Abstract: Virtual reality technology is an important direction of simulation technology, is a collection of simulation technology and computer graphics, human-computer interface technology, multimedia technology, sensing technology, network technology, and other technologies. It is a challenging cross-technology frontier discipline and research field. Virtual Reality (VR) technology mainly includes simulated environment, perception, natural skills and sensing devices. The simulated environment is a computer-generated, real-time dynamic three-dimensional stereo realistic image. This paper explores the transformative potential of virtual reality (VR) technology in English language teaching, focusing on the dynamic interplay between learning motivation and effectiveness. Through immersive VR environments, educators can cultivate increased engagement and foster language acquisition. A comprehensive literature review demonstrates the widespread adoption of VR technology in various fields and highlights its positive impact on learning outcomes. The proposed methodology advocates the seamless integration of VR technology with innovative pedagogical approaches to optimize English language instruction. By analyzing the relationship between learning motivation and effectiveness, this study sheds light on the nuanced dynamics of VR-enhanced learning in English language education.

Keywords: Computer technology applications; Virtual Reality Technology; English Teaching; Learning Motivation; Learning Effectiveness.

I. INTRODUCTION

In April 2018, the Ministry of Education released the "Education Informatization 2.0 Action Plan", which represents China's education reform moving towards a higher level. General Secretary Xi Jinping once clearly pointed out that "informatization is the inevitable choice for modernization development." This strategy leads the in-depth integration of information technology and education and teaching, and promotes the process of educational modernization. As an emerging achievement in the 21st century, virtual reality (VR) technology has shown great potential for development in the field of education. The emergence of VR technology provides a solid technical foundation for "VR + education". Its characteristics include immersion, interactivity and imagination. It not only subverts the traditional teaching model, but also stimulates students' learning initiative to the greatest extent and promotes teaching. Updates to the method.

In professional classroom teaching, there are a series of challenges, such as how to effectively stimulate students' interest in learning, strengthen students' interaction with learning content, and cultivate students' exploration abilities. In response to these challenges, VR technology has three major characteristics: immersion, interactivity and imagination. It can be organically integrated with the teaching environment, content and objects to solve various problems in the teaching process. For example, through the creation of an immersive teaching environment, students' interest in learning can be stimulated and they can get rid of the constraints of the single situation in the traditional classroom; the integration of interactivity and teaching content can achieve effective interaction between students and content, breaking the traditional teacher-mediated teaching mode; the collision of imagination and teaching objects can stimulate students' imagination and also exploration ability in the virtual space, and improve their comprehensive literacy. To begin with, the Figure 1 shows the thinking framework for the integration of VR technology and education.

In this extended study, our paper delves into the dynamic realm of integrating virtual reality technology into English language education. Our primary objective is to dissect the intricate interplay between learning motivation and the resultant effectiveness of this innovative approach. By immersing learners in captivating virtual environments, we aim to not only enhance language acquisition but also illuminate the nuanced connection between engagement and learning outcomes.
Figure 1. The Thinking Framework for the Integration of VR Technology and Education

Especially, the key technologies of VR are summarized in the Table 1.

**Table 1. The Key Technologies of VR**

<table>
<thead>
<tr>
<th>Key Technology</th>
<th>Details and Discussions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network transmission technology</td>
<td>Fast and stable network transmission technology provides intelligent real-time interaction and the construction of realistic virtual scenes for virtual reality (VR) applications. Utilizing lightweight mobile 5G technology, it provides peak speeds, millisecond-level latency and large-scale connection capabilities, reducing the requirements for VR equipment and improving user experience. Edge computing services lower the threshold for cloud-based VR services and promote their commercialization on 5G and fixed networks. The fifth generation fixed network (FG5) has the characteristics of large bandwidth, low latency, openness and all-optical connections, which can improve multi-user VR experience and promote the development of VR network transmission technology.</td>
</tr>
<tr>
<td>Perceptual interaction technology</td>
<td>Perceptual interaction technology aims to improve users' perception and interaction experience in virtual environments, including position awareness, gesture control, eye tracking, voice recognition and other functions. Position tracking is its core skill, and performance is improved through multiple sensor fusion positioning. Gesture recognition technology reduces the cost of interactive devices and enhances user participation. In the future, eye tracking, environmental understanding and three-dimensional reconstruction will become key research directions to achieve a more immersive, natural and intelligent virtual interactive experience.</td>
</tr>
<tr>
<td>Rendering processing technology</td>
<td>Rendering processing technology uses methods such as graphics and light detection to convert the three-dimensional shape, texture details, lighting effects and shadows of the virtual environment into realistic flat images to enhance the user's perceptual experience. Virtual reality (VR) rendering technology has the characteristics of real-time, high resolution and low latency, which reduces the discomfort when switching screens and enhances the visual effect. Cloud rendering and foveated technology further balance rendering quality and efficiency. Foreign companies such as NVIDIA and AMD continue to promote the development of rendering technology and provide graphics processors and software tools specifically designed for VR. Domestic companies such as Huawei and Lenovo are also actively promoting VR rendering technology. The fields of gaming, virtual tourism and education are also researching and applying rendering technology to continuously improve the quality and performance of VR images. With the continuous advancement of VR technology, the improvement of rendering processing technology will achieve a more realistic and smooth virtual experience.</td>
</tr>
</tbody>
</table>

