

Building AIGC-Empowered Future Learning Centers: Trends and Pathways

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Date: 2023-08-28T00:00:00+00:00

Abstract

Abstract: [Purpose/Significance] Leveraging AIGC and other information technologies as well as artificial intelligence, this educational platform provides personalized, collaborative, and innovative learning environments and services for learner-centered future learning centers. [Method/Process] Employing the PEST-SWOT model as the research framework, this study conducts an in-depth analysis of the external macro-environment and internal potential factors in the construction of AIGC-enabled future learning centers, and explores how external social, economic, political, and technological factors affect their development. Simultaneously, it examines the internal actual conditions of the learning centers to uncover their potential advantages and areas for improvement, thereby providing robust support for the sustainable development of future learning centers. [Results/Conclusion] During the initial construction phase of future learning centers, it is essential to guide their development from both planning and implementation perspectives. On the basis of planning that involves scientific analysis, rational design, and effective evaluation, while ensuring the implementation of resources, technology, talent, and cultural connotations, intelligent future learning centers can be constructed.

Full Text

AIGC-Enabled Future Learning Center Construction: Trends and Approaches

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Abstract

[Purpose/Significance] This study proposes an education platform for learner-centered future learning centers that leverages AIGC and other

information technologies and artificial intelligence to provide personalized, collaborative, and innovative learning environments and services. **[Methods/Process]** The PEST-SWOT model serves as the research framework to deeply analyze the external macro-environment and internal potential factors in AIGC-enabled future learning center construction, examining how social, economic, political, and technological external factors influence its development. Simultaneously, the study focuses on the actual conditions within learning centers to identify potential advantages and areas for improvement, thereby providing robust support for sustainable development. **[Results/Conclusion]** The findings indicate that during the initial construction phase, future learning centers must grasp their development direction through both planning and implementation. Based on scientific analysis, rational design, and effective evaluation, construction must address resources, technology, talent, and cultural connotations to build intelligent future learning centers.

Keywords: Future Learning Center; PEST-SWOT Model; Digital Library; Construction Strategy

Classification Number: G251

On December 24, 2021, during the 40th anniversary academic symposium of the Ministry of Education's University Library Work Committee, Director Wu Yan of the Higher Education Department first proposed the task of constructing "Future Learning Centers." This initiative aims to transform libraries into information service centers, student learning centers, and teaching support hubs by integrating literature resources, reshaping spatial workflows, and constructing smart learning spaces. It encourages exploratory team-based, collaborative, and thematic learning to reform traditional talent cultivation models and explore new paradigms for education in the new era.

To address the impact of digital and intelligent technologies on traditional education, the Higher Education Department plans to fully implement the "101 Plan" series in 2023 to comprehensively advance education and teaching reforms. This includes exploring pilot programs for future learning centers by leveraging university library advantages, integrating various learning resources, and utilizing emerging technologies such as artificial intelligence, big data, cloud computing, and the Internet of Things to revolutionize traditional approaches and build future learning centers.

Artificial Intelligence Generated Content (AIGC) refers to a new production method that uses AI technology to automatically generate various forms of digital content, including text, images, voice, video, and even virtual reality [1]. Applying AIGC technology to future learning centers can unlock tremendous potential in personalized learning, teaching resource generation, and intelligent tutoring, providing learners with customized, collaborative, and innovative learning environments and educational services.

The construction of future learning centers represents an urgent need for

paradigm transformation in higher education talent cultivation. AIGC technology ensures the provision of growth-oriented learning environments, comprehensive learning experiences, and transdisciplinary open exchange opportunities, thereby enhancing students' ability to innovate and transform knowledge. Through future learning center construction, we can actively promote reforms in traditional education—a crucial measure for implementing the spirit of the 20th Party Congress. This initiative not only advances digital transformation in education but also contributes to building a lifelong learning society for all citizens, propelling the nation toward becoming a learning powerhouse while aligning with global trends in higher education development. Future learning center construction constitutes an important deployment of the “Accelerating Digital Development, Building a Digital China” strategy and represents a vital component of promoting high-quality development in China’s educational undertakings. Currently, academic research on development strategies for future learning centers remains limited, particularly given the dual challenges of insufficient theoretical depth and limited practical experience. Focusing on the external macro-environment and internal conditions of AIGC-enabled future learning center construction, this study attempts to identify the internal and external factors affecting construction to circumvent various obstacles to long-term development, provide new paradigms for future education, effectively address the increasingly exposed shortcomings of traditional educational libraries, and offer a scientifically effective analytical framework for national development and transformation.

2.1 Construction of the PEST-SWOT Future Learning Center Model

Macro-environment analysis (PEST) examines the macro-environment faced by all organizations within a certain time and space, commonly used in strategic management. The PEST analysis method enables analysis of the external environment for future learning center construction from four dimensions: Political-Legal, Economic, Social-Cultural and Natural, and Technological environments. This facilitates a comprehensive understanding of environmental impacts on center construction.

SWOT analysis, a key strategic selection tool, helps organizations evaluate internal strengths and weaknesses alongside external opportunities and threats to formulate more effective development strategies. This method analyzes the target entity’s inherent strengths and weaknesses to identify core competencies and negative factors, including internal deficiencies, while deeply exploring external opportunities and threats to discover factors that either support or hinder goal achievement. The objective is to leverage strengths, overcome weaknesses, seize opportunities, and guard against threats to propose practical development strategies.

PEST analysis examines the external environment of AIGC-enabled future learning centers, including political, economic, social, and technological factors, to reveal key elements affecting their development. SWOT analysis focuses on

internal potential advantages and challenges to ensure full consideration of interactions between internal and external factors during strategy formulation.

