

Research on Enhancing the Implementation Effectiveness of Intelligent Research and Training from an AI Evidence-Based Perspective

Xi Li

Guangzhou AVA Electronic Technology Co., Ltd., Guangzhou 510700, Guangdong, China

Copyright: © 2025 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), permitting distribution and reproduction in any medium, provided the original work is cited.

Abstract

Against the backdrop of the deep integration of information technology and education, intelligent research and training, as an important avenue for teachers' professional development, has garnered significant attention for its effectiveness enhancement. This paper delves into the challenges faced during the implementation of intelligent research and training and proposes optimization strategies from an evidence-based perspective grounded in artificial intelligence. The study begins by outlining the core connotations and development trends of intelligent research and training, emphasizing the data-driven and personalized characteristics empowered by AI technology. Subsequently, it systematically analyzes specific issues and difficulties encountered in the current implementation of intelligent research and training, including the depth of technological application, the design of research and training activities, teacher participation and adaptability, evaluation of research and training effectiveness, and the data-driven closed loop. In response to these dilemmas, the study proposes highly actionable enhancement strategies, including constructing an AI-empowered design framework for evidence-based research and training activities, developing intelligent personalized learning support systems, establishing a big data-based learning analysis and precise intervention mechanism, designing a multidimensional AI-empowered evaluation system for research and training effectiveness, and creating a data-driven closed loop for the continuous optimization of intelligent research and training.

Keywords

Artificial intelligence; Evidence-based practice; Intelligent research and training; Teacher professional development; Implementation effectiveness

Online publication: September 26, 2025

1. Introduction

The wave of digital transformation in education is profoundly reshaping the modes and pathways of teacher professional development. Leveraging its advantages in technological empowerment, resource sharing, and convenient interaction, intelligent research and training have gradually emerged as a key vehicle for enhancing the quality of the teaching workforce. Relying on modern information technologies such as cloud computing, big data, and artificial intelligence, intelligent research and training establishes a new type of research and training environment that integrates learning, discussion, practice, and reflection, aiming to provide teachers with more precise, efficient, and personalized support for professional growth. However, during the actual promotion and application process, there remains a certain gap between the expected and actual effectiveness of intelligent research and training, and its potential has not been fully unleashed. How to break through existing bottlenecks and effectively improve the implementation effectiveness of intelligent research and training is an important issue that urgently needs to be addressed in the field of educational informatization at present. This study focuses on the “AI evidence-based perspective,” emphasizing the full utilization of artificial intelligence technology for data collection, analysis, and application throughout the design, implementation, evaluation, and optimization of intelligent research and training. Supported by scientific evidence, it aims to achieve precision, personalization, and efficiency in research and training activities.

2. Overview and development trends of intelligent research and training

2.1. Connotation and core characteristics of intelligent research and training

The goal and connotation of intelligent research and training lie in achieving intelligent, personalized, and data-driven organization, management, and service of research and training processes and resources through the in-depth application of information technologies such as artificial intelligence, big data, and learning analytics. Its main characteristics are the intellectualization of the research and training process, the personalization

of research and training resources, and the data-driven nature of research and training services. Among them, the intellectualization of the research and training process is manifested in the ability of intelligent platforms to provide intelligent recommendations, intelligent Q&A, and intelligent evaluations, reducing manual intervention in some research and training management and service processes, and improving research and training efficiency. Personalization in research and training is reflected in the system’s autonomous recommendation of research and training resources, learning paths, and communication methods that teachers want to learn or are suitable for, as well as related learning evaluation services. The digitization of research services relies on the collection of data sources such as behavioral data, interaction data, and achievement data during the training process. It involves mining and analyzing teachers’ research behaviors and achievements to inform the planning, adjustment, monitoring, evaluation, and decision-making of training activities.

2.2. Development trends of intelligent training from the perspective of AI-based evidence

Technological advancements, represented by artificial intelligence technology, have provided intelligent training with wings to soar higher, farther, and towards a more evidence-based and intelligent horizon. From the perspective of evidence-based AI, the development of intelligent training exhibits the following characteristics: Data-empowered, precise training design becomes increasingly prominent. Through natural language analysis, knowledge graphs, and big data mining techniques, platforms can accurately present common characteristics within vast amounts of teacher behavioral data, precisely analyze individual teachers’ weaknesses, and implement tiered, segmented, and thematic training design services, offering data-driven training plans. Smart teacher learning support becomes more intelligent. By leveraging algorithms such as natural language processing, knowledge graphs, and intelligent recommendations, it can real-time track teachers’ learning states, cognitive loads, and preferences, instantly adjust the presentation methods and recommendation sequences of learning resources, personalize learning interaction forms and methods, and provide adaptive learning

support.