II. LITERATURE REVIEW ON VIRTUAL REALITY TECHNOLOGY

In recent times, the utilization of expanded reality (XR) tools, encompassing virtual realm (VR), enhanced reality (AR), and mixed reality (MR), has observed notable proliferation across a multitude of sectors. This
analysis endeavors to scrutinize the present status and forthcoming inclinations of XR technology in various spheres, including healthcare, learning, urban development, and artistic creation, by perusing a collection of pertinent scholarly works.

[1] Moriimoto et al. (2022) delved into the burgeoning acceptance of XR tools in spinal healthcare, propelled by advancements in digitalization and expedited by the COVID-19 pandemic. Their inquiry furnishes an exhaustive overview of XR technology applications in spinal healthcare, spanning surgical procedures, consultations, educational endeavors, and rehabilitative efforts, while also underscoring constraints and future outlooks.

[2] Marks and Thomas (2022) assessed the uptake of VR and AR tools in advanced learning, particularly concentrating on a purpose-tailored VR laboratory at The University of Sydney. Their observations demonstrate the affirmative influence of VR technology on enriching learning outcomes, with a considerable uptick in student numbers and contentment, affirming the merit of investing in VR infrastructure for educational purposes.

[3] Ding et al. (2020) proposed a VR-centric framework for collegiate physical education, integrating IoT and cloud platforms to enhance pedagogical efficacy. Their research showcases the application of VR technology in tackling challenges such as monotonous teaching methodologies and inadequate remote teaching capabilities, offering valuable insights for the transformation of physical education in tertiary institutions.

[4] Liu (2020) underscored the role of VR technology in urban landscape blueprinting and design, accentuating its capacity to provide efficient and user-friendly depictions of planning outcomes through 3D visualization. By deliberating on the developmental context and hurdles of VR technology, the study accentuates its potential in enhancing the efficiency and caliber of urban planning procedures.

[5] Li and Li (2022) focused on the application of 3D animation technology in virtual medicinal setups, particularly for surgical instruction and skill acquisition. Their inquiry illustrates how the fusion of 3D animation and the VR technology circumvents traditional instructional limitations, delivering a rich experiential learning encounter and enhancing instructional efficacy.

[6] Lv (2020) scrutinized the amalgamation of VR technology with the Internet of Things (IoT), aiming to augment user engagement and interaction efficiency. The investigation highlights the potential of melding VR and IoT technologies to fabricate immersive and smart environments, contributing to technological advancement and commercial application.

[7] Huang et al. (2020) explored the utilization of VR technology in welding pedagogy, concocting a VR-assisted welding course and conducting experimental instruction. Their findings indicate that VR technology furnishes a secure, cost-effective, and repeatable learning milieu, amplifying students' welding skills and contentment.

[8] Wang (2022) discussed the application of VR technology in environmental artistic design, focusing on theories, algorithms, and developmental techniques. By dissecting the features of VR technology, the study accentuates its significance in simulating environmental artistic design and underscores the necessity for further exploration in this realm.

[9] Zhang (2021) examined the application of intelligent VR technology in collegiate artistic creation and design instruction. Their study propounds a novel interactive VR paradigm and explores methodologies to mitigate conflicts in virtual settings, proffering insights into amplifying user experience and crafting artistic virtual environments.

[10] Rousseaux et al. (2020) conducted a sweeping review on the fusion of hypnosis and VR technology for pain management. Their findings suggest potential merits in diminishing pain intensity and anxiety, though outcomes diverge among patients. The study underscores the exigency for additional research to delineate the efficacy of VR-supported hypnosis in clinical application.

