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Spatial Reconstruction and Path Implementation of Digital Transformation of Primary and Secondary School Classrooms in the Era of Artificial Intelligence

Mingzhu Gao

Nanning Normal University, Nanning, Guangxi, China

Abstract: ***The spatial reconstruction of the digital transformation of primary and secondary school classrooms in the era of artificial intelligence is an inevitable requirement to adapt to the development of the times. From the perspective of spatial sociology, the digital transformation of primary and secondary school classrooms presents three teaching spaces: physical space, social space, and spiritual space. Expand the existence of the classroom in the physical space, reconstruct the digital identity of social relations in the social space, and build the digital spiritual core in the spiritual space. To realize the spatial reconstruction of the classroom, it is necessary to provide path support for the spatial reconstruction of the digital transformation of the classroom through the channel connecting digital resources and digital teaching materials, the environmental shaping of digital culture and quality, and the relationship reconstruction of the digitalization of educational evaluation.***

Keywords: Classroom Reconstruction in Primary and Secondary Schools, Digital Transformation, Spatial Morphology, Path Implementation**.**

1. Introduction

In the era of artificial intelligence, teaching time and space have undergone tremendous changes. The "Outline for Building a Powerful Education Nation (2024-2035)," issued by the CPC Central Committee and the State Council in January 2025, proposed "expanding the space and platforms for practical and online education" and "establishing an integrated online and offline education mechanism." The "Action Plan for Deepening the Reform of Basic Education Curriculum and Teaching," issued by the General Office of the Ministry of Education in May 2023, proposed "promoting digitalization in expanding teaching time and space, sharing high-quality resources, optimizing curriculum content and teaching processes, and optimizing student learning methods." The "Opinions on Accelerating the Promotion of Digitalization in Education," issued by the Ministry of Education and nine other departments in April 2025, pointed out the need to explore new paradigms for the application of "artificial intelligence + education." In April 2018, the Ministry of Education issued the "Action Plan for Education Informatization 2.0," which proposed to improve the quality and efficiency of "high-quality resources in every classroom" and "network learning space for everyone," and to "popularize and promote the application of network learning space to achieve 'everyone using space'."

In the context of digital education, the teaching space is examined by taking Lefebvre 's theory of spatial production as an example. As a special social space, it is constructed by material space, social space and spiritual space. It is just like a diverse and dynamic teaching ecosystem, which is a collection of fields for interaction and communication between teachers and students [1]. Therefore, in the digital age, learners' learning methods have also undergone tremendous changes. They can learn any content at any time and any place through various online media. This ubiquitous learning, which is "learnable everywhere and anytime", has become possible [2]. It not only promotes the expansion of teaching time and space, but also provides a more diversified path for promoting the modernization of education.

2. The Value and Implications of Digital Transformation in Primary and Secondary School Classrooms

The digital transformation of primary and secondary school classrooms is a process of using digital technology to achieve a comprehensive and intelligent re-creation of all elements in classroom teaching. The so-called digital transformation of classrooms is the process of using digital technology to achieve a new educational ecosystem of data-driven, human-machine collaboration and dynamic evolution in classroom teaching [3]. The changes in teaching time and space in this transformation process are reshaping the ecological pattern of primary and secondary school education. It breaks the time and space barriers of traditional education, allowing learning to happen at any time and in any space in multiple forms, providing students with a richer, more diverse and personalized classroom learning experience, and promoting primary and secondary school education to a higher level.

2.1 Reshaping the Concept of Time and Space to Promote Ubiquitous Learning That Combines the Virtual and the Real.

Ubiquitous learning is a new learning form that allows any learner to access any learning resources they need anytime and anywhere with the support of artificial intelligence technology. In the new era of digital classroom development, ubiquitous learning, which breaks through the limitations of teaching time and space and promotes the integration of virtual and real, has become a widely used new learning form

in the learning society [4]. From the perspective of the combination of technology and education, the ubiquitous learning environment can effectively integrate educational institutions, learning centers, communities and other environments and resources, support learners' interaction in the real world and the virtual world, and has strong embedding and mobility [5]; From the perspective of building a learning society, ubiquitous learning is learner-centered, breaks through the limitations of time and space in resource acquisition, and provides learners with personalized learning with the ubiquitousness of "everyone can learn, there is something to learn everywhere, and you can learn anytime".