3. Key issues in the implementation of intelligent training and research

3.1. Insufficient depth of technological application

Based on the current construction and utilization of intelligent training and research platforms, although a certain degree of information technology integration and usage has been achieved, the full potential of AI technology in terms of deep integration and functional innovation has not yet been fully realized. The current state remains at the primary stage of digitizing resources and streamlining processes in the training and research activities, failing to achieve significant functional breakthroughs supported by artificial intelligence. This is primarily manifested in the crude nature of intelligent recommendations, which lack dynamic construction and improvement based on individual teacher profiles. The recommended resources fail to precisely align with teachers' actual needs^[1]. Additionally, there is insufficient intelligent interaction support, lacking intelligent question-answering teachers capable of understanding natural language and intelligent assistants with functions such as facilitating in-depth Q&A sessions or guiding discussions. As a result, teachers' learning issues, such as confusion, do not receive timely and effective intelligent interactive responses, thereby affecting the learning experience and quality.

3.2. Lack of evidence-based support and appeal in the design of training activities

The intelligent design of training activities is a core factor in ensuring their effectiveness. However, there are currently shortcomings in the design concepts and methods of some training activities, failing to highlight the rational thinking of AI-based evidence. Firstly, the themes and content of training activities are mainly determined by organizers based on experience or directives, lacking an accurate diagnosis of teachers' knowledge structures, weaknesses, and confusions through the analysis of big data on teachers. This causes the themes and content of training to deviate from the real learning needs of frontline teachers, failing to effectively

stimulate their motivation to learn. Secondly, the design of activity formats is relatively monotonous, unable to comprehensively utilize technological means to design diverse and interactive tasks.

3.3. Low participation rate among teachers

Teachers are participants in intelligent training, and their enthusiasm for participation, level of engagement in activities, and proficiency in applying technology will determine the effectiveness of the training. A lack of initiative among teachers in training is a widespread phenomenon at present. Some teachers hold prejudices against new forms of training, believing that online training is impractical and inefficient. They are accustomed to traditional face-to-face training conducted offline and are not yet adapted to online learning and blended training.

4. Core strategies for enhancing the implementation effectiveness of intelligent research and training from the perspective of an AI evidence-based approach

4.1. Constructing an AI-empowered design framework for evidence-based teaching and research activities

To ensure the effectiveness of intelligent research and training, an evidence-based teaching and research activity design model supported by intelligent technology has become pivotal. Firstly, it enables precise teacher evaluation. Based on AI technology, information data such as teachers' personal basic characteristics, teaching experience, learning behaviors, and teaching behaviors are collected from teaching-related data. AI software can automatically generate and update teachers' capability maps, thereby delineating their professional strengths and areas for improvement, such as teaching language, teaching interaction, and instructional design. In response to curriculum standards, cutting-edge disciplinary issues, and the latest educational philosophies, AI software can match appropriate research themes based on teachers' basic characteristics and the specific research needs of the research subjects, thereby achieving precise settings for teacher research and training. Secondly, research

and training design under AI-driven teaching interaction analysis emphasizes interaction and collaboration between teachers and students, as well as among teachers themselves^[2]. Examples include collaborative “intelligent problem-solving tasks” among teachers, intelligent problem-solving tasks in real teaching contexts, and collaborative tasks in AI classroom scenarios involving cross-regional cooperation between schools. These are designed to help teachers enhance their practical transformation capabilities. Through these design forms, teachers can not only experience authentic teaching scenarios firsthand but also share experiences, provide assistance, and receive feedback from others, thereby promoting both individual and collective professional development through teamwork. Intelligent technology will provide data support and real-time feedback for the design of all models, ensuring that every aspect can “precisely focus” on teachers’ needs and professional development goals. In summary, the dynamic design model supported by AI technology points the way towards precise and personalized learning paths for teachers, while also safeguarding the outcomes and direction of teaching professional development.