[11] Feng et al. (2022) explored the assimilation of VR technology into tertiary physical education, centering on web-based applications and data scrutiny. Their inquiry illustrates the potential of VR technology in augmenting physical education pedagogical efficacy and student learning outcomes, proffering invaluable insights for modernizing physical education.

[12] Froiland et al. (2020) dissected the utilization of mobile games and VR technology in biomedical laboratory science instruction. By evaluating a gamified app for phlebotomy practice, the study underscores the potential of the SSG applications in bolstering practical adeptness and sustainable pedagogy.

XR technology harbors promise for multifarious applications across assorted realms, spanning from healthcare and learning to urban planning and artistic creation. While substantial strides have been undertaken,
obstacles persist, necessitating further exploration to fully harness the potential of XR technology and its amalgamation into diverse spheres.

III. THE PROPOSED METHODOLOGY

A. The Basic Discussions of Current English Learning Methodologies

In the contemporary landscape of global economic integration, the indispensability of English as a unique instrument for cross-cultural communication is increasingly conspicuous. The escalating societal regard for English proficiency and communicative prowess imposes elevated standards on English language pedagogy, directly impacting educational quality and instructor pedagogical frameworks. To further enhance pedagogical efficacy and optimize educational outcomes, educators must undergo a transformative pedagogical shift, embracing innovative instructional methodologies while discarding conventional paradigms. This imperative aims to prioritize student engagement and empowerment within the classroom dynamic, fostering a learner-centric approach conducive to comprehensive academic development. In the Figure 2, the general strategies for the English teaching can be summarized.

![Figure 2. The General Strategies for the English Teaching](image)

Then mentioned strategies can improve the educational performance. In the contemporary educational arena, the fusion of cutting-edge information technologies provides a plethora of conveniences for the teaching of English language. Tools such as interactive presentation boards, intelligent classroom systems, web-based learning platforms, and compact instructional segments have heralded a new era in pedagogical methods, significantly augmenting the capacity of English classrooms while placing a spotlight on student-centered learning. This transformative shift not only unlocks the latent potential of students but also cultivates their active participation and empowerment within the learning process. Educators now have the opportunity to fashion dynamic and interactive learning environments, guiding students through tasks that make use of video-based tutorials and visually engaging presentations. This approach not only facilitates a seamless amalgamation of digital and traditional teaching methodologies but also encourages students to take charge of their learning journey, thereby fostering independence and holistic development. Moreover, the utilization of state-of-the-art computer and internet technologies enables educators to access a vast repository of valuable teaching materials. By incorporating multimedia elements such as visuals, audio snippets, and textual resources into their lessons, teachers can offer students immersive learning experiences that captivate their senses and fuel their creative expression. Furthermore, the establishment of web-based learning hubs facilitates seamless communication and collaboration between educators and learners. Through these platforms, instructors can upload teaching aids, assign tasks, and orchestrate interactive activities like online reading assignments, quizzes, and group projects. Additionally, automated assessment mechanisms streamline the evaluation process, enabling instructors to efficiently monitor student progress and deliver prompt feedback. In essence, the integration of advanced information technologies has not only enriched the landscape of the English language education but has also empowered educators to construct dynamic and engaging learning environments tailored to the diverse needs and learning preferences of their students. Then, for the education, the performance evaluation is also essential, and the Table 2 gives the principles for the current learning evaluations.

Table 2. The Principles for the Current Learning Evaluations
B. The Virtual Reality Technology in Education

Incorporating the use of immersive technology, such as virtual reality (VR), within educational contexts, offers significant potential for enriching the teaching and learning experience. VR's ability to simulate and replicate environments creates captivating and true-to-life learning settings, fostering increased engagement among educators and students alike. By harnessing the capabilities of VR technology, educators can effectively illustrate fundamental concepts, leading to deeper comprehension and heightened cognitive involvement among learners. This innovative approach revitalizes teaching methodologies across various educational activities, underscoring its central role in contemporary pedagogy.

Therefore, maximizing the integration of immersive technology, such as VR, into curriculum design and instructional practices represents a vital avenue for educational research and development. Achieving seamless synergy between immersive technology and pedagogical strategies signifies a shift from mere integration to comprehensive application, necessitating further exploration and inquiry within scholarly discourse. This imperative endeavor seeks to leverage the transformative potential of immersive technology in education, thereby advancing the boundaries of teaching and learning in the digital era. In the Figure 3, the demonstration of virtual reality for teaching scenarios is provided.