The focus is on integrating digital technology into all aspects of classroom teaching, and making every effort to promote changes in teaching paradigms, organizational structures, and teaching processes [6], so as to achieve the comprehensive digitalization of educational elements and educational scenarios [7]. In the digital transformation of classroom teaching, teachers can transform abstract and complex knowledge systems into multi-dimensional images or videos for concrete presentation, enhance the interactivity and fun of classroom teaching, optimize teaching effects, stimulate students' enthusiasm for learning, and effectively realize the in-depth innovation of educational activities from form to content, providing strong technical support for improving the quality of education and teaching efficiency. Furthermore, by leveraging the deep integration of digital technology and educational elements [8], classroom teaching reform and innovation can be promoted to achieve the digital transformation of traditional learning processes, teaching processes, and teaching time and space. From the perspective of the deep integration of technology and education, the ubiquitous learning environment of primary and secondary school classroom teaching can effectively support learners to achieve teaching interaction between the real world and the virtual world; it can effectively break through the time and space barriers of resource acquisition and create a ubiquitous learning space where "everyone can learn, there is something to learn everywhere, and you can learn anytime". By deeply integrating artificial intelligence, deep learning, big data analytics, and other intelligent technologies into all aspects of teaching, students can better access educational resources that transcend time and space, achieving personalized learning. In primary and secondary education, students, through intelligent learning systems, can obtain high-quality resources tailored to their individual learning pace and knowledge level based on precise analysis of their own learning data. Teachers, on the other hand, can use intelligent technology to comprehensively monitor and analyze the educational process, gaining timely insights into students' learning progress and depth. This personalized learning model drives education towards a more intelligent and personalized direction.

2.2 Deepen Multi-faceted Interaction and Promote Personalized Learning as the Mainstream

In the traditional education model, personalized learning is a learning approach that optimizes learning progress and methods according to the needs of learners; [9] appropriate teaching methods, teaching aids, evaluation methods, etc. are adopted in the classroom to promote the comprehensive and harmonious development of students based on their development potential and personality [10]. In the digital age and the rapid development of technology platforms, artificial intelligence is profoundly reshaping the learning model, injecting new vitality into personalized learning, emphasizing the learner's "high autonomy" learning path, and transforming the learner's learning from passive acceptance to active acceptance to promote personalized and creative learning behavior, reaching a new height of autonomous knowledge construction [11], and providing a rich learning experience [12].

With the support of AI intelligent agents, students are transforming from passive learners to personalized self-experience learners. As a learning aid, the intelligent learning agent, with its powerful algorithms and massive learning data, accurately pushes suitable course content to students based on their learning style and knowledge mastery, thereby realizing personalized learning plans for students; combined with the characteristics of the subject and learning weaknesses, it provides students with accurate and convenient course content, personalized learning plans, appropriate learning methods and learning paths. The AI teaching system provides learners with adaptive and in-depth self-learning services. At this stage, teachers can be freed from tedious repetitive teaching tasks and basic knowledge transmission work, and can focus more energy and wisdom on cultivating students' personalized higher-order thinking and innovation abilities with the help of digital technology [13]. In the classroom, teachers can design more precise, challenging and creative learning projects and activities based on students' unique needs. Among them, the AI teaching system relies on advanced intelligent sensing technology to sensitively and accurately sense students' learning needs, preferences and personality characteristics, enabling students to transform from knowledge consumers to knowledge creators. Personalized learning in interactive teaching can make the teaching process more dynamic and vibrant, so that personalized learning is no longer the privilege of a few, but is available to all students. Students can use digital platforms to create their own study notes, control their learning pace, and meet their own learning needs.

