Journal of International Education and Development
2025, VOL. 9, NO. 9, 7-11
DOI: 10.47297/wspiedWSP2516-250001.20250909

The Construction Path of the New Liberal Arts STEAM Teaching Model in the Context of Generative Artificial Intelligence

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ABSTRACT
The core functions of generative artificial intelligence, namely understanding, reasoning, and generation, distinguish the current STEAM teaching model in new liberal arts education from traditional teaching models. Based on this, this paper focuses on the integration of generative artificial intelligence and STEAM education in new liberal arts, explores the importance of constructing a STEAM teaching model in new liberal arts education under the background of generative artificial intelligence, analyzes the construction principles of empowering the STEAM teaching model in new liberal arts education with generative artificial intelligence, reveals the current application status and challenges of generative artificial intelligence in STEAM teaching in new liberal arts education, and proposes construction paths such as resource creation, scenario construction, teaching method integration, and evaluation system improvement, providing a reference for constructing a STEAM teaching model in new liberal arts education under the background of generative artificial intelligence.

KEYWORDS
Generative artificial intelligence; New liberal arts; STEAM teaching model; Educational innovation

1 Introduction

With the rapid development of technology, generative artificial intelligence has become an important force driving educational reform. The construction of new liberal arts emphasizes interdisciplinary integration, aiming to cultivate compound talents with innovative ability and comprehensive literacy. The STEAM educational philosophy emphasizes the interdisciplinary integration of science, technology, engineering, art, and mathematics, which is highly compatible with the new liberal arts. The integration of generative artificial intelligence into STEAM teaching in the new liberal arts not only enriches teaching resources and innovates teaching methods, but also provides personalized learning experiences for students, helping new liberal arts education achieve high-quality development. Therefore, it is of great significance to explore in depth the construction path of generative artificial intelligence empowering the STEAM teaching mode of new liberal arts.

2 Concept of steam teaching mode in new liberal arts

The new liberal arts have the characteristics of being contemporary, interdisciplinary, and applicable, focusing on the new needs of social development, and integrating knowledge from humanities and social sciences with natural sciences, engineering technology, and other fields. The new STEAM teaching model for liberal arts is based on this foundation, further highlighting the leading and integrating role of liberal arts, and organically combining liberal arts knowledge with other disciplines, thus playing an important role. The knowledge of philosophy, history, sociology, linguistics, and other disciplines covered by the new liberal arts curriculum runs through the entire teaching process, guiding students to examine issues from a humanistic perspective, think about the ethical and social impacts of technological applications, and ensure that innovative achievements meet the development needs and value orientations of human society.

The STEAM teaching model is an interdisciplinary education model that integrates multiple disciplines such as science, technology, engineering, art, and mathematics. It can break down traditional barriers between disciplines and aims to cultivate talents with comprehensive literacy, innovation ability, and interdisciplinary thinking. Among them, science provides rational thinking and scientific methods for students to explore, helping them understand natural laws and phenomena. Technology is a tool and means to achieve innovation, which enables students to master the ability to use modern technology to solve practical problems. Engineering is the process of transforming creativity into practical results, which can cultivate students' engineering design and practical abilities. Art possesses humanistic sentiment and aesthetic literacy, making works and solutions more humanistic and infectious. Mathematics is the foundation of quantitative analysis and logical reasoning in various disciplines, which can ensure the rigor of the exploration process.

The new STEAM teaching model for liberal arts advocates a focus on complex problems in real-life situations. Through project-based learning, collaborative exploration, and other methods, students can apply scientific knowledge to analyze environmental issues, collect and process data through technological means, and master the core knowledge and skills of various disciplines. It can also cultivate critical thinking, innovation ability, communication and collaboration ability, and

humanistic literacy, truly achieving the integration of knowledge and comprehensive improvement of abilities.

3 Exploring the importance of building a steam teaching model for new liberal arts under the background of generative artificial intelligence

3.1 Adapt to technological changes and cultivate versatile talents

In the era of generative artificial intelligence, technological iteration is advancing rapidly, and there is a surge in demand for versatile talents in various fields. With the application of generative artificial intelligence in the construction of the STEAM teaching model for new liberal arts, traditional liberal arts education is no longer limited to a single knowledge system, enabling students to understand cutting-edge technology and help them improve their creative efficiency and creativity by using AI assisted writing tools when learning literary creation. This can cultivate students' diverse thinking, enabling them to analyze and solve complex problems from a multidisciplinary perspective, and become composite talents that adapt to technological changes, thus meeting the current society's requirements for comprehensive talent literacy.

3.2 Enhance innovation capability and stimulate new vitality in humanities

Generative artificial intelligence has achieved remarkable results in the creative field, capable of generating text, design proposals, and more. With the development of generative artificial intelligence, the new liberal arts STEAM teaching model can break the dull atmosphere of liberal arts teaching. For example, in art and design courses, students can use artificial intelligence image generation technology to obtain inspiration, and combine their own artistic aesthetics and creativity to design unique works. In historical and cultural research, students use artificial intelligence to analyze massive historical materials and explore new perspectives and viewpoints. In the context of generative artificial intelligence, the new liberal arts STEAM teaching model can expose students to innovative thinking and methods from different disciplines, stimulate their own innovative potential, inject new vitality into the field of liberal arts, and assist in the construction of the new liberal arts STEAM teaching model.

