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Original Paper

Research on the Construction of an Educational Service Quality Evaluation System Driven by Artificial Intelligence Technology

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Abstract

In the context of high-quality educational development, the scientific and objective evaluation of educational service quality has become a key concern in educational governance and management. Traditional evaluation approaches face limitations in indicator design, data sources, and result application, which restrict their ability to reflect the dynamic and multidimensional nature of educational service processes. With the deepening application of artificial intelligence in education, its strengths in multi-source data processing, pattern recognition, and intelligent analysis offer new possibilities for improving evaluation systems. Based on a systematic review of existing studies and the foundations of AI applications, this research constructs an educational service quality evaluation system centered on data integration and intelligent analysis. The study focuses on evaluation framework design, indicator system construction, and evaluation model development, and examines how artificial intelligence supports comprehensive assessment and result feedback. A case study is conducted to validate the feasibility and effectiveness of the proposed system. The findings demonstrate that artificial intelligence can enhance the scientific rigor, dynamic adaptability, and practical value of educational service quality evaluation, contributing to the modernization of educational governance.

Keywords

Artificial intelligence, educational service quality, evaluation system construction, intelligent evaluation model, educational governance

1. Introduction

With the continuous advancement of educational modernization and high-quality educational development, educational service quality has become a key dimension for evaluating the operational effectiveness of education systems and the level of educational governance. Educational services extend beyond teaching activities to include resource allocation, learning support, management assurance mechanisms, and educational environments. The quality of these services directly affects educational equity, learning outcomes, and social satisfaction. Therefore, establishing a scientific and systematic evaluation system for educational service quality is of significant practical importance for improving educational management decisions and promoting continuous service improvement. Existing research on educational service quality evaluation has made progress at both theoretical and practical levels, but it remains largely reliant on traditional methods such as expert judgment, questionnaire surveys, and static indicator systems. Although these approaches can reflect overall service quality to some extent, their limitations have become increasingly apparent as educational service processes grow more complex and data sources more diverse. Traditional evaluation systems often struggle to capture dynamic changes in service delivery, leading to delayed evaluation results. Moreover, the predominance of structured or subjective data restricts the exploration of implicit information related to teaching behaviors and learning processes, thereby affecting the comprehensiveness and objectivity of evaluation outcomes.The rapid development of new-generation information technologies, particularly big data and artificial intelligence, has led to the continuous generation of large-scale, multi-source educational data, creating favorable conditions for transforming evaluation methods. Artificial intelligence technologies offer significant advantages in data mining, pattern recognition, and intelligent analysis, enabling deeper and more efficient processing of complex educational data. These capabilities provide technical support for more precise, dynamic, and process-oriented evaluation of educational service quality.Against this background, effectively integrating artificial intelligence technologies into educational service quality evaluation systems has become an urgent issue in educational research and practice. This study addresses this challenge by constructing an AI-driven evaluation system centered on multi-source data integration and intelligent analysis, aiming to enhance the scientific rigor and practical applicability of educational service quality evaluation and to support the modernization of educational governance.

2. Related Research Review and Theoretical Foundations

2.1 Review of Research on Educational Service Quality Evaluation

2.1.1 Conceptual Frameworks and Indicator System Construction

As an important topic in educational management and public service research, educational service quality evaluation has long attracted scholarly attention. Early studies often equated educational quality with learning outcomes or academic achievement, emphasizing examination scores, graduation rates, or other outcome-based indicators. With the gradual recognition of education as a complex service system,

researchers increasingly argue that educational service quality should be understood as a multidimensional concept that extends beyond learning outcomes to include teaching processes, management services, learning support, and educational environments. This shift reflects a growing emphasis on learner needs, service experience, and public educational value (Wang, Wang, Zhu, Wang, Tran, & Du, Z. (2024).

Based on this expanded conceptual understanding, existing studies have proposed various indicator systems to operationalize educational service quality evaluation. Most indicator systems adopt hierarchical structures, organizing evaluation dimensions such as teaching quality, administrative management, resource provision, and learning support into multi-level frameworks. Some studies adapt classical service quality models to educational contexts, while others construct context-specific indicator systems through questionnaire surveys or expert consultation (Huang et al., 2025). These approaches have improved the clarity and applicability of educational service quality evaluation. However, most indicator systems remain relatively static, focusing on predefined dimensions and indicators, and thus have limited ability to capture dynamic changes during educational service delivery or respond flexibly to evolving learner needs.

