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Based on XR-Extended Reality Technology, Construct a Classroom Teaching System for Basic Education

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Abstract

The arrival of the 5G era has strengthened the relationship between information technology and teaching. In the future, human interaction will shift from two-dimensional to three-dimensional forms with more spatial dimensions. 3D visual interaction tends to integrate technologies such as virtual reality (VR), augmented reality (AR), and mixed reality (MR), presenting a new form of augmented reality (XR). Based on XR extended reality technology and focusing on "extension (X)", this research constructs a visual classroom teaching reform system of "Internet plus education". By utilizing the immersive, interactive, and generative features of XR augmented reality technology, virtual holographic scenes with 3D naked eye effects are integrated into real classroom scenes, achieving real-time transmission of information such as images, text, videos, and language, thus realizing the "expansion" of spatial interaction, human-computer interaction, and sensory interaction. By overlaying rich scenes with "X", it is beneficial to provide diverse situational forms and form personalized and visual teaching modes. In teaching, it mainly includes three forms: expanding the radiation range of classroom teaching, overlapping the spatial environment of classroom teaching, and constructing a visual classroom teaching system.

Keywords: XR-Extended Reality, internet+education, basic education

1. The Epochal Characteristics and Classroom Integration of XR-Extended Reality Technology

XR, serving as a "technology-mediated experience" that blends digital and biological realities, provides individuals with extended and virtual information, enabling them to immerse deeply in and rapidly comprehend this information. It achieves the integration of virtual and reality, effectively addressing the issue of spatial separation.In its official training course, Unity compares the "X" in "XR" to the "unknown" in mathematics, which includes augmented, virtual, and mixed reality meanings, indicating that "XR" is a comprehensive term.On the one hand, XR technology can display data in a 3D environment, making distant data more closely related to human actual viewing and situational imagination experience; On the other hand, users can use XR technology to overlay virtual digital objects onto the real world, while also introducing physical objects into the virtual world. [1] That is to say, XR-Extended Reality technology is built on real situations and extends virtual data support and contextual overlay.

XR-Extended Reality technology has made significant breakthroughs based on the development of computers and artificial intelligence. By comprehensively utilizing graphics systems and various reality and control interface devices, it provides users with modern technology that conforms to the characteristics of the times in the generative and interactive 3D environment of computers. The characteristics of the times are manifested in the immersive, interactive, and generative experience achieved through sensory interaction, situational creation, and content connection.

1.1 The Epochal Characteristics of XR-Extended Reality Technology

XR-Extended reality technology is profoundly reshaping the form and boundaries of classroom teaching with its groundbreaking features. It mainly creates an immersive learning environment that allows students to "step into" historical sites, micro worlds, or abstract concepts; Realize natural and real-time teacher-student, student student, and human-computer interaction through interactivity, transforming passive listening into active exploration and practical operation; And through generative creation of dynamic, personalized, and infinitely expandable teaching content and scenarios, it provides unprecedented possibilities for adaptive learning and innovative teaching methods. These three core features - immersion, interactivity, and generativity - together form a powerful cornerstone for XR to empower future education, driving classroom teaching towards more efficient, in-depth, and attractive directions.

Firstly, immersion integrated classroom.XR-Extended range technology focuses on "expansion", emphasizing the bridging between the virtual world and the real world. By "expanding" multiple "X", it eliminates the distance between people's information and experience. [2] For example, expanding virtual visual, tactile, olfactory, and auditory signals in the context to integrate with the real situation can create an immersive experience for users, providing various blurred boundaries between physical spaces and simulated environments. In the field of XR-Extended Reality technology, users can eliminate the interference of other spatial conditions, immerse themselves in a unified context, and achieve wholehearted engagement and perception, with a high level of attention in terms of consciousness.

Secondly, interactivity interactive classroom.XR-Extended Reality technology bridges the distance between reality and virtual space, and interactivity is an important feature of augmented reality technology. Interaction "is reflected in three perspectives: sensory interaction, human-computer interaction, and spatial interaction. XR has abandoned the traditional form of VR that requires wearing professional glasses and replaced it with a "naked eye" 3D perspective. By technically processing information containing letters, numbers, symbols, or graphics, overlaying or integrating it into the real world that users see, students immediately enter a real, naked eye, holographic XR-Extended Reality space, achieving human-computer interaction; Overlap multiple spaces, expand virtual scenes, and achieve spatial interaction; Add virtual visual, olfactory, tactile, and auditory signals in the context to achieve sensory interaction.