The PEST-SWOT model is a commonly used strategic analysis tool that helps organizations evaluate internal and external environmental factors and formulate corresponding strategies. This study conducts an in-depth analysis of AIGC-enabled future learning centers through the PEST-SWOT model, focusing on changes in political and policy environments, economic development trends, social-cultural evolution, and technological innovation impacts. Simultaneously, it examines the learning center's internal organizational structure, teaching resources, faculty teams, and other aspects to identify strengths and weaknesses, providing a basis for developing feasible construction strategies. See the Basic Framework of the PEST-SWOT Future Learning Center Model (Table 1).

PEST-SWOT Future Learning Center Model Basic Framework

| External Environment | Opportunities (O) | Threats (T) |
|------------------------------|---|--------------------|
| Political Factors | Consider government policies and regulations affecting future learning center construction, such as education policies and subsidy measures | |
| Economic Factors | Analyze economic conditions' potential impact, such as financial support and public willingness to invest in education | |
| Social Factors | Focus on social trends and changing educational demands, such as skills training needs and online learning popularity | |
| Technological Factors | Evaluate technological innovation impacts, such as online learning platforms and virtual reality technologies | |

| Internal Conditions | Strengths (S) | Weaknesses (W) |
|---------------------|---|--|
| | Identify internal advantages, such as rich teaching resources, senior faculty teams, and advanced teaching facilities | Identify internal weaknesses, such as financial status and brand recognition |

2.2 Applicability Analysis of the PEST-SWOT Future Learning Center Framework

AIGC technology possesses powerful data processing and analytical capabilities, enabling it to analyze learners' platform usage to identify user needs, consumption habits, and customize personalized learning plans while providing all necessary learning materials and tools. AIGC-enabled future learning centers break through the passive, limited provision of traditional learning fields, using artificial intelligence technology to interact positively with users and deliver learning products and services.

The construction of AIGC-enabled future learning centers inevitably involves multiple stakeholders and elements, with success closely related to both external environmental factors and internal conditions. Therefore, successful construction cannot be achieved solely through basic factors such as construction funding, talent investment, and digital technology. It requires leveraging the unique effects of AIGC technology integration under an analytical framework of external macro-environment and internal conditions, coordinating and adapting construction through deconstruction and integration of center elements. This approach explores development opportunities and challenges for AIGC-enabled future learning centers in the digital context, providing new paradigms for future education while effectively addressing the increasingly exposed shortcomings of traditional educational libraries.

Currently, the future learning center, as an emerging concept, has become a hot topic in academic research, with domestic universities spontaneously exploring construction paths based on existing traditional learning center conditions. Attempts to utilize AIGC, ChatGPT, metaverse technologies, and other enhancements to promote ideal future learning center construction have not yet yielded significant results. Based on this reality, to fully understand the actual conditions of AIGC-enabled future learning center construction and explore effective construction strategies, this study employs the PEST-SWOT model framework to construct a PEST-SWOT analysis matrix for future learning center construction. This matrix comprehensively considers external environmental factors and internal development factors, thoroughly analyzing various influencing factors during the initial exploration phase of future learning center construction to help 及时调整建设策略，推动未来学习中心的建设进程。

3.1.1 Institutional Level: Policy Support and Legal Guarantees for Future Learning Center Construction

In the digital age, with comprehensive development of digital education, future learning centers as emerging knowledge and information hubs face an inevitable trend of continuous construction and development. In recent years, with digital development and applications of AIGC, ChatGPT, and metaverse technologies, the innovation and development of future learning spaces have gained increasing societal attention. Consequently, the Ministry of Education has issued a series of policies encouraging innovative education models and teaching methods, supporting future learning center construction and promoting education modernization.

Prior to 2018, the Ministry of Education issued the “Guiding Opinions on the Construction and Application of Digital Education Resource Public Service Systems.” This guidance, based on the national digital education resource public service system, focused on promoting deep integration of information technology with education and teaching practice. Through application-driven approaches and mechanism innovation, it comprehensively strengthened spatial construction and application, accelerating education informatization upgrades and transforming teaching and learning methods to build a thriving “Internet+Education” ecosystem [2]. The guidance also emphasized implementing the “Guidelines for Network Learning Space Construction and Application” to holistically advance network learning space construction, aiming to fully realize the “one person, one space” concept and provide independent, personalized learning environments for each learner [3]. In the “14th Five-Year Plan for National Economic and Social Development and Long-Range Objectives Through 2035” released in 2021, the government explicitly proposed actively developing smart libraries [4], listing this initiative as one of eight key tasks in the national cultural digitization strategy to promote digital transformation in the cultural sector. By advancing smart library development, digital technologies can be better utilized to enhance library service levels and meet people’s diverse learning and cultural needs. In November of the same year, the Ministry of Education proposed the task of constructing “Future Learning Centers,” encouraging universities to pilot “Future Learning Centers” based on libraries [5]. In May 2022, China issued the “Opinions on Promoting the Implementation of the National Cultural Digitalization Strategy,” emphasizing coordinated advancement of the national cultural big data system, national smart library system, and public cultural cloud construction, integrating new experiential technologies to vigorously develop new digital cultural experiences [6]. In October 2022, the Ministry of Industry and Information Technology and four other departments issued the “Action Plan for Integrated Development of Virtual Reality and Industry Applications (2022-2026),” which pointed out the need to promote key technology integration and innovation in virtual reality and accelerate its application across multiple industries and scenarios [7].