2.1.2 Evaluation Methods, Data Sources, and Application Limitations

In terms of evaluation methods, traditional approaches such as the analytic hierarchy process, fuzzy comprehensive evaluation, and weighted scoring models are widely used to integrate multiple indicators and generate quantitative or semi-quantitative evaluation results. These methods are effective in handling multi-criteria evaluation problems and are easy to implement in practice. Nevertheless, they often rely heavily on expert judgment for indicator weighting, which introduces subjectivity and reduces the objectivity and robustness of evaluation outcomes. Moreover, traditional methods usually assume linear relationships among indicators, limiting their ability to model complex and nonlinear interactions within educational service systems (Ben Zion, Yakov, Abramovitch, Balter, & Davidovitch, 2025).

With respect to data sources and result application, existing research primarily depends on structured or self-reported data, such as questionnaires, interviews, and administrative statistics. While these data sources are convenient to collect, they provide limited insight into learners' actual behaviors, learning processes, and real-time service interactions. Unstructured data, including textual feedback, learning logs, and behavioral traces generated by digital platforms, are often underutilized. Furthermore, evaluation results are commonly used for retrospective analysis rather than continuous monitoring or decision support, resulting in weak connections between evaluation outcomes and management actions. These limitations highlight the need for more dynamic, data-driven, and intelligent evaluation approaches.

2.2 Foundations of Artificial Intelligence Applications in Educational Evaluation

2.2.1 Evolution of Artificial Intelligence and Intelligent Decision Support in Education

With the advancement of educational informatization and digital transformation, artificial intelligence

technologies have gradually expanded their role in educational evaluation. Early applications mainly focused on basic data processing and rule-based analysis, supporting simple statistical evaluation tasks. In recent years, the rapid development of machine learning, data mining, and related techniques has enabled the automated analysis of large-scale educational data generated during teaching and learning activities. This evolution has promoted a shift from experience-driven evaluation models to data-driven and algorithm-assisted approaches (Jauhiainen, 2024).

At the level of educational management and decision-making, artificial intelligence–based decision support systems are increasingly applied to resource allocation, course planning, and learning support services. By analyzing historical data and behavioral characteristics, these systems provide evidence-based recommendations and support dynamic adjustment of educational services. Compared with traditional decision-making methods that rely heavily on expert experience, intelligent systems offer greater consistency, scalability, and responsiveness, demonstrating strong potential for enhancing educational service quality evaluation.

2.2.2 AI Applications in Process Analysis, Teaching Evaluation, and System Integration

In the domain of educational process analysis, machine learning techniques are widely used to analyze learning behavior data, such as attendance records, interaction logs, and learning trajectories. These applications enable dynamic assessment of learner engagement and learning progress, supporting process-oriented evaluation rather than static outcome-based judgment. Such capabilities align closely with the need to evaluate the quality of educational services throughout the entire service lifecycle.

In teaching assessment and feedback, natural language processing technologies have been increasingly applied to analyze textual data such as course evaluations, teaching reflections, and online interaction records. By automatically extracting sentiment and key information, artificial intelligence transforms qualitative feedback into analyzable data, reducing subjectivity and improving evaluation consistency. Recent studies further explore integrated AI-driven evaluation systems that combine multi-source data, intelligent analysis, and decision support functions. These systematic attempts indicate that artificial intelligence is not merely an auxiliary tool, but a core enabler for building comprehensive, dynamic, and feedback-oriented educational service quality evaluation systems (Sebopelo, Baloyi, & Chukwuma, 2025).

3. Conceptual Framework for an AI-Driven Educational Service Quality Evaluation System

3.1 Overall Framework Design of the Educational Service Quality Evaluation System

Under the drive of artificial intelligence technologies, educational service quality evaluation is no longer a static judgment made by a single subject based on limited data. Instead, it has evolved into a systematic process characterized by the participation of multiple stakeholders, the support of multi-source data, and intelligent analysis throughout the entire evaluation cycle. Therefore, it is necessary to design the educational service quality evaluation system from a system-level perspective, so as to clarify the internal logical relationships among evaluation subjects, evaluation objects, and

evaluation objectives, and to establish an evaluation mechanism centered on data integration and intelligent analysis. Based on this rationale, this study constructs an overall framework for an AI-driven educational service quality evaluation system, as illustrated in Figure 1.