2.3 Relying on Data-driven Approaches to Achieve Precise Teaching Decisions

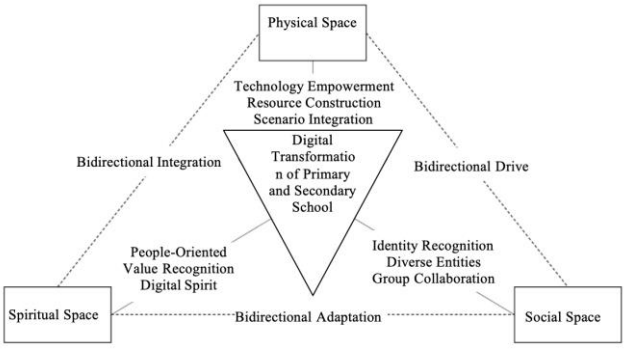
Artificial intelligence is profoundly changing the field of education. Human-machine collaborative teaching is an inevitable teaching paradigm in the digital age, which poses new challenges and requirements to teachers' teaching abilities. At the National Education Conference in 2024, General Secretary Xi Jinping emphasized: "Strengthening the construction of a high-quality and professional teaching force, promoting the spirit of educators, improving the ability to teach and educate people, and consolidating the important basis for building a strong education country." [14] In the process of consolidation, generative artificial intelligence represented by Chat GPT and Deep Seek has brought a new direction for teachers to move from technology empowerment to human-machine co-education.

In the process of digital transformation, data-driven human-machine collaboration accelerates the shift in teachers' teaching capabilities from information-based teaching to a

teacher-led, collaborative, and intelligent system. In the digital age, teachers are no longer simply using information technology to assist teaching; rather, through precise data insights and efficient collaboration with intelligent algorithms, they accurately grasp the details of students' knowledge acquisition and the fluctuations and changes in the learning process, injecting more scientific and targeted elements into instructional design, ensuring that teaching content precisely meets students' learning needs. Data-driven human-machine collaboration fully leverages the powerful advantages of AI's data processing and analysis capabilities, promoting complementary strengths between teachers and AI agents. Teachers recognize the role of artificial intelligence in optimizing teaching decisions but do not blindly rely on the technology. Instead, by understanding the working principles of AI, they can correctly interpret the data analyzed by AI and make better teaching decisions based on the corresponding data. They can accurately analyze the student learning characteristics and needs hidden behind the data, thereby continuously optimizing the teaching decision-making process to promote students' personalized learning needs and tailor exclusive learning paths and growth plans for each student. Furthermore, data-driven human-machine collaborative decision-making uses teachers' professional knowledge and teaching experience to facilitate the mutual cooperation between AI and teachers in generating decisions. In actual teaching scenarios, teachers play a core role in the human-computer collaborative teaching decision-making process. They use their professional knowledge and rich teaching experience to make more accurate use of the information provided by AI. At the same time, AI is also constantly optimizing teaching decision-making algorithms and models based on teachers' feedback, realizing two-way interaction in teaching decisions.

3. New Spatial Patterns in Primary and Secondary School Classrooms Under the Digital Transformation

With the empowerment of AI technology, the teaching space of primary and secondary schools is undergoing a profound transformation, striving to build a new model of AI-empowered teaching space of primary and secondary schools. The spatial social theory of French thinker Lefebvre points out that the classification of the spatial field spans three major fields: material, spiritual and social. That is, space is not only a physical object, but also contains various social relations, psychological experiences and cultural phenomena [15]. The educational space in the digital age is no longer an independent material place, but a smart educational environment with a deep integration of space, technology and education. In this space, the physical space carries the concrete practice mode and the high adaptation of intelligent technology, the social space clarifies the group collaboration mode and digital identity of the educational subject, and the spiritual space forges the digital spiritual core and educational value identity, jointly constructing a new smart educational space that is intelligent, open and integrated. In the new space, students' learning behavior breaks through the limitations of physical space and time, showing a shift in teaching paradigm from traditional "knowledge transmission" to "human empowerment" and from "individual learning" to "collective intelligence".