On the other hand, the previously promulgated “Cybersecurity Law of the Peo-

ple’s Republic of China” provides solid legal support for future learning center construction, aiming to maintain cyberspace security and order [8]. It clearly defines the rights and obligations of all parties involved in cyberspace construction, operation, maintenance, and use, effectively safeguarding the rights and interests of all parties and establishing a spatial network security guarantee mechanism [9]. To ensure users’ orderly and autonomous learning in future learning centers, the Cybersecurity Law implements security responsibilities for all parties in spatial network construction, operation, and maintenance. On one hand, educational administrative departments at all levels create a secure network environment, regulate various business operations in future learning centers, implement cybersecurity classification protection, and establish sound management systems for content review and emergency response [10]. On the other hand, to ensure cybersecurity in future learning centers, schools at all levels must strengthen cybersecurity education and training for future learning center practitioners. This training should focus on cultivating employees’ awareness and ability to consciously maintain cybersecurity and resist harmful information, ensuring the security of networks, information, data, and content in future learning centers. Under a coordinated and unified mechanism, all parties work together to advance future learning center construction, aiming to create a peaceful, secure, open, and cooperative learning environment that fosters a multilateral, democratic, and transparent network governance system to promote healthy development in education.

3.1.2 Economic Level: Financial Support for Future Learning Center Construction

According to the “2022 National Education Funding Implementation Statistics Bulletin” released by the Ministry of Education, “In 2022, total national education funding reached 6,134.4 billion yuan, representing a 6% increase from the previous year. Among this, national fiscal education funding was 4,847.8 billion yuan, a year-on-year increase of 5.8%. Total higher education funding reached 1,639.7 billion yuan, a 6.2% increase from the previous year, with per-student total education expenditure in regular higher education institutions at 39,220 yuan, a 1.3% increase from the previous year” [11]. This data demonstrates that higher education funding occupies an important proportion in education funding at all levels, highlighting the nation’s high regard for higher education and reflecting the state’s consistent prioritization of higher education with continuous attention and support for innovative practices in the field [12]. Future learning centers represent an important task deployed by the Ministry of Education for university construction. By leveraging university library advantages, integrating various learning resources, and utilizing new-generation information technology to create new types of grassroots learning organizations that support learning method transformation, these unique economic advantages will facilitate the successful establishment of future learning centers.

Educational development is not merely the responsibility of government and

education departments but should involve coordinated efforts from all sectors of society to promote educational reform and innovative development. To this end, China has created a favorable policy environment in recent years to attract enterprises and other social capital to participate in the development and construction of future learning centers, providing quality future learning space services and obtaining corresponding returns. This includes government encouragement for investors and social capital to participate in future learning center construction, providing fiscal and tax policy support such as tax reductions and project funding. To promote innovation and entrepreneurship in future learning centers, the state has issued a series of policies supporting innovation and entrepreneurship, including intellectual property protection and transformation of scientific research achievements. Through government-led initiatives involving all of society, the resource advantages of future learning center construction can be fully utilized to reach cooperative framework agreements among government, enterprises, and society as a whole, providing opportunities for future learning center construction.

3.1.3 Social Level: Expanding the Foundation of Demand for Future Learning Center Construction

From a social perspective, current public educational demands and expectations have significant positive impacts on future learning center construction. First, regarding public educational needs, societal development has led to continuously increasing demand for lifelong learning. Technological, economic, and social transformations have caused changes in occupational requirements, necessitating continuous updating and upgrading of knowledge and skills [13]. Second, in terms of educational awareness and learning consciousness, as education popularization continues to improve, societal awareness of the importance of lifelong learning continues to rise, with increasing numbers of groups spontaneously participating in various learning activities. Today, as digital technologies such as artificial intelligence gradually expand their societal influence, public acceptance of these technologies has generally increased. Educational promotion subtly conveys the value of education and lifelong learning to every level of society and different groups, greatly strengthening the social foundation for future learning center construction. Third, with socio-economic development and gradually improving living standards, Maslow's hierarchy of needs suggests that after physiological and safety needs are met, people require education for self-improvement to obtain higher-level needs. Based on the current social and cultural atmosphere, societal attitudes toward learning and cultural environments provide crucial social foundations. A cultural atmosphere that encourages learning, respects knowledge, and promotes innovation is more conducive to future learning center development.

3.1.4 Technical Level: Optimizing Infrastructure Conditions for Smart Community Construction

We live in an era of transformation, and constructing future learning centers inevitably requires scientific and technological progress. The ongoing new technological revolution centered on information technology, bringing artificial intelligence, VR&AR, big data, and mobile internet, will inevitably make it possible for traditional education to break free from numerous limitations. The development of future learning centers depends on these scientific and technological innovations and their integration [14]. Future learning centers, relying on university libraries and utilizing AIGC technology—a technology already successfully applied in global governance, education, and other fields with remarkable results—can be adapted for learners’ multi-scenario applications in learning centers. AIGC-enabled future learning centers can automatically generate various teaching materials for learners, formulate personalized learning plans, and provide real-time problem-solving and learning guidance through intelligent tutoring. Other technologies, such as high-speed internet connectivity, can promote learning and information transmission efficiency in future learning centers to support online courses, remote teaching, multimedia resource access and sharing, as well as virtual reality and augmented reality applications that provide immersive learning experiences such as virtual laboratories and virtual historical recreations, enhancing learning interactivity and engagement [15]. Additionally, cybersecurity technology not only maintains the normal operation of future learning centers but also serves the important function of security and privacy protection. Learning spaces involve large amounts of personal and sensitive information, and secure technical measures and privacy protection mechanisms can ensure learners’ information is not leaked or misused.

