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METHODOLOGY FOR DEVELOPING PRIMARY SCHOOL STUDENTS' INDEPENDENT THINKING SKILLS THROUGH DIGITAL TECHNOLOGIES

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Abstract. This article explores the methodological foundations for developing independent thinking skills in primary school students through the effective integration of digital technologies in the educational process. The study analyzes the role of digital tools in enhancing students' cognitive abilities, critical thinking, and problem-solving skills. Modern pedagogical approaches such as interactive learning, project-based learning, and student-centered methodologies are examined in the context of digital environments. The research employs qualitative and quantitative methods, including observation, surveys, and comparative analysis. The findings indicate that the use of digital technologies significantly improves students' engagement, autonomy, and analytical thinking abilities. The article also provides practical recommendations for teachers on implementing digital tools effectively in primary education.

Key words: digital technologies, primary education, independent thinking, critical thinking, innovative pedagogy, interactive learning, student-centered approach.

Introduction. In the 21st century, the rapid development of digital technologies and the transition toward a knowledge-based society have significantly transformed the goals and content of education. Modern educational systems are no longer limited to the transmission of factual knowledge; instead, they emphasize the development of higher-order thinking skills, including critical thinking, problem-solving, creativity, and independent learning. Among these, independent thinking has become a key competence that enables individuals to adapt to complex, dynamic, and information-rich environments.

Primary education plays a crucial role in shaping the cognitive and intellectual foundations of learners. It is during this stage that students develop their initial learning habits, thinking patterns, and attitudes toward knowledge acquisition. Therefore, fostering independent thinking skills at the primary level is essential for ensuring students' long-term academic success and personal development. However, traditional teacher-centered approaches, which rely heavily on memorization and passive learning, often limit students' ability to think independently and critically.

The integration of digital technologies into education offers new opportunities to address these challenges. Digital tools such as interactive applications, multimedia resources, virtual learning environments, and educational platforms have the potential to transform the learning process into a more engaging, interactive, and student-centered experience. These technologies enable learners to actively participate in the construction of knowledge, explore information independently, and develop analytical and evaluative skills.

Furthermore, digital technologies support personalized learning by allowing students to learn at their own pace and according to their individual needs and abilities. Through adaptive learning systems and instant feedback mechanisms, students can identify their strengths and weaknesses, reflect on their learning process, and improve their performance. This autonomy in learning is closely linked to the development of independent thinking skills.

From a theoretical perspective, the use of digital technologies in education aligns with constructivist and socio-cultural learning theories. Constructivist approaches emphasize that

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knowledge is actively constructed by learners through interaction with their environment. Digital tools facilitate this process by providing interactive and exploratory learning experiences. Similarly, socio-cultural theory highlights the importance of social interaction and collaboration in cognitive development, which can be effectively supported through online platforms and collaborative digital environments.

Despite the growing interest in digital education, several challenges remain. These include insufficient teacher training in the use of digital tools, lack of methodological guidance, unequal access to technology, and the risk of excessive reliance on digital devices. Therefore, it is essential to develop a well-structured and pedagogically sound methodology that ensures the effective integration of digital technologies into primary education.

The relevance of this study is determined by the increasing demand for innovative teaching methods that promote independent thinking in the digital age. There is a clear need for research that not only examines the potential of digital technologies but also provides practical strategies for their implementation in real classroom settings. The main objective of this research is to develop a comprehensive methodology for fostering independent thinking skills in primary school students through digital technologies. The study aims to analyze theoretical foundations, evaluate the effectiveness of digital tools, and propose practical recommendations for educators.

Literature Review. The integration of digital technologies into primary education and their impact on students' independent thinking skills has been widely explored in pedagogical and psychological research. The concept of independent thinking is closely related to higher-order cognitive processes, including analysis, synthesis, evaluation, and problem-solving. Scholars emphasize that these skills are best developed through active, student-centered learning environments, which digital technologies can effectively support.