Thirdly, generativity applied classroom.XR technology integrates the physical world with digital media, creating a virtual sensation of the real world as well as a real sensation within the virtual world. Expand X unknowns based on real-world scenarios. As X changes, users constantly generate new experiential content while perceiving the context they are in. XR, as a technological support, can provide interactive changes in different scenarios, breaking the deadlock of traditional classrooms. In teaching activities, with the continuous changes in students' thinking, XR-Extended Reality technology can dynamically adjust according to the actual situation of learners, and provide comprehensive visual monitoring and evaluation. This also meets the generative requirements of basic education for teaching objectives and teaching processes.

1.2 The Integration of XR-Extended Reality Technology and Classroom

In the era of globalized 5G education, we need to leverage the advantages of online education resources, improve the lifelong learning system, and build a learning oriented society. Accelerate the construction of new infrastructure in the field of education, combine the "new infrastructure" represented by 5G, industrial Internet, artificial intelligence, Internet of Things, etc. with the field of education, upgrade the degree of education informatization, build a national public service system of "Internet plus+education", and prepare for the construction of a high-quality education system. Integrating XR-Extended Reality technology into information-based teaching classrooms is an attempt and challenge in educational reform. Beneficial for designing concrete learning processes, developing gamified learning programs, creating intelligent learning environments, and optimizing creative educational implementation.

Firstly, design a concrete learning process.Virtual simulation training is a key area of joint breakthrough between the VR industry and the education and teaching industry. Virtual reality technology can endow education with immersive and situational experiences, increasing students' sense of immersion, engagement, and opportunities for hands-on operation in the actual learning process. [3] The application of virtual simulation technology in the teaching process has become an important technical form for the comprehensive application of computer graphics and simulation technology, artificial intelligence, and Internet of Things technology in the field of education. Due to the limitations of classroom teaching system in the basic education stage, the learning form is mainly based on indirect experience, which leads to students' learning being too "abstract" and lacking direct perception of "concretization". Through the implementation of virtual simulation technology, students can enter the three-dimensional holographic classroom space through sensory interaction, human-computer interaction, and spatial interaction in the classroom, achieving direct situational perception. Real time interaction through oral, physical, sensory, and other means, namely "what you say is what you get", "what you see is what you get", and "what you think is what you get", can improve teaching efficiency.

Secondly, develop a gamified learning program.On June 25, 2021, the State Council of China released the "Action Plan for National Science Literacy (2021-2035)", which pointed out the need to improve the academic level examination and comprehensive quality evaluation system for junior and senior high schools, including science, mathematics, physics, chemistry, biology, general technology, information technology and other subjects, and guide students with innovative potential to develop personalized skills. Promote the deep integration of information technology and science education, and promote scenario based, experiential, and immersive learning.

The shift of the outline from "improving quality" to "focusing on scientific quality" is in line with the requirements of education reform in the information age. [4] Anna Craft also proposed in her book "The Future of Creativity and Education" that using online games can enhance students' motivation. Because in online games, there is an inherent social and material world that involves various open or closed problem-solving processes, all of which involve the participation of "distributed social organizations" that typically organize themselves (Squire, 2006:22). In fact, many gamers see games as "possibility spaces" where they can socialize with friends (Squire 2006:22). The design of games can facilitate deep communication with family, friends, or other belonging groups, in order to consider whether education can refer to the design of games and awaken and stimulate students' learning motivation. XR technology also provides certain support for the transformation of teachers' roles in gamified learning, and its intuitive interactive characteristics can enable teachers to quickly construct gamified teaching scenarios. For example, when conducting science teaching, teachers can combine virtual simulation teaching software under XR technology, allowing learners to operate their "human substitute" in the classroom to conduct various scientific operations in virtual experiments. In fields such as material science, life science, earth and space science, technology and engineering, virtual learning scenarios can be created to guide students to directly enter immersive experiences through online platforms and achieve human-computer interaction.

