

Analysis and Discussion of Influential Factors in the Construction of Digital Learning Spaces in the Context of Higher Education Digitization

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Abstract: With the trend of digitization in higher education, digital learning spaces have gained widespread attention as important learning environments. This article first outlines the development trends of digitization in higher education, including digitization of teaching tools, digitization of teaching content, and digital learning spaces. It then analyzes the influential factors in the construction of digital learning spaces, including requirements for digital technology, pedagogical innovation, repositioning of teacher and student roles, breaking the limitations of physical time and space, and the transformation of managerial functions. Finally, it provides an outlook on the development prospects of digital learning spaces.

1 Introduction

With the rapid development of technology, digitalization has permeated various aspects of people's lives, including higher education. Traditional teaching models and educational approaches can no longer meet the needs of today's society and students. In this digital age, higher education needs to leverage digital technology to provide more open, flexible, and personalized learning approaches to meet the diverse needs of students and cultivate the skills required for future workplaces. The digital transformation will change the landscape of traditional education, allowing learning to break free from the confines of the classroom, enabling global sharing of educational resources, and making knowledge acquisition more convenient. It also presents new possibilities for promoting access to higher education, improving the quality and efficiency of education. The digital transformation of higher education is inevitable. Only by embracing digital education, seizing the pulse of technological development, can we stay at the forefront of the era and make significant contributions to cultivating innovative and globally competitive talents. Currently, the digital development of higher education can be divided into two directions: digitization of teaching tools and digitization of content. With the rapid development of digital tools and digitized content, a virtual learning environment that includes digital tools and digitized content has emerged, namely digital learning spaces. This article explores the construction of digital learning spaces

as a new direction for the digital development of higher education.

2 High-level education digital development trends

2.1 Digitalization of teaching tools

The digitalization of teaching tools in higher education refers to the use of digital technology and tools to improve the teaching and learning process. For example, online learning platforms provide various learning resources and tools. Students can use these platforms to complete course learning and submit assignments. Some common online learning platforms include Coursera, edX, and Udemy, which provide a large number of online courses from top universities and institutions worldwide. Students can choose and learn according to their interests. Electronic textbooks and e-books gradually replace traditional paper textbooks. Electronic textbooks can be read on electronic devices such as tablets and e-book readers, and operations such as searching, annotating, and taking notes can be performed. Smart devices and applications, such as smartphones, tablets, and smartwatches, allow students to access learning resources, participate in online discussions, and receive personalized learning anytime and anywhere. Teaching management systems are software platforms used to manage courses, students, and teachers, including functions such as course management, student management, assignment management, and evaluation management, to improve the efficiency and quality of the

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teaching process. These digital tools provide more learning resources and tools for higher education, allowing students to personalize their learning according to their needs and enabling teachers to better design and evaluate their teaching. The application of digital tools has pushed higher education towards a more flexible, convenient, and innovative direction. Currently, domestic scholars are digging deep into digital technology, using it to support innovative teaching concepts, break through teaching bottlenecks, supplement and expand classroom content, support teaching structure reforms, and build open classroom teaching structures through the direct interaction and connection of various elements in the digital classroom^[1] (Jiang Wei, 2018). Actively building digital teaching platforms and sharing resources on these platforms can achieve good sharing of teaching resources, information storage, and the transmission of high-quality information. This is favorable for improving students' independent learning ability and inquiry ability and for stimulating students' learning enthusiasm^[2] (Zhang Desheng, 2018). A survey conducted by the University of Oldenburg in Germany found that both teachers and students use a limited number of digital technology for predominantly assimilative tasks, with the Learning Management System being perceived as the most useful tool^[3] (BOND M, 2018).

