

Implementation of Higher-Order Thinking Skills (HOTS)-Based Curriculum in Elementary Education: Enhancing Educational Quality and Student Outcomes

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ABSTRACT

This research explores the implementation and impact of a Higher-Order Thinking Skills (HOTS)-based curriculum in elementary education, focusing on its influence on educational quality and student outcomes. The study synthesizes current research findings and compares them with previous studies to identify consistencies, advancements, and challenges in integrating HOTS-focused approaches into educational practices. Key findings indicate that HOTS-based education enhances critical thinking skills, improves academic performance, and prepares students for future workforce demands by fostering creativity, collaboration, and problem-solving abilities. The research underscores the importance of teacher professional development, technological integration, and collaborative efforts in sustaining effective HOTS initiatives. Future directions include longitudinal studies to assess long-term impacts, innovative assessment methods, and strategies for scaling successful HOTS practices across diverse educational contexts. By embracing HOTS principles, educators and policymakers can enhance educational outcomes and prepare students to succeed in a complex and interconnected global society.

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1. Introduction

In the rapidly evolving landscape of education, the emphasis on developing students' Higher-Order Thinking Skills (HOTS) has gained significant momentum (Sharma et al., 2020). HOTS encompasses critical, analytical, and creative thinking abilities, which are essential for students to navigate the complexities of the modern world. The traditional education system, often focused on rote memorization and basic comprehension, falls short in equipping students with these advanced cognitive skills (Sprenger, 2018). As a result, there is a growing recognition of the need to reform educational curricula to foster HOTS, particularly at the foundational elementary level.

The current state of elementary education reveals a critical gap in the development of students' thinking skills (Lai, 2011). Many educational systems worldwide still adhere to conventional teaching methods that prioritize knowledge recall over critical thinking and problem-solving. This approach not only limits students' intellectual growth but also hampers their ability to apply knowledge in real-world contexts (Barab & Plucker, 2002). Consequently, students often struggle to transition to higher levels of education and face challenges in adapting to the demands of the modern workforce. Addressing this issue requires a fundamental shift in educational practices, starting with the implementation of a HOTS-based curriculum.

Implementing a HOTS-based curriculum in elementary schools is pivotal in improving the quality of education (Tyas & Naibaho, 2021). A curriculum designed to enhance HOTS aims

to cultivate a deeper understanding of subject matter, encourage inquiry-based learning, and promote the application of knowledge in novel situations. By focusing on skills such as analysis, evaluation, and creation, a HOTS-based curriculum prepares students to think independently, solve complex problems, and make informed decisions. These competencies are increasingly valued in today's knowledge-driven society, where the ability to innovate and adapt is crucial for success.

The rationale for adopting a HOTS-based curriculum is supported by extensive educational research (Al Maawali, 2021). Studies have shown that students exposed to curricula emphasizing higher-order thinking exhibit improved academic performance, greater motivation, and enhanced cognitive abilities. Moreover, educators trained in HOTS-based teaching methods report higher levels of job satisfaction and a more dynamic classroom environment. Despite these positive outcomes, the implementation of such curricula remains limited, often due to systemic barriers such as inadequate teacher training, resistance to change, and insufficient resources (Nevenglosky, 2018).

Higher-Order Thinking Skills (HOTS) refer to a set of cognitive processes that involve complex thinking beyond mere memorization and recall of facts (Tikhonova & Kudinova, 2015). These skills include analysis, evaluation, synthesis, and creation, which are essential for problem-solving, critical thinking, and creativity. In the context of education, HOTS are crucial for preparing students to navigate the complexities of the modern world, where the ability to think critically and solve problems is highly valued.

HOTS can be understood through the framework of Bloom's Taxonomy, a widely recognized model that categorizes cognitive skills into lower-order and higher-order thinking (Febrina et al., 2019). The lower levels of Bloom's Taxonomy remembering, understanding, and applying focus on basic knowledge and comprehension. In contrast, the higher levels analyzing, evaluating, and creating require students to engage in deeper cognitive processes. Analysis involves breaking down information into components and understanding relationships between them (Leech & Onwuegbuzie, 2007). Evaluation requires making judgments based on criteria and standards. Creation involves generating new ideas, products, or ways of understanding.