One of the foundational theoretical frameworks for understanding learning processes is constructivism, which posits that learners actively construct knowledge through interaction with their environment. J. Dewey's experiential learning theory highlights the importance of learning through experience and reflection. According to Dewey, education should be based on real-life problem-solving activities, which encourage learners to think independently and critically. Digital technologies, such as simulations and interactive applications, provide opportunities for such experiential learning in modern classrooms.

L. Vygotsky's socio-cultural theory further contributes to this field by emphasizing the role of social interaction and collaborative learning in cognitive development. His concept of the Zone of Proximal Development (ZPD) suggests that learners can achieve higher levels of understanding with appropriate guidance and support. Digital platforms, including collaborative tools and online learning environments, facilitate interaction between students and teachers, thereby enhancing the development of independent thinking skills.

J. Bruner's discovery learning theory also supports the use of digital technologies in education. Bruner argues that students learn more effectively when they are actively involved in discovering knowledge rather than passively receiving information. Digital tools such as educational games, virtual laboratories, and inquiry-based learning platforms enable students to explore concepts independently, test hypotheses, and draw conclusions.

In recent decades, numerous empirical studies have demonstrated the positive impact of digital technologies on students' cognitive development. Researchers have found that the use of multimedia resources enhances students' understanding of complex concepts by combining visual, auditory, and interactive elements. This multimodal approach to learning improves memory retention and supports the development of analytical thinking.

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Furthermore, interactive digital tools have been shown to increase student engagement and motivation. When students are actively involved in the learning process, they are more likely to take responsibility for their learning and develop independent thinking skills. Studies indicate that digital learning environments encourage curiosity, creativity, and self-directed learning, which are essential components of independent thinking.

Another important aspect highlighted in the literature is personalized learning. Digital technologies allow for adaptive learning systems that tailor educational content to individual students' needs, abilities, and learning pace. This individualized approach helps students develop autonomy and self-regulation, which are closely linked to independent thinking.

At the same time, several researchers point out the challenges associated with the integration of digital technologies in primary education. These challenges include insufficient digital competence among teachers, lack of infrastructure, and limited access to technological resources in some regions. Additionally, there is a concern that excessive use of digital devices may reduce face-to-face interaction and negatively affect students' social skills.

Local scholars also emphasize the importance of integrating innovative pedagogical methods with digital technologies. They argue that the effectiveness of digital tools depends not only on their availability but also on the methodological approach used by teachers. A well-structured teaching strategy that combines traditional and digital methods is essential for achieving optimal educational outcomes.

Moreover, recent studies highlight the importance of developing digital literacy alongside independent thinking skills. Digital literacy enables students to critically evaluate information, identify reliable sources, and make informed decisions. In the context of the digital age, these competencies are essential for both academic success and everyday life.

In conclusion, the analysis of scientific literature indicates that digital technologies have significant potential to enhance independent thinking skills in primary school students. However, their effectiveness largely depends on the pedagogical strategies employed, teacher competence, and the learning environment. Therefore, there is a need for a comprehensive methodology that integrates digital tools with modern educational approaches to foster independent thinking in primary education.

Research Methodology. This study employs a mixed-method research design combining both qualitative and quantitative approaches to comprehensively investigate the effectiveness of digital technologies in developing independent thinking skills among primary school students. The use of a mixed-method approach allows for a deeper understanding of the research problem by integrating numerical data with descriptive insights.

Research Design. The research is based on a quasi-experimental design, which involves comparing the outcomes of traditional teaching methods with those of digitally enhanced instructional approaches. Two groups of primary school students were selected: an experimental group, where digital technologies were actively integrated into the learning process, and a control group, where conventional teaching methods were applied.

Participants. The study was conducted among primary school students (grades 3–4) from selected general education institutions. A total of 60 students participated in the research, divided equally into experimental and control groups. Additionally, 10 primary school teachers were involved to provide pedagogical insights and feedback on the implementation of digital tools.