3.2.1 Institutional Level: Lack of Local Planning for Construction

Future learning centers emphasize leveraging university library advantages, integrating various learning resources, utilizing new-generation information technology, and creating new types of grassroots learning organizations that support learning method transformation. The lack of local planning for future learning center construction at the institutional level may lead to a series of problems and challenges that affect the development and operation of learning centers.

In recent years, numerous universities, urban libraries, and industry associations have devoted themselves to exchanging and discussing future learning center construction strategies, with a batch of universities taking the lead in attempting to complete the important task of constructing future learning centers as soon as possible. Although future learning center construction projects have been implemented across various regions, with traditional learning spaces attempting to break away from conventional models and integrate into schools’ future academic ecosystems by creating entirely new academic ecologies in spatial layout, unified local policy planning for the actual construction of future learning centers has yet to be implemented, with overall planning still insufficient regarding

construction entities and implementation approaches.

To date, although the Ministry of Education has issued policies encouraging universities to construct future learning centers, specific standards for future learning center construction have not yet been released. Simultaneously, there is a lack of supporting organizational, policy, and financial guarantees, particularly since the design and construction of future learning centers rely on existing infrastructure of individual universities, resulting in an overall lack of systematic, standardized, and locally distinctive approaches to future learning center construction.

3.2.2 Economic Level: Lack of Continuous Capital Injection

Future learning centers, based on 5G application scenarios and educational industry development ecosystems, build smart learning platforms and spaces that provide digital intelligent services and promote healthy development of learning resource sharing and platform economies [16]. Investment of national and social funds aims to create application-oriented, sustainable construction and development that maximizes educational resource benefits. However, current funding usage still requires further optimization and auditing of the construction and operation funding investment mechanism. Expenditure on equipment and facility procurement, related resource allocation, and staff quality training should comprehensively consider reasonable proportions among construction and operation funds, talent training funds, and other expenses to optimize funding structure and ensure stable operation and continuous effectiveness of future learning centers.

3.2.3 Social Level: Lack of Security Guarantees for Participating Entities

Under normalized COVID-19 prevention and control, the application of online learning spaces built on internet technology has provided rich practical experience for China's future learning center construction [17]. First, future learning centers using AIGC technology create more technical conditions and provide diversified intelligent products and services, but problems also exist. AIGC technology requires large amounts of learning data for training, which raises issues of student data privacy and information security [18]. Due to numerous cases of personal information leakage appearing in the public eye, the public indeed has privacy concerns about learning centers collecting personal data. Second, emphasizing the importance and necessity of social participation requires actively establishing partnerships with all sectors of society, conducting project cooperation across social fields, engaging in service exchanges at all social levels, and obtaining feedback from all social aspects. This enables learners to understand social needs, solve social problems, contribute social value, and achieve social benefits. As the concept of future learning centers was proposed relatively recently, the public needs time to understand and accept this emerging concept, and substantial promotional preparation is still required to expand

participation scale. Finally, since future learning center construction tasks are currently primarily assigned to universities nationwide, the current target audience for construction is mainly limited to universities and their surrounding communities, resulting in a relatively narrow reach that is not conducive to future learning centers' development toward society as a whole.

3.2.4 Technical Level: Lack of Data Resource Integration and Sharing

Future learning center construction may face external dilemmas at the technical level that could impact its development and operation. On one hand, selecting appropriate technologies and systems for learning centers is a critical decision. However, rapid technological change and instability may render chosen technologies obsolete shortly after construction completion, causing waste of resources and funds. With technology advancing daily, rapid progress may lead to facility obsolescence, and learning centers may face outdated facilities shortly after construction. If construction fails to consider flexibility for future technological development, learning center facilities may quickly become outdated, affecting teaching and research effectiveness. On the other hand, applying AIGC technology still presents security risks. Future learning center construction inevitably requires collecting, storing, and processing large amounts of sensitive data related to development management and numerous users' legitimate rights and interests. Significant privacy and data security issues may be affected by regulations, compliance requirements, and public concerns, necessitating strict data protection measures. Additionally, as digital institutions, future learning centers may become targets of cyberattacks and data breaches. Future learning centers must invest substantial resources to protect their systems and data from digital security threats, and insufficient security infrastructure and technical support may prevent them from fully realizing their educational and research functions. Furthermore, AIGC-generated content may involve ethical and moral issues and may contain inaccuracies or biases that current technology cannot completely avoid.

3.3.1 Significant Teaching Resource Advantages Inject Vitality into Future Learning Center Construction

Future learning centers serve as important means to deepen school education and teaching. As a realistic prospect for future educational space development, their characteristics in educational resources include not only diversity but also openness [19].

First, regarding resource diversity, future learning center construction pilots rely on university libraries. Compared to traditional libraries and other physical learning spaces, future learning centers add more digital textbooks and online resources to existing resource libraries, such as e-books, online tutorials, and video courses. Under AIGC technology operation, these resources can generate high-quality learning materials through intelligent creation based on disciplinary characteristics and learning objectives. This automated teaching resource gen-

eration approach saves substantial time and effort, allowing greater focus on learning. AIGC-enabled future learning centers support anytime, anywhere access, facilitating learner autonomy while enabling personalized adjustments based on learning progress and interests [20]. The diverse teaching resources in future learning centers provide rich learning experiences that meet different students' learning styles and interests.

