability. Only by realizing the construction of smart classroom can we promote the process of smart education, which makes smart classroom become one of the important directions of smart education research.

The construction of a learning-centered smart classroom environment is an urgent need for innovation and reform of the traditional knowledge classroom. Literature [1] has studied students' learning environment preferences and constructed an ecological and conceptual model of intelligent learning environments. Although information technology has been in the classroom for a long time, the construction of a smart classroom is still subject to many

uncontrollable problems when implemented into actual teaching. Teachers usually have misconceptions about the revolutionary changes in application supported by information technology. This also fundamentally leads to the failure to realize the construction of a smart classroom. Although the relevant departments have paid enough attention to information technology, how to appropriately and accurately use information technology to improve classroom teaching and accomplish high quality and efficient teaching quality is still a major problem in the construction of smart classroom. Although our country has been trying to make reforms in education and teaching in recent years, educational innovation as the fundamental problem of education is still prominent, and the classroom form is still dominated by "knowledge classroom". Therefore, it is very important to promote the construction of smart classroom and build a learning-centered smart learning space. Teaching interaction is an important part of the smart classroom to effectively play its smart teaching function.

## **2. Conceptual Connotation of Smart Classroom**

The smart classroom is developed on the basis of the smart classroom. The smart classroom is the main carrier of the smart classroom. The smart classroom is a classroom environment of media-rich technology, and the smart classroom is the concentrated manifestation of the smart technology in the smart classroom. The wisdom of the smart classroom has mainly aspects of meaning: on the one hand, it refers to the intelligent technology used in the smart classroom; on the other hand, it means that the smart classroom is to develop students' wisdom as the goal of smart teaching. The intelligent technology adopted in the smart classroom is the teaching environment support for the teaching activities of smart education, but no matter what kind of intelligent technology is adopted and how the intelligence develops, how the teaching activities of the smart classroom are carried out, and how the subject of the smart classroom interacts, the essence of the smart classroom is to promote the learning of the students and to promote the development of students' wisdom.

At present, there are two main ways to explain the concept of wisdom classroom. One is from

a pedagogical point of view, focusing on the concept of education, in order to cultivate students' wisdom for the purpose that classroom teaching is not a simple process of knowledge transfer or learning, but teachers and students of the process of generating a synthesis of emotion and wisdom, the fundamental task of the wisdom of the classroom is to "develop the wisdom of the students". Wu Yongjun [2] that the wisdom of the classroom is a classroom full of wisdom, is the product of interaction between educational thinking and educational emotions, is the process and results of the symbiosis of the interaction between teachers and students wisdom. Gu Jianfang [3] mentions that a smart classroom is a type of classroom, a classroom based on wisdom, a classroom with students as the main body, focusing on competence, and aiming at literacy. The other is based on the emerging information technology perspective, that the smart classroom refers to the use of advanced intelligent information technology means to achieve the informationization and intelligence of classroom teaching, to create intelligent classroom teaching links, to support the teacher's precision teaching and individuality of a new type of space, as opposed to the classroom that uses traditional means. Chen Weidong [4] and others believe that an intelligent classroom is an enhanced classroom that relies on intelligent space technology to realize the control and operation of audio-visual, computer, projection, interactive whiteboards and other audio-visual, optical, and electrical equipment equipped in the classroom to facilitate the access of teachers and students to the resources, characterized by natural human-computer interaction. Tang Ye-wei et al [5] define smart classroom as "a new type of classroom that effectively promotes the cultivation of wisdom ability by changing teaching methods and methods, integrating technology into classroom teaching, and constructing personalized, intelligent, and digital classroom learning environments under the support of information technology." Liu Jun [6] believes that the smart classroom is a development space that realizes the reengineering of the teaching process on the basis of the two-way in-depth integration of technology and teaching, and it is a classroom that adopts the intelligent form of technology to build a

classroom teaching environment rich in wisdom in order to meet the learners' personalized learning needs. Literature [7] suggests that smart classrooms are created through the use of intelligent environments equipped with a variety of hardware and software devices and apps that are in addition to traditional classroom environments and incorporate advanced instructional technologies into classroom environments in order to promote the development of students' learning skills and engagement in the curriculum.

### **3. Intelligent Classroom Teaching Interaction**

#### **3.1 Teaching Interaction**

The term "pedagogical interaction" first appeared in the field of distance education, mainly referring to the mutual communication and interaction between distance learners and all distance education resources. Due to the nature of distance education, which is separated in time and space, the implementation of educational activities must rely on communication media. And with the passage of time, the communication media in it are also constantly developing and changing. From the original traditional media to a variety of communication technologies and devices, a variety of communication technologies and devices based on teaching resources are also constantly enriched. Therefore, the interaction in teaching is no longer limited to the traditional classroom teaching of teacher-student interaction based on verbal behavior, but also includes a variety of media elements. Therefore, compared with the traditional classroom "teacher-student interaction", the "teaching interaction" in the smart classroom is richer in content and more diverse in form.