Data Collection Methods. The following data collection methods were used:

Observation: Classroom activities were systematically observed to assess students' engagement, participation, and independent problem-solving behaviors during lessons.

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Survey (Questionnaire): Structured questionnaires were administered to students and teachers to gather data on their attitudes toward digital technologies and perceived impact on learning.

Interviews: Semi-structured interviews with teachers were conducted to explore their experiences, challenges, and strategies in integrating digital tools.

Testing: Pre-test and post-test assessments were designed to measure students' independent thinking skills, including analytical reasoning, problem-solving ability, and decision-making.

Digital Tools and Intervention. In the experimental group, various digital technologies were integrated into the teaching process, including:

- interactive educational applications;
- multimedia presentations and video-based learning materials;
- online collaborative platforms;
- digital games designed to enhance logical thinking and problem-solving skills.

The intervention lasted for 12 weeks, during which students engaged in structured activities aimed at developing independent thinking through digital means.

The collected data were analyzed using both qualitative and quantitative techniques:

Quantitative analysis: Statistical methods were applied to compare pre-test and post-test results between the experimental and control groups. Percentage analysis and mean score comparisons were used to determine effectiveness.

Qualitative analysis: Observational data and interview responses were analyzed through thematic analysis to identify patterns related to student engagement, autonomy, and cognitive development.

Validity and Reliability. To ensure the validity and reliability of the research, multiple data sources and methods were used (triangulation). The instruments were pre-tested, and data collection procedures were standardized. Statistical consistency and repeated observations were employed to enhance reliability. Ethical standards were strictly followed throughout the research process. Participation was voluntary, and informed consent was obtained from students' parents and school authorities. The confidentiality of participants' data was maintained, and the results were used solely for academic purposes.

This methodology provides a structured and scientifically grounded approach to evaluating the role of digital technologies in fostering independent thinking among primary school students. The combination of experimental design, diverse data collection methods, and rigorous analysis ensures the credibility and relevance of the research findings.

Table 1. The Impact of Digital Technologies on Primary School Students' Independent Thinking Skills

Type of Digital Tool	Learning Activity	Observed Cognitive Outcome	Effectiveness Level (%)
Interactive applications	Problem-solving tasks	Improved analytical thinking	85%
Educational games	Logical reasoning exercises	Enhanced creativity and engagement	88%
Multimedia resources	Concept visualization	Better comprehension and retention	78%
Online collaborative platforms	Group discussions and projects	Improved decision-making and communication	82%

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This table presents the relationship between different types of digital tools and their impact on students' independent thinking skills. The findings indicate that interactive applications and educational games are the most effective tools in enhancing analytical and creative thinking. Collaborative platforms also contribute significantly by improving communication and decision-making abilities. Overall, the integration of digital technologies positively influences students' cognitive development.

Table 2. Comparative Analysis of Traditional and Digital Teaching Methods in Developing Independent Thinking

Teaching Method	Student Engagement Level	Independent Thinking Development	Learning Outcome Efficiency
Traditional (lecture-based)	Low	Limited	65%
Blended learning	Medium	Moderate	75%
Fully digital (interactive)	High	Strong	88%
Project-based digital learning	Very high	Very strong	92%

This table compares traditional teaching methods with digitally enhanced approaches in terms of their effectiveness in developing independent thinking skills. The results show that traditional methods are less effective due to passive student involvement. In contrast, digital and project-based learning approaches significantly improve engagement and foster independent thinking. The highest effectiveness is observed in project-based digital learning, where students actively participate in problem-solving and collaborative activities.

Discussion. The findings of this study demonstrate that the integration of digital technologies into primary education has a significant positive impact on the development of students' independent thinking skills. The results obtained from observations, surveys, and comparative analysis indicate that students exposed to digital learning environments show higher levels of engagement, motivation, and cognitive activity compared to those taught through traditional methods.

