High-Consciousness Learning Service Scenarios and Construction of AIGC-Supported Smart Libraries

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Abstract: Generative Artificial Intelligence (AIGC) emerges and exists as an "external brain" for human understanding of the world, empowering invisible cognition and thinking, and elevating human cognition and thinking to a state of high consciousness. High-consciousness learning will become the primary form of cognition and thinking in future society. Taking the promotion of in-depth application of AIGC technology in higher education and the deep integration of AIGC technology with smart libraries as the entry point, this paper elaborates on the concepts, connotations, and characteristics of AIGC and high-consciousness learning, analyzes the composition of high-consciousness learning service scenarios in smart libraries supported by AIGC, and explores construction measures for these scenarios, aiming to establish a new paradigm of learning in smart libraries and promote the reshaping of smart library services.

1. Introduction

Intelligent science, represented by artificial intelligence, impacts humans primarily at the levels of cognition and thinking. While traditional science, technology, and tools function as the "external organs" through which humans transform the world, artificial intelligence serves as an "external brain" that enhances human understanding of the world, with generative artificial intelligence (AIGC) being the most typical example. The former extends and augments the functions of human physical organs, whereas the latter empowers human invisible cognition and thinking, fundamentally transforming and enhancing cognitive and thinking abilities, thereby elevating them to a state of "high consciousness."

As AIGC technology matures and is increasingly applied in the field of higher education, its influence on the cognition and thinking of university learners becomes comprehensive and profound. High-consciousness learning is poised to become the primary form of cognition and thinking among future learners in higher education. The smart library, as the core entity supporting the construction of future learning centers in universities, will be the primary venue for future learning. This paper elaborates on the concepts, connotations, and characteristics of AIGC and high-consciousness learning, analyzes the composition of high-consciousness learning service scenarios in smart libraries supported by AIGC, and explores construction measures for such scenarios. These discussions play a positively significant role in establishing a new paradigm of learning in smart libraries and promoting the transformation of smart library services [1].

2. Overview of AIGC and High-Consciousness Learning

2.1. AIGC and Its Connotations and Characteristics

AIGC is the abbreviation of "Artificial Intelligence Generated Content," referring to content generated by artificial intelligence, also known as generative artificial intelligence. It took form with the official release of ChatGPT by OpenAI in 2022 as a milestone. Externally, AIGC manifests as a ubiquitous intelligent technology, also known as a general large model of AI. It achieves a series of functions such as automated, autonomous, and intelligent perception, analysis, decision-making, and execution through deep integration of elements such as massive and diverse data, immense

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computational power, and specific generative algorithms. It aims to reorganize and allocate production factors related to specific domains, industries, organizations, systems, or problems to optimize work efficiency and outcomes [2].

The capabilities and influence that AIGC exhibits are determined by its unique internal and external characteristics. The internal characteristics include strong multimodal learning ability and natural language interaction ability. Multimodal learning ability refers to the use of immense computational power and specific generative algorithms, fed with large volumes of diverse data, to automatically or even autonomously identify, learn, and discover "patterns," build "models," and generate "content" from existing data, information, and knowledge. This is the core capability of AIGC. Natural language interaction ability breaks the interaction barrier between machines and humans, facilitating and enriching the channels and methods of interaction between AIGC and humans, and serves as the foundation for embodied interaction between AIGC and human beings. The external characteristics are reflected in the rapid iterative ability to integrate intelligence and wisdom in a unified manner. Based on high-speed distributed networks and diverse intelligent terminals, AIGC can exist in the form of "avatars" across the entire network and simultaneously participate in all affairs. It can rapidly grow in intelligence and wisdom by integrating vast amounts of "computational" results from the entire network and all terminals in a short time, achieving exponential "evolution." The influence of AIGC on various fields and industries is transformative and disruptive. It takes the field of higher education as its main battleground, while also feeding back into and reshaping the ecosystem of higher education. In particular, it profoundly and dimensionally elevates the cognition and thinking of university learners, promoting a shift in their learning paradigm toward high-consciousness learning [3].

2.2. High-Consciousness Learning and Its Connotations and Characteristics

High consciousness is based on the theory of hierarchical levels of consciousness, which was proposed by Gregory Bateson and improved by Robert Dilts. This theory holds that consciousness is divided from low to high into six levels: environment, behavior, capabilities, values, identity, and future vision. The first three levels represent low-level consciousness, mainly aimed at transforming the external world, while the latter three levels represent high-level consciousness, focusing on transforming the subjective world. High-level consciousness is characterized by the awareness, activation, and modification of low-level consciousness.

