Analysis of the Needs and Characteristics of Educational Digital People

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Abstract. This paper deeply discusses the needs and characteristics of digital human education. In the context of the development of digital education, the definition and characteristics of the educational digital person are expounded in detail, and their needs in personalized learning, interactive teaching, practice and experiment, fairness, and popularization are analyzed. This paper discusses its application in classroom teaching, online learning, special education and other scenarios and points out the challenges, such as technical limitations, ethical issues and teacher role change. Finally, the research results are summarized, the future development trend is looked forward, and relevant suggestions are put forward.

Keywords: educating digital people; personalized learning; interactive teaching; technical limitations; ethical issues

1   Introduction

The rapid advancement of information technology is catalyzing a significant transformation in the educational sector, giving rise to digital education platforms, virtual reality teaching methods, and intelligent educational software[1]. Among these developments, educational digital humans are emerging as an innovative and impactful tool, offering personalized, interactive, and immersive learning experiences. The deployment of digital humans in educational contexts aims to bridge gaps between traditional pedagogical methods and the evolving needs of modern learners. By providing a virtual presence that simulates human behavior, language, and cognitive processes, educational digital humans have the potential to transform how teaching and learning processes are designed and delivered[2].

As the global education technology market continues its upward trajectory, there is a growing investment by educational institutions in developing digital human technologies[3]. These investments are geared towards accommodating diverse student

learning needs, ensuring personalized learning pathways, enhancing interactive teaching methods, and promoting the equitable distribution of high-quality educational resources. However, despite the potential benefits, the adoption of digital human technology in education faces numerous challenges, including technical limitations, ethical considerations, and the need for educators to adapt their roles within this new technological landscape.

2   Foreword

2.1   Research Background

With the rapid development of information technology, the field of education is undergoing a profound digital transformation. The wide application of digital technology in education, such as online learning platforms, virtual reality teaching, and intelligent education software, has brought unprecedented opportunities for education. In this context, digital people are an emerging technology application that is gradually rising. The emergence of digital people can provide a more vivid, personalized, and interactive learning experience for education[4,5].

According to relevant data, the size of the global education technology market continues to grow, and it is expected to maintain a high growth rate in the next few years[6]. At the same time, more and more educational institutions have begun to invest resources in the development and application of digital human technology to meet the increasingly diverse learning needs of students.

2.2   Study Purpose

This study aims to deeply dissect the needs and characteristics of educational digital people. Specifically, we hope that through the study of educational digital people, we can clarify their unique role in the presentation of teaching content, the innovation of teaching methods, and the improvement of students' learning effect. At the same time, explore how to optimize the design and application of educational digital people according to the characteristics of students of different disciplines and different ages so as to achieve more accurate and efficient education services.

2.3   Study Significance

Understanding educational digital people is of great significance for promoting educational innovation and optimization. First of all, educating digital people can make up for the shortcomings of traditional education and provide students with more personalized learning paths and real-time feedback. For example, digital students can adjust their teaching content and pace in a timely manner according to students' learning progress and knowledge mastery. Secondly, it is helpful to expand the supply channel of educational resources. Through the application of digital people, the limitation of time

and space can be broken, and more students can enjoy high-quality educational resources. Moreover, it also plays a positive role in improving the fairness and popularization of education. No matter where students are, they can interact with educational digital people. In short, the research of educational digital people can help to promote the innovation of education mode and provide strong support for the cultivation of talents to adapt to future social development.

3 The Definition and Characteristics of Educational Digital People

3.1 Definition

An educational digital person is a digital role specially designed and developed for the field of education[7]. It uses artificial intelligence, big data, and other technologies to simulate human language, behavior and way of thinking to assist the teaching and learning process. Compared with the general digital person, the educational digital person focuses more on the educational function, and their knowledge system and behavior mode are closely built around the educational goals and teaching needs. The general digital people may be more used in entertainment, social networking and other fields, while the core task of educating digital people is to improve the educational effect and learning experience.

3.2 Features

The autonomy of educational digital people is reflected in the ability to interact with students and guide learning according to preset rules and algorithms. For example, when students study independently, educational digital people can automatically provide corresponding tips and suggestions according to students' operations and questions. In terms of learning ability, it is able to continuously learn and update knowledge from a large amount of educational data to adapt to different teaching content and student needs. For example, according to students' learning progress and feedback, teaching strategies and knowledge points should be adjusted in a timely manner. Interactivity enables educational digital people to communicate with students in real-time and effectively, answer questions, discuss ideas, and stimulate students' interest and enthusiasm in learning. Educational digital people can play multiple roles, such as teachers, counselors, learning partners, etc., and play different roles in different educational scenarios, for example, as a teacher to explain the knowledge, as a counselor to provide psychological support, and as a learning partner to complete the learning tasks together.