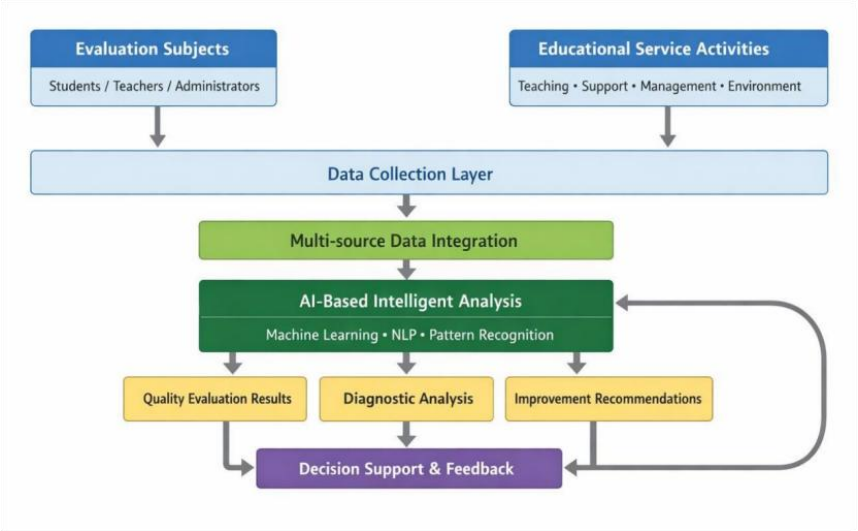

Figure 1. Overall Framework of AI-Driven Educational Service Quality Evaluation System

The framework takes educational service activities as the primary evaluation object and incorporates multiple evaluation subjects as input sources. Through the integration and intelligent analysis of multi-source educational data, the framework enables comprehensive evaluation and feedback optimization of educational service quality. Structurally, the framework consists of a data collection layer, a data integration and intelligent analysis layer, and an evaluation output and feedback layer, which together form a closed-loop operational mechanism. At the level of evaluation subjects and objects, the framework fully considers the multidimensional nature of educational services by identifying learners, teachers, and educational administrators as the main evaluation subjects (Ben, Yakov, Abramovitch, Balter, & Davidovitch, 2025). Their evaluation behaviors, together with the operational processes of educational services, jointly constitute the core data sources for evaluation. The evaluation objects extend beyond teaching activities themselves to include teaching support services, management assurance mechanisms, and learning environments, ensuring that the evaluation system can comprehensively reflect the overall quality of educational services rather than isolated aspects. In terms of the operational mechanism, as shown in the central part of Figure 1, multi-source educational data first enter the data collection layer, which integrates various types of information such as learning behavior data, teaching process data, management operation data, and textual feedback data. These data are then processed and analyzed in the data integration and intelligent analysis layer using artificial intelligence techniques such as machine learning and natural language processing. Through this process, key features of educational service quality are automatically identified and comprehensively assessed. This approach effectively overcomes the limitations of traditional

evaluation methods in terms of data processing capacity and analytical depth, resulting in more objective and dynamic evaluation outcomes. At the evaluation output and feedback layer, the framework generates comprehensive evaluation results, diagnostic analyses, and improvement recommendations to support educational management decisions and service optimization. Evaluation results are not only used to describe the current status of educational service quality, but are also fed back into the educational service process to facilitate continuous improvement. As a result, the entire evaluation system forms a closed-loop structure characterized by data-driven operation, intelligent analysis, and dynamic feedback, providing a clear structural foundation for subsequent indicator system construction and evaluation model design (Jantakun, Jantakun, & Jantakoon, 2025).

3.2 Principles for Constructing the Educational Service Quality Evaluation Indicator System

Within an AI-driven educational service quality evaluation system, the indicator system serves as the critical link between the evaluation framework and the evaluation model. Its scientific rigor and rationality directly affect the validity and interpretability of evaluation results. Given the comprehensive and complex nature of educational services, the construction of the indicator system must not only accurately reflect the core attributes of educational service quality, but also be well aligned with the requirements of artificial intelligence technologies for data processing and dynamic analysis. Accordingly, based on the overall framework design, this study proposes that the construction of the educational service quality evaluation indicator system should adhere to the principles of scientific validity, systematic structure, dynamic adaptability, and operational feasibility. First, the principle of scientific validity requires that indicator selection be grounded in sound theoretical foundations and clear practical relevance, enabling accurate representation of the key characteristics of educational service quality. Indicators should conform to the fundamental principles of educational service delivery while avoiding redundancy and arbitrary subjectivity, thereby providing reliable inputs for subsequent intelligent analysis. On this basis, the principle of systematic structure emphasizes that the indicator system should adopt a holistic perspective and capture educational service quality across multiple dimensions, including teaching processes, service support, management assurance, and learning environments, so that evaluation results reflect the overall performance of educational services rather than partial outcomes. Second, the principle of dynamic adaptability distinguishes AI-driven evaluation systems from traditional evaluation approaches. Educational service quality is not static, but continuously evolves throughout teaching activities and service operations. With the support of artificial intelligence technologies, indicator weights no longer rely solely on manual assignment, but can be adaptively adjusted in response to data variations. This allows evaluation results to timely reflect stage-specific characteristics of educational service quality. Meanwhile, continuous data input and model updating enable dynamic optimization of the evaluation process, enhancing the system's adaptability to real educational scenarios. In addition, the principle of operational feasibility highlights the practical applicability of the indicator system. Indicators should have clearly defined data sources and quantifiable attributes, allowing relevant data to be obtained through educational management