Second, future learning centers provide learners with maximally open learning spaces. AIGC technology can combine natural language processing and machine learning methods to provide students with real-time problem-solving and learning guidance. Whether in understanding course content or solving academic problems, intelligent tutoring can help students progress more quickly, breaking traditional spatial barriers to create a more freely flowing open learning environment. For researchers, providing virtual laboratories and simulation software offers experimental and operational opportunities without requiring actual physical equipment [21]. Additionally, future learning centers provide online discussion forums, social platforms, etc., to promote interaction and cooperation among users. This helps scholars share experiences, solve problems, and expand social networks. With artificial intelligence technology, personalized learning suggestions and resources can be provided based on students' learning performance and needs, helping students learn more efficiently.

3.3.2 Senior Faculty Teams Cultivate Talent for Future Learning Centers

Future learning centers require not only the latest technology to enhance learning experiences but also helping operation managers improve their technical and digital literacy [22].

Future learning centers are learning and research platforms that gather experts from multiple fields. Outstanding talents from universities, research institutes, enterprises, and industry associations provide intellectual services in network learning spaces, breaking spatial barriers and exploring teaching in digital technology environments. These outstanding talents can provide learners with extensive knowledge and skills, enrich teaching content, and possess rich practical experience that combines theoretical knowledge with real-world problems to provide learners with practical guidance and training. Among them are teachers and researchers with excellent academic research capabilities who can provide learners with real-world guidance and inspiration, lead students in cutting-edge research, cultivate entrepreneurial spirit and innovation capabilities, and promote the learning center's research environment and reputation. Additionally, AIGC technology can provide teachers and researchers with more teaching resources and auxiliary tools to help them better conduct teaching and improve work efficiency.

3.3.3 Advanced Teaching Facilities Provide Fundamental Guarantee for Future Learning Centers

The degree of teaching facility renewal largely reflects the progress of education reform. In the digital age, teaching facilities should also transform in the digital direction. First, future education platforms support educational research equipment and facilities that can accommodate diverse teaching methods such as online teaching, virtual experiments, and multimedia courses. These not only meet educational needs but also stimulate innovation, enhance teaching effectiveness, and provide learners with rich learning experiences [23].

Future learning centers will fully utilize AIGC technology to make learning unrestricted by time and space, enabling anytime, anywhere autonomous learning [24]. Second, other innovative equipment includes facilities such as 3D printers, programming equipment, and creative materials that can stimulate students' innovative and practical spirits and cultivate problem-solving abilities.

3.4.1 Unstable Financial Conditions Affect Stable Development of Future Learning Centers

Currently, the financial condition of future learning center construction may be one of the internal weaknesses facing these centers. First, regarding funding needs, future learning centers rely on resources from traditional libraries and other learning spaces during construction and operation, and shortage of development funds affects investment in facility construction, textbook procurement, and faculty training. Second, the lack of stable funding sources creates financial instability. Future learning centers have single funding sources, relying solely on appropriations from national education management agencies, which limits their development scale and quality. Seeking diversified funding channels is essential for sustainable and healthy development. Moreover, in the early development stage, future learning centers have no profit-generating capacity and cannot continuously support long-term development. Finally, non-standard financial management and lack of long-term financial planning may prevent learning centers from addressing future financial challenges. Therefore, developing medium- and long-term financial strategies and clarifying financial goals and planning are crucial for future learning center construction and development. Regular financial forecasting and risk assessment are needed to adjust financial strategies promptly. Establishing complete financial management processes ensures standardization in budget preparation, fund usage, and reimbursement approval. Simultaneously, recruiting professional financial personnel ensures accurate and transparent financial records to avoid resource waste and poor fund management that could affect financial health.

3.4.2 Brand Recognition Affects Learning Center Attractiveness and Competitiveness

In earlier years, learning spaces were not accessible to the general public. With improved social education levels, future learning spaces have become a universal need [25], representing an inevitable trend in future education development. The habit of continuous learning has made the pursuit of learning spaces increasingly popular. Despite its unique advantages, the future learning center still faces a journey to stand out among numerous brands.

First, the low retention rate of future learning centers cannot be guaranteed, as most learners leave before fully understanding all services, and they may lack sufficient confidence or satisfaction compared to traditional library consumption habits. Unsatisfactory retention rates directly affect the sustainable development of future learning centers, causing brand influence to fall into a vicious cycle. Therefore, establishing the influence of future learning centers and promoting sustainable development is imperative. Second, given the disadvantage of insufficient brand recognition, media exposure for future learning centers is inadequate. Except within education circles, there is virtually no media attention or coverage of future learning centers, resulting in lack of publicity and exposure opportunities and insufficient attractiveness. Finally, low brand recognition and lack of attractiveness make it difficult to establish beneficial partnerships with educational enterprises and industry, limiting cooperation and exchange opportunities for learning centers.

4. Development Pathways for AIGC-Enabled Future Learning Center Construction

4.1 Future Learning Center Planning Pathways

Using the PEST-SWOT analysis framework to conduct scientific analysis, rational design, and effective evaluation of various factors in AIGC-enabled future learning center construction, this study focuses on three aspects: needs analysis, program design, and evaluation mechanisms to ensure future learning centers align with educational goals, adapt to social needs, meet learner expectations, and guarantee sustainable development.

4.1.1 Needs Analysis Needs analysis involves comprehensive and in-depth investigation of the objects, scope, content, and methods served by future learning centers to clarify the problems to be solved, needs to be met, and goals to be achieved. Needs analysis involves four levels: First, at the national level, analyzing the guiding significance and requirements of national education policies, development strategies, and social expectations for future learning centers; Second, at the regional level, analyzing influencing factors and constraints such as regional education status, development trends, and resource conditions; Third, at the institutional level, analyzing the supporting roles and guarantee measures of institutional education concepts, development visions, and management mod-

els; Fourth, at the individual level, analyzing learning characteristics, needs, and satisfaction to evaluate participation levels and effectiveness.