3.1 Physical Space: Expanding the Existence of Teaching Spaces under Digital Technology

Lefebvre 's theory of spatial production explores concrete practical methods for the digital transformation of primary and secondary education. Driven by digital technologies, the physical space of primary and secondary education is undergoing profound changes. Therefore, it is essential to explore the tangible and intangible resources within the physical space of teaching and learning to expand the modes of existence of educational practices.

First, develop online space interaction, utilize online open space to achieve clustered learning, and build a sustainable education ecosystem. With the development of technologies such as the Internet of Things, virtual reality and digital twins, space is no longer an "extension of tangible physical space" [16]. The technology-enabled primary and secondary school education space is a material space based on digital information, focusing on the specific learning needs of the education subjects to form a real educational situation with perception and strong participation. In addition, strengthen the online and offline cooperation and exchanges with the existing off-campus education platforms, broaden the sources of educational resources for students to provide diversified practice opportunities, such as the current AI intelligent learning assistant, dual-teacher classroom, inter-school collaborative teaching practice, etc. [17], promote the deep integration of virtual space and real space, and provide education subjects with a more personalized, precise and immersive learning experience. Further enhance the openness and integration of education space, and increase the joint participation and sustainable development among primary and secondary school education subjects. Second, break through the time and space limitations of curriculum resources, promote the unification of real physical space and virtual physical space, and effectively aggregate the educational resources of dual spaces. Therefore, by constructing an intelligent resource management system, both physical resources in the real physical space and digital resources in the virtual physical space can be managed and allocated in a unified manner, such as online courses, e-books, and teaching resource databases. Intelligent technologies can be used to achieve categorized management, precise delivery, and convenient access to resources, ensuring the maximum utilization and categorized management of educational resources. Furthermore, through intelligent sensing devices, timely resources can be collected and supplemented in real time, along with data on the usage of facilities and equipment in the physical space and environmental utilization. This optimizes the layout and resource allocation of the physical

space, improves space utilization efficiency, maximizes the expansion of the forms of educational space and the ways in which educational resources can be accessed, and strengthens the function of the physical space.

3.2 Social Space: The Reconstruction of Social Relations of Digital Identity under Technological Rationality

Educational space is a dynamic and unique spatial form, embodying both the physical carrying and accommodating functions of physical space and the social space established by the social relationships of various educational subjects. Driven by digital technology, these social relationships give rise to a spatiotemporal interplay between people and between people and events. Swept up in the digital wave, both the core and the extension of social space have changed. From a sociological perspective, the reconstruction of social relationships within social space is essentially the continuous reshaping of self-awareness and group belonging by educational subjects in the fusion of virtual and real environments — a chain reaction caused by the deep embedding of technology into social structures.

the embodiment of multiple subjects online and offline. Technology is no longer a simple tool superposition in education, but an extension of the educational subject. With the popularization of the Internet of Things and wearable devices, the physical perception and cognitive boundaries of the educational subject have been expanded, and the students' thinking process is no longer implicit, but is shown in the form of visualized data flow. This process of technology subjectification makes the educational space transform from a physical container into a meaning production field, and reconstructs the presence of education with multi-sensory collaboration. Second, teacher-student interaction has shifted from "real field" to "virtual-real symbiosis" intelligent scene, and student-student communication has shifted from "individual field" to "group field" [18]. The digital transformation of primary and secondary education not only affects the change of teaching paradigm, but also the teacher-student relationship is undergoing paradigm shift. Intelligent teaching assistants form an intelligent teaching scene of virtual-real symbiosis through natural language processing technology, and student-student communication has also shifted from individual interaction to group collaboration ecology. For example, student communities supported by blockchain technology enable students to build distributed knowledge networks in global collaboration; decentralized educational metaverse allows students to participate in the "global campus" project through virtual identities. Therefore, the collective intelligence brought about by this virtual-real teaching scene is breaking the boundaries of the traditional classroom. Furthermore, the restructuring of social relationships in educational spaces is also reflected in the reshaping of collaborative models. Virtual spaces offer the possibility of cross-regional and cross-cultural collaboration. For a given topic or teaching challenge, a learning community can be built through asynchronous discussions, online collaboration, and other means.

