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Research on the Development and Application of English Teaching Resources Based on Augmented Reality

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Abstract

With the rapid development of the information age, there are more and more cases of new technologies being used in education, and English education should also increase the use of these technologies to diversify the way in which teaching content is presented. Augmented reality technology can help people connect with the virtual world and access information in real time. Applying it to the teaching classroom can help students participate in knowledge exploration, strengthen student-teacher interaction and promote the development of students' creativity and imagination. Based on this, this paper first proposes an augmented reality-based case study teaching resource for university English. Further, the theoretical basis for the construction of teaching resources, including contextual cognitive theory, constructivist teaching theory, second language acquisition theory and immersion learning theory, is clarified. Finally, through statistical analysis of students' learning outcomes, it is concluded that the application of augmented reality technology to the university English classroom can stimulate students' interest in English learning and enhance their English learning outcomes.

Keywords

Augmented Reality, English Language Teaching and Learning, Teaching Resources, Immersion Learning Theory, Testing and Assessment

1. Introduction

With the development of science and technology, people's lives are also changing rapidly. In the age of rapid development of Internet technology and people using mobile phones to surf the Internet, information technology and intelligence have also gradually become a hot topic of discussion in the field of educa-

tion. In the field of education, the deep integration of technology and teaching has given rise to many new teaching methods. Immersive and interactive teaching models have been widely applied in fundamental disciplines, such as chemistry, physics, and mathematics. Traditional teaching methods can no longer meet the massive demand for knowledge from students in the context of the information age. The creation of virtual three-dimensional environments through augmented reality technology can combine reality with reality, which can better stimulate students' interest and motivation, thus improving their learning efficiency and facilitating the innovation of teaching methods (Wu & Gao, 2022). The learning of language knowledge is not simply a matter of inputting knowledge from books, but also requires the support of a concrete language environment in which students are more likely to understand and master the knowledge and be able to use it better. However, traditional English classrooms are difficult to provide students with such contexts, which may lead to students not being able to understand the knowledge well, or even having varying degrees of resistance to language knowledge, finding classroom teaching boring and abstract, and eventually having to learn English by rote (Xue & Wang, 2021). In addition, as it is difficult for students to obtain effective multimedia link resources on their own in an environment outside the classroom, they can only rely on teachers' lectures and consult relevant books for English learning, which may lead to students not obtaining suitable knowledge input ports. To effectively solve these teaching problems, teaching staff need to make full use of their professional knowledge and skills in their daily teaching work to explore, utilise, design and develop and integrate various quality teaching resources, so as to maximise the value of these information resources.

The application of augmented reality technology in English language teaching can be used in a blended learning model that combines the advantages of both digital learning and classroom learning to achieve deep language learning (Soto-Martin et al., 2020). During online learning, students scan AR images on their mobile phones for three-dimensional reading, live-action video recording and practice, using these methods to complete key learning tasks. In offline learning, students can use augmented reality e-texts for constant practice and revision, enhancing learning efficiency to reinforce the learning effect. The above advantages of augmented reality technology have a strong fit with English vocabulary teaching, and it can be used to improve the quality of English vocabulary teaching. This paper therefore explores the application of augmented reality technology in English vocabulary teaching practice through action research, and provides a reference for empirical research on the use of augmented reality technology in English teaching.

2. Definition of Concepts Related to Augmented Reality Technology and Teaching Resources

Teaching resources are extended from resources. After the reform of higher

education, more and more researchers have focused on this field of study, and the concept of teaching resources has been defined differently by various researchers, but at the core, they all refer to all those conditions that can help classroom teaching to run smoothly as teaching resources (Abu Owda, 2020). Teaching resources are all those resources that can support the smooth running of classroom teaching and learning activities, mainly including human and non-human resources. Human resources mainly include teachers, students, parents, etc.; non-human resources include various teaching aids and equipment, such as chalk, blackboard, objects, projection, television, etc. Also, major social and educational institutions, including libraries and museums, can be called teaching resources (Zhao et al., 2020). With the development of teaching resources and information technology, society's demands on teachers are becoming higher and higher, not only requiring them to tap, integrate and use all conditions and elements that are beneficial to the teaching process based on the teaching content, but also requiring them to gradually build up an awareness of resources and no longer limit themselves to the traditional teaching materials and blackboards.

2.1. The Connotation of Augmented Reality Technology

Augmented reality is one of the advanced forms of expression of virtual reality, and therefore the concept of virtual reality should be understood before the concept of augmented reality technology.

Jaron Lanier first introduced the concept of virtual reality in 1989, stating that virtual reality is a technology developed on the basis of computers, artificial intelligence and other technologies that can give people the experience of interacting with a virtual world. Augmented virtual reality is a type of virtual reality, a technology that can integrate the virtual world and the real world together (du Tolt-Brits, 2019). The most obvious difference between augmented reality and virtual reality is that the information resources presented by virtual reality are virtual. Augmented reality, on the other hand, presents information resources that are partly virtual and partly real (Fu & Li, 2021).

