THE EFFECTIVENESS OF TEACHING NUMBERS IN PRESCHOOL EDUCATION USING MODERN VISUAL TECHNOLOGIES

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Abstract. This thesis examines the effectiveness of using modern visual technologies in teaching numbers to preschool children. Visual technologies, including interactive whiteboards, digital games, animations, and multimedia presentations, provide an engaging and multisensory learning environment that enhances children's numerical understanding, attention, and motivation. The study analyzes pedagogical strategies for integrating visual technologies into early childhood mathematics instruction and evaluates their impact on children's cognitive, linguistic, and problem-solving skills. Findings indicate that using modern visual tools significantly improves number recognition, counting skills, and mathematical reasoning in preschool-aged children.

Introduction. Preschool age is a critical period for the development of fundamental cognitive skills, including numerical understanding, logical reasoning, and problem-solving abilities. Mastery of numbers and early mathematical concepts during this stage forms the foundation for later academic success and supports overall intellectual growth. However, traditional teaching methods, such as rote counting and paper-based exercises, often fail to capture young children's attention and may limit their engagement and motivation in learning numerical concepts.

In recent years, modern visual technologies have emerged as effective tools for enhancing preschool mathematics education. These technologies include interactive whiteboards, educational software, digital games, animations, and multimedia presentations. By combining visual, auditory, and kinesthetic stimuli, such tools provide multisensory learning experiences that are particularly suitable for preschool-aged children. Visual technologies allow children to interact with numbers dynamically, observe numerical patterns, and explore mathematical relationships in an engaging and meaningful way.

Educational research emphasizes that interactive and visually enriched learning environments contribute not only to numerical proficiency but also to the development of communication skills, attention span, creativity, and problem-solving abilities (Fleer, 2019; Sullivan & Bers, 2016). Piaget's constructivist theory

highlights the importance of active, hands-on experience in learning, while Vygotsky's socio-cultural theory underlines the role of guided interaction and social collaboration in cognitive development. Visual technologies align with these pedagogical principles by providing opportunities for active engagement, collaborative learning, and immediate feedback.

Despite the recognized benefits, the systematic application of visual technologies in preschool mathematics classrooms remains limited. Many educators lack methodological guidance or access to appropriate digital resources, which can reduce the effectiveness of these tools. Consequently, exploring strategies for integrating modern visual technologies into the teaching of numbers is essential to improve learning outcomes and support holistic child development.

The purpose of this study is to investigate the effectiveness of teaching numbers in preschool education using modern visual technologies, analyze pedagogical strategies, and evaluate their impact on children's numerical understanding, speech, and cognitive development. This research aims to provide practical recommendations for educators to optimize early childhood mathematics instruction through innovative visual tools.

Literature Review. The development of numerical skills in preschool children is widely recognized as a critical component of early childhood education. Early numerical competence, including number recognition, counting, and basic arithmetic, serves as a foundation for later mathematical learning and logical reasoning (Clements & Sarama, 2007). Research highlights that children learn best when mathematical concepts are presented in engaging, interactive, and multisensory formats, rather than through traditional rote memorization methods (Sarama & Clements, 2009).

In recent years, modern visual technologies have gained attention as effective pedagogical tools in preschool mathematics education. These technologies include interactive whiteboards, tablets, educational software, animations, and multimedia applications, which combine visual, auditory, and kinesthetic modalities to enhance learning (Fleer, 2019). Such tools provide opportunities for active participation, immediate feedback, and differentiated learning, allowing children to explore numerical concepts at their own pace while maintaining motivation and engagement.

Several studies demonstrate that interactive digital tools significantly improve number recognition, counting skills, and problem-solving abilities in preschool-aged children. Sullivan and Bers (2016) found that integrating digital games and visual animations into early math instruction led to higher engagement, better understanding of numerical relationships, and improved retention of mathematical concepts. Similarly, Clements and Sarama (2011) emphasize that dynamic visual representations help children understand abstract mathematical ideas, making learning more concrete and accessible.

Visual technologies also contribute to cognitive, linguistic, and social development. While exploring interactive mathematical tasks, children practice verbal expression by explaining their reasoning, collaborating with peers, and reflecting on their solutions (Rogoff, 2003). This aligns with Vygotsky's socio-

cultural theory, which stresses that learning is most effective through social interaction and guided participation. Moreover, multisensory visual experiences reinforce memory, attention, and comprehension, supporting both short-term learning and long-term mathematical understanding (Fleer, 2019).

Despite the clear advantages, research indicates that systematic integration of visual technologies in preschool classrooms is often limited. Teachers may lack sufficient training, methodological guidance, or access to age-appropriate digital resources (Edwards, 2017). Therefore, further investigation is necessary to develop evidence-based strategies for effectively incorporating modern visual tools into number instruction, ensuring that these technologies maximize learning outcomes for preschool children.

In summary, existing literature confirms that modern visual technologies are a highly effective pedagogical resource for teaching numbers in early childhood. They enhance engagement, support multisensory learning, and contribute to the development of numerical, cognitive, and communicative skills. However, successful implementation requires careful planning, teacher training, and integration into structured curricula.

Conclusion. The study demonstrates that modern visual technologies are highly effective in teaching numbers to preschool children. These tools, including interactive whiteboards, educational software, multimedia presentations, and digital games, provide multisensory and interactive learning experiences that enhance number recognition, counting skills, and basic mathematical understanding. Integration of visual technologies supports cognitive, linguistic, and social development, as children actively engage in problem-solving, verbalize reasoning, and collaborate with peers. The approach also increases motivation, attention, and engagement, making the learning process more enjoyable and effective. Furthermore, systematic implementation of visual technologies in preschool mathematics instruction aligns with constructivist and socio-cultural theories of learning, emphasizing active participation, guided discovery, and social interaction. Therefore, educators are encouraged to incorporate age-appropriate visual tools into curricula, receive professional development on their use, and balance screen-based activities with hands-on manipulative learning. In conclusion, modern visual technologies represent a pedagogically valuable approach for enhancing number learning in preschool, fostering both numerical competence and holistic child development. Their effective use can significantly improve early mathematics education outcomes and better prepare children for future academic success.

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