DATA-DRIVEN MANAGEMENT MODEL IN PRIMARY EDUCATION MANAGEMENT

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Abstract. The digital transformation of education has significantly changed the principles and mechanisms of educational management. In primary education, effective management increasingly requires the systematic collection, analysis, interpretation, and application of educational data to support evidence-based decision-making. This article examines the theoretical and practical foundations of a data-driven management model for primary education management. The study analyzes the role of student achievement data, attendance records, formative assessment results, teacher performance indicators, parental engagement, and digital learning analytics in improving managerial decision-making. A conceptual model is proposed that integrates data collection, data processing, analytical interpretation, decision-making, implementation, monitoring, and feedback into a continuous management cycle. The article argues that data-driven management can contribute to more targeted resource allocation, early identification of learning difficulties, differentiated educational planning, teacher professional development, and continuous improvement of educational quality. At the same time, effective implementation requires data literacy among school leaders and teachers, reliable digital infrastructure, data protection mechanisms, ethical standards, and institutional readiness. The proposed model provides a methodological framework for integrating educational data into strategic and operational management processes in primary education.

Keywords: data-driven management, primary education, educational management, learning analytics, data literacy, decision-making, digital transformation, educational quality.

Introduction. The rapid development of digital technologies has transformed educational institutions from traditionally administrated organizations into increasingly data-intensive environments. Schools generate significant amounts of information related to student achievement, attendance, assessment, teaching practices, parental participation, and educational resources. When appropriately collected and interpreted, such information can support evidence-based management and contribute to the continuous improvement of educational outcomes. Primary education represents a particularly important context for data-driven management because learning difficulties and developmental needs that emerge during the early years of schooling can influence students' subsequent educational trajectories. Consequently, school leaders and teachers require timely and reliable information to identify

learning gaps, monitor student progress, allocate resources, and design appropriate pedagogical interventions. The concept of data-driven decision-making has become increasingly important in educational management. Schildkamp et al. argue that data use in education should not be reduced to the collection of information; rather, it involves a systematic process in which educators interpret relevant data and translate evidence into actions aimed at improving educational practice. Similarly, the OECD emphasizes the importance of using reliable evidence and information for improving educational policies and institutional decision-making. In primary education management, however, data-driven approaches should be adapted to the developmental characteristics of young learners. Excessive reliance on standardized indicators may narrow the understanding of educational quality. Therefore, quantitative information should be combined with qualitative evidence, teacher observations, student feedback, and parental perspectives. The purpose of this study is to develop a conceptual data-driven management model applicable to primary education and to identify the major organizational, technological, and pedagogical conditions required for its effective implementation.

Literature Review. The theoretical foundations of data-driven educational management are associated with evidence-based decision-making, learning analytics, educational leadership, and organizational learning. Schildkamp, Poortman, Ebbeler, and Pieters emphasize that effective data use requires a structured inquiry process in which educational practitioners identify problems, collect relevant data, analyze evidence, formulate hypotheses, implement interventions, and evaluate their effects. From this perspective, data become valuable only when they contribute to meaningful educational improvement. Datnow and Hubbard consider data-driven decision-making as an organizational process that requires not only technical access to data but also appropriate leadership, collaborative cultures, professional learning, and institutional capacity. Thus, the effectiveness of data-driven management depends on the interaction between technological systems and human competencies. Learning analytics provides another important theoretical foundation. Siemens and Long describe learning analytics as the measurement, collection, analysis, and reporting of data about learners and their contexts with the purpose of understanding and optimizing learning and the environments in which learning occurs. Although learning analytics is frequently associated with higher education and online learning, its principles can also be adapted to primary education through age-appropriate monitoring of learning progress. The concept of educational leadership is also closely connected with data use. Effective school leaders establish organizational conditions in which teachers can collaboratively examine evidence, identify educational problems, and develop improvement strategies. Consequently, data literacy becomes an important component of contemporary educational leadership. Recent international approaches increasingly emphasize that digital transformation in education should not be understood simply as the introduction of digital devices. It involves organizational transformation, development of digital competencies, responsible data governance, and the creation of evidence-based decision-making cultures.

Research Methodology. The study employs a theoretical and conceptual research methodology. The following methods were used: analysis of scientific and pedagogical literature, comparative analysis, systems analysis, competency-based analysis, modeling, synthesis and generalization. The research focuses on identifying the structural components of

data-driven management and establishing relationships among data collection, analysis, managerial decision-making, implementation, monitoring, and feedback.

The conceptual framework is based on the assumption that educational management can be represented as a continuous data-management cycle:

Data Collection → Data Processing → Data Analysis → Decision-Making → Implementation → Monitoring → Feedback → New Data Collection

This cycle transforms educational data from passive information into an instrument for continuous organizational improvement.

Results. The proposed data-driven management model for primary education consists of seven interconnected components.

Component	Main Function	Examples
Data collection	Gathering relevant information	Assessment, attendance, behavior, participation
Data integration	Combining information from different sources	Student information systems, LMS, assessment platforms
Data analysis	Identifying trends and problems	Achievement gaps, attendance patterns
Decision-making	Developing evidence-based solutions	Intervention plans, resource allocation
Implementation	Applying managerial decisions	Individual support, teacher development
Monitoring	Measuring implementation and outcomes	Progress indicators, periodic assessment
Feedback	Adjusting management strategies	Corrective actions and new planning

The first component is data collection. Primary schools may obtain data from formative and summative assessments, attendance systems, classroom observations, student portfolios, digital learning platforms, parent communication systems, and teacher reports. However, not all available data should automatically be incorporated into managerial decision-making. Data should be selected according to relevance, reliability, validity, timeliness, and ethical considerations.