Augmented reality technology incorporates a variety of modern technologies such as intelligent display, tracking registration and human-computer interaction. Intelligent display technology functions mainly to enable the superimposition of virtual information in the real world, and its main device terminals are head-mounted displays, computers and smartphones. Head-mounted displays offer the best user experience because they are designed to fit the human body, but are less widely used because they are more difficult to produce. Mobile phones, which are already in widespread use around the world, are the best choice for the application of augmented reality technology. Registration tracking technology allows for the location of real things and virtual information to be repositioned if the location of the real thing changes, allowing for the superimposition of virtual information. Human-computer interaction technology is primarily designed to connect system inputs and outputs and is divided into strong and weak interac-

tions. Strong interaction gives the user a better experience but is more difficult to implement; while weak interaction gives the user a poorer experience but is less difficult to implement (Ma & Zhang, 2021).

2.2. Classification and Characteristics of Augmented Reality Teaching Resources

AR teaching resources are a kind of digital teaching materials based on augmented reality technology, a new kind of teaching resources, whose specific types and the characteristics of each type are as follows:

Classification by teaching style: Inquiry-based teaching resources that make use of student autonomy. This type of teaching resource places great emphasis on the independent spirit of student inquiry, with the teacher playing the role of a mere guide in the teaching process, helping students to do hands-on work, enhance their experience, and thereby understand and consolidate their knowledge for better learning results. Teacher-led teaching resources. Teachers present augmented reality resources to students on a screen.

This type of resource presents abstract knowledge to students in a tangible form, which motivates them to learn and improves their learning outcomes.

Classification by interaction: media presentation teaching resources. Using augmented reality technology to present teaching content in the form of 3D models, animations, videos, etc. Dynamic interactive teaching resources. Adding interaction to the media display enhances the user's immersion and interaction, which helps the user to better understand complex abstract knowledge.

Classification by recognition method: Picture recognition teaching resources. The user scans the relevant recognition image directly to obtain the corresponding virtual resource. Real/physical recognition resources. Users use the resources in 3D space by directly identifying the object with a real or physical object.

3. Theoretical Basis for the Development of English Teaching Resources Based on Augmented Reality

The application of augmented reality technology in the field of education and teaching requires the support of relevant theories. By collating relevant literature, the author found that the main theoretical foundations of AR education applications include: contextual cognitive theory, teaching media view, second language acquisition theory, constructivist teaching theory, embodied cognitive theory and immersion learning theory (Bi, 2020). The development of these theories provides strong support for the implementation of AR educational applications, so this paper selects four of the main theories for relevant analysis.

3.1. Situated Cognition

According to contextual cognitive theory, people do not simply carry out activities based on their perceptions of the world, but in constant contact with their environment, and therefore human behaviour is influenced by various factors,

mainly social, physical and cognitive (Hu et al., 2022). Thus, educators cannot design and develop resources in isolation from the learner's environment and focus only on the learner's sense of reasoning and cognitive level. It is therefore important for teachers to combine knowledge content with learners' practical experiences in the teaching and learning process, so that learners can interact with real-life situations and thus enhance the effectiveness of teaching and learning.

Miller and Gildea found that learners can learn English words quickly and effectively in concrete communicative contexts, but if these words and sentences are taken out of their concrete contexts, it is difficult for students to understand the meaning of the words and even less likely that they will be able to apply them well (Kernan et al., 2018). Harry Jespersen uses the terms "ghost" and "zombie" to describe isolated words, suggesting that language learning cannot be separated from contextual support. To promote vocabulary acquisition, students need to imitate specific contexts and create an appropriate language learning environment (Ritter & Mostert, 2018). However, in China, most students do not have the objects and contexts to engage in English conversation, so it is necessary to create realistic conversational contexts for students. Researchers have also found that many students enjoy role-playing in a context created by the teacher, as this is a novel context in which they are not in their long-standing Chinese environment and are therefore motivated to learn, thus improving their learning outcomes.

The creation of realistic environments is an important condition for motivating students to learn, and augmented reality technology, with its unique features, can effectively create realistic scenarios to help students learn language in realistic conversational situations, increasing their independent learning ability and improving their learning outcomes.

