A Study on the Construction of an AIGC-Enabled Experiential Learning Model for Enhancing Digital Literacy among Community Residents

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Abstract: *With the rapid development of artificial intelligence-generated content (AIGC) technology and its penetration into various social domains, community residents are confronted with an increasingly complex digital environment, which places higher-level demands on their digital literacy, encompassing operational, critical, collaborative, and innovative competencies. Traditional models for cultivating digital literacy exhibit limitations in terms of situational authenticity, depth of interaction, and personalized support. This study aims to construct an AIGC-enabled experiential learning model for enhancing digital literacy among community residents. The research first analyzes the intrinsic coupling logic among the technological paradigm of AIGC, the contemporary connotations of digital literacy, and experiential learning theory. It then deconstructs the core elements of the model, including dynamic contextualized task design driven by AIGC, a subject participation mechanism characterized by deep human-machine collaboration, and the generation of adaptive learning pathways based on continuous feedback. Finally, the study delves into the efficacy mechanism of the model in facilitating knowledge construction and skill transfer, examines its potential risks and ethical boundaries, and envisions the evolving role of AIGC in future learning ecosystems. This research provides theoretical reference and a model framework for innovating the cultivation pathways of digital literacy among community residents in the context of intelligent technology.*

Keywords: *Artificial Intelligence-Generated Content (AIGC); digital literacy; experiential learning; learning model; human-machine collaboration*

Introduction

The deepening development of the digital intelligence era has established digital literacy as a core competency for individual social participation and development. However, the accelerating pace of technological iteration and the increasing complexity of the information environment pose unprecedented challenges to the breadth and depth of digital literacy among community residents. Existing approaches for enhancing literacy often focus primarily on knowledge transmission and tool operation, demonstrating insufficient efficacy in fostering the development of higher-order abilities such as critical thinking, complex problem-solving, and adaptation to unfamiliar situations. The emergent, generative, and naturally interactive characteristics of Artificial Intelligence-Generated Content (AIGC) technology offer new technical possibilities for creating highly simulated, strongly interactive, and evolving immersive learning environments. This provides a high potential for alignment with experiential learning theory, which emphasizes learning through the transformation of experience. Therefore, exploring the construction of an AIGC-enabled experiential learning model constitutes not only a cutting-edge response to the educational application of technology but also a theoretical and practical necessity for fundamentally innovating the mechanism of digital literacy development and addressing the literacy deficit. The significance of this study lies in its systematic integration of intelligent technology and learning science theory to construct and elucidate a novel learning model framework aimed at promoting the deep, personalized, and sustainable development of digital literacy among community residents.

1. Theoretical Coupling between AIGC and the Enhancement of Community Residents' Digital Literacy

1.1 Analysis of the AIGC Technological Paradigm and Its Cognitive Interaction Characteristics

The technological paradigm of Artificial Intelligence-Generated Content (AIGC) signifies a profound transformation in content creation and knowledge production, shifting from traditional human-led models to human-machine collaborative models. Its core mechanism lies in utilizing large-scale pre-trained models to perform representation learning on massive, heterogeneous data, thereby capturing and generating complex patterns. This paradigm transcends the limited, response-based nature of previous tool-oriented artificial intelligence, exhibiting characteristics of openness, emergence, and generalizability. It can dynamically generate multimodal content-such as text, code, images, and audio-based on natural language instructions, thereby extending the capabilities of computational systems from information retrieval and process automation to the realm of creative content construction.

Within this technological paradigm, human-computer cognitive interaction exhibits new characteristics. The interface has shifted from formal command input to immersive conversations primarily based on natural language dialogue, significantly lowering the technical barrier to operation. More crucially, AIGC systems possess capabilities for contextual understanding, logical reasoning, and content generalization, enabling them to assume roles such as knowledge collaborator, thinking stimulator, and personalized tutor. This interaction constitutes a dynamic, constructive process where the system's output is not a definitive answer but rather cognitive material that users can continuously question, refine, and deepen. This fosters a bidirectional calibration and co-evolutionary cognitive partnership, thereby providing the technical foundation for reconstructing learning environments[1].

1.2 The Connotative Composition of Community Residents' Digital Literacy and Its Contemporary Challenges

The connotation of community residents' digital literacy continues to evolve amidst the wave of intelligent technology, having developed from early operational skills and information acquisition capabilities into a comprehensive cognitive, practical, and critically adaptive competency. Its core composition includes: the ability to operate and apply digital technologies; the capability for critical evaluation and integration of multimodal digital information; communication and collaboration skills based on digital environments; and the ability to use digital tools for innovative problem-solving and creation. This literacy emphasizes maintaining agency, autonomy, and a sense of responsibility within complex digital ecosystems, making it crucial for achieving individual social participation and self-development.