Thirdly, create a smart learning environment.In the "Action Plan for Education Informatization 2.0" issued by the Chinese Ministry of Education in April 2018, it was clearly stated that "we will vigorously promote intelligent education, carry out learner centered intelligent teaching support environment construction, promote the full process application of artificial intelligence in teaching, management and other aspects, use intelligent technology to accelerate the reform of talent cultivation mode and teaching methods, and explore the construction and application mode of ubiquitous, flexible and intelligent new education and teaching environment". [5] Liberate human labor through intelligent technology and achieve intelligent teaching forms in the field of education.Gradually, teaching space has become a hot topic in the field of education, and the setting and layout of space have to some extent affected learners' spatial thinking ability. In order to achieve a better permanent environment, with the support of XR information technology, basic education can set up new smart classrooms, utilizing the intelligent, deep experiential, and strong interactive features of smart classrooms to realize the value of teaching space "form domain" and "field domain". The common forms of smart classrooms include: creating subject classrooms to promote embodied experiences; Create a composite pattern to meet diverse needs; Innovate spatial layout and achieve multidimensional interaction; Match reasonable colors to expand innovation space.

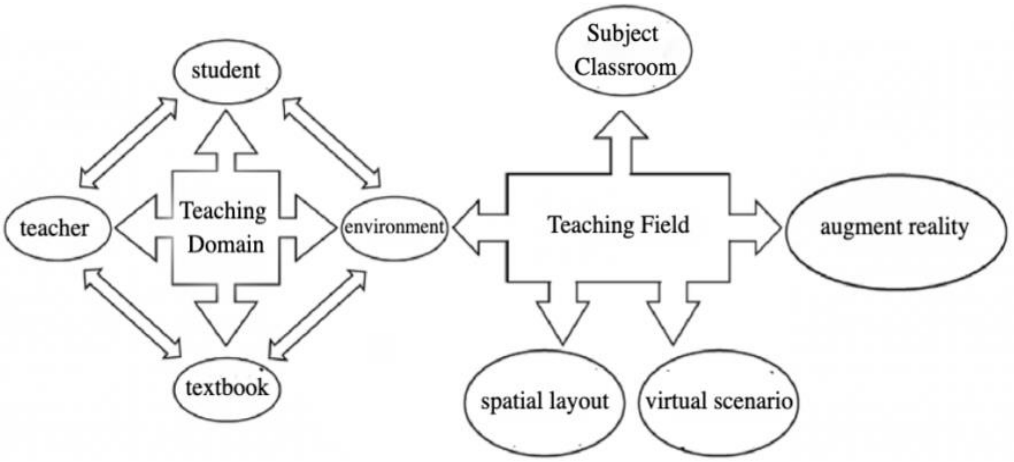

Figure 1. Extended Reality Classroom Teaching Field Relationship Diagram

In actual basic education classroom teaching, what kind of fields can we adopt based on XR-Extended Reality? You can think about it in conjunction with the above picture

Finally, optimization creative implementation of education.Interdisciplinary integration teaching has become a pursuit direction for knowledge integration nowadays. Although the current subject based teaching is conducive to students' systematic knowledge acquisition, it is not conducive to the formation of a complete knowledge system and the cultivation of comprehensive thinking ability. In recent years, STEAM education and maker education have both focused on interdisciplinary learning, emphasizing the cultivation of students' innovative spirit and practical ability through the cross integration of different disciplines. Interdisciplinary learning advocates setting themes based on real-life problems, connecting different disciplines around the same theme, and constructing a

interconnected curriculum system. The future of the XR industry, just like the "X" in its name, is full of infinite possibilities. By utilizing XR-Extended Reality technology and combining it with 5G technology, 5G+XR can be achieved. Through the medium of network informationization, connections between various disciplines can be established. In one class, XR-Extended Reality can be used to integrate databases of relevant concepts, truly realizing interdisciplinary integrated teaching forms.