#### **3.2 Intelligent Classroom Teaching Interaction**

Teaching in the smart classroom is mainly carried out in the smart classroom as a carrier, and teachers and students are still the main interactive subjects of teaching. However, compared with the traditional classroom teaching, since the smart classroom is built with the help of the intelligent technology of rich media technology, in addition to the language-based interaction in the smart

classroom, the interaction between teachers and students also includes rich media elements. In fact, the teaching interaction environment of the smart classroom is not only limited to the smart classroom. Therefore, smart classroom teaching interaction is the interactive activity process of mutual influence and interaction between the subjects and elements of the smart classroom in order to realize certain smart classroom teaching goals. Teaching interaction is an important way for smart classroom teaching to realize the expected teaching goals.

### **3.3 Types of Teaching Interaction in the Smart Classroom**

According to the relationship between the main elements of the smart classroom and the characteristics of the interaction technology, the types of interaction in smart classroom teaching mainly include the interaction between the teaching subject and the learning resources, the interaction between the teaching subject and the teaching environment, the interaction between the teaching subject and the classroom technology, the interaction between the teaching subject and the teaching subject, and the interaction between the teaching subject and the subject of the teaching subject itself.

### **4. Problems with Smart Classroom Teaching Interaction**

#### **4.1. Intelligent Technology Fails to Fully and Effectively Empower**

The smart classroom is the carrier of the smart classroom. Smart classroom needs the support of smart classroom and smart teaching system. The operating environment of the smart teaching system should have a network, a data center, intelligent centralized control terminals (various mobile terminals used by students, such as computers, tablets, and cell phones), student behavior perception equipment (student data collection equipment), and integrated teaching equipment.

At present, many colleges and universities have centered on smart education, invested a lot of resources in the construction of smart classrooms and smart campuses, and carried out smart classroom teaching activities. However, few colleges and universities have already established qi effective smart teaching system, especially the smart teaching system

based on big data platform, relying on big data and artificial intelligence to realize real-time analysis of classroom teaching. The current smart teaching system is not yet able to realize the effective collection and mining of teaching data and the precise allocation of teaching resources in terms of function.

From the functional point of view, on the basis of retaining the advantages of the original blended teaching, the smart classroom should also have the whole process of dynamic collection of students' learning information data, and real-time analysis and feedback functions, to help teachers comprehensively and meticulously understand the overall situation of students' learning and the special situation, and provide personalized guidance recommendations in a targeted manner. Students should be able to dynamically grasp their own learning status according to the real-time data fed back from the smart classroom, and make clear their learning difficulties and problems according to their individual learning portraits. Thus, they can choose their own learning paths and learning partners in the learning network resources, and learn logically, systematically and efficiently.

#### **4.2. Single Form of Teaching Interaction**

With the help of rich media and other intelligent technologies, the smart classroom provides a strong support for classroom teaching interaction, and can provide a variety of interaction options. However, the existing actual smart classroom teaching, many teachers are not able to make full use of the various devices in the smart classroom, the teaching concept is still stuck in the traditional multimedia classroom, teaching activities and teaching organization and the usual multimedia classroom teaching is not very different. Teachers often just interactive all-in-one equipment is simply used as a substitute for the projection equipment in the multimedia classroom. As a result, the technology in the actual smart classroom has not been used to play its due effect. Teachers still use a relatively single teaching method. Some of the reasons for this are that the teachers still use the traditional teaching mode in the smart classroom, while others are that the teachers are not familiar with the use of the smart classroom.

#### **4.3. Teachers' Insufficient Understanding of the Connotation of Interaction and One-Sidedness of The Subject of Interaction**

The existing smart classroom structure, on the surface, seems to realize the students' participation in the classroom, but in fact, the student body has not been able to effectively collaborate and interact with the teacher, give full play to their higher-order abilities such as active cooperative inquiry, problem solving, etc., and also in a passive state in the interaction with learning resources and learning environment. Teachers are still in the absolute dominant position in the interactive process of wisdom teaching, which is not conducive to the construction of learning-centered wisdom classroom teaching structure, and it is difficult to effectively cultivate students' higher-order abilities, which is not conducive to the students' transformation of knowledge into wisdom. Therefore, the lecturing teachers are not deep enough and comprehensive enough in their understanding of the actual connotation of the smart classroom, and there is one-sidedness in their understanding of the interaction subject, which requires effective design of the interaction activities of the smart classroom.

#### **5. Teaching Interaction Design**

A study in the literature [8] found that students are significantly more engaged in the smart classroom relative to the traditional classroom during instructional interaction activities. The paper analyzes the reasons for this, and discusses and proposes a smart classroom interaction model that facilitates classroom interaction by considering the interplay of pedagogy, space, and technology. Literature [9] examined the factors influencing situational engagement in smart classrooms and explored the relationship between situational engagement, personal characteristics, and perceptions of the learning environment, finding that perceptions of the environment and students' personal factors have different effects on situational engagement. Literature [10] explores the establishment of university English classroom under the development of the Internet in the new era, and argues that the smart classroom breaks the time and space limitations of traditional education, enables students to access knowledge at any time through the Internet, strengthens the

interaction between teachers and students, integrates a variety of educational functions, and promotes the cultivation of students' independent learning ability.