The importance of HOTS in education cannot be overstated (Chabeli, 2006). In today's rapidly changing world, the ability to think critically and creatively is more important than ever. The traditional education system, which often emphasizes rote memorization and standard tests, falls short in developing these essential skills. Students who excel in recalling information may struggle when faced with real-world problems that require innovative solutions and critical judgment (Kek & Huijser, 2011). By integrating HOTS into the curriculum, educators can better prepare students for the challenges they will encounter in their academic and professional lives.

Firstly, HOTS foster a deeper understanding of subject matter. When students analyze information, evaluate different perspectives, and create new solutions, they gain a more comprehensive and nuanced understanding of the content (Petersen, 2021). This deep learning is more likely to be retained and applied in various contexts, compared to surface learning that focuses solely on memorization. For example, in a science class, students who engage in experiments and analyze data are more likely to understand scientific concepts than those who merely read about them.

Secondly, HOTS promote problem-solving abilities. In a world where the nature of problems is constantly evolving, the ability to approach challenges creatively and critically is invaluable (Inesti, 2020). By developing HOTS, students learn to approach problems systematically, consider multiple solutions, and make informed decisions. These skills are not only essential for academic success but also for career readiness and lifelong learning.

Thirdly, HOTS encourage independent and lifelong learning. When students are equipped with higher-order thinking skills, they are better able to take charge of their learning. They become more curious, ask insightful questions, and seek out knowledge independently (Chin & Chia, 2004). This intrinsic motivation to learn is crucial in a world where continuous learning and adaptation are necessary to keep pace with advancements in technology and knowledge.

One of the most notable findings is that incorporating HOTS into the curriculum leads to substantial improvements in students' academic achievements (Abdullah et al., 2020). Research indicates that students exposed to HOTS-based learning environments perform better on standardized tests and demonstrate a deeper understanding of the subject matter. For instance, a study by Zohar and Dori (2003) found that elementary students who engaged in HOTS-focused science lessons showed significant gains in their ability to analyze and interpret scientific data compared to those in traditional classrooms. This suggests that HOTS not only enhances content knowledge but also equips students with the skills to apply their learning in practical contexts.

Another key finding is the positive impact of HOTS on students' cognitive development (Abdullah et al., 2015). Studies have shown that early exposure to higher-order thinking activities fosters critical thinking, problem-solving, and creativity. For example, research by King, Goodson, and Rohani (1998) revealed that elementary students who participated in HOTS-based programs exhibited improved problem-solving skills and greater creativity in their responses to open-ended questions. These cognitive benefits are crucial for students' overall intellectual growth and their ability to navigate complex situations both inside and outside the classroom.

Research also highlights the role of teacher training in the successful implementation of HOTS in elementary education. Teachers' understanding and attitudes towards HOTS significantly influence how effectively these skills are integrated into their teaching practices (Ramdiah & Royani, 2019). Studies, such as the one conducted by Fisher (2013), emphasize the need for comprehensive professional development programs that equip teachers with the knowledge and tools to foster HOTS. When teachers are well-prepared and confident in implementing HOTS strategies, students are more likely to engage in higher-order thinking activities and benefit from them.

Moreover, the positive effects of HOTS extend beyond academic performance to include social and emotional development. Research has shown that students who engage in higher-order thinking activities develop better communication skills, increased self-confidence, and a greater sense of autonomy. For example, a study by Resnick (1987) found that students involved in collaborative problem-solving tasks displayed improved teamwork and communication abilities. These skills are essential for students' overall development and their ability to succeed in various social and academic settings (Greenberg et al., 2003).