Currently, the enhancement of digital literacy among community residents faces contemporary challenges arising from both technological and social dimensions. The accelerating pace of technological iteration leads to the rapid obsolescence of tools, platforms, and interaction logics, resulting in continuous adaptation pressure as existing skills easily become outdated. The information environment is growing increasingly complex due to the proliferation of Artificial Intelligence-Generated Content (AIGC), blurring the boundaries between synthetic and authentic information, which places higher demands on individuals' information discernment and critical thinking. Furthermore, the depth and breadth of digital participation are continuously expanding, ranging from consumption to production and from entertainment to governance. This requires residents not only to be able to use technology but also to understand its operational logic and social impact, thereby avoiding being inadvertently dominated by technological logic or marginalized.

1.3 The Intrinsic Logical Connection Between Experiential Learning Theory and the Development of Digital Literacy

Experiential learning theory views learning as a continuous activity involving knowledge construction and meaning-making, achieved through a cyclical process comprising four stages: concrete experience, reflective observation, abstract conceptualization, and active experimentation. The core proposition of this theory is that the validity of knowledge is rooted in the subject's action, reflection, and conceptual integration within authentic or simulated situations. It emphasizes the central role of the learner, the instructional value of experience, and the synergistic interaction between cognition and affect, positing that deep-seated abilities and literacies originate from the internalization

process of the individual's interaction with the context[2].

The development of digital literacy is, in essence, the acquisition of complex skills, cognitive schemas, and behavioral dispositions, which aligns closely with the inherent logic of experiential learning. Digital literacy cannot be effectively formed through abstract indoctrination divorced from context; it must be cultivated within concrete experiences such as solving authentic digital tasks, creating digital content, and participating in digital community interactions. The dynamic, interactive, and trial-and-error-tolerant environments created by AIGC precisely provide an ideal "digital training ground" for this type of experiential learning. Through collaborative interaction with AIGC, learners undergo the complete cycle of problem definition, solution exploration, content generation, outcome evaluation, and iterative refinement. Within this cyclical process, they internalize digital knowledge, hone digital skills, and gradually develop the thinking habits and strategic knowledge necessary to address digital challenges, thereby achieving a substantive transfer of digital literacy from cognitive understanding to behavioral competence.

2. Deconstruction of the Elements of the Experiential Learning Model for Cultivating Digital Literacy

2.1 Contextualized Learning Task Design Enabled by AIGC

The core of contextualized learning task design lies in constructing a problem field that is closely connected to the learner's real-world experience and presents cognitive challenges, thereby driving the meaningful construction and transfer of knowledge. The intervention of AIGC allows such task design to break through the static and limited nature of traditional simulated scenarios. Leveraging its powerful multimodal content generation and semantic understanding capabilities, AIGC can dynamically generate highly realistic and personalized task backgrounds, problem clues, and resource materials. For example, centered on the literacy theme of "family digital asset management," AIGC can instantly generate simulation cases containing specific financial data, equipment lists, and risk scenarios, immersing learners in a complex, uncertain, and authentic problem space that requires the comprehensive application of multiple digital skills to resolve. This generative capability not only provides rich initial contexts but also allows for the real-time evolution of situational parameters based on learner interventions, simulating the dynamics and complexity of the real world.

AIGC further expands the dimensions of task design, extending from problem presentation to the collaborative definition and evolution of the problems themselves. Learners no longer merely face predetermined tasks; they can engage in dialogic interaction with AIGC to jointly analyze the essence of tasks, deconstruct problem structures, and explore multiple solution paths. This dynamic task construction process itself serves as crucial training for digital critical thinking and problem definition capabilities. Consequently, the task context transforms from a fixed "stage" into an "ecosystem" that evolves in sync with the learner's cognitive progress. Its complexity and relevance can thus be continuously adapted to the learner's cognitive level, ensuring the learning experience consistently remains within their zone of proximal development.

2.2 Construction of a Human-Machine Collaboration-Centered Subject Participation Mechanism

In traditional digital learning environments, human-computer interaction often manifests as an instrumental "command-response" relationship, where the learner's agency is easily constrained by rigid procedural flows. The participation mechanism pivoting on AIGC aims to establish a deeply collaborative cognitive partnership. Within this mechanism, AIGC does not replace the learner in thinking or operating. Instead, it functions as a generative, reflective, and adaptive intelligent agent, assuming multiple roles such as a scaffold, a simulated thinking opponent, a source of creative inspiration, and a process recorder[3]. The learner's agency is manifested through metacognitive monitoring of the learning process, decision-making, and engaging in critical dialogue with the output of AIGC.

