Research on the Analysis of Classroom Teaching Behavior Based on Artificial Intelligence technology

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Abstract. The study of classroom teaching behavior is usually the primary concern of teaching research, and the early methods of analyzing classroom teaching behavior require a lot of human and material resources, but with the development of information technology, artificial intelligence technology is more and more widely used in education, and the use of artificial intelligence technology can quickly and easily achieve the analysis of classroom teaching behavior, and the application of artificial intelligence technology in the analysis of classroom teaching behavior It plays an important role in the professional development of teachers and the improvement of teaching quality. At this stage, most of the research on analyzing classroom teaching behavior uses computer vision technology and face recognition technology; analyzing classroom teaching behavior requires a large amount of data, and the smart classroom provides a data source and support platform for this research. Artificial intelligence technology involves a very large number of technologies, and how other related technologies can be integrated into various aspects of education and teaching to achieve a deep integration of artificial intelligence and education is a question that should be considered in future research.

Keywords: Artificial intelligence; Classroom teaching behavior analysis; Face recognition; Smart classroom.

1. Introduction

Artificial intelligence is a science that is used to study how intelligent machines or systems can be created that can mimic human activities and thinking, and it can also extend and expand human intelligence [1]. Human society and technology are advancing, and technology has brought great changes to our learning lives. The Education Information 2.0 Action Plan issued by our Ministry of Education suggests that we need to carry out the construction of intelligent teaching support environments, intelligent education and continuously promote the application of artificial intelligence in teaching and management [2].

The classroom is the main place where teaching activities are carried out and is an important environment for teaching and learning, while teaching behavior is not only an external expression of the teacher's quality and ability and teaching philosophy, but in addition a concrete application of the teacher's own teaching skills and experience, and a fundamental component of the teaching phenomenon [3]. As research continues, researchers have gradually turned their attention to the study of classroom behavior, through which they can, on the one hand, promote teachers' own development and, on the other, help with teaching reform. When carrying out analysis, it is difficult to be objective in the support of tools if there is no proper methodological guidance [4]. Through the collection and collation of relevant literature, it is found that there have been many traditional methods for analyzing classroom teaching behavior, but these analysis methods basically use self-reporting and manual observation methods to collect and analyze data. These methods have some drawbacks, requiring a large number of researchers to spend a lot of time to collect and analyze data, self-reporting analysis methods are more subjective, while manual observation methods The use of artificial intelligence technology to analyze these data is more timely, comprehensive and visual, and teachers can improve their teaching methods, optimize their teaching strategies and make adjustments to their teaching based on the results of these analyses, thus improving the quality of teaching in the classroom [2].

2. Related concepts

2.1 Artificial Intelligence

Artificial intelligence is a comprehensive discipline that was previously described in studies on artificial intelligence as the use of computers to simulate human learning activities, and has since been extended by various factors [5]. Over the years, AI has been used in many areas, including agriculture, medical devices, and defense, of course, education [6]. With the application of artificial intelligence in various fields, and under its impact and influence, the field of education has to undergo a deep change, technology has reshaped the new form of education, how to use artificial intelligence technology to promote the development of education is a major research focus, "artificial intelligence + education" has gradually become the focus of research [7].

There are many technologies involved in artificial intelligence, each of which can support some relevant elements of education and teaching in various ways, providing strong support for educational activities. For classroom behavior analysis, the use of AI can not only compensate for the shortcomings of traditional analysis methods, but is also an example of how AI can be used to empower education. The analysis of classroom behavior can be done by analyzing gestures, expression states, etc. The use of computer vision technology and facial expression recognition technology are both part of the AI technology, which shows the power of AI. The use of AI in classroom teaching not only enables teachers to teach better and students to learn better, it can also help teachers' professional development; in addition, the use of AI in education teaching is also a manifestation of the positive response to relevant national policies.