Despite the numerous benefits, research also identifies challenges in implementing HOTS in elementary schools. These challenges include resistance to change from traditional teaching methods, lack of resources, and insufficient time allocated for HOTS activities. Studies, such as those by Cuban (1993), suggest that overcoming these barriers requires a systemic approach, involving curriculum redesign, policy support, and ongoing professional development for teachers. Addressing these challenges is crucial for maximizing the potential of HOTS in improving elementary education.

Given these challenges, this research seeks to explore the implementation of a HOTS-based curriculum in elementary schools and its impact on the quality of education (Pulungan et al., 2021). By examining successful case studies, identifying best practices, and addressing potential obstacles, the study aims to provide actionable insights for educators, policymakers, and stakeholders. The ultimate goal is to advocate for a transformative approach to elementary

education that prioritizes the development of critical thinking skills, thereby laying a solid foundation for lifelong learning and adaptability in an ever-changing world(Perry, 2011).

2. Method

The methodology employed in researching the implementation of a HOTS-based curriculum in elementary schools is crucial for ensuring the study's rigor, validity, and applicability of findings. The research employs a mixed-methods approach to provide a comprehensive understanding of the implementation and impact of HOTS-based curriculum. This approach combines qualitative and quantitative techniques to capture both the depth of experiences and the breadth of outcomes associated with HOTS in elementary education.

Qualitative data is gathered through semi-structured interviews with teachers, school administrators, and curriculum developers involved in HOTS implementation(Dima & Ahmadi, 2021). Focus groups are also conducted with students to explore their perceptions and experiences with HOTS activities. Curriculum documents, lesson plans, and teacher training materials are analyzed to understand the structure, content, and implementation strategies of the HOTS-based curriculum.

Quantitative data is collected through surveys administered to teachers and students to assess their perceptions of the effectiveness of HOTS in improving critical thinking skills, academic performance, and overall educational quality(Wilson & Narasuman, 2020). Standardized tests or assessments are administered to students before and after exposure to the HOTS curriculum to measure changes in cognitive skills, content knowledge, and problem-solving abilities.

The study involves elementary schools selected through purposive sampling based on their implementation of HOTS-based curriculum initiatives(Tong et al., 2022). Participants include teachers, school administrators, and students from diverse socioeconomic backgrounds to ensure a representative sample and varied perspectives on HOTS integration.

Interviews and focus groups are conducted in-person or virtually, recorded with consent, and transcribed verbatim for qualitative analysis(Gill & Baillie, 2018). Themes related to perceptions of HOTS effectiveness, challenges in implementation, and perceived impact on student learning are identified. Surveys are distributed electronically or in print form, ensuring anonymity and confidentiality. Quantitative data from surveys are analyzed using statistical software to identify trends, correlations, and significant differences in perceptions among different participant groups. Curriculum documents and related materials are systematically reviewed to identify key components of the HOTS-based curriculum, such as learning objectives, instructional strategies, and assessment methods.

Thematic analysis is employed to identify patterns, themes, and relationships within interview transcripts and focus group discussions(Braun & Clarke, 2006). Coding of qualitative data helps in understanding the complexities of HOTS implementation and its impact on educational practices. Descriptive statistics, inferential tests (e.g., t-tests, ANOVA), and correlation analyses are used to analyze survey data and pre-post test results. Statistical analysis provides insights into the effectiveness of HOTS in achieving educational outcomes and informs recommendations for practice.

Participants are provided with detailed information about the study objectives, procedures, and their rights before obtaining written consent. Confidentiality of participant data is maintained through anonymization and secure data storage practices(Corti et al., 2000). Researchers ensure respect for participants' viewpoints, cultural sensitivities, and privacy during data collection and analysis.

Findings may be limited to the specific context and sample of elementary schools studied. Researcher bias in data interpretation and participant responses may influence

results. Constraints in time, funding, and access to participants may impact the scope and depth of the study.

3. Results and Discussion

Results

One of the primary findings of the research is the positive effect of HOTS-based curriculum on academic achievement and cognitive development. Studies consistently demonstrate that students engaged in HOTS activities show improvements in critical thinking, problem-solving skills, and academic performance across different subject areas. For instance, research by Zohar and Dori (2003) found that elementary students participating in HOTS-focused science lessons exhibited deeper understanding and higher proficiency in analyzing scientific data compared to their peers in traditional classrooms. This suggests that HOTS not only enhances content knowledge but also fosters the skills necessary for rigorous academic pursuits.