systems, teaching platforms, or learning analytics systems. This helps avoid implementation difficulties caused by data unavailability or excessive data acquisition costs. The advantages of artificial intelligence technologies in multi-source data integration and automated processing further support the operational feasibility of the indicator system. Based on these principles, this study constructs an example of an AI-driven educational service quality evaluation indicator system, as presented in Table 1. At the first-level dimension, the indicator system captures the major dimensions of educational service quality, while second-level indicators further specify evaluation content and corresponding data source types, providing a solid foundation for subsequent evaluation model design and empirical analysis (Isaifan, 2025)

Table 1. Educational Service Quality Evaluation Indicator System (Example)

Level-1 Dimension	Level-2 Indicators	Indicator Description	Main Data Sources
Teaching Quality	Teaching Effectiveness	Achievement of teaching objectives and learning outcomes	Learning records, assessment data
	Teaching Interaction	Frequency and quality of teacher–student interaction	Platform logs, interaction data
Service Support	Learning Support Services	Availability and responsiveness of learning support	Service system records
	Resource Accessibility	Accessibility and adequacy of learning resources	Resource usage data
Management Assurance	Administrative Efficiency	Timeliness and effectiveness of administrative services	Management system data
	Policy Implementation	Consistency and effectiveness of policy execution	Management reports
Learning Environment	Learning Platform Stability	Reliability and usability of learning platforms	System operation logs
	Learning Experience Feedback	Learners' satisfaction and experience perception	Text feedback, survey data

4. Design of the AI-Based Educational Service Quality Evaluation Model

4.1 Construction Method of the Educational Service Quality Evaluation Model

Within an AI-driven educational service quality evaluation system, the evaluation model serves as the core mechanism for integrating indicator information and generating evaluation results. Based on the overall framework and indicator system established in the preceding sections, this study develops a comprehensive evaluation model that combines multi-source educational data with artificial intelligence methods, aiming to enhance the objectivity, dynamic responsiveness, and interpretability of evaluation outcomes through a data-driven approach (Wang, 2024). The model construction begins with the educational service quality evaluation indicator system presented in Table 1 as the primary input. Data corresponding to each indicator—including structured behavioral data, management operation data, and unstructured textual feedback—are incorporated into a unified processing pipeline. Through data preprocessing and normalization, the model retains the essential characteristics of indicator information while reducing noise, thereby ensuring a reliable foundation for subsequent analysis (Zhai, Shi, & Guo, 2024). At the core of the model design, artificial intelligence technologies are applied to enable adaptive learning of indicator weights and integrated analysis of multiple indicators. Unlike traditional approaches that depend on expert judgment for weight assignment, the proposed model employs machine learning algorithms to learn the relative contributions of indicators from historical evaluation data. This enables the model to capture nonlinear relationships among indicators and to dynamically adjust weights in response to changing data patterns, improving its ability to reflect actual educational service conditions. During operation, evaluation results are continuously updated as new data are introduced, transforming the evaluation process from a static assessment into a process-oriented and dynamic analysis. Overall, the proposed model aligns structurally with the evaluation framework and provides a solid methodological basis for subsequent result analysis and feedback mechanisms, supporting the practical application of artificial intelligence in educational service quality evaluation (Ding & Magerko, 2025).

4.2 Intelligent Analysis and Feedback Mechanism of Evaluation Results

In an AI-driven educational service quality evaluation system, the value of evaluation results lies not only in describing the current state of educational services, but also in supporting continuous improvement and management decision-making. Therefore, it is necessary to incorporate intelligent analysis and feedback mechanisms based on model outputs, enabling deeper interpretation and practical application of evaluation results (Maurya & Kochmar, 2025). Based on the evaluation model developed in the previous section, evaluation outcomes are presented as multidimensional quality scores and indicator performance profiles. Artificial intelligence technologies play a key role in result visualization by transforming complex outputs into intuitive charts and trend representations. This approach allows educational managers and relevant stakeholders to quickly grasp the overall level and structural characteristics of educational service quality, improving the readability of results and facilitating communication among different participants. In terms of trend prediction, artificial