3.3 Spiritual Space: Cultivating the Soil of Digital Culture and Strengthening the Core of Digital Spirit

The reason why education can promote the construction and return of the spiritual world is that education is a meaning-generating activity aimed at constructing a meaningful world for people [19]. The way of digital transformation of education is to use the innovation of digital technology to continuously generate and invest new digital cultural elements, and thereby derive the digital spiritual space of education [20]. As conceivable content after detaching from material perception, digital cultural elements such as digital concepts and digital symbols are collectively used in the interaction and reproduction of the spiritual world of multiple educational subjects to constitute digital cognition, digital consciousness, digital spirit and other digital spiritual spaces of education [21].

First, cultivating students' information literacy and self-learning abilities, enabling them to filter, integrate, and utilize information in a digital environment, is the cornerstone of building a mental space and sowing the seeds for lifelong learning. In the context of globalization, relying solely on school spaces is no longer sufficient to fulfill the educational tasks of the new era. It requires focusing on students' ability to quickly filter, accurately integrate, and effectively utilize massive amounts of digital information during the learning process, and to have a deep understanding and value judgment of the presented educational information. Therefore, at the knowledge transmission level, optimizing curriculum design and incorporating digital culture foundation courses into the education system is an important way to cultivate students' information literacy and self-learning abilities, and a key prerequisite for the sustainable development of lifelong education. At the cultural construction level, building digital learning communities provides learners with an open, interactive, and shared learning platform, offering space and support for self-learning; stimulating intrinsic learning motivation through self-learning is key to cultivating lifelong awareness. Second, optimizing learners' cognitive experience and educational gains in educational philosophy, knowledge production, and social service will achieve a higher level of transmission of educational spirit. In the journey of digital transformation in education, cultivating a rich digital culture and forging a strong digital spirit is not only a mission entrusted to education by the times, but also an inevitable requirement for education to achieve self-renewal and development. By cultivating learners' digital literacy, self-learning ability, innovative thinking, and social responsibility, we can inject continuous vitality and motivation into their spiritual world, strengthen their steps forward in the digital wave, and actively embrace digital culture with a more open and inclusive attitude. In the digital age, the dissemination of information is no longer limited by geography; learners can communicate and collaborate with people all over the world through the internet. Educators should encourage learners to participate in international digital learning projects and exchange activities, allowing them to broaden their horizons, enhance their understanding and respect for different cultures, and cultivate a global cooperation awareness and cross-cultural communication skills through interaction with people from different cultural backgrounds.

4. Mechanisms for Guaranteeing Teaching Time and Space in Primary and Secondary

School Classrooms under the Digital Transformation

At present, AI creates a virtual interactive and immersive teaching environment by connecting online and offline teaching spaces, making human-computer interaction and large-scale collaboration the norm in teaching, and building a ubiquitous teaching space that everyone can learn anytime and anywhere [22]. In the digital transformation of primary and secondary education, in order to ensure the effective operation of physical space, social space and spiritual space, digital resources mined by digital technology and digital textbooks, digital culture and literacy cultivation, and the construction of digital education evaluation are used to ensure the optimization and expansion of teaching time and space, and promote the modernization of education.