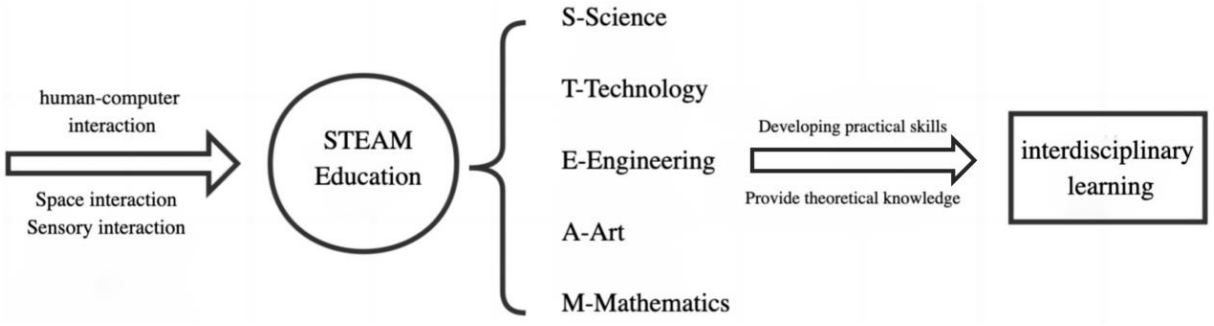

Figure 2. Structural diagram of XR application in STEAM education practice

What classroom structure can we implement to achieve interdisciplinary thematic learning and development for students when XR is applied in STEAM education? You can think about it by combining the above picture

2. The Manifestation of XR-Extended Reality Technology in Basic Education Classrooms

Teaching has methods, but there is no fixed method. Teaching methodology refers to the adoption of teaching methods that must conform to the cognitive characteristics and laws of students, the cognitive laws of environmental science knowledge, and the requirements of environmental teaching tasks and content. Teaching without fixed methods refers to adopting teaching methods that are based on reality, China's national conditions, and specific conditions such as local areas, schools, teachers, students, and equipment. We cannot adopt a one size fits all approach or a single model, nor can we blindly apply them. Instead, we should promote different teaching styles and schools. Practice has proven that every teaching method has its merits, but it is not a universal, unique, or unchanging optimal method. XR expanded reality technology meets the requirements of the Ministry of Education to speed up the construction of new infrastructure in the field of education and promote the teaching system of "Internet plus education".

2.1 Expand the Radiation Range of Classroom Teaching

Firstly, classroom: integration and compatibility of interdisciplinary knowledge.In his book "Intelligence Without Representation," Brooks proposed that artificial intelligence, based on existing computer theory, has not fully reflected the intelligence of biological tissues. Humans and other animals adjust their behavior through continuous learning to better adapt to their environment and thus learn (Brooks, 1991). The basic education curriculum standards released by the Chinese Ministry of Education also emphasize the integration and understanding of interdisciplinary knowledge, which has become a form of knowledge learning.By integrating the relevant knowledge elements in a "modular" manner, students can effectively encode and form logical structural representations in their cognition. XR-Extended Reality technology has changed the previous single form by presenting databases to students in an integrated and compatible manner, which is conducive to connecting knowledge from various disciplines and expanding the radiation range of classroom teaching. For example, when students engage in unit learning or project-based learning, teachers can use XR-Extended Reality technology to provide students with a virtual resource library. Students can refer to and discuss different fields of content in the self selected resource library, guiding them to extract understanding of difficult problems from a vast amount of knowledge.

Secondly, teaching: communication and exchange in cross school teaching.Bourdieu's discourse on the concept of "field" reflects the existence of mutually influential fields in the social world, just like the natural world. The educational "field" refers to an objective network of relationships formed between educators, learners, and other educational participants, mediated by knowledge and aimed at human development, formation, and elevation. Throughout the nature and attributes of education, schools possess a natural 'field' characteristic. The fixation of teaching space means the prominence of the teaching field. In teaching, in order to break the fixed effect of thinking patterns, teaching communication can be implemented through cross school teaching. For example, when teachers engage in teaching and research activities, they can switch fields and use XR-Extended Reality technology to

overlap another real field, achieving spatial interactivity and allowing users to construct a real spatial state in their naked eyes, achieving cross school teaching and discussion.

2.2 The Spatial Environment of Overlapping Classroom Teaching

Firstly, embodiment creating a realistic classroom teaching atmosphere.The first generation of cognitive science was characterized as "detached" research, which is also the theoretical source of artificial intelligence, emphasizing that cognition can exist independently of the human body in terms of function. The ideological origin of detached cognition can be traced back to the ancient dualism of body and mind. Plato attempted to distinguish the world into two forms: the sensory world and the conceptual world. The second generation of cognitive science, embodied, emphasizes the core role of the body in the cognitive process. It is a concept that places the human body and mind at the same level, emphasizing the important role of the body in information dissemination and interaction.The classroom teaching environment has a subtle influence on students, just as embodied cognition theory suggests that the body is the foundation of the mind and plays an irreplaceable role in students' cognition and related social interaction activities. XR-Extended reality technology focuses on the fundamental cognitive requirements of humans, emphasizing the "embodied" actual feelings. In teaching, teachers use XR-Extended Reality technology to superimpose virtual visual, auditory, and tactile senses onto reality, allowing students to immerse themselves in a created "real+virtual" extended classroom and realizing the application of "embodiment" theory in teaching.