3.2. Constructivist Theory of Teaching and Learning

Since the 1980s, constructivism has not only had a profound impact on Western scientific and philosophical thought, but has also influenced the development of educational and teaching ideas (Fleckenstein et al., 2016). The core of constructivist theory is student-centred, advocating the development of students' independent inquiry skills so that they can actively identify problems and construct their own knowledge systems. There are three main perspectives in constructivist theory, namely the knowledge perspective, the learning perspective and the teaching perspective. The concept of knowledge means that students should treat knowledge with a questioning attitude in the process of learning, and should not regard knowledge as unchanging, but should look at it from a developmental perspective; the concept of learning means that learners should bring into play their own subjectivity, transform passive learning into active learning, and construct their own knowledge based on their existing knowledge and experience under the guidance of teachers. The concept of teaching means that teachers should play a leading role in guiding students to discover problems, solve them

and build their own knowledge system.

Constructivist theory emphasizes situational teaching, and various modern high-tech technologies provide strong support for the creation of specific contexts, thus promoting the application of emerging technologies in the field of education, making constructivist theory an important guiding theory for domestic and foreign researchers to conduct educational research. Primary school English education, as a part of education and teaching in China, is also applicable to the guidance of constructivist theory. Because this theory emphasizes meaningful learning, which emphasizes the cultivation of students' understanding abilities in the teaching process and opposes rote memorization. In the process of students' autonomous construction of knowledge, they need to understand and master new knowledge content based on their existing knowledge and experience, and integrate new and old knowledge to improve their new and old knowledge and experience. Therefore, the construction process of meaning learning is not a simple process of information input and accumulation, but a process of learners repeatedly and bi-directional adjustment and reconstruction of existing knowledge and experience and newly acquired knowledge and experience.

3.3. Second Language Acquisition Theory

Since the 1970s, many researchers have conducted relevant research on various aspects of second language acquisition, also known as second language learning. Among these research results, the most influential one is the monitoring theory proposed by the famous American linguist Krashen. This theory mainly includes five hypotheses, namely, the acquisition and learning hypothesis, the affective transition hypothesis, the monitoring hypothesis, the natural acquisition order hypothesis, and the Input hypothesis (Goodyear & Dudley, 2015).

Krashen believes that learners are involved in two processes when learning a second language, namely the acquisition process and the learning process. Acquisition mainly refers to the unconscious absorption of language knowledge in contact with the external environment, and the ability to unconsciously, accurately, and fluently use language knowledge for communication activities. Learning refers to the planned and conscious understanding of language knowledge by learners. Krashen believes that acquisition allows learners to easily and smoothly acquire language knowledge and communicate, making it more meaningful than learning. The hypothesis of natural acquisition order refers to the fact that when people are learning a second language, the acquisition order of certain rules precedes other orders, which is a natural law and has no relation to the classroom teaching order at that time. The Input hypothesis refers to the second language acquisition achieved by learners through their understanding of the input language knowledge, but the input language knowledge must be easy to understand language input, because only at this time can language input promote the acquisition of the second language. The affective filtering hypothesis suggests that learners' learning speed varies depending on the amount of understandable language

knowledge input they are exposed to and its influencing factors.

In the development history of English teaching research, many researchers have attempted to use acquisition theory to guide the creation of language environments, thereby promoting the development of teaching, and also leading to the emergence of some new teaching methods. For example, listening to speech is a teaching method guided by behaviorism theory, which believes that language learning must have two processes: listening and speaking, in order to promote the smooth progress of reading and writing. This method attaches importance to students' learning of pronunciation and intonation, which is in line with the process of Language acquisition. This teaching method is widely used in the United States, and has achieved good application results. This also indicates that in the process of learning language knowledge, the creation of language environment is very important.

3.4. Immersive Learning Theory

In 1975, Csikszentmihalyi proposed that immersion is a state in which people engage in certain activities, focusing their attention and being fully engaged without any interference from other factors. In this state, people screen out all irrelevant factors and demonstrate full participation and pleasure. They are in the best state of their intrinsic motivation and also the best period for people to acquire knowledge (Xiao, 2016).

Students in an immersive state have a better learning experience, and a good learning experience can also extend the duration of their immersive state. Therefore, in the specific learning process, learners should be provided with a more authentic learning experience, so that they can more easily enter an immersive state and achieve better learning outcomes. From the two elements of immersion theory, namely challenges and skills, it can be seen that the learning experience we provide to students not only needs to be in line with their existing cognitive level but also has a certain degree of challenge, so that students can improve their personal skills while entering an immersion state.

This article focuses on studying the specific context of simulated AR case teaching resources, presenting abstract knowledge content in the form of 3D models in front of students, which can attract their attention; At the same time, this resource also incorporates appropriate interactive activities to enable students to delve deeper into the knowledge content, and their immersion state can be maintained for a longer time, thereby stimulating their learning interest and enthusiasm, helping them enhance their confidence in learning English, and thereby improving their learning effectiveness.