4.1 Connecting Digital Resources and Digital Textbooks

The digital transformation of primary and secondary school classroom teaching empowered by artificial intelligence takes the digitalization of education as its foundation. Promoting the development of digital technology and digital textbooks is an important direction for the digital transformation of education and a "dual engine" for promoting the modernization of education. Digital technology focuses on shaping the form of education and is the core force for optimizing the allocation of educational resources, re-engineering teaching processes, and innovating classroom teaching models. Digital textbooks, as a new carrier of knowledge dissemination, activate the main body of space and ensure the real-time availability of resources by utilizing their interactivity, multimedia integration, and real-time updates of textbook resources.

On the one hand, strengthen the construction and investment of school infrastructure. In promoting the digital transformation of primary and secondary education, we should actively increase investment in the construction of digital infrastructure and equip ourselves with digital terminal equipment, such as tablet computers, smart learning machines, smart whiteboards, wearable digital terminals, etc., to provide solid hardware support for digital teaching. On the other hand, improve the construction of digital textbooks. The fundamental starting point for the design of digital textbooks is to complete the teaching implementation required by the curriculum standards, and the ability to support basic teaching implementation is the main basis for the design of digital textbooks [23]. As the core resource of digital teaching, digital textbooks can meet the requirements of teachers for teaching scenarios, realize the effectiveness and pertinence of intelligent recommendation of teaching resources based on learning big data, automatic generation of teaching design schemes, and intelligent teaching assistants, etc., to a certain extent, reduce the burden of teaching for teachers, and also promote teachers to use intelligent assistants to help students learn basic knowledge and then conduct higher-order thinking teaching in a more targeted manner. On the other hand, build a digital education resource co-construction and sharing mechanism, create a cross-regional and cross-school education resource sharing platform, and promote the circulation of high-quality education resources. If digital resources can be integrated and utilized, they will bring new ways of value creation and higher levels of creativity to classroom teaching, and achieve deep integration of technology and teaching practice [24]. Therefore, establishing a sharing and co-construction mechanism for digital education resources can effectively integrate digital resources from different regions and schools, and maximize the utilization of resources; it also helps to narrow the gap in educational resources between regions and between urban and rural areas. Educators can access diverse digital resources and carry out secondary development and innovative applications according to the developmental needs of learners, and innovate more teaching content and teaching methods suitable for the personalized development of students.

4.2 Shaping the Environment for Digital Culture and Literacy

Culture is an expression of the way of existence of an individual or a group of people, while digital culture in primary and secondary education is an expression of the way of existence of primary and secondary schools in the digital age [25]. The inherent requirement of digital transformation of primary and secondary school classrooms is to realize the digitalization of human ideology and to live in the wave of global digital development with a new digital perspective. The creation of school digital culture and the formation of teachers' quality and literacy are inseparable.

First, we should use digital information as a bridge to integrate new digital technologies into the existing teaching environment and promote the construction of digital culture in schools. The construction of digital culture in schools is the foundation of the digital transformation of education. To create a development ecosystem for the digital transformation of primary and secondary education, we need to build digital infrastructure and update digital equipment according to the dynamic changes of the school itself and the needs of cultural development [26]. It can cover the construction of campus network facilities, the construction of digital teaching resource platforms and the organization of digital teaching activities, and promote the digital upgrade of physical space. In addition, we should enhance the immersion of learners in the learning environment and promote the deep learning and transfer of knowledge [27]. Therefore, for students, we can develop cultural learning projects based on virtual reality (VR) or augmented reality (AR) technology so that learners can naturally and realistically contact and feel the cultural symbols contained therein. For teachers, we can carry out project-based practice in combination with local cultural customs, use digital technology to collect resources, simulate the production process, and present digital stories of cultural works to enhance learners' understanding and recognition of local culture. Second, we should improve the digital literacy of teachers and students. Teachers' digital literacy is the key soft power to promote the digital transformation of education and an important support for building a high-quality education system and cultivating high-quality talents. Therefore, it is crucial to enhance teachers' awareness, willingness, and will to embrace digitalization. This should be achieved by providing them with systematic and comprehensive digital literacy training courses, such as basic digital technology learning and training in data analysis and visualization applications. Furthermore, it is necessary to cultivate teachers'