Secondly, overlap linking the performance patterns of different fields.The theory of embodiment states that the presence of the body is necessary to achieve a process of wholehearted participation, closely linking the brain and the body structure that carries the brain, as well as the interaction between the body and the environment. This requires the use of overlapping methods to correlate performance patterns in different fields. The key to "overlap" is to superimpose virtual digital objects onto the real world, concretize abstract information, overlay different fields in the same space, and achieve a unified perception of the body.XR-Extended Reality technology emphasizes "augmented reality", which is not virtualization like VR, but rather the realization of virtual scenes by overlaying different fields in real situations, achieving spatial interaction, enriching its own field structure, and creating a rich and novel world. Furthermore, it affects the cognitive structure of learners, enabling them to transfer from bodily perception to brain signal output.

2.3 Building a Visualized Classroom Teaching System

Firstly, create a virtual classroom teaching environment.By utilizing XR-Extended Realitytechnology to provide teaching resources, it is possible to create teaching spaces that effectively combine classroom teaching scenarios with virtual temporal and spatial contexts, thereby achieving the integration of virtual and real, fully utilizing the short classroom time to achieve optimal teaching effects, and helping students deepen their learning. For example, when teachers talk about climate types and characteristics in geography, they can use XR-Extended Reality technology to immerse students in different latitude locations, land and sea locations, and terrain environments, turning written materials into tangible physical and mental insights, and experiencing various factors that trigger climate differences in specific contexts, which can stimulate students' interest in learning and experiential learning experiences. For example, when teaching classical Chinese, Chinese language teachers need to use dictionaries to query their understanding of words. They can use XR augmented reality technology to present the dictionary to students with holographic effects, allowing them to read and search together, triggering students' initiative, being realistic, vivid, and interesting.

Secondly, expansion: returning concrete classroom teaching processes.Japanese scholar Sato proposed in his book "Curriculum and Teachers" that the disconnect between research and practice in the field of curriculum is particularly prominent in daily life. Looking back over the past 20 years, the "latent curriculum" (Jackson) and "non school theory" (Illich) in Japan have also had a huge impact among educational researchers. B. Bernstein's analysis of disciplinary "classification" and "integration", M. W. Apple's analysis of power and ideology, and P. Freire's strategy of "from transmission to dialogue" have attracted attention no less than that of Europe and America. To avoid the disconnection between classroom and teaching, real classroom situations should be created during teaching, and real scenes with real-time feedback (or cloud recording) naked eye 3D effects should be constructed, transforming indirect experience into direct experience. XR-Extended Reality technology can also be used for the transformation of classroom teaching processes. Through XR technology, multiple real-life scenarios can be integrated into the current classroom teaching system, achieving a 1+X reflection of classroom teaching content. For example, in English teaching, in order to have a dialogue with foreigners at zero distance in the classroom and realize exchange, XR can be used to expand the reality technology, transform the online state of video into a holographic state, and build a virtual portrait in reality, so that students can communicate with foreigners in person and shorten the communication distance.

3. The Significance of XR-Extended Reality Technology in Basic Education Classrooms

XR augmented reality technology is deeply integrated into basic education classrooms, and its core value lies in creatively constructing a visual and holographic teaching space that integrates reality and virtuality. This space revolutionizes the creation of scenarios, presenting abstract concepts concretely, vividly reproducing historical scenes, and making the micro world within reach, thus greatly innovating classroom teaching methods and stimulating students' interest in active exploration; It efficiently integrates diverse digital resources and physical environments, seamlessly linking textbooks, models, online information, and even vast natural and social domains, significantly expanding the physical and cognitive boundaries of student learning; At the same time, AR technology can also capture learning behavior and feedback in real time, provide visual data for teachers, accurately assist in teaching evaluation and process diagnosis, and effectively promote the construction of efficient classrooms and the optimization of teaching strategies. These transformative applications collectively provide vast possibilities for breaking through the limitations of traditional teaching methods. It can be said that XR-Extended Realitytechnology is reshaping the ecology and future of basic education from multiple core dimensions such as teaching methods, student thinking, and learning forms.