3.3 Comparison with Traditional Educational Methods

In terms of teaching effect, traditional education methods often rely on teachers' personal ability and teaching methods, and there may be great differences in teaching ef-

fect. Educational digital people can provide standardized and consistent teaching content and guidance to ensure that every student can obtain the same quality of educational resources[8,9]. In terms of student participation, in traditional education, some students may be afraid to participate due to introversion or fear of teachers. The education of digital people, with its friendly and equal image, can let more students dare to express their own ideas and questions and improve their participation. In addition, traditional education is greatly limited by time and space, and educational digital people can provide services to students at any time, breaking these restrictions.

4   Education of the Needs of Digital People

4.1   Personalized Learning Needs

In today's diversified learning environment, students' demand for personalized learning has become increasingly prominent. Each student has a unique learning style, interests, and knowledge base, and they expect to educate digital people to customize their learning content and methods according to their individual differences. For example, for students with strong logical thinking, digital people can provide more challenging logical reasoning exercises and in-depth theoretical discussion; for students with visual learning preferences, digital people can present knowledge with rich images, charts, and videos. Through intelligent algorithms and big data analysis, educational digital people can accurately understand students' learning status, tailor personalized learning paths for them, and push courses, exercises, and learning resources that meet their ability level and development needs.

4.2   Interactive Teaching Needs

Both students and teachers desire a richer, real-time, interactive teaching experience. Students hope to communicate with educational digital people at any time during the learning process, not only by asking questions and getting answers but also by including in-depth discussions and the collision of ideas. Teachers expect digital people to be used as an auxiliary tool to participate in classroom interaction in real-time and enhance the interest and participation of teaching. For example, in group discussions, digital people can guide students to conduct more targeted discussions, provide different views and cases, and stimulate students' innovative thinking. In addition, the real-time feedback and evaluation function of digital people can also help students adjust their learning strategies in time and improve their learning effect.

4.3   Practice and Experimental Requirements

In terms of experimental operation and practical exploration, educational digital people have a broad application space. For some complex or dangerous experiments, digital people can simulate the real experimental environment and operation process, let students practice in the virtual environment, and reduce the experimental risk and cost. At

the same time, digital people can provide students with detailed experimental guidance and error correction to help students better master experimental skills and scientific methods. For example, in a chemical experiment, digital people can demonstrate the correct experimental steps, remind students to pay attention to safety matters, and conduct real-time evaluations and feedback on students' operations.

4.4 Demand for Fairness and Popularization

Educating digital people plays an important role in promoting equitable distribution and widespread access to educational resources. In areas with relatively scarce educational resources, digital people can make up for the shortage of teachers and provide high-quality educational services for students. No matter whether the students are in urban or rural areas, no matter how the economic conditions are, as long as they have the Internet, they can enjoy the same level of educational support. Digital people can break regional restrictions, pass on high-quality educational content to students in every corner, narrow the educational gap between urban and rural areas and regions, and promote the realization of educational equity. In addition, digital people can also reduce the cost of education so that more people can afford quality educational resources, thus promoting the wide popularization of education.

5 Application Scenarios for Educating Digital People

5.1 Classroom Teaching

In the regular classroom, educational digital people can play the role of auxiliary teachers. It can display vivid multimedia content in real-time, such as 3D models, dynamic demonstrations, etc., to help students understand abstract knowledge more intuitively. Digital educational people can also repeat the knowledge points and provide multiple explanations of the difficult parts to ensure that every student can keep up with the teaching progress. It can interact with students, timely understand the students' grasp of the situation, and give targeted feedback and suggestions. In addition, educational digital people can also assist teachers in classroom management, such as recording students' performance, statistical participation, etc., to provide data support for teaching evaluation.

5.2 Online Learning

In distance teaching, the advantage of educating digital people is significant. It is not limited by time and space, and students can access the learning resources at any time according to their own needs. Through intelligent analysis of students' learning behaviors and habits, personalized learning plans are customized for them. For example, the course content and difficulty should be adjusted according to the students' learning length, answer accuracy, and other data. In terms of application, educational digital

people can serve as online mentors to answer students' questions in real-time and provide learning guidance. It can also organize online discussion groups to promote communication and cooperation among students. At the same time, through the virtual laboratory and other functions, students can also carry out experimental operations and practice at home to enhance their interest and practicality in learning.

5.3   Special Education

In the field of special education, educating digital people plays an important role. For visually impaired students, digital people can help them understand their knowledge through voice description and audio guidance. Provide clear sign language demonstration and visual prompts for hearing-impaired students. For students with cognitive impairment or learning difficulties, digital people can teach in a more patient and easier-to-understand way, adjusting the pace of teaching according to the student's response and progress. In terms of emotional management, digital people can act as companions to give emotional support and psychological counseling to special students. For example, by telling stories and playing games, autistic students improve social skills and emotional expression skills.

6   The Challenge and Response of Educating Digital People

6.1   Technical Limits

There are obvious deficiencies in the current technology in realizing certain functions of educating digital people. For example, in terms of speech synthesis, although the speech of digital people is quite natural, it is still difficult to fully simulate the rich human tone, tone, and emotional changes, which may lead to suboptimal communication in some situations. In the simulation of expression and action, the performance of digital people may appear stiff and mechanical, lacking natural and smooth subtle movements and expression changes, which affects the students' emotional resonance and learning experience. In addition, for the in-depth explanation of complex knowledge and logical reasoning ability, the educational digital people still need to be improved, and they may not be able to respond to students' various questions and thinking expansion needs as flexibly as experienced teachers. At the same time, when dealing with multi-task and complex scenes, the response speed and stability of digital people also have certain limitations, and there may be lag or delay, which will affect the coherence and fluency of teaching.

