Analysis of Community Experiential Education Pathways Based on AIGC Technology and Their Impact on Literacy Enhancement

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Abstract: *Generative Artificial Intelligence (AIGC) provides a new technological pathway for overcoming the inherent limitations of community experiential education in terms of resources, context, and support. This study systematically constructs an AIGC-driven community experiential education framework. By elucidating its coupling mechanism with experiential learning theory concerning context deepening and cognitive transformation, it proposes intelligent education pathways encompassing personalized path generation, immersive scenario construction, and dynamic content adaptation. Building on this foundation, the study constructs a three-dimensional literacy analysis framework consisting of cognitive, social, and metacognitive dimensions. It analyzes the mechanisms through which AIGC, serving as an intelligent scaffold, a social simulator, and a metacognitive partner, drives literacy development. Furthermore, it develops a methodological system integrating multimodal learning analytics and processual assessment, thereby offering theoretical reference and practical guidance for AIGC-enabled contextualized learning.*

Keywords: *Generative Artificial Intelligence (AIGC); Community Experiential Education; Personalized Learning Paths; Immersive Learning; Literacy Development; Educational Assessment*

Introduction

The core value of community experiential education lies in providing learners with opportunities for embodied experience and meaning construction within authentic, complex contexts. However, its development has long been constrained by challenges such as physical spatiotemporal limitations, difficulties in constructing high-fidelity scenarios, and insufficient personalized support. The evolution of Generative Artificial Intelligence (AIGC) technology is driving its transition from a supportive tool to a collaborative creator in education. Against this backdrop, exploring the deep integration of AIGC with community experiential education holds dual theoretical and practical significance. Theoretically, it addresses the core proposition of how to utilize intelligent technology to substantially enhance situated learning and the transformation of experience. Practically, it offers new possibilities for overcoming existing obstacles and constructing scalable, high-quality learning experiences. Therefore, systematically constructing AIGC-empowered community experiential education pathways and rigorously analyzing their effects on promoting learners' higher-order literacy have become a crucial subject connecting cutting-edge technology with educational innovation.

1. Theoretical Coupling Between AIGC Technology and Community Experiential Education

1.1 The Connotation of AIGC Technology and Its Potential for Educational Application

AIGC (Artificial Intelligence Generated Content) technology represents a pivotal leap from data intelligence to content creation. Its core connotation lies in the use of deep learning models to comprehend, generate, and reorganize multimodal information. Within the educational context, AIGC transcends the scope of traditional auxiliary tools, revealing its multifaceted potential as a dynamic content generator, a personalized scenario constructor, and an intelligent interactive agent. This technology can dynamically generate text, images, audio, and even virtual scenes based on preset objectives or real-time interactions, thereby deconstructing the inherent limitations of static and homogenous educational resources. Its application potential focuses on creating infinitely diverse learning materials, simulating hard-to-replicate real-world situations, and providing adaptable dialogue

and feedback loops. This furnishes the technical groundwork for constructing highly flexible, scalable educational environments responsive to individual learner differences, making it possible for the educational process to shift from content delivery to collaborative creation.

1.2 The Core Essence of Experiential Learning Theory in Community Education

Experiential learning theory conceptualizes learning as a cyclical process of knowledge creation through the transformation of experience. Its core essence emphasizes that individuals construct cognition and capability through direct participation, reflective observation, abstract conceptualization, and active experimentation within authentic or simulated situations. In the non-formal and unstructured learning environment of community education, the value of this theory is particularly prominent. The inherent social nature, locality, and complexity of a community itself provide learners with a natural context imbued with authentic problems, diverse roles, and cultural nuances. The essence of community experiential education is to guide learners through embodied experience in their interactions with the community environment, interpersonal networks, and specific issues, thereby facilitating the transformation of personal experience into abstract understanding and the application of newly constructed knowledge to subsequent participation and action. This process concerns not merely the acquisition of knowledge but places greater emphasis on the synergistic development of socio-emotional aspects, critical thinking, and identity formation.

1.3 Analysis of the Fusion Mechanism Between AIGC and Community Experiential Education

The fusion mechanism between AIGC technology and community experiential education is rooted in their complementarity in empowering contextual deepening and promoting cognitive transformation. Through its generative capabilities, the technology can digitally extend and enhance the physical environment and social context of a community, constructing an "enhanced experiential field" that transcends spatiotemporal constraints. Within this field, learners can immerse themselves in scenarios simulated by AIGC, whether historical recreations or future foresights, and can also rehearse complex social interactions and decision-making through interactions with intelligent agents. The dynamic narratives and personalized challenge tasks driven by AIGC can precisely align with different stages of the experiential learning cycle: providing high-fidelity contexts during the concrete experience stage, offering structured guidance and multi-perspective analysis during the reflective observation stage, assisting with pattern recognition and theory generation during the abstract conceptualization stage, and predicting action consequences while providing a safe trial-and-error space during the active experimentation stage. This deep integration essentially embeds AIGC's intelligent generation and adaptive capabilities within the cognitive developmental framework of experiential learning, thereby reshaping the technology-enabled pathway for knowledge creation and literacy growth within community environments[1].