HOTS-based education promotes the development of critical thinking skills among elementary students. By encouraging them to analyze information, evaluate perspectives, and make reasoned judgments, the curriculum cultivates a mindset of inquiry and intellectual curiosity. Students become adept at questioning assumptions, examining evidence, and constructing well-supported arguments—an essential skill set for navigating complex issues in academics and beyond. Research underscores the importance of critical thinking in preparing students to become lifelong learners capable of adapting to evolving challenges in a globalized world.

Another significant finding is the role of HOTS in fostering creativity and innovation among young learners. By engaging students in activities that require them to generate ideas, explore alternative solutions, and think creatively, the curriculum stimulates imagination and originality. Studies show that students exposed to HOTS-based instruction demonstrate greater creativity in problem-solving and exhibit a willingness to explore unconventional approaches to tasks. This creative mindset not only enhances academic performance but also prepares students to innovate and contribute meaningfully to society in their future endeavors.

Research highlights the importance of teacher professional development in effective HOTS implementation. Educators who receive training and support in HOTS strategies report increased confidence in their teaching abilities and a deeper understanding of instructional practices that promote higher-order thinking. Studies emphasize the need for ongoing professional development to equip teachers with the skills and resources necessary to integrate HOTS into daily classroom instruction effectively. This investment in teacher professional growth not only enhances instructional quality but also contributes to a positive school culture centered on continuous improvement and student success.

Implications of Research Results on HOTS-Based Curriculum in Elementary Schools

The implications of research on Higher-Order Thinking Skills (HOTS)-based curriculum in elementary education are profound, offering valuable insights into its impact on educational practices, student outcomes, and the broader educational landscape. Research underscores the transformative potential of integrating HOTS into educational practices and pedagogy. By prioritizing critical thinking, creativity, and problem-solving skills, HOTS-based curriculum shifts the focus from passive learning to active engagement. Educators are encouraged to adopt inquiry-driven approaches that foster deeper understanding and application of knowledge among students. This pedagogical shift promotes student agency, intellectual curiosity, and lifelong learning habits—essential qualities for academic success and personal growth.

The research consistently demonstrates positive impacts on student outcomes and academic achievement through HOTS-based education. Students engaged in HOTS activities show improvements in critical thinking abilities, problem-solving skills, and content mastery across various subject areas. These outcomes are associated with higher academic performance, increased retention of learning, and enhanced readiness for higher education and future careers. By equipping students with transferable skills and competencies, HOTS-based curriculum prepares them to excel in complex academic tasks and navigate real-world challenges with confidence and competence.

HOTS-based education aligns with the demands of the 21st-century workforce by emphasizing skills such as creativity, innovation, collaboration, and adaptability. Research findings indicate that students exposed to HOTS develop the capacity to innovate, communicate effectively, and collaborate in diverse settings. These skills are increasingly valued by employers seeking adaptable and skilled professionals capable of contributing to organizational success and driving innovation in a globalized economy. As such, HOTS-based curriculum prepares students to thrive in dynamic and evolving work environments, positioning them for long-term career success and economic mobility.

Research highlights the potential of HOTS-based curriculum to promote equity and inclusivity in education. By providing all students regardless of background or socioeconomic status with opportunities to develop critical thinking and problem-solving skills, schools contribute to closing achievement gaps and fostering educational equity. HOTS-based approaches support diverse learning needs and empower students from underrepresented groups to achieve academic excellence and realize their full potential. This commitment to equity ensures that educational opportunities are accessible and equitable for all learners, promoting social mobility and reducing disparities in educational outcomes.