2.2 Teaching behavior in the classroom

According to some researchers, "teaching behavior" is a collection of all the teacher's activities, and these activities refer to a series of behavioral activities that stimulate students to learn, keep students learning and promote students' learning. Teaching behavior is characterized by openness and flexibility [8]. The issue of teaching behavior has always existed in teaching research, but it has not been specifically studied. With the implementation of the education and teaching reform, researchers have slowly shifted the direction of their research to the study of the classroom [9]. With the continuous promotion of information technology in education, the teaching environment has been improved accordingly, and along with the in-depth reform of the curriculum, researchers have gradually focused their research on the classroom, analyzing in depth the interaction between teachers and students in the classroom or other teaching activities, which can be understood in a general direction as two aspects of behavior: teacher behavior and student behavior, which can be seen as a combination of the two. It can be seen as a combination of these two [10]. An analysis of the literature shows that teachers' behavior in the classroom affects the quality of teaching and learning to a large extent, so imagine that if a teacher does not behave appropriately in the classroom, students' learning will not proceed smoothly. For this reason, classroom behavior has always been a hot issue in the field of education and is an important part of educational research [11].

At present, there are a number of research methods for analyzing classroom teaching behavior at home and abroad. They analyze the classroom from different perspectives, and after generalization, there are several of them: S-T analysis, Flanders analysis, TIMSS analysis and TIAS analysis [4]. With the development of artificial intelligence, the use of artificial intelligence to analyze classroom teaching behavior has become more detailed, as the use of artificial intelligence technology can analyze facial expressions and behavioral movements, so that teaching can be better improved and the quality of teaching can be more effectively enhanced and the effect of teaching optimized.

3. Current state of research

Early research focused on the use of video technology to analyze classroom teaching behavior, and with the development of artificial intelligence technology and its depth in the field of education,

this is when the use of artificial intelligence to analyze classroom teaching behavior formally began. This was followed by the emergence of big data, computer vision, intelligent classroom, behavioral analysis, intelligent analysis and to face recognition, image recognition, intelligent classroom and other research content, the use of AI technology in the analysis of classroom teaching behavior is becoming more and more research and the technologies used are becoming more and more diverse. From the above analysis, the following three research hot issues have been summarized: computer vision technology, the application of face recognition technology in classroom teaching behavior analysis and what changes smart classrooms can bring to classroom teaching behavior analysis.

3.1 Using computer vision technology to analyze classroom teaching behavior

Computer vision, as an emerging discipline, has been active in the research field, there has been a lot of research on the subject both domestically and internationally [12]. Computer vision technology in general terms is actually a direction in the field of artificial intelligence and is an important part of it. It is a comprehensive discipline that uses computers to be able to extract and analyze the contents of a picture and then produce an analysis result, so computer vision processing has attracted researchers from various disciplines to start research on this field of study [13]. It is a technology that uses computers to simulate human visual processes, in other words, the technology has the ability to see as well as perceive the surrounding environment that humans have [14].

Gu Xiaoqing et al [13] used computer vision technology to analyze the gestural movements of students in the classroom, algorithmically analyzing the footage of the video and observing the students' movements in a particular screen, whether they were looking down at a book, listening to the teacher or communicating with each other and other such behaviors could be analyzed before determining how engaged the students were in learning in the class. With the continuous development of artificial intelligence technology, computer vision technology continues to penetrate all aspects of people's social life, and is now used extensively in areas such as healthcare, agriculture, transportation and education. The analysis of classroom teaching behavior is particularly important as it plays a vital role in the development of teachers and the learning of students. Traditional methods of analyzing classroom behavior require manual analysis, which is time-consuming and requires a large number of researchers, and in general requires a lot of human and material resources. The emergence of artificial intelligence has facilitated the processing of these big data, using computer vision technology to analyze teaching behavior in the classroom, so as to obtain information from the results of the analysis that is useful for teaching. Teachers can use the data obtained to reflect on teaching, replace teaching methods and choose better teaching strategies to help complete teaching, thus promoting professional development and improving teaching quality and being able to better promote student progress.

Although computer vision processing technology has been around for many years, as the technology continues to develop and advance, more and more of its functions are being discovered, as well as the extremely wide range of applications of the technology in areas such as agriculture and medicine, even beyond the field of education. In subsequent research, researchers can make full use of the existing technology to analyze phenomena in education and teaching or look for computer vision technology in other areas of The researcher can make full use of the existing technology to analyze phenomena in education and teaching or look for applications of computer vision technology in other fields, and translate these applications to better serve education.

3.2 Using face recognition technology to analyze classroom teaching behavior

In fact, we are familiar with face recognition technology because it is all relatively common in our lives. It refers to the use of computers to recognize faces and extract useful information from them, such as key points, because everyone's face is different and there are no two identical people in the world, so this technology is commonly used to make a distinction of identity and in the 1990s was a research hot area of research. If face recognition technology is to be divided, it belongs to the research direction of computer vision technology, which belongs to the category of computer vision, and after

continuous development, this technology has slowly become an independent and popular research direction, which is more and more widely used in our study life, and is a more familiar technology [15].