Data Classification in Primary Education Management. Educational data can be classified into several categories. Academic data include grades, formative assessment results, reading and mathematical literacy indicators, learning progress, and achievement levels. Behavioral data include attendance, participation, classroom behavior, homework completion, and engagement. Organizational data include teacher workload, classroom utilization, availability of learning materials, and implementation of educational programs. Stakeholder data include parent feedback, teacher perceptions, and student experiences. Digital data may include interaction with learning platforms, completion of digital tasks, and learning activity patterns. The integration of these categories allows school managers to develop a more comprehensive understanding of educational processes.

Data-Based Identification of Learning Problems. One of the main advantages of data-driven management is the possibility of identifying educational problems at an early stage. For example, if a student demonstrates declining reading performance over several assessment cycles while attendance remains stable, the school can initiate a more detailed diagnostic process. Teachers can then examine reading fluency, comprehension, vocabulary development, and other relevant factors. Thus, data-driven management supports the

transition from reactive management to preventive management. Instead of waiting until a student experiences serious academic failure, managers and teachers can identify early warning indicators and provide timely support.

Data can also improve the allocation of educational resources. Suppose assessment data demonstrate that a significant proportion of students in a particular grade experience difficulties in mathematical problem-solving. In this situation, school management can prioritize:

- additional instructional materials;
- teacher professional development;
- targeted remedial activities;
- small-group instruction;
- digital learning resources.

Therefore, resource allocation can be based not only on general administrative assumptions but also on identified educational needs.

Teacher Professional Development. A data-driven management model should also support teacher professional development. Analysis of student learning outcomes can reveal areas in which teachers may need methodological support. Importantly, such data should not be used primarily as a punitive instrument. Instead, they should serve as evidence for identifying professional learning needs.

For example, if several classes demonstrate persistent difficulties in reading comprehension, school leaders may organize professional development focused on:

- reading strategies;
- formative assessment;
- differentiated instruction;
- literacy development;
- student-centered pedagogical approaches.

This creates a connection between student data and teacher learning.

Discussion. The findings indicate that data-driven management has the potential to strengthen the effectiveness of primary education management by making managerial decisions more systematic, transparent, and evidence-based. However, the presence of large amounts of data does not automatically lead to better management. A fundamental challenge is data literacy. Teachers and school leaders need to understand what particular indicators mean, how reliable they are, and how they should influence managerial decisions. Another important issue is data overload. When educational institutions collect excessive amounts of information without clearly defined purposes, data may become an administrative burden rather than a management resource. Therefore, schools should establish clear principles regarding which data are necessary and how frequently they should be analyzed. The second important issue concerns the quality of data. Inaccurate, incomplete, outdated, or inconsistently collected information can lead to inappropriate decisions. Consequently, data quality assurance should be an integral part of the proposed model. The third issue is ethical data use. Primary school students are children, which makes privacy and responsible information management particularly important. Student data should be collected and used only for legitimate educational purposes, with appropriate safeguards against unauthorized access and inappropriate disclosure. The fourth issue concerns the human dimension of

educational management. Data cannot replace professional judgment. Quantitative indicators should be interpreted within the pedagogical context of individual learners and classrooms. For example, low attendance may be associated with different circumstances, and the same numerical indicator may require different interventions for different students.

Therefore, the proposed model emphasizes the combination of data evidence + professional judgment + collaborative analysis.

The effective implementation of the model requires several conditions.. First, schools need appropriate digital infrastructure, including student information systems, assessment platforms, secure databases, and analytical tools. Second, school leaders and teachers need data literacy. Professional development should therefore include basic principles of educational statistics, data interpretation, visualization, evidence-based decision-making, and ethical data management. Third, schools need a culture of collaboration. Data should be discussed collectively through professional learning communities, methodological meetings, and collaborative planning. Fourth, data governance policies should define responsibilities related to data collection, storage, access, protection, and use. Fifth, management systems should integrate quantitative and qualitative information. Numerical indicators should be complemented by observations, interviews, student work, portfolios, and teacher reflections.

Conclusion. Data-driven management represents an important direction in the modernization of primary education management. The proposed model demonstrates that educational data can support a continuous management cycle consisting of data collection, integration, analysis, evidence-based decision-making, implementation, monitoring, and feedback. The study establishes that the effectiveness of this approach depends not only on digital technologies but also on human and organizational factors. Data literacy, professional collaboration, leadership capacity, data quality, ethical standards, and institutional readiness are essential conditions for successful implementation. In primary education, data-driven management should primarily serve the educational development of children rather than merely administrative control. Therefore, student achievement data, attendance information, formative assessment results, teacher observations, and stakeholder feedback should be interpreted comprehensively. The integration of data analytics with professional pedagogical judgment can enable school leaders and teachers to identify learning difficulties earlier, allocate resources more effectively, support teacher professional development, and improve educational quality. Consequently, the data-driven management model can be considered not simply a technological innovation but a comprehensive organizational approach to evidence-based management and continuous improvement in primary education.

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