The effective operation of this participation mechanism relies on bidirectional intention understanding and capability complementarity. The learner needs to clearly articulate their goals, confusions, and strategies. AIGC, in turn, responds to this intention by generating suggestions, providing alternative solutions, pointing out potential contradictions, or demonstrating different representational forms. This process prompts the learner to externalize and refine their internal thinking, while the feedback from AIGC acts as a "cognitive mirror," assisting the learner in self-examination

and adjustment. This continuous dialogue and action coordination between human and machine transforms the learning activity into a distributed cognitive system. Within this system, humans excel at strategic planning, value judgment, and emotional resonance, while the machine is adept at information retrieval, pattern association, and tireless generative iteration. The integration of these respective strengths jointly advances the deepening of digital literacy through authentic cognitive labor. The essence of this mechanism is the creation of an augmented intelligent environment that allows for the recurrent cycle of cognitive offloading and internalization, thereby facilitating the leap in literacy from simple skill operation to complex cognitive strategy.

2.3 Generation of Adaptive Learning Pathways Based on Continuous Feedback

The generation of adaptive learning pathways relies on the continuous, multi-dimensional assessment and diagnosis of the learner's state, followed by the provision of precise interventions and resource navigation based on this analysis. AIGC offers a technological pathway to achieve this goal that surpasses traditional rule engines and static knowledge graphs. By conducting real-time analysis of the learner's natural language dialogues throughout their interaction with the system, problem-solving steps, output products, and metacognitive statements, AIGC can construct a dynamic, non-representational learner cognitive model. This model focuses not only on the mastery of knowledge points but also provides insight into the learner's thinking patterns, strategic preferences, encountered cognitive obstacles, and level of emotional engagement.

Based on this dynamic model, AIGC can generate highly personalized immediate feedback and suggestions for pathway adjustment. The feedback content is no longer confined to correctness judgments but extends to include process-oriented guidance, prompts for alternative methods, the provocation of cognitive conflicts, and open-ended questions that encourage further exploration. Consequently, the learning pathway evolves from a linear or branched tree-like structure into a network-like structure that dynamically radiates in multiple possible directions from the learner's current cognitive node. AIGC continuously assesses the anticipated cognitive load and learning benefits of each potential path, providing personalized navigation for the learner and supporting exploratory learning based on their own pace and interests. This data- and dialogue-driven adaptive mechanism ensures the fluency and effectiveness of the learning experience, making the cultivation of digital literacy a self-driven, on-demand, and continuously growing process. It achieves a paradigm shift from "one path for a thousand people" to "a thousand paths for a thousand people," and even to "a thousand paths for one person," enabling the learning system to proactively adapt to and promote the unique digital competency development trajectory of each resident.

3. The Efficacy Mechanism and Prospective Reflection on the AIGC-Enabled Experiential Learning Model

3.1 Mechanisms for Promoting Individual Knowledge Construction and Skill Transfer through Technological Enablement

The efficacy mechanism of the AIGC-enabled experiential learning model lies fundamentally in its deep intervention in and reshaping of the individual's cognitive process, facilitating a transformation from shallow information reception to deep knowledge construction. At the level of knowledge construction, AIGC acts as an external cognitive scaffold and a tool for expanding thinking by providing immediate, interactive, and multi-perspective problem solutions and explanations. During dialogic negotiation with AIGC, learners continuously undergo a cognitive cycle of "hypothesis generation, verification, and revision." This process compels individuals to externalize and refine their internal mental models, effectively reducing cognitive load while promoting the understanding and integration of concepts. The diverse examples and counterexamples dynamically generated by AIGC aid learners in discerning conceptual boundaries and conditions of applicability, thereby facilitating the construction of a more flexible and contextually relevant knowledge network[4].

At the level of skill transfer, the facilitating effect of this model stems from its combined cultivation of "conditional knowledge" and "metacognitive skills." The highly simulated, low-risk task contexts created by AIGC allow learners to repeatedly apply digital skills within complex and variable simulated environments, thereby deepening their understanding of the applicable preconditions and operational boundaries of these skills and forming a transferable "condition-action" rule repository. More importantly, continuous interaction with AIGC requires learners to consistently engage in goal setting,

strategy selection, and effectiveness evaluation, which is essentially systematic metacognitive training. When learners become accustomed to utilizing AIGC for self-questioning, planning, and process reflection, their ability to monitor and regulate their own cognitive activities is strengthened. This higher-order metacognitive skill constitutes the key cognitive foundation for ensuring the successful transfer of digital literacy to novel, unanticipated situations.

