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THE POTENTIAL OF LEARNING ANALYTICS IN MANAGING THE QUALITY OF PRIMARY EDUCATION

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Abstract. The rapid digital transformation of education has created new opportunities for improving the management and quality assurance of primary education. One of the most promising approaches is learning analytics, which enables educational institutions to collect, process, interpret, and use data generated during learning activities. This article examines the potential of learning analytics in managing the quality of primary education. Particular attention is paid to the use of learning data for monitoring student progress, identifying learning difficulties, supporting individualized instruction, improving teacher decision-making, evaluating educational processes, and developing evidence-based management strategies. The study applies theoretical analysis, comparative analysis, system analysis, pedagogical modelling, and generalisation of contemporary research. The proposed model integrates data collection, data processing, learning analysis, early identification of learning difficulties, pedagogical intervention, monitoring, feedback, and quality improvement. The study demonstrates that learning analytics can transform educational quality management from a predominantly retrospective process into a continuous, evidence-based, and preventive system. At the same time, successful implementation requires teacher data literacy, reliable digital infrastructure, ethical data governance, privacy protection, and careful interpretation of analytical results.

Keywords: learning analytics, primary education, educational quality, data-driven management, student progress, digital transformation, learning outcomes, educational monitoring.

Introduction. The digital transformation of education is changing the ways in which educational institutions collect information, monitor learning processes, evaluate outcomes, and make managerial decisions. Digital learning platforms, electronic assessment systems, learning management systems, and educational applications generate increasing amounts of information about students' learning activities. When appropriately collected and interpreted, these data can provide valuable evidence for improving teaching and educational management.

UNESCO defines learning analytics as an emerging field in which data concerning learning processes can be analysed to generate insights into learning dynamics and support evidence-based decision-making. The 2023 UNESCO Global Education Monitoring Report also notes that learning analytics can support formative feedback and early detection of learning difficulties, while emphasising the importance of data literacy and institutional capacity. In primary education, the potential value of learning analytics is particularly significant. Young learners have diverse levels of prior knowledge, learning pace, motivation, and support needs. Traditional assessment conducted at the end of a learning unit may identify achievement differences but may not provide sufficiently

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timely information for preventing learning difficulties. Learning analytics can complement traditional assessment by providing continuous information about learning behaviour and progress. The OECD describes learning analytics as the use of data analytics to understand and improve teaching and learning. Digital learning environments can generate information about student engagement and learning activities that can be connected with learning outcomes to support student success. Therefore, the development of learning analytics in primary education can contribute to a transition from reactive quality management toward continuous monitoring, early intervention, personalised support, and evidence-based decision-making. The purpose of this study is to examine the potential of learning analytics in managing the quality of primary education and to develop a conceptual model for integrating learning analytics into educational quality management.

Literature Review. Learning analytics has developed into an important area of educational technology research. Its fundamental purpose is to transform large volumes of educational data into information that can support pedagogical and managerial decisions.

UNESCO identifies learning analytics as an approach capable of processing learner data, visualising learning dynamics, and supporting evidence-based decisions. At the same time, UNESCO stresses the importance of critically considering ethical issues and the limitations of computational models.

The 2023 UNESCO Global Education Monitoring Report indicates that learning analytics can contribute to formative feedback and early detection systems. However, effective use requires sufficient data literacy among educational actors and institutional capacity to interpret and act upon analytical information.

Recent research specifically examining K–12 education provides additional evidence. A 2024 qualitative metasynthesis of 47 publications identified potential benefits of learning analytics including more equitable instruction, individualised learning, and enhanced assessment for learning. At the same time, the review highlighted concerns related to privacy, misuse of data, and misinterpretation of analytical results.

Research focused specifically on primary education also suggests that learning analytics can support self-regulated learning when analytics are appropriately connected with learning design. A 2024/2025 study involving primary-school classes found that learning design influences students' self-regulated learning behaviours and the ways in which learning analytics can be interpreted.

UNESCO's more recent work on digital transformation further emphasises the importance of data and evidence systems, interoperability, data quality, data protection, and ethical use of AI in education.

Consequently, the literature demonstrates that learning analytics should not be understood merely as a technological tool. It represents an integrated approach connecting educational data, pedagogical interpretation, professional judgement, and quality improvement.

Research results and discussion. The analysis conducted in this study demonstrates that learning analytics has considerable potential for improving the management of educational quality in primary education institutions. The findings indicate that the systematic collection, integration, analysis, and interpretation of learning data can transform quality management from a predominantly retrospective assessment process into a continuous and evidence-based management system. The results demonstrate that the main value of learning analytics is not the accumulation of large amounts

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of data but the transformation of educational data into meaningful pedagogical decisions. In this context, the effectiveness of learning analytics can be represented as:

Data → Analysis → Interpretation → Decision → Intervention → Monitoring → Improvement.

This sequence establishes a direct connection between digital information and educational action.