6.2   Ethical Issues

The application of educating digital people may involve a range of ethical issues. The first is privacy protection. In the process of interacting with students, digital people will collect a large amount of personal data, such as study habits, interests, and hobbies. If these data are improperly used or leaked, it will seriously violate the privacy of students.

Secondly, data security is also a big hidden danger. Hacking attacks or improper data storage may lead to the loss and tampering of educational data and affect the normal progress of teaching and students' learning records. If only some students had access to high-quality digital people education resources, it would aggravate the uneven allocation of educational resources. Moreover, how the behavior and speech of digital people are regulated and supervised to ensure that the values they convey meet the social, moral, and educational goals is also a question that needs to be considered deeply.

6.3   Teacher Role Change

In the context of the widespread use of educational digital people, the role of teachers faces a significant shift. Teachers are no longer just the imparters of knowledge but more become the guides and organizers of learning. They need to help students correctly understand and effectively use the assistance of digital people and guide students in developing their critical thinking and self-directed learning abilities in their interactions with digital people. Teachers should also assume the responsibility of evaluating the teaching effect of digital people and adjusting and optimizing the teaching content and methods of digital people according to the actual situation. In addition, teachers play a more prominent role in emotional education and value shaping. Through face-to-face communication with students, students' social-emotional ability and correct values should be cultivated to make up for the deficiency of digital people in this aspect.

7   Conclusion and Outlook

7.1   Study Summary

This study explores multiple aspects of educating digital people in depth. In terms of needs, it covers diversified needs such as personalized learning, interactive teaching, practice and experimentation, and fairness and popularization. Its characteristics include autonomy, learning ability, interactivity, and versatility. Compared with traditional education methods, it has significant advantages in terms of teaching effect, student participation, and time-space limitations. Application scenarios include classroom teaching, online learning, and special education areas. However, educating digital people also faces challenges such as technical constraints, ethical issues, and teacher role shifts.

7.2   Future Development Trend

In the future, the education of digital people will continue to improve in technology. Speech synthesis will be more natural and smooth, with rich emotional color; expression and action simulation will be more realistic, to achieve highly similar to human beings; the interpretation of complex knowledge and logical reasoning ability will be significantly improved, can better meet the needs of students for knowledge. In terms of application expansion, it will not only be limited to common subject education but

also play an essential role in vocational education, lifelong education, and other fields. At the same time, with the development of emerging technologies such as meta-universe, the application scenarios of educational digital people will be richer and more diversified, providing learners with a more immersive learning experience.

7.3   Suggestions and Inspirations

In order to promote the development and effective application of educational digital people, we should increase the investment in related technology research and development and encourage interdisciplinary cooperation to break through the technical bottleneck. Educational institutions and developers should establish a sound data protection mechanism to ensure students' privacy and data security. Furthermore, clear norms and ethics for digital people should be developed so that the values they pass align with educational goals. In the process of promoting educational digital people, the differences between regions and schools should be fully considered to avoid causing new educational inequity. In short, only with reasonable planning and scientific application can educational digital talents bring greater value to the education cause.

Acknowledgments

References

1. Guo M J, Yan Z L. Research hotspots and trends of education digitization at home and abroad [J]. China Education Informatization, 2023 (12): 67-12.
2. Li S. Discussion on the development of educational digital people based on artificial intelligence [A]. Proceedings of the National Educational Technology Academic Conference [C], Beijing, 2021:123-130.
3. Wang H. The role of digital people in education [N]. China Education Daily, 2024-05-10 (03).
4. Zhihu. Reading through the Future of Digital Man, https://zhuanlan.zhihu.com/p/447760946, 2021-12-20 20:26.
5. Zhihu. Digital human industry map and typical examples, https://zhuanlan.zhihu.com/p/452071022, 2021-12-31 14:45.
6. Kocdar S, Bozkurt A. Supporting learners with special needs in open, distance, and digital education[M]//Handbook of open, distance and digital education. Singapore: Springer Nature Singapore, 2023: 881-895.
7. García-Vandewalle García J M, García-Carmona M, Trujillo Torres J M, et al. Analysis of digital competence of educators (DigCompEdu) in teacher trainees: the context of Melilla, Spain[J]. Technology, Knowledge and Learning, 2023, 28(2): 585-612.

8. Denden M, Tlili A, Chen N S, et al. The role of learners' characteristics in educational gamification systems: A systematic meta-review of the literature[J]. Interactive Learning Environments, 2024, 32(3): 790-812.
9. Montenegro-Rueda M, Fernández-Batanero J M. Adaptation and validation of an instrument for assessing the digital competence of special education teachers[J]. European Journal of Special Needs Education, 2024, 39(3): 367-382.