2. Construction of AIGC-Based Community Experiential Education Pathways

2.1 The AIGC Generation Mechanism for Personalized Learning Pathways

2.1.1 Dynamic Learner Modeling Based on Multi-Source Data Fusion

This subsystem is responsible for integrating and analyzing learners' heterogeneous data. This data includes explicit information such as prior knowledge assessment results and selected interest tags, as well as implicit information like behavioral logs (e.g., browsing paths, dwell times, and interaction frequencies within digital communities), generative content (e.g., questions posed, reflective journals written), and affective computing analysis outcomes. By fusing these data sources, AIGC constructs and continuously updates a high-dimensional, dynamic learner profile. This profile accurately depicts the learner's knowledge structure, cognitive style, motivation level, and affective state, thereby providing personalized input for pathway generation.

2.1.2 Intelligent Mapping and Sequence Generation Between Educational Objectives and Community Resources

The system deconstructs macro literacy objectives into a series of observable and assessable micro-competency nodes. Concurrently, it performs semantic annotation and structural processing on both physical and virtual community resources, forming a "community knowledge graph." In this context, AIGC's generation mechanism acts as an "intelligent planner." Utilizing sequence

recommendation algorithms, it performs optimal matching among the learner model, the competency node graph, and the community resource graph to generate a set of potential learning activity sequences. These sequences are not linearly arranged but rather form a network-like pathway map comprising core tasks and exploratory branches, allowing learners to navigate with a certain degree of autonomy.

2.1.3 Dynamic Optimization and Emergent Guidance of Pathways

The learning pathway is not fixed during its execution. The AIGC system monitors the learner's progress, performance, and feedback in real-time[2]. Upon detecting cognitive difficulties, shifts in interest, or unexpected successes, the path-planning algorithm reassesses the suitability of subsequent nodes and makes immediate adjustments. For instance, it may insert supportive micro-experiences for learners encountering difficulties or provide more challenging extension tasks for those mastering content rapidly. This dynamic optimization endows the learning pathway with adaptive and emergent characteristics, enabling it to respond to the nonlinear changes that arise during the learning process.

2.2 AIGC Construction Strategies for Immersive Experience Scenarios

2.2.1 Plot-Based Generation of Multimodal Content

Based on the theme and objectives set by the learning pathway, AIGC first constructs the narrative framework. Large language models generate the core storyline, character settings (including virtual community members, historical figures, or future advisors), and key dialogue scripts. Subsequently, visual generation tools such as diffusion models create corresponding scene images, character appearances, or historical scene reconstructions based on textual descriptions. Audio generation models then produce environmental sound effects, character voices, and background music. This process ensures all modal content is semantically highly consistent, collectively serving a unified narrative theme.

2.2.2 Construction of Spatial Narratives through Physical-Virtual Integration

A key construction strategy involves anchoring the generated multimodal content to physical community spaces. Utilizing Augmented Reality (AR) or Mixed Reality (MR) technology, digitally generated elements are superimposed onto real community landmarks, buildings, or objects. The AIGC system dynamically triggers and renders relevant narrative elements based on the learner's geographical location and focus of attention. For instance, when a learner arrives at a community historical site, the system automatically generates and presents a visual reconstruction of the location's historical appearance along with narrations of past events and figures, thereby transforming a static space into an educational theater that carries a dynamic story.

2.2.3 Interaction-Driven Plot Progression and Environmental Responsiveness

The immersive scenarios possess a high degree of interactive responsiveness. The choices, inquiries, and actions of learners directly alter the narrative direction of the scenario. The intelligent agent characters within the AIGC framework can understand natural language interactions and provide dynamic responses aligned with their character settings and educational objectives. Furthermore, the environment itself can be designed to be "investigable." Learners can use virtual tools to examine, combine, or deconstruct elements within the scene, thereby discovering hidden information or triggering new task chains. This strategy transforms the scenario from a passive viewing backdrop into an active, investigable, and malleable cognitive partner.