intelligence models integrate historical evaluation data with real-time inputs to analyze and forecast changes in educational service quality. By identifying patterns in key indicator variations, the system can detect potential risks or emerging issues at an early stage and provide timely alerts for management (Farhan, Sadiq, Zwayyer, & Arnout, 2024). This capability extends evaluation from post hoc assessment to proactive monitoring and process-oriented analysis, enhancing its forward-looking value. At the decision-support level, evaluation results are further translated into targeted improvement recommendations through intelligent analysis. By combining indicator performance with historical optimization outcomes, artificial intelligence technologies generate differentiated strategies for improving specific service components, thereby reducing reliance on subjective judgment and increasing the precision of management interventions. Furthermore, evaluation results are continuously fed back into educational service operations, forming a closed-loop feedback mechanism. As new data are incorporated, evaluation outcomes are dynamically updated, supporting sustained improvement through ongoing monitoring and adjustment. Overall, this intelligent analysis and feedback mechanism enables the evaluation system to function as a dynamic and practice-oriented tool for long-term educational governance and service optimization (Educational Evaluation in the Age of Artificial Intelligence: Challenges and Innovations, 2024).

5. Empirical Analysis or Application Case Study

To examine the feasibility and effectiveness of the AI-driven educational service quality evaluation system in practical settings, this study selects the online teaching and learning support service platform of a comprehensive university as an application case and conducts an empirical analysis of the proposed evaluation model. In recent years, the university has actively advanced educational informatization, with teaching activities, learning support, and management services largely dependent on digital platforms. This has resulted in relatively complete data accumulation related to teaching processes, learning behaviors, and service feedback, providing favorable conditions for artificial intelligence–based evaluation. The evaluation covered online course teaching services, learning support services, and related management assurance services over one academic semester. Data were collected from learning behavior records on the teaching platform, course interaction logs, operational data from teaching management systems, and students' textual feedback. These data included both structured behavioral data and unstructured text data (A systematic review on the future of educational assessment, 2026). Following preprocessing, all data were mapped to corresponding indicator dimensions defined in the educational service quality evaluation indicator system, forming the input dataset for the evaluation model. During model operation, multi-source data were integrated, and artificial intelligence algorithms were applied to automatically learn indicator weights without relying on expert-defined assignments. The model conducted a comprehensive evaluation across dimensions such as teaching quality, service support, management assurance, and learning environment. The results showed strong performance in teaching interaction and learning support, while revealing potential weaknesses in

course resource utilization efficiency and responsiveness to student feedback. Further intelligent analysis enabled trend assessment and problem diagnosis. By examining changes in key indicators over the semester, the system identified a clear association between teaching interaction frequency and learning outcomes, as well as fluctuations in certain support service indicators during peak teaching periods. These findings provided administrators with clear evidence for targeted intervention. Evaluation results were visualized and delivered to teaching management departments to support service optimization. Following adjustments to learning support processes and resource allocation, several key indicators showed noticeable improvement, confirming the practical value of the AI-driven evaluation system in supporting continuous enhancement of educational service quality (Mustafa et al., 2024).

6. Conclusion

With the continuous advancement of educational digitalization and intelligent transformation, the scientific and dynamic evaluation of educational service quality has become a fundamental issue in modern educational governance. In response to this demand, this study constructs an artificial intelligence–driven educational service quality evaluation system based on multi-source data integration and intelligent analysis. By systematically designing the evaluation framework, indicator system, and evaluation model, the study demonstrates how artificial intelligence can overcome the limitations of traditional evaluation approaches in terms of static indicators, limited data sources, and delayed application of results. From a theoretical perspective, this research proposes a "data–model–feedback" closed-loop evaluation paradigm, which conceptualizes educational service quality evaluation as a continuous and adaptive process rather than a one-time assessment. The construction of a dynamically adjustable indicator system further extends existing research by providing a data-driven alternative to fixed indicators and subjective weighting methods. From a practical perspective, the proposed system offers an operable technical pathway for educational administrators to conduct comprehensive assessment, trend monitoring, and targeted improvement of educational services, thereby supporting the transformation of educational governance toward evidence-based decision making.

Nevertheless, this study also has limitations. The extensive use of multi-source educational data raises challenges related to data privacy protection and ethical governance, while the interpretability of AI-based evaluation models requires further enhancement. In addition, the applicability of the proposed system across different cultural contexts and educational stages has not yet been fully validated. Future research may address these issues by incorporating privacy-preserving technologies, explainable artificial intelligence methods, and cross-context empirical studies to further refine and generalize AI-driven educational service quality evaluation systems.

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