3.2 Potential Risks and Ethical Boundary Considerations in the Operation of the Learning Model

Despite the significant potential of the AIGC-enabled learning model, its operational process is accompanied by potential risks that warrant serious scrutiny. The primary risk lies in the potential exacerbation of cognitive dependence and skill narrowing. Learners, due to over-reliance on the efficient output of AIGC, may see their willingness and ability to conduct deep information retrieval, independent critical thinking, and creative ideation weakened. This could lead to the cognitive illusion that "generation equals understanding," thereby eroding the core of digital literacy-critical autonomy. Secondly, the inherent uncertainties in AIGC-generated content, including potential "hallucinations," hidden biases, and possible knowledge obsolescence, constitute a feedback quality risk. If learners lack sufficient discernment, erroneous or biased information may be incorporated into their knowledge systems, affecting the reliability and fairness of learning outcomes.

Therefore, it is crucial to clarify the ethical boundaries of this learning model. One boundary pertains to the division of responsibilities between human and machine: AIGC should be explicitly positioned as a tool for assisting cognition and stimulating thought, not as a subject that replaces human judgment and decision-making. The design of the learning process must ensure that the human learner always remains at the ultimate point of accountability for cognitive activities and at the core of value judgments. Another boundary involves data privacy and algorithmic transparency. The vast amount of interaction data generated during the learning process, which contains the learner's cognitive characteristics and behavioral patterns, must be collected, used, and stored in accordance with strict ethical guidelines to safeguard the learner's data sovereignty. Simultaneously, the pursuit of explainability for AIGC's key decision-making logic is a prerequisite for building trust and conducting effective critical questioning, which also constitutes an indispensable ethical requirement in the model's design.

3.3 The Evolving Role and Developmental Trajectory of AIGC in Future Learning Ecosystems

Looking ahead, the role of AIGC within learning ecosystems will evolve from a relatively standalone interactive agent into a deeper, more ubiquitous layer of intelligent infrastructure. Its developmental trajectory may manifest as a high degree of integration with the learning environment, becoming an underlying "intelligent medium" that supports personalized learning experiences. For instance, AIGC could seamlessly integrate with technologies like the Internet of Things (IoT) and Virtual Reality (VR) to dynamically generate immersive learning contexts that bridge physical and virtual spaces, thereby enabling experiential learning to transcend screen limitations and achieve pervasive integration across all scenarios. Simultaneously, AIGC may evolve into an intelligent hub connecting diverse knowledge nodes and human learners. It would not only respond to individual requests but also proactively identify collective knowledge gaps and interest trends within community learning groups, thereby facilitating collaborative knowledge construction and social learning.

A more forward-looking developmental trajectory lies in its evolution towards becoming a "cognitive partner." This entails AIGC possessing deeper long-term memory and user modeling capabilities, enabling it to accompany learners across different learning projects and life stages, thereby forming a continuous learning biography and development plan. It would not only assist with specific tasks but also, based on analyzing the learner's long-term cognitive development trajectory, provide prospective recommendations for capability development and learning opportunities. Ultimately, the AIGC-enabled experiential learning ecosystem will tend towards forming a highly adaptive, complex system with the ultimate goal of promoting the holistic development of human agency. Within this system, technology will no longer be merely a tool but an environmental element co-evolving with human cognition. Its core value lies in amplifying human creativity and critical wisdom, not in replacing it, thereby guiding us towards a more inclusive and empowering future of lifelong learning.

Conclusion

Through theoretical coupling analysis, deconstruction of model elements, and exploration of efficacy mechanisms, this study systematically constructs an AIGC-enabled experiential learning model for enhancing the digital literacy of community residents. By employing AIGC as the core enabling technology, this model embeds the cultivation of digital literacy into an interactive, reflective, and practical cycle based on authentic problems. It achieves this through the creation of dynamic contextualized tasks, the construction of a deep human-machine collaboration mechanism, and the generation of adaptive learning pathways. The research elucidates the model's internal mechanism for promoting knowledge construction and skill transfer, which operates by supporting cognitive cycles and fostering conditional knowledge and metacognitive skills. Simultaneously, the study emphasizes the necessity of prudently considering potential risks such as cognitive dependence and information reliability associated with the model. It also underscores the importance of clarifying boundaries pertaining to human-machine responsibility division and data ethics. In the future, the role of AIGC within the learning ecosystem will further evolve towards a ubiquitous and intelligent cognitive partner. Its deep integration with technologies like Extended Reality and the Internet of Things will drive the formation of a more inclusive, adaptive, and lifelong learning ecosystem. Subsequent research can build upon this foundation to further explore the model's specific application within different communities and cultural contexts, as well as mechanisms for evaluating its long-term effectiveness.

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