2.3 AIGC Adaptation Model for Dynamically Adaptive Educational Content

2.3.1 State Diagnosis Based on Real-Time Learning Analytics

The adaptation model begins with the continuous analysis of the learner's state of immersion. The system analyzes the learner's operation sequences, problem-solving strategies, the semantic depth of dialogues, the quality of creative outputs, and even engagement metrics obtained through physiological sensing or affective computing. This enables the real-time diagnosis of the learner's cognitive load level, misconceptions, skill mastery, and usage of metacognitive strategies. AIGC acts as a "diagnostic engine," identifying educationally significant patterns and signals from the vast amount of interaction data[3].

2.3.2 Real-Time Generation and Delivery of Educational Intervention Content

Based on the outcomes of the state diagnosis, the AIGC content generation engine is activated. Its

adaptive behaviors manifest across multiple levels. At the task level, it can dynamically adjust the current challenge's constraints, resource provision, or success criteria. At the feedback level, it can generate personalized feedback that goes beyond simple correctness judgments, offering rich explanations and heuristic guidance to highlight cognitive blind spots and suggest directions for improvement. At the scaffolding level, it can timely provide prompting questions, comparative examples, step-by-step breakdowns, or strategic advice, with the granularity of the scaffolding dynamically increasing or decreasing (fading or strengthening) as needed.

2.3.3 Personalized Adaptation of Content Style and Presentation Format

Beyond adjusting the cognitive dimensions of the content, AIGC can also adapt to learners' preferences and specific contexts. For instance, it can generate more charts and schematic diagrams for visual learners; embed abstract principles into more vivid story cases for learners who prefer narratives; or adjust the pacing and media format of the content presentation based on the specific time of learning or the ambient noise level. This adaptation of content "style" and "format" further reduces external cognitive distractions, enhances the fluency and affinity of the learning experience, and seamlessly integrates educational support into the individual's exploration process.

3. Analytical Framework for the Literacy Enhancement Effects of AIGC-Driven Community Experiential Education

3.1 The Multi-Dimensional Structure of Literacy Enhancement and Its Representational Indicators

3.1.1 Cognitive Literacy: Complex Problem-Solving and Critical Thinking

Cognitive literacy is reflected in the learner's comprehension, analysis, and innovative response to complex community issues. Its key representations include: the structural integrity, degree of innovation, and contextual appropriateness of solutions proposed when addressing dynamic situational challenges generated by AIGC; the ability to demonstrate information discrimination, logical reasoning, and evidence integration when processing vast amounts of multimodal, and sometimes contradictory, information provided by the technology; and the performance in effectively transferring patterns, principles, or strategies acquired in specific situations to novel or more complex community problems. These indicators collectively reflect the construction level of higher-order thinking skills within a technology-enhanced environment.

3.1.2 Social Literacy: Collaborative Communication and Digital Citizenship Awareness

Social literacy focuses on the participatory efficacy and ethical conduct of learners within technology-mediated community interaction networks. Specific representations encompass: within collaborative tasks conducted on AIGC platforms, the complementarity of individual actions, negotiation efficiency, and capacity for consensus-building; the clarity, empathy, and effectiveness of conflict resolution strategies evident in communication during meaningful collaboration with intelligent agents or peers. Furthermore, this includes the awareness and adherence to data privacy, copyright of generated content, and norms for community participation in digital interactions, reflecting the nascent awareness and behavioral inclinations of a responsible digital citizen[4].

3.1.3 Metacognitive Literacy: Self-Directed Learning and Adaptability

Metacognitive literacy pertains to the individual's monitoring, evaluation, and strategic regulation of their own learning process. Its representative indicators can be observed in the following aspects: the clarity of goals and the ability to break down tasks that learners independently set during the experiential process; the timeliness and effectiveness of reflective strategies, help-seeking behaviors, or plan adjustments proactively adopted when facing challenges or cognitive disequilibrium; as well as their functional understanding of AIGC tools, critical awareness of their use, and comprehension of their limitations. This dimension ensures the learner's autonomy and capacity for sustainable development.

3.2 Analysis of the Mechanism Through Which AIGC Drives Literacy Enhancement

3.2.1 The Intelligent Scaffolding Mechanism for Cognitive Construction

AIGC acts as a dynamic cognitive scaffold. By generating explanatory examples, comparative diagrams, heuristic question chains, or step-by-step guidance in a timely manner, it provides precise

support for learners in understanding and solving complex community problems. The core of this mechanism lies in its adaptability and fading nature: the level of support is dynamically adjusted based on the learner's real-time performance and is gradually withdrawn as their capability improves. This effectively guides the optimization of cognitive load, facilitating the transformation of problem-solving strategies and critical thinking from externally supported skills to internalized capabilities.