4.1.2 Program Design Program design involves systematic planning and detailed design of construction content, scale, form, and steps based on needs analysis results, dedicated to designing and constructing multifunctional, multi-type, intelligent future learning spaces [26]. This involves several aspects: First, regarding construction content, determining the main functional modules to be provided, such as reading areas, discussion areas, display areas, and maker spaces, fully utilizing AIGC technology to create scenario-based learning spaces that meet users' environmental pursuits [32]. This novel scenario-based learning approach attracts and retains consumers; Second, regarding construction scale, determining the size, quantity, and distribution of physical and virtual spaces to be occupied, as well as the personnel capacity, equipment scale, and activity scale for each space; Third, regarding construction form, determining the construction methods and means to be adopted, such as new construction, renovation, expansion, or collaboration, along with the technical, financial, and human resources conditions involved; Fourth, regarding construction steps, determining the construction processes and timelines to be followed, such as preliminary preparation, mid-term implementation, and post-evaluation, along with specific tasks, objectives, and standards for each phase.

4.1.3 Evaluation Mechanism The evaluation mechanism involves continuous monitoring, regular feedback, and continuous improvement of the construction process and outcomes to ensure smooth implementation according to design requirements and achievement of expected goals and effects [27]. The evaluation mechanism includes four aspects: First, evaluation subjects, clarifying evaluators and participants such as government departments, educational institutions, experts, social organizations, and learners, along with each subject's role, responsibilities, and collaboration methods, or establishing independent quality evaluation agencies to professionally evaluate AIGC-generated content, learning center output products, and services; Second, evaluation content, clarifying evaluation indicators and standards to ensure AIGC-generated content quality, including accuracy, authority, and comprehensibility; Third, evaluation methods, clarifying evaluation tools and procedures such as real-time questionnaires and intelligent interviews published through AIGC technology, observation and recording of user data for analysis, along with design principles, usage methods, and precautions for each tool; Fourth, evaluation results, clarifying evaluation reports and feedback, including report content, format, and release, as well as feedback recipients, methods, and content.

4.2 Future Learning Center Standardized Construction Pathways

During construction, future learning centers should follow scientific principles, rational methods, and effective measures, focusing on resource integration, technological innovation, talent cultivation, and cultural shaping to ensure high-

quality completion of construction tasks according to planning requirements and full utilization of various advantages and potential.

4.2.1 Resource Integration Successful future learning center construction requires effective collection, screening, allocation, and utilization of various needed resources to maximize benefits. On one hand, from internal and external perspectives, internal integration requires optimizing combinations and coordinated arrangements of existing or obtainable internal resources, such as literature and information resources including books, electronic resources, and physical exhibits, as well as physical space resources including reading areas, discussion areas, and display areas. External integration requires effective introduction and appropriate adjustment of externally referencable or introducible resources, such as resources from libraries, museums, and laboratories, as well as information technology resources including internet, cloud computing, and big data.

On the other hand, from horizontal and vertical distribution perspectives, horizontal integration requires effective sharing and rational division of resources between future learning centers and similar educational institutions, such as establishing cooperative relationships for resource interconnection, service integration, and mutual activity assistance with other learning centers, smart libraries, and digital museums to achieve horizontal resource expansion and promote vigorous educational industry development [28]. Vertical integration requires effective connection and organic integration of resources between future learning centers and educational institutions at different levels or in different fields, such as establishing collaborative relationships for curriculum alignment, certification, and talent cultivation with school education, community education, and vocational education.

4.2.2 Technological Innovation Technological innovation involves continuous updating, improvement, and optimization of AIGC technology used in future learning centers to maximize technological effectiveness. Technological innovation should address several aspects: First, research and improvement of educational functions. AIGC technology can collect large amounts of student learning data for educational research and improvement. By analyzing student learning patterns and difficulties, educational institutions can better optimize curriculum design and teaching methods [29], providing students with broader learning choices. Future learning centers can use AIGC technology to create adaptive learning paths where systems automatically adjust teaching content and difficulty based on student progress and comprehension, ensuring each student learns at their own pace. Second, leveraging teacher assistance functions. AIGC technology can become a powerful assistant for teachers, enabling them to utilize AIGC-generated resources and materials to focus more on guiding and answering student questions, achieving deeper interaction and discussion. Teachers can use AIGC technology combined with multimedia elements to create more vivid and engaging teaching content. Third, providing personalized

learning experiences. Under AIGC technology, the traditional education model where teachers use uniform methods and students have nearly identical learning experiences can be transformed to achieve personalized student learning development [30]. AIGC technology can capture students' activity traces in learning centers to analyze learning interests, styles, and abilities, generating personalized teaching content. This means each student can obtain materials and exercises suitable for their needs, improving learning efficiency and motivation. Through one-on-one educational experiences, learners can feel the humanistic care provided by the learning environment, achieving psychological, emotional, and cognitive support for both learners and educators [31], stimulating interest, regulating motivation, providing strategic guidance, and offering feedback.

4.2.3 Talent Cultivation Talent cultivation involves effective selection, training, and assessment of various talents involved in future learning centers to maximize contributions. First, through AIGC technology, future learning centers can create diverse learning resources that meet different students' learning styles and interest needs, thereby stimulating learning interest and improving motivation. Second, future learning centers provide various training courses, exchange activities, evaluation mechanisms, and incentive measures to cultivate educators with professional, technical, and managerial educational capabilities, as well as service awareness, skills, and attitudes. Finally, there is manager cultivation. AIGC-enabled future learning centers are not only used to serve users but can also be used to manage center administrators [32]. Managers need to comply with learning center regulations and systems, propose assessment mechanisms and reward-punishment standards for staff, thereby cultivating managers with planning, organizational, and coordination abilities, as well as management literacy including communication, decision-making, and execution skills, and leadership qualities including leadership styles, arts, and charisma.