2.2 Digitization of Teaching Content

Digitization of higher education content refers to the transformation of traditional teaching content into digital forms, providing online access and communication. For example, online courses allow higher education institutions and teachers to record course content in videos or other digital formats and provide them to students through online platforms. Students can learn at their own time and location, flexibly choose courses of interest, and review them when needed. Digital textbooks and e-books are gradually replacing traditional textbooks and learning materials. Digital textbooks can be read on electronic devices such as tablets and e-book readers, allowing students to search, annotate, and take notes. E-books can also be downloaded and accessed through the internet, providing students with learning materials and references. Open educational resources are increasingly shared by higher education institutions and teachers, such as course videos, lecture notes, and teaching plans. These open educational resources can be freely accessed and used globally, providing students with a wealth of learning materials and references. The digitization of higher education content provides flexible learning methods, expands the scope of learning resources, and promotes communication and collaboration between students and teachers, making higher education more convenient, personalized, and innovative. Currently, domestic scholars are updating teaching content through digitization, using digital technologies such as semantic networks and knowledge graphs to remove relatively useless teaching content. They generate scalable and personalized content restructuring paths based on the empowerment of data, supporting the continuous

improvement and refinement of teaching content organization^[4] (Xie Youru, et al., 2022). At the same time, using digital teaching methods, the learning mode of students in the classroom can be effectively changed, enhancing their experience of classroom learning. It enables students to actively engage in learning with a more positive and proactive attitude, enriching their intuitive imagination and mobilizing their enthusiasm and initiative for learning^[5] (Pan Shijun, 2021).

2.3 Digital Learning Spaces

Digital learning spaces refer to virtual spaces where learning activities take place using digital technology and online platforms, providing diverse learning resources and opportunities. Digital learning spaces are customized based on the learners' needs, allowing each student to tailor their learning content and pathways according to their learning styles and pace. This provides a more personalized, flexible, and responsive learning approach that accommodates the diverse learning needs of students. In a digital learning space, students can receive immediate feedback tailored to their learning needs. Teachers and students can provide feedback through online discussions, student submissions, quizzes, and other means, helping students better understand and master knowledge. Teachers can manage and access learning materials anytime and anywhere, use various media and tools for teaching. Additionally, digital learning spaces can provide features such as tracking learning progress and performance assessment, helping teachers evaluate and adjust their teaching methods based on student learning conditions. It frees teachers from tedious paper materials and manual assignments, saving valuable teaching time and energy, making teaching more efficient and interesting. Currently, domestic scholars have conducted research on the construction of digital learning spaces. Taking a certain course as an example, researchers have studied the course structure design, online-offline integration design, design that reflects teaching content on the network, and big data analysis of learning process feedback design, and obtained high student evaluations^[6] (Wang Xin, et al., 2020). Exploring the construction of digital twin intelligent learning spaces, it consists of core elements such as symbiotic virtual and real spaces and resources, information transmission system, intelligent brain system, teaching and learning support system. It can support learning activities with characteristics such as high-fidelity experience across time and space, distributed cross-regional collaboration, data-driven symbiosis of virtual and real, and design-oriented authentic learning^[7] (Li Haifeng, et al., 2021). Developing a shared digital learning space, redefining the roles between students and teachers, allowing for new and deeper forms of learning^[8] (Bendik Bygstad, 2022).

3 Factors Influencing the Construction of Digital Learning Spaces

3.1 Requirements for Digital Technology

The construction of digital learning spaces places high demands on digital technology, requiring support in terms of network reliability, data security, compatibility, personalized support, multimedia and interactivity, as well as computational and storage capabilities. Network reliability and bandwidth - digital learning spaces rely on stable and reliable network environments that can support multiple users accessing and using learning resources simultaneously. In addition, high-bandwidth networks can ensure quick loading and transmission of large files and multimedia resources during the learning process. Data security and privacy protection - digital learning spaces are feature-rich, and both students and teachers upload, download, and store data. Therefore, digital learning spaces need to have the capability to ensure data security and privacy protection, preventing the leakage or misuse of learners' personal information and learning data. Cross-device and cross-platform compatibility - learners may use different devices such as computers, phones, tablets, etc., for learning on different operating systems and platforms. Therefore, digital learning spaces need to have cross-device and cross-platform compatibility, enabling seamless operation on different devices and platforms, while providing a consistent learning experience. Personalized learning support - digital learning spaces should provide personalized learning experiences and resources based on students' learning characteristics and needs. Therefore, digital technology needs to have functions such as learning analysis and recommendation, and provide personalized learning support based on students' learning data and feedback. Multimedia and interactivity - digital learning spaces need to support the display and interaction of multimedia teaching resources. Digital technology needs to have the capability to process and present multimedia and provide interactive tools and features, such as online discussions, feedback, and assessment, to facilitate student engagement and interaction. Powerful computational and storage capabilities - digital learning spaces may require complex computations and processing, such as learning analysis and recommendation algorithms, video conferencing, etc. Therefore, digital technology needs to provide powerful computational and storage capabilities to ensure efficient learning processes.