The analysis of contemporary research also demonstrates that learning analytics can support individualised learning, assessment for learning, and more equitable instructional practices. However, existing evidence does not justify assuming that the mere introduction of analytics automatically improves educational outcomes. A 2024 qualitative metasynthesis of 47 K–12 studies identified both potential benefits and significant concerns, particularly regarding privacy, misuse, and misinterpretation of data. Learning Analytics as a Tool for Continuous Quality Monitoring. One of the main results of the study is the identification of learning analytics as an effective mechanism for continuous monitoring of student progress. Traditional quality monitoring often relies on periodic examinations, end-of-term grades, attendance records, and teacher reports. Such information is useful, but it may provide only a limited picture of the learning process. Learning analytics makes it possible to examine learning activity continuously through digital assessment systems, learning platforms, electronic portfolios, and other educational technologies.

The proposed monitoring structure is presented below:

Initial Assessment → Continuous Data Collection → Data Analysis → Progress Identification → Pedagogical Intervention → Reassessment.

This approach enables teachers to identify changes in student performance before difficulties become persistent. UNESCO emphasises that data and evidence are important for monitoring learning quality and improving educational processes. The OECD similarly notes that learning analytics can generate information about student engagement and learning outcomes and can serve as an additional source of evidence for improving teaching and educational decision-making.

Identification of Individual Learning Needs. The research results indicate that one of the most significant potentials of learning analytics is the identification of individual learning needs. Primary-school students differ considerably in their prior knowledge, learning pace, motivation, interests, and learning difficulties. Therefore, a uniform approach to all students may not provide equally effective learning opportunities.

Learning analytics can help construct an individual learning profile based on several indicators:

- assessment results;
- task completion;
- frequency of participation;
- types of errors;
- reading progress;
- mathematical performance;
- learning activity;
- attendance;
- feedback responses;
- self-assessment results.

For example, if a student repeatedly demonstrates difficulties with a particular mathematical concept, the analytical system can identify the pattern and provide information for the teacher. The

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teacher can then design additional exercises, provide differentiated explanations, or organise individual support.

The proposed individualisation mechanism can be expressed as:

Learning Data → Individual Learning Profile → Learning Need → Differentiated Support → Progress Monitoring.

This result is consistent with recent research showing that learning analytics can contribute to individualised learning and assessment for learning in K–12 education.

Discussion. The analysis demonstrates that learning analytics has considerable potential for transforming quality management in primary education. First, learning analytics can make quality management more continuous. Instead of relying primarily on periodic examinations, teachers and school leaders can monitor learning progress throughout the educational process. Second, analytics can make management more preventive. When patterns of difficulty are identified early, schools can provide support before learning gaps become more significant. Third, learning analytics can make management more individualised. Student learning profiles can help teachers identify differences in progress and design differentiated support. Fourth, learning analytics can strengthen evidence-based decision-making. UNESCO's work on education data emphasises that data are valuable when they are high quality, interpreted in context, and combined with other relevant information. Fifth, learning analytics can contribute to institutional learning. Aggregated data can help school leaders identify broader patterns and evaluate the effectiveness of educational interventions. However, the analysis also demonstrates that learning analytics should not be treated as an autonomous decision-making system. The most appropriate model is a human-centred approach in which algorithms identify patterns, while teachers and educational leaders interpret those patterns within pedagogical and social contexts. Thus, the effective use of learning analytics depends not only on software and infrastructure but also on data literacy, leadership, teacher competence, ethical governance, and organisational culture.

Conclusion. Learning analytics has significant potential to improve the management of primary education quality by transforming educational data into meaningful evidence for pedagogical and managerial decision-making. The analysis presented in this study demonstrates that learning analytics can support a continuous quality-management cycle based on data collection, integration, analysis, interpretation, intervention, monitoring, and improvement. Rather than relying exclusively on traditional summative assessment, primary education institutions can use learning analytics to obtain more timely information about students' learning progress, participation, difficulties, and individual educational needs. One of the major findings of the study is that learning analytics can strengthen individualized and differentiated approaches in primary education. By analysing learning outcomes and patterns of student activity, teachers can identify learning gaps and provide more targeted pedagogical support. At the classroom level, analytics can also support teachers in monitoring engagement and deciding when instructional intervention or adaptation may be required. At the institutional level, learning analytics can contribute to evidence-informed management by connecting individual student data with classroom- and school-level information. This creates opportunities for school leaders to identify trends, monitor educational processes, evaluate interventions, and develop more informed quality-improvement strategies. OECD research indicates that learning analytics can provide summative, real-time, and predictive insights that support learning, teaching, organisational efficiency, and educational decision-making. In this context, the sustainable use of learning analytics

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in primary education requires an integrated approach that combines data quality, analytical capacity, teacher competence, timely pedagogical intervention, continuous monitoring, and ethical governance. Such an approach can contribute to the development of a more responsive, evidence-informed, learner-centred, and continuously improving primary education system.

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