4.2. Developing an intelligent personalized learning support system

Thirdly, establish an intelligent learning support system to better support teachers’ autonomous development. In addition to performing operations such as intelligent learning data mining based on big data and correlation analysis between knowledge and learning behaviors as mentioned above, the AI system also needs to provide teachers with various forms of learning support, such as videos, case studies, and academic papers, based on an analysis of their learning styles, abilities, and statistics of their previous learning behaviors. This helps teachers to achieve in-depth improvement in specific areas or address specific problems. Taking enhancing classroom interaction skills as an example, when an AI learning counselor identifies that a teacher has weak classroom interaction skills regarding a particular issue, it can recommend relevant videos or articles related to that specific topic to the teacher. Similarly, to improve classroom teaching design, when the AI counselor identifies that a teacher lacks skills in teaching design, it

can recommend relevant lesson plans, examples of lesson plan designs, and other resources. On this basis, the intelligent interactive counselor can also provide timely answers and explanations to teachers’ learning questions, guide teachers in deep thinking, and thus enhance their professional abilities in learning assistance and support. The AI learning counselor can also achieve real-time perception of teachers’ learning status, emotions, and feelings^[3]. Through affective computing and behavioral analysis techniques, the AI counselor can identify and analyze teachers’ learning behaviors such as engagement, cognitive load, and emotional fluctuations during the learning process. When the AI counselor detects issues or low learning morale among certain teachers, it can provide corresponding learning resources or adjust learning plans, promptly adjusting teachers’ own learning strategies and motivation.

4.3. Establishing a big data-based learning analysis and precision intervention mechanism

Leveraging AI to achieve precise intervention through big data learning analysis, in order to comprehensively enhance training effectiveness. Big data and artificial intelligence technologies can conduct data analysis and precise intervention throughout teachers’ learning processes. On the one hand, based on the indicator characteristics during teachers’ learning processes, including dimensions such as learning engagement, interactive collaboration, and cognitive level, the intelligent system can precisely monitor teachers’ performance at various nodes. Traditional monitoring methods often fall short in capturing the nuanced, real-world teaching behaviors of educators. In contrast, AI, leveraging behavioral data, can comprehensively and exhaustively collect information on students’ learning processes, learning behaviors, and emotional behaviors, thereby providing support for teachers to make precise interventions. For instance, when the AI system analyzes and finds that a teacher’s participation level is low during interactive sessions, the intelligent system will recommend learning resources to enhance their interactive abilities. When teachers encounter difficulties in practical application, the intelligent system can provide practical teaching cases and assist teachers in setting new practical application goals. On the other hand, based on

machine learning and data mining, intelligent systems can identify learning patterns and potential learning risks among groups of teachers from vast amounts of learning data, enabling them to predict significant or minor risks that teachers may face in the future ^[4]. For example, using clustering analysis techniques, artificial intelligence can group teachers based on their learning behaviors, identify common issues during the learning process, and differentiate between various types of learning groups, offering tailored and precise intervention support. Predictive AI can detect the likelihood of teachers abandoning their learning based on factors such as low participation and poor learning states, and then intelligently remind learners while providing motivational or personalized learning support to ensure that every teacher's learning process is positively guided and motivated.

4.4. Designing a multidimensional AI-empowered evaluation system for training effectiveness

The multidimensional AI-empowered evaluation system for training effectiveness is designed to ensure the efficiency, relevance, and effectiveness of training. Traditional evaluation methods are generally result-oriented, lacking detailed and dynamic insights into teachers' actual efforts or stage-by-stage progress during their learning process. However, AI can collect and analyze a vast amount of data generated during teachers' learning process in real time, providing more detailed and dynamic evaluation data. The evaluation system should encompass both process-oriented evaluation and course-conclusion evaluation. Process-oriented evaluation utilizes AI technology to automatically assess teachers' learning participation, interaction depth, and collaborative effectiveness throughout the process, conducting learning analysis on their various performances to form a comprehensive and detailed evaluation of their learning behavior. AI can analyze teachers' speech effectiveness in learning communities through natural language processing, evaluating their depth of inquiry into issues, their active participation in discussions with others, and assessing their contributions to knowledge and learning outcomes ^[5]. On the other hand, AI can automatically analyze practical products submitted by teachers, such