3.2 Innovation in Teaching Methods

The construction of digital learning spaces disrupts traditional teaching methods and presents new challenges to teaching methods, including: Re-designing teaching content - digital learning spaces provide teachers with more teaching resources and tools, requiring teachers to redesign teaching content that incorporates the characteristics and functions of digital learning spaces, making it more attractive and interactive to adapt to the digital learning space environment. Changing teaching

methods - traditional teacher-centric teaching methods are no longer applicable in digital learning spaces. Teachers need to play more of a guiding and facilitating role, leading students to explore and learn actively, and fully tapping into students' autonomy and creativity. Transformation of learning assessment - digital learning spaces can monitor and assess students' learning progress in real-time. Teachers need to master the assessment tools and features of digital learning spaces to analyze and evaluate students' learning and provide timely feedback and guidance based on the assessment results. Promotion of collaborative teaching - digital learning spaces facilitate communication and collaboration among students. Teachers need to guide students to engage in collaborative learning in digital learning spaces, fostering their cooperative spirits and teamwork abilities. Improvement of technical abilities - constructing digital learning spaces requires teachers to have certain technological skills and abilities, including familiarity with digital technology and the Internet, proficiency in operating and managing digital learning spaces, etc. Teachers need to continuously enhance their technical abilities to meet the demands of digital learning spaces.

3.3 Repositioning of Teacher and Student Roles

The construction of digital learning spaces has repositioned the roles of teachers and students. In traditional classrooms, teachers typically act as knowledge providers and guides, while students are passive recipients of knowledge. However, in digital learning spaces, there is a significant change in the roles of teachers and students. In digital learning spaces, teachers are no longer the sole source of knowledge and controllers of information, but rather become guides and facilitators of learning. Teachers need to pay more attention to students' learning interests and needs, stimulate their learning interests and motivation through design and guidance, and encourage students to learn actively and autonomously. The role of students shifts from passive recipients to active learners. Students can access more learning resources and channels through digital learning spaces and learn at their own pace and according to their own interests, improving learning outcomes through personalized learning. At the same time, collaborative learning is emphasized. In digital learning spaces, collaboration between teachers and students and among students becomes more important. Teachers encourage communication and interaction among students, promote collaboration among students through participating in collaborative projects, discussions, and sharing of achievements, helping students develop teamwork and communication skills. Digital learning spaces also provide more opportunities and pathways for personalized learning. Students can choose learning content based on their learning needs and interests and learn at their own pace and in their own ways. Teachers need to support and guide students' personalized learning and provide appropriate resources and guidance. This repositioning can better stimulate students' learning motivation and initiative, improving learning outcomes and experiences.

3.4 Breaking the Limitations of Physical Space and Time

The construction of a digital learning space breaks the limitations of traditional physical classrooms, allowing learning to take place anytime and anywhere. Firstly, there is flexibility in time. Traditional classroom teaching has time limits, but in a digital learning space, learning can take place at any time. Students can arrange their learning time according to their own schedule, choose the time period that suits them best, and adapt to their learning pace, thus improving learning effectiveness. Secondly, there is flexibility in location. The digital learning space eliminates the restriction that learning can only take place in the classroom. Students can learn at any location according to their needs, whether it be at home, in the library, a cafe, or while traveling. All they need is an internet connection to access learning materials. Thirdly, learning resources are ubiquitous. Through the digital learning space, learning resources are available worldwide. Students can access abundant learning materials, course content, and teaching resources online, no longer restricted to traditional textbooks and classroom resources. Lastly, it enables cross-regional collaborative learning. The digital learning space provides students with opportunities for cross-regional collaborative learning. Through online platforms and tools, students can interact and collaborate with classmates from different regions, working together on projects and discussing issues, thereby expanding the boundaries and perspectives of learning. By breaking the limitations of physical space, the digital learning space provides students with a more flexible and convenient learning environment. Learning is no longer restricted by time and location. Students can schedule their learning time and location according to their needs and interests, fully utilize learning resources, and improve learning flexibility and effectiveness.