With the development of AIGC technology, more and more experts and scholars "implicitly acknowledge" its characteristics of "consciousness," believing that it has already crossed the "singularity" threshold and reached a human-comparable level in terms of low-level consciousness, though there is still a gap in high-level consciousness. "High consciousness" is regarded as an important criterion for distinguishing humans from artificial intelligence in the future and one of the few important traits by which humans can surpass AI algorithms [4].

Faced with the support and challenges of AIGC, we need to proactively develop high-level consciousness based on low-level consciousness—that is, to carry out high-consciousness learning. High-consciousness learning refers to the process in which learners, based on the developmental needs of high-level consciousness, engage with specific problems through repeated cognitive and behavioral co-interactions with objects, inquiry, critical reflection, and deep understanding of related new values, new ways of thinking, and new wisdom, thus actively improving their cognitive structure and adjusting behavioral patterns to form an integrated mental model used to guide subsequent practice and creation.

High-consciousness learning has rich connotations and distinct characteristics. First, it is a nonlinear learning process, accompanied by various types of consciousness such as problems, collaboration, inquiry, critique, value, practice, creation, and vision, progressing step by step. Second, it includes high-level thinking and application processes such as problem-situation analysis, association of new and existing cognition, multidimensional information integration, metacognitive monitoring, and the construction, practice, and creation of new cognition. Third, it enables learners to form generalized, abstract, and schematic deep understanding and integrated mental models for

specific problems. It is a typical form of wisdom-based learning [5].

AIGC-supported high-consciousness learning is a personalized learning modality based on the low-level consciousness of artificial intelligence, aiming at developing human high-level consciousness and generating wisdom. It involves immersive, embodied cognition and interaction, the practice of high-level thinking, promotion of deep understanding, and innovative practice, producing profound influence.

3. Composition of High-Consciousness Learning Service Scenarios in AIGC-Supported Smart Libraries

At present, the continuous acceleration of smart library construction in Chinese universities and the effort to provide more intelligent services are largely driven by the changes in learning paradigms among university learners. The paradigm is shifting from traditional "low-level consciousness learning" characterized by fixed classrooms, designated instructors, specialized teaching, comprehensive and systematic content, and passive reception of knowledge and skills, to intelligent "high-level consciousness learning" that allows for anytime, anywhere access, multi-source acquisition, need-oriented, fragmented, self-directed inquiry. This new learning paradigm makes the smart library the main place of learning for university learners and is gradually turning it into the learning center of universities. This demands the construction of new types of learning service scenarios to adapt to and support the new paradigm, and to promote the transformation of smart libraries from knowledge services to intelligent services. The application of AIGC technology in smart libraries will greatly facilitate the formation of high-consciousness learning service scenarios [6].

3.1. Adaptable, Diverse, and Abundant Knowledge Content Service Scenarios

Smart libraries supported by AIGC can provide adaptable, diverse, and abundant knowledge content services for high-consciousness learning among university learners. AIGC technology enables smart libraries to adopt a human-centered, machine-assisted model of knowledge content production. The content boom it has triggered is driving the role of the smart library from passive auxiliary collaboration and cost-effectiveness improvement toward proactive intelligent creation and value-added generation, truly turning the smart library into a growing organic system. The impact of AIGC on smart library construction is reflected mainly in two aspects. First is the digitization of traditional collections. AIGC, in combination with technologies such as computer graphics and blockchain, conducts "digital twin" replications of traditional collections, achieving permanent preservation in virtual space and enhancing reuse value. Second is the production of native digital resources. AIGC excels at low-cost, automated content generation. Based on multimodal general large models and supported by ever-increasing computational power, it revitalizes, reorganizes, and sequences library resource data, user characteristic and behavior data, spatial environmental data, and Internet resource data to produce knowledge content in various formats—text, graphics, images, audio, video—as well as 3D objects, virtual scenes, and digital humans, all of which are adaptable, diverse, and abundant. AIGC enhances the quality of knowledge content, thereby supporting the development of high-consciousness learning among university learners.