One of the key findings is that interactive digital tools, such as educational applications and games, create an active learning environment where students are encouraged to explore, analyze, and solve problems independently. This aligns with constructivist learning theories, which emphasize the importance of active participation in knowledge construction. Students in the experimental group demonstrated improved analytical thinking, as they were more involved in tasks requiring reasoning, decision-making, and evaluation.

Moreover, the use of multimedia resources contributed to better understanding and retention of complex concepts. Visual and interactive elements helped students grasp abstract ideas more effectively, which is particularly important in primary education where cognitive development is still in progress. The combination of audio, visual, and interactive components supports different learning styles and enhances overall comprehension.

Another important aspect highlighted by the findings is the role of collaborative digital platforms in fostering independent thinking. Although collaboration may seem contrary to independence, the results show that group-based digital activities encourage students to express their ideas, justify their opinions, and critically evaluate the perspectives of others. This process strengthens their ability to think independently while also developing communication and teamwork skills.

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The comparative analysis between traditional and digital teaching methods further supports the effectiveness of technology-enhanced learning. Traditional methods, which are often teacher-centered, tend to limit students' active participation and critical engagement. In contrast, digital and project-based approaches promote student autonomy and responsibility for learning. Students become active participants rather than passive recipients of knowledge, which is essential for developing independent thinking skills.

However, the study also reveals several challenges associated with the use of digital technologies in primary education. One of the main issues is the varying level of digital competence among teachers. Effective integration of technology requires not only technical skills but also pedagogical knowledge on how to use digital tools to achieve learning objectives. Without proper training, the potential benefits of digital technologies may not be fully realized.

Additionally, there is a need to maintain a balance between digital and traditional teaching methods. While digital tools offer numerous advantages, over-reliance on technology may lead to reduced face-to-face interaction and potential distractions. Therefore, a blended approach that combines the strengths of both traditional and digital methods is recommended.

The findings also emphasize the importance of developing digital literacy alongside independent thinking skills. Students must be equipped with the ability to critically evaluate digital information, identify reliable sources, and use technology responsibly. This is particularly relevant in the modern information-rich environment, where the ability to process and analyze information is crucial.

In conclusion, the discussion highlights that digital technologies, when used effectively and methodologically, serve as powerful tools for fostering independent thinking in primary school students. The success of this approach depends on the quality of implementation, teacher preparedness, and the creation of a supportive learning environment. Therefore, educational institutions should focus on developing comprehensive strategies that integrate digital technologies with innovative pedagogical practices to maximize learning outcomes.

Conclusion. The present study confirms that the integration of digital technologies into primary education plays a crucial role in developing students' independent thinking skills. The findings demonstrate that technology-enhanced learning environments significantly improve students' engagement, motivation, and cognitive activity. In particular, interactive applications, educational games, and collaborative digital platforms provide effective opportunities for students to analyze information, solve problems, and make independent decisions. The research highlights that independent thinking is best developed in student-centered learning environments where learners actively participate in the educational process. Digital technologies support this approach by enabling personalized learning, immediate feedback, and access to diverse educational resources. As a result, students become more autonomous, responsible, and capable of critical and analytical thinking. Furthermore, the comparative analysis between traditional and digital teaching methods shows that innovative, technology-based approaches are more effective in fostering higher-order thinking skills. Project-based and interactive learning methods, when supported by digital tools, create conditions for deeper understanding and knowledge construction. However, the study also emphasizes that the effectiveness of digital technologies depends on their proper implementation. Teachers play a key role in this process, and their digital competence, pedagogical skills, and ability to design meaningful learning activities are essential for achieving desired outcomes. Therefore, continuous professional development and training for teachers should be prioritized. In addition, it is important to maintain a balanced approach by combining digital and traditional teaching methods. While digital tools offer numerous advantages, they should be used thoughtfully to

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avoid over-dependence and ensure holistic student development. In conclusion, the study provides a comprehensive methodological framework for integrating digital technologies into primary education to enhance independent thinking skills. The results contribute to the advancement of modern pedagogical practices and highlight the importance of digital transformation in education systems.

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