ability to innovatively integrate digital technologies in the physical space and develop teaching content imbued with digital culture; to flexibly utilize digital platforms and technologies in the virtual space to expand the sources of digital cultural information; and to foster their critical and dialectical cultural thinking abilities in the intellectual space, establishing a long-term mechanism for the continuous improvement of teachers' digital literacy. This can be achieved through initiatives such as building online self-learning platforms and regularly organizing digital teaching seminars, providing teachers with learning resources for continuous learning and development.

4.3 Reconstruction of Relationships in Digital Education Evaluation

Educational evaluation, as a value judgment activity, is essentially subordinate to the category of relationships [28]. In teaching evaluation, the evaluation subject is not singular; different subjects such as teachers, students, and parents jointly constitute a complex evaluation relationship network in the evaluation process. In daily teaching, it is of certain significance to carry out multi-subject evaluation by combining information technology tools to correctly and scientifically evaluate students' learning process.

First, strengthen the recognition and incentives for innovative practices in digital evaluation among teachers. The key to the digital transformation of education in the new era lies in promoting the development of teachers' evaluation capabilities and the deep integration of digital technologies. Among these, stimulating teachers' intrinsic interest in and motivation to apply digital evaluation is crucial for its successful implementation. Therefore, schools and education authorities should establish digital evaluation platforms to provide teachers with comprehensive, objective, and dynamic evaluation support. Teachers can leverage human-computer collaboration to conduct case analysis, learning situation analysis, and learning outcome analysis, allowing them to deeply experience how data analysis and teaching evaluation supported by digital technology can continuously optimize teaching effectiveness. For example, the "Anmaiyou Digital Evaluation Platform" built by Shanghai Jiading No. 1 Middle School uses intelligent technology to achieve dynamic monitoring and precise evaluation of teachers' teaching processes and students' learning. The platform also has functions for collecting, analyzing, and providing feedback on student data, covering modules such as teaching objectives, curriculum systems, and assessment procedures, to build a closed-loop feedback system to help teachers improve their teaching. Second, the diversity of educational evaluation subjects. The "Compulsory Education Curriculum Standards (2022 Edition)" states that "evaluation subjects should include teachers, students, and parents." On the digital evaluation platform built by schools, for a given course, teachers can use the real-time feedback function of classroom interaction software to evaluate students' participation in class, and can also use the data analysis function of the learning management system to evaluate students' learning progress and academic trends. Students use learning analytics tools to evaluate their own learning behaviors and outcomes. Parents can view their child's learning progress and teacher feedback on the digital evaluation platform, and can also participate in instructional design through online evaluation functions. For example, the "Smart Star Digital Evaluation Platform" built by Beijing Chaoyang District Experimental Primary School provides comprehensive evaluation functions for teachers, students, and parents, promoting home-school communication and collaboration in the teaching process, and providing strong support for optimizing teaching decisions.

5. Conclusion

The digital transformation of primary and secondary school classroom teaching has a profound historical context and practical foundation. It is an inherent requirement of the ever-changing teaching space and time in the new era, and an inevitable response to the continuous improvement of the teaching space and time structure. Therefore, the expansion and integration of primary and secondary school teaching space and time under the empowerment of artificial intelligence has become an irreversible trend. The teaching space is mainly constructed with physical space, social space, and spiritual space, realizing the return of educational space from instrumental rationality to value rationality. However, with the sweeping wave of technology, we need to be wary of the risks of educational alienation and privacy leaks caused by the excessive penetration of technology. Therefore, in promoting the digitalization of education, we must accurately weigh the depth of integration between technology and education, build a strong privacy and security defense with strict systems and norms, uphold technological ethics, and ensure that primary and secondary education can move steadily forward in the digital transformation.

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