The emergence of digital technology is fundamentally altering the instructional methods within English education, prompting a reevaluation of educators' roles. Traditionally, educators in English education have served as knowledge transmitters, responsible for imparting specialized knowledge and skills to students. However, in today's digitalized English education landscape, students have the autonomy to choose their learning resources and paths, necessitating a gradual transition of educators into mentors and guides. This shift presents several challenges. Firstly, many educators are unfamiliar with this new role and lack the skills and experience to facilitate self-directed learning among students. Secondly, the rapid evolution of digital technology renders the knowledge and skills of many educators quickly obsolete, placing significant pressure on their professional development. Addressing these challenges requires strategic measures such as ongoing English training and learning initiatives. Educational institutions and governmental bodies can offer a diverse range of online and offline training programs to ensure educators remain current with contemporary trends. Additionally, schools and educational institutions should provide educators with varied career advancement opportunities, including roles as researchers, curriculum designers, and project managers. Collaboration with businesses to offer internships or work placements can also help educators stay informed about the latest industry developments.
Figure 3. The Demonstration of Virtual Reality for Teaching Scenarios

C. The Specialized Discussion between Learning Motivation and Learning Effectiveness

After the integration of the mentioned theories and methodologies, this section provides the detailed test regarding the learning motivation and learning effectiveness.

For the evaluation factor, the SOLO is selected as the methodology. Biggs and Collins proposed the theory of evaluating the quality of learning - SOLO classification, which divides students' learning outcomes into five levels: prestructural level (PS), single-point structural level (US), multi-point structural level (MS), correlation level (R), and extended abstract level (EA): black rectangles represent specific knowledge, black dots represent abstract knowledge that has been systematically integrated and processed, and straight lines represent the connections between knowledge. The prestructural level refers to students finding answers unrelated to the problem, indicating that no learning has occurred; the single-point structure level refers to students identifying only a single point of knowledge related to the problem, but failing to think fully and deeply; the multi-point structure level refers to students' ability to find multiple points of knowledge when faced with problems, but they cannot organically connect these points of knowledge, and the knowledge structure is still scattered and isolated; The relational structure level refers to the ability of students to effectively summarize, integrate and compare their learned knowledge, make hypotheses, find multiple knowledge points related to the problem, and construct a systematic knowledge structure system; Expanding the abstract structure level refers to the ability of students to expand, deepen, innovate and develop their knowledge structure system on the basis of the relational structure level, have the ability to solve problems, and have theoretical and practical innovation. Then, for the test, questionnaire is selected as the approach. In the Table 3, the learning ability scale information is provided.

Table 3. The Learning Ability Scale Information

<table>
<thead>
<tr>
<th>Learning Ability Dimension</th>
<th>No. Of Test</th>
<th>Representative Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning motivation</td>
<td>5</td>
<td>I feel very happy and satisfied when I learn new knowledge.</td>
</tr>
<tr>
<td>Learning engagement</td>
<td>8</td>
<td>I actively participate in class discussions and express my opinions</td>
</tr>
<tr>
<td>Learning strategy</td>
<td>8</td>
<td>I can construct a concept map (similar to a mind map)</td>
</tr>
</tbody>
</table>
Learning effect | 12 | Capable of acquiring, sifting, and extracting information

The purpose of this interview is to understand the deep learning methods of students from different majors and their impact on English learning, and to ask students to self-evaluate their deep learning ability. The interview outline includes five framework questions related to deep learning ability and college English learning, which will be appropriately adjusted in the actual interviews as needed. The data show that the meaning and value load of learning is the highest and is the most important factor influencing learning motivation. A rich learning environment places higher demands on learners' intrinsic motivation to learn. When learners have insufficient intrinsic learning motivation, they tend to engage in superficial or coping learning, lacking higher-order thinking skills.

IV. CONCLUSION

This study underscores the profound implications of integrating VR technology into the English language classroom. By utilizing immersive VR environments, educators can increase both learning motivation and effectiveness. The extensive literature review highlights the widespread adoption of VR technology and confirms its transformative potential across multiple sectors. Through the proposed methodology, which emphasizes the seamless fusion of VR technology with innovative pedagogical strategies, English language instruction can be optimized for maximum impact. By exploring the intricate relationship between learning motivation and effectiveness, this study provides valuable insights into the transformative power of VR-enhanced learning in English language education. Moving forward, continued research is essential to fully unlock the potential of VR technology and its role in promoting overall language proficiency and academic development.

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REFERENCES