3.2. Timely, Accurate, and Dynamic Learning Process Service Scenarios

Smart libraries supported by AIGC can provide timely, accurate, and dynamic learning process services for high-consciousness learning among university learners. First is support for the teaching process, where AIGC acts as a teaching assistant or instructional aide. For example, AIGC technology can be used to comprehensively understand and accurately diagnose learners' pre-class preparation and post-class assignments, determine learners' knowledge and ability levels as well as personal traits, assist teachers in scientifically developing teaching plans, designing instructional activities, generating classroom reports, etc. It can also fully and comprehensively record and evaluate learners' learning content, methods, processes, and outcomes, thereby improving the comprehensiveness, scientific rigor, and effectiveness of evaluations, and supporting teachers' decision-making and

instructional improvement. Second is support for learning and research processes. For example, AIGC can "profile" learners, help them formulate efficient learning and research plans; engage in key knowledge Q&A to clarify doubts; and "accompany" learners during reading, communication, study, and research, dynamically providing suggestions on methods, strategies, pathways, and resources. Whether in the teaching process or the learning and research process, the application of AIGC reduces the burden on both teachers and learners, allowing more energy to be devoted to the development of high consciousness.

3.3. Authentic, Interactive, and Inquiry-Based Learning Environment Service Scenarios

Smart libraries supported by AIGC can provide authentic, interactive, and inquiry-based learning environment services for high-consciousness learning among university learners. Situated learning theory posits that learning is an interaction between individuals and their environment. An authentic, interactive, and inquiry-based learning environment more easily stimulates learners' inquiry motivation based on the "zone of proximal development," prompting them to actively interact with the environment and promote the development of high-level consciousness such as problem awareness and inquiry capacity. The ideal form of learning lies in real work environments, tasks, and processes, but due to limitations in time, space, and operational conditions, this has not yet been truly achieved. AIGC and related technologies demonstrate unique advantages in simulating and recreating real work environments. First, AIGC successfully breaks the constraints of time, space, and operational conditions, transforming complex real-world work scenarios into manageable learning contexts for learners. Second, through the design and application of intelligent learning systems, AIGC transforms factual production problems into learners' inquiry problems. Third, learning situations that integrate virtual and real elements, enable joint participation and collaborative inquiry, provide learners with embodied interaction conditions and experiences. An authentic, interactive, and inquiry-based learning environment is a guarantee for the effectiveness of high-consciousness learning among university learners.

3.4. Constructive, Practical, and Creative Wisdom-Generation Service Scenarios

Smart libraries supported by AIGC can provide constructive, practical, and creative wisdom-generation services for high-consciousness learning among university learners. High-consciousness learning begins with learners' inquiry into factual production problems. Through problem-based elicitation of existing cognition, triggering of cognitive conflict, stimulation of critical awareness, and the integration and synthesis of new and prior knowledge, learners complete cognitive construction, form new cognitive schemata, and use these schemata to guide production practice and engage in innovation and creation. In this process, AIGC plays a role in the following three aspects: First, the application of AIGC and related technologies and tools can significantly enhance learners' ability to adapt to and perceive the learning environment, effectively improving learning efficiency and outcomes. Second, AIGC can help learners deeply explore the logic and values behind new and existing cognition, strengthen the effect of integrating and associating the two, promote optimization of cognitive structures, and form high-level cognitive schemata—that is, wisdom. Third, the authentic, interactive, and inquiry-based learning environment supported by AIGC provides favorable conditions for learners to use new cognitive schemata to engage in production practice and creation, thus promoting the development of higher-level consciousness such as practice and creativity.

4. Construction Measures for High-Consciousness Learning Service Scenarios in AIGC-Supported Smart Libraries

4.1. Optimize Algorithm Design, Computing Power Application, and Data Structure to Improve the Quality of Knowledge Content Production

Algorithm, computing power, and data are the three fundamental components of AIGC, among which the algorithm is the core, computing power is the foundation, and data is the key. Efforts can be made from these three aspects to improve the quality of knowledge content production in AIGC

and provide effective support for high-consciousness learning among university learners in smart library environments. First, the study focuses on optimizing algorithm design by improving the architecture of algorithm models to enhance generation capability, refining training strategies to increase stability, strengthening data preprocessing to improve generalization, establishing evaluation and feedback mechanisms to mitigate algorithmic bias, and integrating affective computing technologies to ensure the integrity of algorithmic intelligence.Second, the optimization of computing power application is emphasized, as computing power has become a core productive element in the new era. It is a crucial support for AIGC and is involved in all stages and aspects of AIGC operations. Planned enhancement of computing power is an important task in constructing high-consciousness learning service scenarios in smart libraries. Third, the optimization of data structure is essential. Efforts should leverage the advantages of smart libraries' foundational corpora, which encompass massive, multi-source, multimodal, and structured data resources, and explore the application of synthetic data technologies to protect user privacy, enhance data diversity, and eliminate data silos.