4.2.4 Cultural Shaping Cultural shaping involves effective inheritance, promotion, and innovation of various cultures formed by future learning centers to maximize cultural impact, which is also an important foundation for enhancing the brand system of future learning centers. First, shape conceptual culture by promoting the core concepts of learner-centeredness, collaborative innovation, social participation, and humanistic care to form a positive, open, inclusive, knowledge-seeking, innovative, and socially responsible conceptual culture. Second, create an atmospheric culture of relaxation, freedom, autonomy, interaction, cooperation, and unlimited creativity that encourages exploration, supports experimentation, tolerates failure, and pursues excellence. Third, require participating users to be polite and friendly, rule-abiding, respectful of others, and protective of the digital learning environment to form a behavioral culture of integrity, diligence, cooperation, and social contribution. Finally, cultivate value culture that always prioritizes people, learning, application, and innovation to form a value culture that pursues truth, beauty, effectiveness, and

progress.

5. Conclusion

In future learning center construction, AIGC technology empowerment plays a crucial role. Through AIGC technology, future learning centers can create diversified and personalized learning environments that meet students' different learning needs and interests. This not only enhances learning attractiveness and effectiveness but also cultivates students' autonomous learning abilities and innovative thinking. Simultaneously, AIGC technology provides managers with more intelligent decision-making support and data analysis capabilities, helping optimize learning center operations.

However, we must also recognize the external threats and internal weaknesses that remain in AIGC-enabled future learning centers. Therefore, the construction process and development trends of future learning centers require caution and careful consideration. In future learning center construction, planning design and construction pathway research must be well-executed to gradually grasp the correct development direction while addressing resources, technology, talent, and cultural connotations. Through continuous exploration and practice, we can build AIGC-enabled future learning centers into powerful engines for talent cultivation, knowledge inheritance, and social progress. While pursuing technological development, we must not neglect humanistic care and the essence of education. We need to balance technological innovation with educational values to ensure technology applications truly bring better experiences and growth to learners.

References:

- [1] China Academy of Information and Communications Technology, JD Explore Academy. White Paper on Artificial Intelligence Generated Content (AIGC) [EB/OL]. [2022-12-22]. [http://www.caict.ac.cn/sytj/202209/t20220913_408835}.htm](http://www.caict.ac.cn/sytj/202209/t20220913_408835.htm).
- [2] Ministry of Education of the People's Republic of China. Guiding Opinions on the Construction and Application of Digital Education Resource Public Service Systems. December 21, 2017. [http://www.moe.gov.cn/srcsite/A16/s3342/201802/t20180209_327174}.htm](http://www.moe.gov.cn/srcsite/A16/s3342/201802/t20180209_327174.htm).
- [3] See Ministry of Education Notice on Issuing the "Guidelines for Network Learning Space Construction and Application" (Jiao Ji [2018] No. 4), Peking University Law Database
- [4] Xinhua News Agency. Outline of the 14th Five-Year Plan for National Economic and Social Development and Long-Range Objectives Through 2035 of the People's Republic of China [EB/OL]. [2023-06-18]. [https://www.gov.cn/xinwen/2021-03/13/content_5592681}.htm](https://www.gov.cn/xinwen/2021-03/13/content_5592681.htm).
- [5] Wang Dayong: "‘Future Learning Center’ Innovation Development Forum Held," June 10, 2023, China University of Petroleum News, 2023(9), p.2. <http://sydxb.upc.edu.cn/detail?record=50&ChannelID=1888&resultid=12910>
- [6] Xinhua News Agency. Opinions of the General Office of the CPC Cen-

tral Committee and the State Council on Promoting the Implementation of the National Cultural Digitalization Strategy [EB/OL]. [2023-06-20]. https://www.gov.cn/xinwen/2022-05/22/content_{5691759}.htm.

[7] Notice of the Ministry of Industry and Information Technology, Ministry of Education, Ministry of Culture and Tourism, National Radio and Television Administration, and General Administration of Sport on Issuing the “Action Plan for Integrated Development of Virtual Reality and Industry Applications (2022-2026),” Central People’s Government of the People’s Republic of China, https://www.gov.cn/zhengce/zhengceku/2022-11/01/content_{5723273}.

[8] Liang Yu: “Strengthening Information Ethics Education in Higher Education,” China Social Sciences Net, January 26, 2021, <https://baijiahao.baidu.com/s?id=1689936216867728583&w>

[9] 2016 Cybersecurity Law of the People’s Republic of China, Peking University Law Database, November 7, 2016, <https://webvpn.swu.edu.cn/https/537775736869676568616f78756565212aae4>

[10] “Ministry of Education Guiding Opinions on Strengthening Network Learning Space Construction and Application,” China Daily Net, January 28, 2019, <https://baijiahao.baidu.com/s?id=1623863950370285146&wfr=spider&for=pc>

[11] “2022 National Education Funding Implementation Statistics Bulletin,” Ministry of Education of the People’s Republic of China, June 30, 2023, http://www.moe.gov.cn/jyb_{xwfb}/gzdt_{gzdt}/s5987/202306/t20230630_{1066490}.html

[12] Wang Yu, Sun Peng. “Logical Starting Point, Era Opportunities, and Exploration Paths for Future Learning Center Construction in University Libraries,” *University Library Journal*, 2022, 40(04): 26-32+40. DOI: 10.16603/j.issn1002-1027.2022.04.004.