Face recognition technology has penetrated into every aspect of society, and there are many scenarios in our life where face recognition is used, such as ticket gates, mobile phone unlocking, Alipay's face payment, etc. With the increasing influence of this technology on our life, people gradually put this technology into the field of education for research. Jia Pengyu et al [16] used this technology to identify the faces of students in the classroom to obtain the number of students, determine whether all students came to class, and then extract the key points of the face to analyze the facial expressions of students, teachers can judge the effect of students' listening in class based on these analysis results, and when most people have a confused expression at a certain time, to find out whether it is because the content taught was not understood by students or for other reasons. When the majority of students look confused at a certain point in the lesson, it is important to find out whether this is because the students have not understood the content or for other reasons, and then make adjustments to the teaching. The psychologist Mehrabian said that the expression of emotional information = 7% speech + 38% voice + 55% facial expression, from this structure it can be seen that expression is very important for the expression of emotion, and the recognition technology of expression is one of the face recognition technology [17]. Facial expressions are an important source of teaching feedback, and teaching feedback is an important guarantee for improving teaching quality. In the process of classroom teaching, teachers can, on the one hand, analyze students' facial expressions to understand their learning situation, and on the other hand, observe whether their own expressions are appropriate, because the teacher's expressions in the classroom will also affect students' learning situation, and then according to these data, they can This data can then be used to adjust the pace of teaching and to optimize the selection and use of teaching methods and strategies.

Face recognition technology can be seen everywhere in our daily life and has certainly brought a different life experience to us. In the subsequent research, the technology can be fully utilized to extract and analyze information on classroom teaching behavior, so that face recognition technology can better empower education.

3.3 Smart classroom provide a source of data for classroom teaching behavior analysis

In the late 1990s, our country began to reform some educational infrastructures to make them more informative, in response to a direction of informatization of education advocated by the state. After continuous efforts to build them, multimedia classrooms have emerged one after another in our country, as well as the smart classrooms advocated now [18].

Nie Fenghua et al [19] refer to the smart classroom as a new form of classroom informatization, an educational space capable of providing some intelligent services for teaching and learning activities and a synthesis of some of the related equipment needed for this educational space; while Huang Ronghuai et al [20] consider the smart classroom as a new type of classroom that requires the support of various technologies, in addition to the fact that this classroom is also capable of optimized for processing and students' access to learning resources is more convenient. As well as a new type of classroom that better facilitates interaction between teachers and students; the smart classroom creates an environment that actively corresponds to the educational informatization and teaching reform advocated by the state, and at the same time, it is a product under educational informatization [20]. In terms of the current development, the development of smart classrooms in China presents a thriving development trend with its own characteristics, but for the use of smart classrooms, it is still similar to traditional classrooms, where teachers still occupy a dominant position and the initiative of students' learning is not reflected and brought into play, nor does it fully reflect the cultivation of students' innovative power [21]. Compared to traditional classroom behavior analysis, analysis of teaching behavior in the smart classroom is easier to achieve, by analyzing the lecture videos in the smart classroom and other resources provided by the smart classroom, with more data and higher accessibility.

There has been a great deal of research in our country in recent years on smart classrooms, which are different from traditional classrooms in that they can collect a lot of data that can provide the basis for subsequent analysis, and in subsequent research, researchers can turn their research towards how to better analyze the data within smart classrooms.

4. Conclusion

With the proposal of "artificial intelligence + education", artificial intelligence technology has been increasingly practiced in education and teaching, whether it is personalized resource recommendation before class, virtual reality or augmented reality technology in class, and analysis of classroom teaching behavior after class, etc. All teaching aspects are supported by artificial intelligence technology. Among them, in the classroom teaching behavior analysis link, the main technologies currently used are computer vision technology as well as face recognition technology, while the smart classroom is an effective support platform for generating these teaching behavior data.

In the future development process, we should continuously explore about the application of AI technologies in education teaching, make full use of relevant technologies to analyze classroom teaching behaviors, make the analysis results more objective, and save the use of human and material resources; continuously research and explore how relevant technologies can be integrated into various aspects of education teaching, and realize the deep integration of AI and education.

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