In the design of smart classroom teaching interaction activities, it can be divided into three stages: before, during and after class. In the pre-course stage of pre-study assessment, teachers can use a variety of learning platform software to release a variety of related micro-video courseware and test practice questions. Students watch the micro-video courseware through the learning platform, independently complete the learning of the course content in the pre-study phase and complete the test practice questions released by the lecturer in advance. Teachers then check the students' pre-study situation through the teaching platform, understand the students' learning effect from the completion results of the test and practice questions, and carry out targeted teaching activities and program design accordingly. In the formal wisdom classroom teaching stage, the lecturer teacher creates a teaching situation, the students will be appropriate multiple groups, each member of the group can play different roles, choose a knowledge point for cooperative inquiry, and show the results of the inquiry. After the completion of the activity, the teacher and the students to grade the results of each group. Finally, the teacher will make a summary. At the post-course stage, the teacher can further personalize the relevant assignments and provide personalized tutoring for students. The specific analysis is as follows:

### **5.1 Pre-Course Stage**

In the pre-course stage, the traditional classroom teaching teacher's task is mainly to prepare the lesson, while the students' task is mainly to pre-study. Therefore, the teacher's work in this stage is mainly to study and research the content of the textbook, consult related materials, and carefully write the lesson plan for the class. However, in the process of writing the lesson plans, the teachers did not analyze the students' learning conditions in depth, but generally only based on previous experience and the intuitive feeling of the students. The students' pre-study is mainly self-study of the teaching materials and reference materials provided by the lecturers in advance, and some of them are even only the contents of the teaching materials. Students

generally do not have the opportunity to communicate and discuss with teachers or classmates in the process of self-study.

However, in smart classroom teaching, the lecturer can conduct a more in-depth analysis of the learning situation and optimize the teaching design on this basis. With the help of the information technology platform, teachers can pre-check the statistics of students' historical learning results, and master the students' learning situation and basic situation. Students can study the pre-study materials pushed by the teacher in advance, complete the corresponding test questions and submit them to the teaching platform, and can also discuss the difficulties and problems encountered in the process of self-study with other students through the platform. Based on the statistical analysis of the students' completion of the test questions and the discussion on the teaching platform, the teacher further conducts a comprehensive analysis of the learning situation, which serves as the basis for the design of the teaching program.

### **5.2 In-Class Phase**

In the in-class stage, traditional classroom teaching is mainly the teacher's lectures and face-to-face questions in the classroom. In smart classroom teaching, teachers, students and teaching resources can interact with each other in various forms. Teachers can create a variety of teaching situations, students can play a variety of roles, and make full use of a variety of online teaching and learning resources. Teachers for the difficulties and problems encountered in student learning, targeted to the students to recommend the provision of appropriate learning resources, students can also be based on their own actual situation, choose their own needs of learning resources. Teachers and students can communicate and interact with each other in real time, and students can have face-to-face group discussions on site. Such diversified exchanges, communication and collaboration can effectively stimulate students' interest in learning, improve students' autonomy and subjective initiative in learning, and help cultivate students' higher-order ability of innovative thinking and analyzing and solving problems.

### **5.3 After-School Stage**



In the after-school stage, traditional classroom teaching mainly involves lecturers giving students after-school assignments. Students complete their homework after class and submit it to the teacher for correction. Teachers' homework assignments to students are uniform, and teachers' feedback to students on homework is lagging behind, often the completion of homework in this class and the problems can not be fed back to students until the next class. Moreover, the teacher's evaluation of the homework is only for the common problems of the homework to explain. Smart classroom teaching, on the other hand, can make use of the information technology platform to personalize the teaching and counseling tutorial learning for students. Teachers assign homework is not uniform, but based on each student's learning situation to set up a needle personalized homework tasks, based on the information technology platform intelligent push personalized learning and review materials. Students can submit their homework to the teacher through the teaching platform in a timely manner after completing the homework, and the teacher can review and feedback the results to the students in a timely manner, and personalized counseling for students. Students can discuss and communicate with other students and teachers through the teaching platform.

## 6. Conclusion

Guided by the teaching concept of "learning before teaching, teaching based on learning" and the teaching mode of "pre-class micro-lesson guidance, classroom interactive exploration, and after-class individualized tutoring", smart classroom uses new generation information technologies such as big data, cloud computing, Internet of Things and mobile Internet to achieve digital teaching content, diversified communication and interaction, timely evaluation and feedback, and intelligent resource push. Promote teachers to carry out precision teaching and personalized teaching, and effectively improve teaching quality and teaching efficiency. How to design classroom teaching interaction is the key to smart classroom teaching. Although this paper discusses how to design intelligent classroom teaching interaction from three stages: before class, during class and after class, and has achieved some results, it still

needs further research on how teachers and students interact with teaching resources.

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