3.1 Updating Traditional Teaching Methods to Meet the Development Needs of the Information Age

XR-Extended reality technology shifts classroom teaching from teaching support to learning support, focusing on the subject status of students in teaching activities. The shift from teacher-student interaction to sensory interaction, spatial interaction, and human-computer interaction reflects a multidimensional teaching form. The shift from technological presentation to experiential interaction has triggered students' generative knowledge formation in teaching. The application of XR in teaching has three characteristics: diversification, informatization, and personalization.

Firstly, diversification data sorting.XR needs to process complex, diverse and unstructured massive data in a centralized manner, and will reduce the load on terminal devices by using artificial intelligence algorithms and collaborative processing of corresponding data source platforms, such as edge computing. Due to the massive processing characteristics of XR technology, classroom teaching can be diversified in teaching forms, and the data processing technology carried by XR can be used to solve abstract problems related to teaching. In teaching, teachers can also set up diverse interactive scenarios through XR, and choose suitable and targeted scene changes based on the differences in knowledge teaching.

Secondly, personalization analysis and evaluation. XR is a symbol of the era of information technology development, and education has shifted from technological presentation to experiential interaction. Based on the role of educational technology platforms in classroom teaching, XR can achieve interactive teaching processes in the process of informatization. XR can also analyze and process physiological data generated by the surrounding environment and learners themselves. So as to analyze the learning characteristics of specific learners and learning groups, and carry out information-based teaching. In teaching activities, students are in the main position, and their learning process will change with the teaching process. The preset situation cannot be completely consistent in real teaching. Through personalized processing of XR, students can flexibly respond to changes in teaching activities.

Thirdly, contextualization creative extraction.The key to XR technology is "extension", which aims to overlay virtual scenes onto real scenes, achieving spatial interaction, human-computer interaction, and sensory interaction. The extended context is intuitive and natural, and does not contradict the real context. The contextualization of XR technology is not a single presentation, but rather a naked eye holographic 3D effect, achieving a "embodied" immersive experience, which is a form that VR and MR have not achieved. Situational teaching is also a teaching method advocated in basic education, which is conducive to connecting students' life experiences and realizing the process from direct experience to abstract thinking.

3.2 Improving Students' Thinking Quality is Conducive to Achieving Their Comprehensive Development

The Organization for Economic Cooperation and Development (OECD) first proposed the "Core Competencies" structural model in the early 21st century, aiming to address the core knowledge, abilities, and emotional attitudes that 21st century students should possess, in order to ensure their successful integration into future society, meet personal self actualization needs, and promote social development. This model emphasizes the educative and learnable characteristics of core competencies, with developmental continuity and stage sensitivity, laying the foundation for students' lifelong learning and adaptability.The standard of core competencies in a subject is a concentrated reflection of the educational value of the subject, and it is the correct values, essential qualities, and key abilities gradually formed by students through subject learning. The development and improvement of thinking emphasizes the need to enhance students' depth, agility, flexibility, criticality, and originality in their own thinking.

[6] The application of XR-Extended Reality technology embodies the flexibility, criticality, and agility of students' thinking training.

Firstly, flexibility constructing curriculum.Heidegger pointed out in "Being and Time" that formal manifestation has naturalistic representations (appearances), which need to be "deconstructed" (revealed, illuminated) to open up the way, remove obscuration, suspension, return to the thing itself, and understand its construction process. Students' learning should be achieved through a process from concrete to abstract to concrete. Starting from 'real life', setting the context, returning to the essence in understanding, and reflecting the flexibility of thinking.The application of XR-Extended Reality technology achieves real-time intelligent decision-making, intelligent push, and intelligent evaluation, reflecting the shift from teaching support to learner centered learning support. By overlapping the fields of external learning environment and internal real environment, students can support learners to carry out deep level learning activities in both real and virtual learning environments, and obtain flexible and rich learning experiences. Introducing real-life scenarios into abstract knowledge allows for divergent thinking.