3.2.2 Low-Risk Simulation and Iterative Mechanism for Social Skills

AIGC constructs high-fidelity, repeatable virtual social scenarios, providing learners with a safe space to practice complex social interactions. Under this mechanism, learners can engage in negotiations, collaboration, or leadership exercises with virtual characters possessing different stances, personalities, and goals, while immediately observing the chain of consequences resulting from various behavioral strategies. This characteristic of immediate feedback and scenario repetition allows learners to make multiple attempts and engage in reflective iteration within a low-risk environment, thereby accelerating the internalization and refinement of social skills such as communication, collaboration, and empathy[5].

3.2.3 Externalized Dialogue and Guidance Mechanism for Metacognitive Development

AIGC, serving as a "metacognitive dialogue partner," can guide learners to externalize and examine their own thought processes. By posing metacognitive questions such as "Why did you make this choice?", "What other alternative approaches are possible?", or "What are your underlying assumptions?", the technology promotes learners' continuous monitoring and evaluation of their own decision-making rationale, cognitive strategies, and learning state. This sustained, structured metacognitive dialogue significantly strengthens the learner's self-regulatory awareness and strategy repertoire, thereby enhancing the autonomy and adaptability of their learning.

3.3 Methodological Framework for Process-Oriented and Developmental Effect Assessment

3.3.1 Multimodal Learning Analytics and Process Data Fusion

The foundation of this methodology lies in the systematic collection and analysis of multimodal data generated during the learning process. This includes learners' interaction logs, dialogue text sequences, behavioral trajectories, and creative digital artifacts (such as solution reports, multimedia reflections) within the AIGC environment, along with potential affective or physiological sensor data. By applying techniques such as temporal analysis, sequence mining, and social network analysis, this approach extracts micro-level evidence from these process data streams that reflects the evolution of cognitive strategies, the formation of collaborative patterns, and the occurrence of metacognitive events. This enables the construction of a process-oriented map of literacy development.

3.3.2 Embedded Assessment Design and Evidence-Centered Logic

The core of embedded assessment design lies in adhering to the principle of "Evidence-Centered Design," which involves the structural integration of assessment activities with the experiential tasks generated by AIGC. Assessment nodes or evidence capture mechanisms are naturally embedded within the AIGC-generated experiential tasks. For instance, the solution submitted by a learner while addressing a simulated community planning challenge, along with their argumentation process with the intelligent agent, can simultaneously serve as direct assessment evidence for their problem-solving ability and critical thinking. This approach ensures the ecological validity of the assessment and makes evaluation an integral component that promotes learning.

3.3.3 Dynamic Growth Modeling and Personalized Feedback Generation

The ultimate purpose of the assessment framework is to support development. Utilizing the collected process data, it applies longitudinal data analysis and growth models to delineate development trajectories, growth rates, and key inflection points for individuals and groups across various literacy indicators. Based on these models, the framework not only evaluates the overall effectiveness of the intervention but also generates personalized descriptive feedback. This feedback reveals learners' strengths, growth patterns, and potential bottlenecks, thereby providing a basis for subsequent adaptive adjustments to learning pathways. This fundamentally transforms assessment from "judgment" toward "understanding" and "facilitating" development.

Conclusion

This study, through analyzing the fusion mechanism of AIGC technology and community experiential education, constructing systematic educational pathways, and establishing an analytical framework for literacy enhancement effects, demonstrates the fundamental possibilities that generative artificial intelligence offers for reshaping community learning experiences. The research indicates that AIGC, leveraging its powerful generative and interactive capabilities, can transform static community spaces into dynamic, investigable "enhanced experiential fields." Through the synergistic effect of the trinity—personalized pathways, immersive scenarios, and adaptive content—it constructs an intelligent environment for learners that supports deep cognitive engagement, social skill rehearsal, and metacognitive development. The proposed multidimensional literacy analysis framework and process-oriented assessment methodology provide theoretical tools for understanding and measuring the complex outcomes of this technology-enhanced learning. Future research can deepen along three directions: first, exploring the integration of AIGC with technologies like the Internet of Things (IoT) and Extended Reality (XR) to enhance the sense of physical interaction within immersive environments; second, focusing on the educational governance of ethical, privacy, and algorithmic fairness issues in human-machine collaboration; third, conducting long-term longitudinal studies to verify the impact mechanisms of this pathway on the long-term literacy development of different learner groups. These efforts will advance the field from pathway design towards ecological construction and empirical deepening.

Fund Projects

2025 “Social Innovation Integrated Education” Community Education Innovation Project

Project Title: Research on Experiential Education Pathways for Enhancing Community Residents’ Literacy Empowered by AIGC

Project No.: SCRJ20251024016

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