[13] Dong Tongqiang, Ding Shiqiang. “Smart Library Service Scenarios and System Design Driven by ‘Digital Intelligence’ Integration,” *Library Science Research*, 2022(01): 2-8. DOI: 10.15941/j.cnki.issn1001-0424.2022.01.001.

[14] Yan Weidong. “Research on Smart Library Construction Practice at the Technical University of Denmark,” *Library and Information Service*, 2021, 65(08): 122-130. DOI: 10.13266/j.issn.0252-3116.2021.08.013.

[15] Lan Guoshuai, Wei Jiakai, Huang Chunyu, et al. “Learning Metaverse Empowering Education: Building a New ‘Intelligence+’ Education Application Model,” *Distance Education Journal*, 2022, 40(02): 35-44. DOI: 10.15881/j.cnki.cn33-1304/g4.2022.02.003.

[16] Zhao Yang, Zhang Xue, Fan Shengyue. “AIGC-Driven Smart Library Transformation: Framework, Path, and Challenges,” *Information Studies: Theory & Application*, 2023, 46(07): 9-16. DOI: 10.16353/j.cnki.1000-7490.2023.07.002.

[17] Du Pingping, Li Yuke, Chen Yue. “Research on Knowledge Transfer Models and Mechanisms of Future Learning Centers in Chinese University Libraries from the Perspective of Memetics,” *University Library Journal*, 2022, 40(04): 19-25. DOI: 10.16603/j.issn1002-1027.2022.04.003.

[18] Lu Kang, Liu Hui, Zhang Xiangxue, et al. “Research on Data Risk Governance of Smart Libraries in China in the ‘Society 5.0’ Era,” *Library*, 2023(04): 22-27.

[19] Wang Wenzhi, Sheng Qunli. “Exploring the Mysteries of Problem-Solving and Creation—Landa on Problem-Solving and Thinking Methods,”

- Distance Education Journal, 2010, 28(03): 37-47. DOI: 10.15881/j.cnki.cn33-1304/g4.2010.03.005.
- [20] Lan Liqiong. “Connotation Coupling of ‘Smart Library’ and ‘Future Learning Center’—Reflections and Analysis for ‘China Education Modernization 2035’,” China University Teaching, 2022(09): 74-79.
- [21] Huang Ruhua, Jiang Yumeng. “Future Learning Center Construction in University Libraries: Global Progress,” Library Journal: 1-13 [2023-08-17]. <http://kns.cnki.net/kcms/detail/31.1108.G2.20230720.1412.002.html>
- [22] Fan Yafang, Li Chen, Wang Qingqing, et al. “Construction and Service Practice of Future Learning Centers in University Libraries—Taking the Library of the University of Science and Technology of China as an Example,” University Library Journal, 2022, 40(04): 5-11. DOI: 10.16603/j.issn1002-1027.2022.
- [23] Zhu Yongxin, Yang Fan. “Redefining Education: Form Construction and Practice Imagination of Future Learning Centers—Exclusive Interview with Professor Zhu Yongxin,” Journal of Soochow University (Educational Science Edition), 2020, 8(04): 83-91. DOI: 10.19563/j.cnki.sdjk.2020.04.010.
- [24] Zhu Yongxin. “Future Learning Center Concept,” Research in Educational Development, 2017, 37(09): 3. DOI: 10.14121/j.cnki.1008-385
- [25] Sun Lihui, Liu Siyuan, Li Mang. “China’s Educational Informatization Development Vision for 2035—Based on ‘China Education Modernization 2035’,” China Educational Technology, 2019(8): 1-8+43.
- [26] Chen Jianlong, Shao Yan, Zhang Huili, et al. “Frontier Issues and Contemporary Propositions of University Library Modernization—Interpretation of the ‘University Library Modernization Compass Report’,” Journal of Library Science in China, 2022, 48(01): 17-28. DOI: 10.13530/j.cnki.jlis.2022
- [27] Chang Li, Zhang Hao. “Construction of Public Library Service Effectiveness Evaluation Index System,” Library Theory and Practice, 2021(03): 10-15+39. DOI: 10.14064/j.cnki.issn1005-8214.2021.03.003.
- [28] Li Yuhai, Jin Zhe, Li Jiahui, et al. “Five Major Problems Facing Smart Library Construction in China,” Journal of Library Science in China, 2020, 46(02): 17-26. DOI: 10.13530/j.cnki.jlis.2020012.
- [29] Yang Feng, Zhang Xuelei, Li Juan. “Enlightenment and Reflection of Future Learning Centers on Smart Library Construction,” Library Journal: 1-14 [2023-08-17]. <http://kns.cnki.net/kcms/detail/31.1108.G2.20230706.1505.004.html>
- [30] Xu Jing, Dong Xiaoju, Li Xinwan. “Thoughts and Practice on Future Learning Center Construction in University Libraries,” University Library Journal, 2022, 40(04): 12-18. DOI: 10.16603/j.issn1002-1027.2022.04.002.
- [31] Liu Bin, Wang Menghui, Guo Yuxuan. “Research on the Impact of Teacher Support on Online Learners’ Self-Regulated Learning,” Digital Education, 2021, 7(05): 39-45.
- [32] Chu Jingli, Zhang Guorui. “Librarian Capacity Building for Smart Libraries,” Library Theory and Practice, 2022(04): 1-3. DOI: 10.14064/j.cnki.issn1005-8214.20220315.001.

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