3.3 Optimize teaching resources and achieve personalized learning

Generative artificial intelligence has powerful data processing and analysis capabilities, which can provide rich and optimized teaching resources for STEAM teaching in the new liberal arts. Under the influence of generative artificial intelligence, teachers can use AI platforms to quickly generate teaching materials, cases, and expanded materials based on course content and student needs, which can save lesson preparation time and improve teaching preparation efficiency. At the same time, artificial intelligence platforms can track and analyze students' learning progress, homework completion, test scores, and other learning data to construct a student learning profile, understand students' learning characteristics and weak links, and develop personalized learning plans and coaching solutions for each student. This helps students to obtain suitable reading materials and practice questions based on their own reading comprehension level when studying humanities courses, achieving personalized learning and improving learning effectiveness.

3.4 Promote educational equity and expand learning space

Traditional liberal arts education is limited by geographical and school resources, and there are significant differences in teaching quality among different regions and schools. Generative artificial intelligence breaks this limitation, and the new liberal arts STEAM teaching model utilizes online education platforms, intelligent learning software, etc. to spread high-quality teaching resources to remote areas and schools with weak educational resources. As long as there are network devices, students can access rich humanities courses, lectures, learning materials, etc., and be exposed to the same teaching content as students in developed regions. For example, some students from impoverished areas participate in STEAM courses for new liberal arts through online platforms, interact with teachers and students from prestigious universities, broaden their horizons, and improve their learning level. At the same time, the virtual learning environment supported by artificial intelligence allows students to learn anytime and anywhere, without being limited by time and space, promoting educational equity and expanding students' learning space.

4 The application status of generative artificial intelligence in steam teaching of new liberal arts

4.1 Overview of the application of generative artificial intelligence technology in the field of education

Generative artificial intelligence technology covers multiple fields such as natural language processing and computer vision, and has been widely applied in the generation of educational resources, intelligent tutoring, and the creation of virtual learning environments. In the field of natural language processing, generative artificial intelligence can generate text content, such as automatically generating lesson plans, learning materials, story scripts, etc., saving teachers preparation time and providing students with diverse learning materials. Computer vision technology helps create virtual simulation experiments and immersive learning scenarios, enhancing the intuitiveness and interactivity of learning. For example, through virtual reality and augmented reality technology, students can immerse themselves in the process of historical events and artistic creation, deepening their understanding and perception of knowledge.

4.2 Characteristics and requirements of STEAM teaching in new liberal arts

The new liberal arts STEAM teaching breaks down disciplinary barriers and emphasizes the comprehensive application of knowledge and innovative practice. Its characteristics include interdisciplinary, situational, innovative, and practice oriented. In terms of interdisciplinarity, it is required to integrate knowledge from humanities and engineering disciplines, and cultivate students' ability to analyze and solve problems comprehensively. Situational learning emphasizes placing learning in a real context, stimulating students' interest and motivation in learning. Innovation encourages students to unleash their creativity, propose unique insights and solutions. Practice orientation emphasizes enhancing students' practical abilities through project-based learning, experimental operations, and other methods. However, traditional teaching methods are unable to meet these needs and there is an urgent need to utilize generative artificial intelligence technology to achieve teaching innovation.

4.3 Problems and challenges in current applications

Although generative artificial intelligence has shown great potential in STEAM teaching of new liberal arts, its current application still faces many problems and challenges. The accuracy and reliability of generative artificial intelligence tools at the technical level need to be improved, as the generated content may contain errors or biases, which can affect learning outcomes. Text generated by natural language may have grammar errors, logical inconsistencies, and other issues. At the educational level, teachers' mastery of generative artificial intelligence technology varies greatly, and some teachers lack the ability and awareness to integrate technology into teaching, resulting in the application of technology being superficial. In addition, the application of generative artificial intelligence technology also brings ethical and legal issues, such as content copyright ownership and data privacy protection, which need to be further regulated and resolved.

5 Principles for building a generative artificial intelligence empowered steam teaching model for new liberal arts

5.1 The principle of student-centered approach

The new liberal arts STEAM teaching model should always be student-centered and meet the personalized learning needs of students. Generative artificial intelligence technology can provide personalized learning paths and resource recommendations for students based on their learning progress, knowledge mastery, interest preferences, and other learning data. For example, generative artificial intelligence uses intelligent tutoring systems to accurately push targeted practice questions and expand reading materials for students, helping them identify and fill in gaps, and deepen their understanding of knowledge. At the same time, encourage students to actively participate in the use of generative artificial intelligence tools, such as using text generation tools to create stories and poems, and unleash students' subjective initiative and creativity.