The implementation of HOTS-based curriculum necessitates ongoing teacher professional development and leadership in educational innovation. Research indicates that educators who receive training in HOTS strategies report increased confidence in their teaching abilities and a deeper understanding of effective instructional practices. This professional growth enhances teacher effectiveness, boosts job satisfaction, and fosters a collaborative school culture centered on continuous improvement. Additionally, teachers proficient in HOTS serve as leaders in educational innovation, advocating for curriculum reforms, sharing best practices, and driving positive change within their schools and communities.

The implications of research on HOTS-based curriculum extend to educational policy and future directions in curriculum development. Policymakers are encouraged to prioritize the integration of HOTS strategies into national and state educational frameworks, supporting schools in adopting evidence-based practices that enhance student learning outcomes. Future research should focus on longitudinal studies, scalability of HOTS interventions, and the impact of technology integration on HOTS development. Moreover, collaborations between researchers, educators, and policymakers are essential to advancing educational practices that promote critical thinking, creativity, and lifelong learning in the digital age.

Challenges in Implementing a HOTS-Based Curriculum in Elementary Schools

One of the primary challenges in implementing a HOTS-based curriculum is resistance to change among educators, administrators, and stakeholders. Traditional teaching methods often prioritize memorization and standardized testing, making it challenging to shift towards inquiry-based learning and critical thinking activities. Educators may resist adopting new pedagogical approaches due to concerns about unfamiliarity, perceived workload increase, or uncertainty about the effectiveness of HOTS strategies. Overcoming resistance requires comprehensive professional development, clear communication of benefits, and supportive leadership that fosters a culture of innovation and continuous improvement.

Another significant challenge is the lack of resources and infrastructure needed to support effective HOTS implementation. This includes access to updated instructional materials, technology resources, and professional development opportunities for teachers. Schools with limited budgets may struggle to allocate funds for curriculum redesign, teacher training, and ongoing support systems essential for sustaining HOTS initiatives. Additionally, disparities in resource allocation across different schools and districts can exacerbate inequities in educational opportunities, hindering efforts to provide all students with access to high-quality HOTS-based education.

Effective implementation of HOTS-based curriculum relies heavily on teacher preparedness and training in pedagogical strategies that promote higher-order thinking skills. Many educators may not have received adequate training during their professional development to effectively integrate HOTS into their teaching practices. This gap in training can lead to inconsistent implementation, varying levels of student engagement, and challenges in assessing learning outcomes aligned with HOTS objectives. Addressing this challenge requires targeted professional development programs, mentorship opportunities, and ongoing support to empower teachers with the knowledge and skills necessary to facilitate HOTS activities effectively.

Assessing student mastery of higher-order thinking skills poses challenges in terms of measurement and accountability. Traditional assessments often focus on recall of factual knowledge rather than application, analysis, and synthesis of information—core components of HOTS. Developing valid and reliable assessment tools that accurately measure students' critical thinking abilities and problem-solving skills requires careful consideration of assessment design, rubric development, and alignment with curriculum objectives. Additionally, establishing accountability frameworks that recognize and value HOTS outcomes is essential for sustaining motivation among educators and students to prioritize these skills in teaching and learning.

Adapting HOTS-based curriculum to diverse cultural and contextual settings presents challenges related to relevance, inclusivity, and cultural responsiveness. Educational reforms must account for the unique backgrounds, languages, and learning styles of students from diverse socio-economic and cultural backgrounds. A one-size-fits-all approach may overlook the contextual factors that influence students' learning experiences and hinder their engagement with HOTS activities. Schools and educators must collaborate with communities, parents, and cultural stakeholders to ensure that HOTS strategies are meaningful, inclusive, and aligned with the diverse needs and aspirations of students.

Ensuring the sustainability of HOTS-based curriculum initiatives requires long-term commitment, strategic planning, and continuous support from educational leaders and policymakers. Short-term funding cycles, changes in administrative leadership, and competing educational priorities can jeopardize efforts to embed HOTS into the core curriculum and sustain positive outcomes over time. Schools and districts must prioritize investment in infrastructure, ongoing professional development, and collaborative partnerships to build capacity, monitor progress, and adapt strategies in response to evolving educational landscapes and student needs.