as teaching plans and classroom clips, to evaluate their teaching innovation and quality, further refining the evaluation of teachers. The course-conclusion evaluation combines traditional evaluation methods, such as tests, questionnaires, and academic reports, with AI technology to automatically analyze the quality of teachers' tests, learning reports, and the resulting teaching improvement plans. For instance, by utilizing an AI-constructed intelligent test question bank, the system's intelligence dynamically generates targeted questions based on teachers' learning progress and abilities for analysis, thereby assessing their growth and mastery during the training process. This two-dimensional comprehensive evaluation of teachers provides them with a detailed feedback report, enabling them to clearly understand their training strengths and weaknesses. Subsequently, they can plan and formulate subsequent learning steps to enhance their teaching abilities.

4.5. Creating a data-driven, intelligent training continuous optimization closed loop

A data-driven continuous optimization closed loop is also a crucial component and guarantee for intelligent training. Traditional training activities typically follow a cyclical process of planning, implementation, evaluation, and summarization. However, this approach no longer meets the dynamic development needs of teacher-centered training. AI-supported training activities should also enter a dynamic cycle of continuous optimization, where the entire process, from data collection and analysis to plan optimization and implementation feedback, is closely interconnected across various stages. After a training activity concludes, it is essential to collect various types of data from teachers, including demand data, participation data, practical data, evaluation data, and reflective data, and then conduct data mining and analysis on these datasets. This analysis aims to identify the strengths and weaknesses of the current training activity. The data is derived from self-feedback provided by teachers, as well as analyses of their teaching behaviors and collaborative interaction data among peers ^[6]. AI can utilize data-driven analytical methods to extract key data points and analyze factors influencing the effectiveness of the training. For instance, if a particular teaching segment yields poor results or if certain content fails to

be effectively delivered, these issues can be identified. By summarizing such influencing factors, targeted optimization strategies can be developed. These strategies can then be implemented in subsequent training activities, followed by continuous data analysis and evaluation of new plans. This iterative process ensures the optimization of every critical step, ultimately leading to improved outcomes at each stage.

5. Conclusion

This paper discusses the promotion methods of intelligent research and study from the perspective of AI-based evidence. It analyzes and discusses the challenges in the current application practices of intelligent research and study regarding the depth of artificial intelligence

technology application, the development and design of intelligent research and study activities, teachers' investment and roles in intelligent research and study, and the evaluation of research and study outcomes. Based on this analysis, it provides targeted and highly actionable suggestions for promoting intelligent research and study. In the future, the integration of AI-based technologies and educational data is bound to empower and enhance intelligent research and study in terms of exploring higher levels of targeted needs, achieving more natural interaction methods, enabling wiser judgment and analysis, and significantly improving outcomes. This will greatly accelerate teachers' professional development and provide a strong impetus for the high-quality development of education.

Disclosure statement

The author declares no conflict of interest.

References

- [1] Liu Y, Xu A, 2024, An Evidence-Based Smart Research and Training Model for Achieving Core Competencies. *Research on Education and Equipment*, 40(1): 26–30.
- [2] Li J, Liu J, 2024, Integration of Teaching, Research, and Training: Practices and Innovations in Smart Research and Training in Chengdu High-Tech Zone. *Research on Education and Equipment*, 40(1): 21–25.
- [3] Zhao Z, Zhou J, 2023, Intelligent and Precision-Oriented Teaching Research: Concept Definition, Value Pursuit, and Practical Pathways. *Journal of Yangzhou University (Higher Education Research Edition)*, 27(6): 58–65.
- [4] Li W, 2024, Exploring Strategies for Enhancing the Digital Literacy of Rural Middle School Teachers. *Road to Success*, (20): 69–72.
- [5] Wang Y, 2023, Digital Transformation of Campus Education (Part V): Smart Teaching Research Empowering Teacher Growth. *China Comment*, (6): 62–63.
- [6] Zeng L, Tao Y, Zhang X, et al., 2025, Smart Research and Training System Promoting the “Digital and Intelligent” Transformation of Teachers. *Sichuan Education*, (13): 2–3.

Publisher's note

Whoice Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.