5.2 Principle of interdisciplinary integration

Fully leverage the advantages of generative artificial intelligence technology and promote the deep integration of humanities and engineering. In course design, utilizing generative artificial intelligence to generate interdisciplinary teaching materials, integrating science, technology, engineering, art, and mathematics knowledge organically into the new liberal arts teaching content. For example, in history teaching, generative artificial intelligence should be used to create virtual historical scenes, incorporating architectural engineering knowledge to showcase ancient urban layouts,

and combining artistic elements to showcase cultural landscapes of historical periods, allowing students to understand historical events from a multidisciplinary perspective. In the teaching process, students should be guided to use interdisciplinary methods to solve problems and cultivate interdisciplinary thinking and comprehensive literacy.

5.3 Ethical and safety principles

When applying generative artificial intelligence technology, it is necessary to adhere to ethical and safety bottom lines. Ensure that the content generated by generative artificial intelligence complies with ethical standards and legal regulations, and avoid spreading harmful information. At the same time, we should strengthen ethical education for students, guide them to use generative artificial intelligence technology correctly, respect intellectual property rights of others, and protect personal privacy. At the technical level, security measures are taken to prevent data leakage, abuse, and other issues, ensuring the safe and orderly conduct of teaching activities.

6 The construction path of generative artificial intelligence empowering new liberal arts steam teaching mode

6.1 Create teaching resources based on generative artificial intelligence

Generative artificial intelligence technology can generate text resources such as stories, cases, and popular science articles related to STEAM courses in the new liberal arts through natural language processing technology. Use computer vision technology to generate art appreciation images, virtual experimental scene videos, etc. Taking history courses as an example, generative artificial intelligence can generate vivid story scripts based on historical events, combined with virtual scene videos, allowing students to experience history as if traveling through time and space. At the same time, encourage teachers and students to participate in resource creation together, use generative artificial intelligence tools to reprocess and innovate existing resources, and form distinctive school-based teaching resources.

6.2 Generative artificial intelligence assists in the construction of teaching scenarios

Build immersive and interactive teaching scenarios using generative artificial intelligence technology. Using VR and AR technology combined with generative artificial intelligence to generate virtual scenes and characters, creating a realistic learning environment for students. For example, in the study of literary works, students can enter the world depicted in the works through VR devices, interact with virtual characters, and gain a deeper understanding of the content of the works. In engineering design courses, students can use AR technology to simulate the process of engineering construction in real-life scenarios and adjust design plans in real time. In addition, generative artificial intelligence can dynamically generate teaching scenarios based on teaching content and student needs, enhancing the fun and attractiveness of learning.

6.3 Innovation of teaching methods integrating generative artificial intelligence

Adopting project-based learning, inquiry based learning and other teaching methods, combined with generative artificial intelligence tools to enhance teaching effectiveness. In project-based learning, students use generative artificial intelligence tools in small groups to complete project tasks, such as designing "murder mystery" using artificial intelligence. From determining the theme, creating the script to designing the scene, the entire process utilizes generative artificial intelligence technology to exercise students' ability to comprehensively apply knowledge and technology. In inquiry based learning, students use generative artificial intelligence tools to independently search for information, propose hypotheses, and verify conclusions, cultivating their ability for independent exploration and innovative thinking. Teachers utilize generative artificial intelligence technology for intelligent tutoring, providing real-time answers to students' questions and personalized guidance.

7 Conclusion and prospect

7.1 Summary of research conclusions

This study explores the application status and challenges of generative artificial intelligence in the teaching of new liberal arts STEAM through in-depth exploration. It proposes the principles of student-centered, interdisciplinary integration, innovation and practice orientation, ethics and safety, and puts forward the construction path of generative artificial intelligence empowering new liberal arts STEAM teaching mode from the aspects of teaching resource creation,

teaching context construction, teaching method innovation, and teaching evaluation system improvement. Through practical case analysis, the effectiveness of this teaching model in improving students' learning outcomes and cultivating their comprehensive literacy has been verified.

7.2 Future research directions and practical suggestions

Future research can focus on specific strategies for the deep integration of generative artificial intelligence and new liberal arts STEAM teaching, such as developing more suitable generative artificial intelligence tools for teaching and exploring new forms of teaching organization supported by generative artificial intelligence. In practice, it is recommended to strengthen teacher training and enhance their ability to apply generative artificial intelligence technology and interdisciplinary teaching. Establish and improve ethical and legal norms for the application of generative artificial intelligence in education, ensuring the healthy development of teaching activities. Strengthen inter school cooperation and resource sharing, jointly promote the innovation and practice of the new liberal arts STEAM teaching model, and lay a solid foundation for cultivating compound innovative talents that meet the needs of the times.

Funding

Jiangsu Educational Informatization Association for Higher Education Institutions: Constructing a Generative Artificial Intelligence-Empowered STEAM Instructional Model for New Liberal Arts(NO: 2025JSETKT209)

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