3.5 Transformation of Managerial Functions

The construction of a digital learning space has brought about significant changes in managerial functions. These include technical support and maintenance - managers are responsible for technical support and maintenance of the digital learning space, including platform construction, server maintenance, software and hardware updates and repairs, etc. Managers need to possess certain technical skills to solve technical problems and ensure the normal operation of the digital learning space. Platform and content management - managers need to comprehensively manage the digital learning space, including student information management, teacher information management, course information management, etc. Managers need to ensure the security and stability of the platform, and manage and maintain the quality and legitimacy of learning resources. Data analysis and decision support - the vast amount of data generated by the digital learning space can provide valuable information to managers. Managers need to master data analysis skills to analyze and evaluate students' learning situations and teaching effectiveness, provide decision support, and optimize educational management. Teacher training and

support - the construction of the digital learning space requires higher demands on teachers. Managers need to be responsible for teacher training and support, provide teacher training and guidance, help teachers adapt to the teaching environment of the digital learning space, and improve teaching level and competence. User support and communication - managers are responsible for user support and communication of the digital learning space, answering users' questions and collecting feedback, continuously improving and optimizing the functions and services of the digital learning space. With the construction of the digital learning space, the functions of managers are no longer limited to traditional educational management. They need to possess certain technical skills and data analysis capabilities to ensure the smooth operation and teaching quality of the digital learning space.

4 Prospects and Development of Digital Learning Space

The digital learning space has vast prospects in its future development. For example, the popularity of mobile learning. With the popularity of mobile devices and the development of networks, learning will become more convenient and flexible. Students can learn anytime, anywhere through mobile phones, tablets, and other devices, accessing learning resources on buses, in cafes, or even outdoors. Mobile learning applications will also innovate further, combining location services, personalized recommendations, and other functions to provide more exclusive learning experiences. The realization of personalized learning. The digital learning space provides more opportunities for personalized learning. Through artificial intelligence and data analysis technology, learning platforms can provide personalized learning content and recommended resources based on students' interests, learning styles, and levels, helping students learn more efficiently. With further technological maturity, personalized learning will become more intelligent and refined. Increased cross-regional collaborative learning. The digital learning space can break geographical restrictions and promote cross-school and cross-national collaborative learning. Students can collaborate with classmates from different places, working together to solve problems, carry out projects, etc., promoting cultural exchange and expanding global perspectives. In the future, the digital learning space will further enhance the functionalities of collaborative learning, strengthening student interactions and collaboration through real-time communication, collaborative editing, and other tools. Applications of virtual reality and augmented reality. The development of virtual reality and augmented reality technology will enrich the learning experience of the digital learning space. Students can immerse themselves in virtual learning environments through devices such as virtual reality headsets or augmented reality glasses, experiencing more vivid and immersive learning experiences. Applications such as virtual laboratories and virtual scenarios will also further develop, providing students with more opportunities for practice and exploration. Strengthening

social learning. The digital learning space encourages collaboration and interaction among students, improving learning effectiveness through discussions, collaborations, etc. In the future, the digital learning space will further strengthen the functionalities of social learning, such as providing online discussions, project collaborations, etc., promoting student communication and co-learning. The emphasis on social learning will also promote thinking collisions and the formation of collective intelligence among students. Data-driven teaching optimization. The vast amount of data generated by the digital learning space can be used for teaching optimization and personalized education. Data analysis technology will further develop to identify students' learning difficulties, monitor their learning progress, and evaluate learning effectiveness, etc. With the help of data analysis, teachers can better understand students' learning needs and feedback, adjust teaching strategies, and provide more effective guidance and support.

5 Conclusion

The development of the digital learning space will further promote innovation and changes in education. Personalized learning, mobile learning, cross-regional collaboration, virtual reality, social learning, and data-driven teaching optimization will all experience further development and application. The development of the digital learning space will provide students with a more convenient, personalized, cross-regional, and highly interactive learning environment. It will also provide more possibilities and opportunities for education, providing strong support for the digital transformation of higher education.

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