4.2. Precisely Identify Learning Needs, Promote the Integration of Traditional Services, and Improve the Effectiveness of Learning Process Services

In smart library environments, the learning needs of university learners can be categorized as follows: First, basic needs, such as information on library collections, borrowing methods, service appointments and consultations, behavioral guidance and alerts, and user data management. Second, expected needs, such as multi-source data, virtual spaces, social interaction, resource visualization, and intelligent support. Third, personalized needs, such as decision-making support, literacy enhancement, research guidance, future prediction, emotional companionship, and immersive experiences. AIGC technology can be used to precisely identify the above learning needs of university learners, thereby enhancing the specificity, effectiveness, and user engagement of high-consciousness learning process services.

Promoting the integration of traditional learning support services is another effective measure to improve the effectiveness of high-consciousness learning process services. With the aid of AIGC technology, it is possible to integrate traditional learning tool support services, learning status analysis support services, learning evaluation support services, content resource support services, and communication interaction support services, thereby strengthening the integrated and scenario-based construction of learning process services and achieving seamless support for high-consciousness learning processes.

4.3. Enhance the Authenticity, Interactivity, and Immersiveness of the Learning Environment to Create an Embodied Cognition Learning Environment

The more authentic, interactive, and immersive the learning environment is, the more conducive it is to the development of learning activities. A series of digital technologies represented by AIGC can be used to enhance the authenticity, interactivity, and immersiveness of the smart library environment, turning the smart library into an embodied cognition learning environment. This enables deep integration between content and scenarios and satisfies learners' needs to experience knowledge and services through situational immersion. First, this study focuses on comprehensively acquiring, analyzing, refining, and mining physical space data and connecting it with virtual space data. These processes are combined with technologies such as virtual simulation, augmented reality, and digital twins to construct a learning environment featuring multidimensional perception and highly realistic experiences. Second, the improvement of the physical-psychological matching degree of learner avatars within the integrated virtual-physical space is emphasized, enabling learners to navigate the environment in a "real-body" form, access required resources, engage in free interaction, and participate in learning activities as needed, thereby achieving embodied interaction experiences. Third, efforts are directed toward promoting the continuity and integration among physical, virtual, social, and psychological spaces, ensuring seamless migration across various high-consciousness learning scenarios and allowing learners to experience a strong sense of presence and immersion.

4.4. Enhance Digital, Learning, and Ethical Literacy to Promote Human–Machine Intelligence Integration and Symbiosis

The application of AIGC in smart libraries imposes higher demands on the digital, ethical, and learning literacy of librarians and learners, and requires strengthened integration of human and machine intelligence. First, enhance digital literacy. Librarians and learners must have the awareness and ability to identify risks associated with AIGC technologies, such as data privacy, algorithmic bias, and false content. Second, enhance ethical literacy. Librarians and learners must have a strong sense of social responsibility in following ethical norms and using technology appropriately. They should possess the ability to clearly assign responsibility, establish accountability mechanisms, correct errors, and bear responsibility. Third, enhance learners' learning literacy. High-consciousness learning demands that learners possess strong autonomy, self-awareness, and self-discipline, along with positive mindsets, a lifelong learning attitude, superior metacognitive ability, and perseverance. Fourth, promote human–machine intelligence integration. In high-consciousness learning, AIGC is not a substitute but an assistant. It aims to form a mutually supportive, spiraling upward relationship through the "entanglement" between the thinking chain of AI algorithm models and the cognitive chain of university learners, thereby promoting the fusion and joint advancement of human and machine intelligence.

5. Conclusion

The emergence and application of AIGC technology signify that human society has entered a stage of human–machine intelligence integration and symbiosis. "High-consciousness learning," based on the low-level consciousness of artificial intelligence, will become the primary form of cognition and thinking for university learners in future society. As the future learning center of universities, the smart library is the main venue for university learners to engage in high-consciousness learning. The application of AIGC technology can create diverse high-consciousness learning service scenarios for university learners. Analyzing the composition of high-consciousness learning service scenarios in AIGC-supported smart libraries and proposing effective construction measures are valuable explorations for building a new paradigm of smart library learning and promoting the reshaping of smart library services.

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