4. Design and Development of Augmented Reality English Teaching Resources

Resource requirement analysis is essential in the process of resource design and development. Only by knowing what requirements the resource needs to meet can design and development work begin. The augmented reality resources de-

signed and developed in this article are aimed at solving the problems that exist in the current English learning process of college students. Therefore, before designing and developing them, it is necessary to analyze the problems that exist in the current English teaching classroom, and design and develop them based on the needs of teachers and students for the resources. Compared with the rapid application of information technology in various fields, the application of technologies such as augmented reality in college English teaching is still in its early stages. The reason for this issue is partly due to the need to improve the maturity of technology. On the other hand, the acceptance level of English teachers themselves also restricts the application of new technologies in the classroom.

4.1. AR English Teaching Resources Overall Architecture Design

The purpose of designing this case teaching resource is to test whether AR English teaching resources can enhance students' interest and learning effectiveness in English learning. Therefore, when designing the resource, work should be carried out according to the requirements of the new curriculum standards for college English teaching. This teaching resource aims to help students learn simple words and daily conversations, and stimulate their interest in learning English. When designing and producing enhanced information, attention should be paid to connecting with already learned knowledge, so that students can consolidate their knowledge while learning new knowledge. If students click on the corresponding model when displaying new words to them, detailed descriptive words and their phonetics of the learning object will appear. Clicking on the corresponding model again will present an overall animation of the object's appearance, displaying its structure while also displaying the words and their phonetics associated with the scene. The overall framework adopts a bottom-up structural design, including the establishment of the underlying model library, word learning module, association scene module, etc., and ultimately generates corresponding QR codes for users to scan and use.

4.2. Specific Division of Functional Modules

Based on resource demand analysis and resource content analysis, the author divides the functional modules of augmented reality teaching resources into two modules: word learning module and associated scene module. Each module presents corresponding augmented reality information by identifying corresponding recognition maps.

Word learning module: This module mainly helps students learn key words and phrases. In this module, users can obtain the corresponding 3D model by scanning the recognition map of words, and at the same time, users can directly interact with virtual information with their fingers. And while learning new words, connecting relevant words that have already been learned can achieve a combination of new and old knowledge, which not only consolidates students' memory of the learned knowledge but also helps them better understand and

memorize new knowledge.

Scenario dialogue module: If students acquire language knowledge through both visual and auditory senses, and express the language knowledge with their own understanding, it can greatly improve their understanding and memory of these knowledge. Therefore, the purpose of this module design is to provide virtual contexts for students to exercise their daily oral dialogue skills, help them actively participate in the teaching process, and acquire the knowledge content of this unit while obtaining vivid and interesting learning experiences. Considering the poor observation, thinking, and behavioral abilities of students, this module mainly uses scanning recognition images and gesture clicks to achieve interaction between students and virtual information. Teachers and students can also play their own model roles, turn off the audio, engage in simulated conversations, or create conversations. The interactive operation of this module is simple and easy to learn, which not only helps students acquire language knowledge more easily and effectively, but also cultivates students' observation ability and associative memory learning habits invisibly.

4.3. Learning Process Design

Through resource demand analysis, it can be seen that the most basic requirement for students and teachers to use this AR teaching resource is that it should not affect students' normal English learning process. Therefore, usability is a factor that cannot be ignored in the development process of this case teaching resource. Therefore, the learning process designed by the author is simple and easy to operate. Starting from students scanning QR codes to recognize relevant word information, and ending with obtaining and observing enhanced information, organically embedding mobile augmented reality resources into the classroom teaching process does not affect normal teaching progress and learning arrangements, providing good technical support for traditional teaching, achieving the dual purpose of assisting teachers in teaching and students in immersive learning.

5. Conclusion

With the continuous development and application of AR technology, it has shown many advantages in both language and non-language teaching. Although there are many studies on the application of AR in language teaching, there are few empirical studies on English teaching. This article designs and develops English teaching resources based on AR, and applies them to college English classroom teaching to test their application effectiveness. The author combines the current situation of college English teaching, teaching resources, teaching content, resource demand analysis, and relevant theoretical foundations to design and develop case teaching resources, and will elaborate in detail on the development steps of this teaching resource, apply the designed AR case teaching resources to specific classrooms. By analyzing and organizing relevant data, the main conclu-

sions of this study are as follows: English teaching resources based on AR are recognized by teachers and students in specific experimental teaching, and have a certain promoting effect on students' understanding and memory of English words, exercise of daily English oral dialogue skills, and knowledge transfer. At the same time, it can also cultivate students' interest in English learning and help them establish good confidence in English learning. Therefore, it is feasible to apply AR based English teaching resources to university classrooms. AR technology can enhance the spatial sense of English teaching in a more three-dimensional form. It can try to explore setting up AR learning environments in multiple scenarios, such as student dormitories, canteens, and sports fields, creating a comprehensive language learning environment for students. In the future, with the improvement and promotion of application achievements, research will continue to enrich development resources, optimize models, and provide users with a better learning experience.

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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