Comparison of Research Results on HOTS-Based Curriculum in Elementary Schools

Research on the implementation of Higher-Order Thinking Skills (HOTS)-based curriculum in elementary education has evolved over the years, yielding valuable insights into its impact on educational quality and student outcomes. Both current and previous research consistently demonstrate that HOTS-based curriculum enhances students' critical thinking skills. Studies by Zohar and Dori (2003) and Perkins (1995) indicate that students engaged in HOTS activities exhibit deeper analytical abilities, better problem-solving techniques, and a stronger grasp of complex concepts compared to peers in traditional learning environments.

There is a recurring finding across multiple studies that HOTS implementation correlates positively with improved academic performance. Students participating in HOTS-focused instruction tend to achieve higher scores on standardized tests and demonstrate greater proficiency in subject areas such as mathematics, science, and language arts (Trilling & Fadel, 2009; Partnership for 21st Century Skills, 2009).

Both current and past research highlight the role of HOTS-based education in preparing students for future workforce demands. Skills such as creativity, innovation, collaboration, and adaptability are consistently identified as outcomes of HOTS instruction, essential for success in a globalized, technology-driven economy (Partnership for 21st Century Skills, 2009; Perkins & Salomon, 1989).

Recent research has advanced the integration of technology in HOTS-based curriculum, emphasizing digital literacy and computational thinking alongside traditional critical thinking skills. Studies explore how digital tools and online resources can enhance student engagement, facilitate collaborative learning, and promote higher-order thinking in diverse educational settings (ISTE, 2016).

Advancements in research methodology include longitudinal studies that track the long-term impact of HOTS initiatives on students' academic trajectories and career readiness. These studies provide insights into the sustainability of HOTS interventions, their enduring effects on student learning outcomes, and factors influencing implementation success over time (Perkins & Salomon, 1989; Gibbons, 2001).

Despite advancements, there remains ongoing debate in research about the most effective methods to assess higher-order thinking skills. Some studies argue that traditional assessments may not fully capture the complexity of HOTS, prompting calls for innovative assessment strategies that align with curriculum objectives and provide meaningful insights into students' cognitive development (McPeck, 1981; Gibbons, 2001).

Research highlights disparities in the equitable implementation of HOTS across diverse socio-economic and cultural contexts. While HOTS can promote equity by fostering critical thinking skills among all students, challenges persist in ensuring that resources, support systems, and instructional practices are accessible and culturally responsive to diverse student populations (Gibbons, 2001; Trilling & Fadel, 2009).

4. Conclusion

The implementation of a Higher-Order Thinking Skills (HOTS)-based curriculum in elementary schools represents a transformative approach to enhancing educational quality and preparing students for future challenges. Through an analysis of current research findings and comparisons with previous studies, several key conclusions emerge. Research consistently demonstrates that HOTS-based education improves critical thinking skills, enhances academic performance, and fosters the development of essential 21st-century competencies such as creativity, collaboration, and problem-solving. Students engaged in HOTS activities are better equipped to navigate complex problems, think critically about information, and apply their knowledge in meaningful ways. The shift towards HOTS-based curriculum signifies a move from traditional, rote-learning approaches to more inquiry-driven, student-centered instructional practices. Educators play a crucial role in facilitating this transition by incorporating innovative teaching strategies, leveraging technology, and promoting a culture of continuous improvement and professional development. Despite the positive outcomes, challenges such as resistance to change, resource constraints, and disparities in educational equity remain pertinent. Addressing these challenges requires collaborative efforts among educators, administrators, policymakers, and community stakeholders to ensure equitable access to high-quality HOTS education and support systems for all students. Moving forward, future research should focus on longitudinal studies to assess the long-term impact of HOTS

initiatives, innovative assessment methods that capture higher-order thinking skills, and strategies for scaling effective HOTS practices across diverse educational contexts. Additionally, continued investment in teacher professional development and technological integration will be crucial in sustaining and enhancing the benefits of HOTS-based curriculum.

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