Secondly, criticality divergent thinking.Hirsch said in his book "The Validity of Interpretation": "Countless different intentional acts can obtain the same intentional object, that is to say, they can point to the same intentional object; Secondly, people believe that the meaning cannot be grasped by the interpreter. In Hirsch's view, that is due to mistaking the impossibility of exact understanding for the impossibility of understanding. Hirsch believed that people's ability to understand knowledge does not mean completely confusing the impossibility of exact understanding with the impossibility of understanding, which is logically incorrect. Similarly, equating knowledge with certainty is also incorrect. Therefore, 'I think, therefore I am.'. Thinking cannot be based on contradictions and paradoxes, and should be effectively revealed.The teaching process is no longer limited to a single lecture style, abandoning the teacher's "one-man lecture" situation. The teaching time tends to be diversified, and the dynamic and multidimensional interaction between teachers, students, teaching content, teaching equipment, and teaching environment in teaching activities is the basic form of XR-Extended Reality technology teaching. During the learning process, students can start from different dimensions, seek truth, and engage in critical understanding of their thinking.

Thirdly, agility future experience.The phenomenological concept of "probability" holds that the main characteristic of all probabilistic judgments is their uncertainty, which manifests as a fact that is partially unknown and may never be precisely realized (such as in interpretation). This' probability 'is a form of learners learning essential knowledge. The scene construction in teaching meets the requirement of "probability" and reflects the non deterministic expression of 1+X.XR-Extended reality technology is a manifestation of 1+X teaching extension, based on real teaching scenarios and incorporating "concrete" virtual scenes. Although XR technology wants to break through virtuality and present real scenes, X essentially expands the virtual space. When students adapt to spatial overlap, their thinking agility is also developed and strengthened.

3.3 The Transformation of Teaching forms, Focusing on Students' Subject Consciousness in the Classroom

In teaching activities, students are the main body of learning. Humanistic psychologist Rogers emphasized the importance of "putting people first". The 2022 "Chinese Language Curriculum Standards for Compulsory Education" published by the Chinese Ministry of Education also emphasizes that cultivating students' moral qualities is the fundamental task of education. In teaching, emphasis should be placed on the effective integration of the subject and object of education, as well as the organic combination of educational objectives and means. Putting students at the center and stimulating their interest in learning is the key to achieving the integration and symbiosis of the "five educations".

Firstly, proactivity. John Dewey pointed out in "School and Society" that people often say that education is "drawing out", and this statement is very good if it is only compared to the injection process. However, it is difficult to connect the introduced concepts with the daily activities of children aged three, four, seven, or eight. His various activities are already too numerous and abundant. This requires enhancing students' initiative awareness, using XR-Extended Reality technology to stimulate their desire for active learning, and being good at reflection and correction in learning. The original form of learning experience is like a "hodgepodge". If students lack initiative, the structure of knowledge will become unstable. XR-Extended Reality technology enhances students' sense of experience, which is conducive to guiding students to gain direct experience and grow through direct experience and reflection.

Secondly, generativity. Shi Liangfang pointed out in "Learning Theory" that "learning refers to the relatively lasting changes in the behavior, abilities, and psychological tendencies of learners caused by experience. These changes are not caused by maturity, disease, or medication, and may not necessarily manifest as overt behavior.The accumulation of experience lies in the understanding, perception, and generation of situations. Abstract knowledge

is not easy to remember, and only through sensory interaction and generative resources can it be stored in the brain for a long time. The classroom of XR-Extended Reality technology will be adjusted in a targeted manner according to students' own understanding, conforming to their understanding behavior, and generating related resources.

Thirdly, Research oriented. By utilizing XR-Extended Reality technology, we aim to create innovative learning spaces, provide supportive forms of learning activities, and leave students with ample research space in terms of content. Unknown variable (X) is reflected in the overlapping of virtual space in the teaching reality space, allowing the limited space to extend infinitely and achieving a perfect combination of virtual and real images. The extensive feature leaves learners with a lot of research space. In teaching activities, students can also choose X based on their own expectations, and in the evolution and development of the situation, screen and increase, explore the true knowledge system in research, and build a visual classroom teaching mode.

In summary, XR-Extended Reality technology is not only a world of communication and experience, but also a practical space for manipulating natural causal processes. Driven by 5G, XR-Extended Reality technology is increasingly forming interactive "manifestations", and future interactions tend to integrate reality and virtuality. Providing massive reading materials and rich contextual experiences in teaching requires the use of XR augmented reality to achieve. The combination of virtual and reality is conducive to students' immersive experience, expanding the virtual "reality" in the real scene, realizing the integration and intercommunication of basic education curriculum teaching and informatization, and effectively building a visual classroom teaching system of "Internet+education". XR-Extended reality technology guides students to play a role in the metacognitive scaffold, allowing them to benefit from the insights generated during the learning process.

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