DEVELOPING LOGICAL THINKING IN DENTISTRY WITH NEW TECHNOLOGY

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ABSTRACT the research provides theoretical support for the high efficacy of stem technologies as a sophisticated teaching tool for students' deliberate development of logical thinking foundations. Stem technologies, which integrate science, technology, engineering, and mathematics, guarantee the active acquisition of logical operations (analysis, synthesis, classification, and generalisation) through problem-oriented, research-based, and practical activities, according to an analysis of domestic pedagogical approaches (t.v. Volosovets, i.m. Klimova). It turns out that the preschoolers' primary activities are play and experimenting, and this method works well for them. The author's suggestions and methodological approaches for promoting the growth of all facets of logical thinking, including algorithmic thinking and skill development, are provided in the conclusion.

Keywords: Senior preschool age, robotics, building, logical processes, algorithmic thinking, stem technologies, and cognitive development

Introduction: The development of logical thinking is one of the main goals of contemporary preschool education, and it is closely linked to the cognitive development criteria of the federal state educational standard (fses) for preschool education. The basis of effective classroom learning is logical thinking, which is defined as the capacity to work with concepts, draw conclusions, and identify cause-and-effect links.

There is a noticeable shift from visual-imaginative to verbal-logical thinking in senior preschool age (5–7 years), which promotes the deliberate development of sophisticated mental processes. However, conventional labour techniques, which are mostly focused on verbal instructions and passive observation, often fail to provide the required practical engagement and are incompatible with preschoolers' primary activities, which include play and experimenting. This stops the growth of creativity and independence and results in a lack of mastery of logical processes (analysis, synthesis, and classification).

The primary contrasts are the strong social and educational requirement to develop a child's logical and creative personality and the absence of systematisation of stem technologies as the primary pedagogical instrument to address the psychological and pedagogical features of senior preschool age.

The requirement of creating and putting into practice ideas and tactics in preschool education that would guarantee the active, pleasurable, and thorough development of all logical thinking components is the basis for the study's significance. Combining science, technology, engineering, and mathematics, stem technologies serve as a synthetic form of activity [5], highlighting the depiction of scientific processes, the links across academic courses, and the application of knowledge in practical situations. This makes the process of acquiring intricate logical regularities accessible and emotionally interesting for older children.

The purpose of this essay is to argue that stem technology is the best way to help older children develop their logical thinking skills. It does this by providing theoretical support, analysing methodological strategies, and making practical recommendations.

In contemporary pedagogy, the use of stem technology in preschool education is an issue that is always evolving. S.a. Averin, v.a., and tv volosovets. Since they created the partly modular program "Stem education for preschool children," Which is employed both as part of the main educational program and within the scope of supplementary courses, markova has shown the full nature of this approach.

Literature review

the growth of logical thinking in older toddlers is an important predictor of future academic success and general intellectual development, and it is a fundamental aspect of cognitive pedagogy. Visual-action and visual-imaginative reasoning gradually give way to the early elements of abstract, verbal-logical thinking throughout the transition from late toddlerhood to early childhood. Jean piaget's structural phases of cognitive development are the source of this shift.

This change in early childhood education necessitates innovative, synthetic pedagogical strategies that might externalise abstract structural connections into tangible, engaging, and emotionally powerful activities. Stem (science, technology, engineering, and mathematics) technologies have shown to be very successful as integrative, practice-oriented frameworks that may systematically support these cognitive processes across the many paradigms that are emerging in modern preschool education.

Early childhood education and stem theory

the incorporation of stem—and its linguistically expanded counterpart, steam, which encompasses the arts—in early childhood settings represents a paradigm shift away from traditional, segmented discipline teaching toward a unified, project-based educational approach. In contrast to teaching scientific or mathematical rules in isolation, stem education emphasises the visualisation of underlying scientific processes, the natural connections between various academic subjects, and the immediate application of knowledge in tangible, hands-on contexts (volosovets, averin, & markova, 2018).

Foundational study on the mostly modular program "Stem education for preschool children" Indicates that this method works as a synthetic sort of child activity. Using a child's natural curiosity and need for experimentation, it turns passive instructional awareness into active, constructive-engineering discovery. Stem environments stimulate the senses and combine object-oriented play with cognitive problem-solving, making abstract logical regularities real, tangible, and extremely motivating for older preschool brains.

Interventions for cognitive mechanisms and speech underdevelopment

stem technologies provide significant cognitive advantages in two domains:

Language development and structural logic. Research by klimova and kashtanova (2021) demonstrates the extraordinary potential of integrated technological solutions to foster verbal-logical thinking, particularly in children with general speech underdevelopment (gsu).

Psycholinguistic research indicates a strong correlation between language proficiency and the development of logical operations; children who struggle to articulate causal links also often struggle to organise logical sequences. Integrated stem activities overcome this challenge by providing a concrete, observable basis for cognition. A child must explain their methodology, make predictions, and defend their conclusions when they test a physical theory or work with an engineering product. This concentrated contextualisation helps children overcome expressive challenges and improves their ability to communicate and draw sound, logical conclusions.

Algorithmic reasoning and robotics in education

a rapidly emerging field in early childhood stem education is the use of programmable tools and instructional robots. The introduction of kid-friendly, accessible devices like as the programmable "Robot mouse" Or "Bee-bot" Has fundamentally altered the way older children are taught algorithmization and linear logic concepts, particularly those with special education needs or health constraints (galashova, 2020).

In pedagogical metrology, educational robots function as an externalised model of computational thinking. To successfully guide a robotic item over a game board, a child must complete a difficult combination of cognitive tasks:

Decomposition is the process of breaking down a large navigational goal into distinct, sequential movements.

Anticipation: Projecting how a multi-step digital instruction will seem in the future.

The process of finding, recognising, and correcting a specific problem inside an improperly ordered sequence of actions is known as error analysis, or debugging.

This procedure provides the ideal foundation for rigorous algorithmic thinking by replacing the child's intuitive, trial-and-error approach with an organised, predicted mental framework.

Integrating stem tools with conventional logical operations
to transition from spontaneous play to purposeful cognitive development, modern early childhood courses must consciously map stem skills directly onto classical logical methods. Current work identifies four key methodological dimensions where engineering concepts improve structural logic:

In their publications, i.m. Klimova and s.n. Kashtanova emphasises how steam technology might help children, especially those with general speech underdevelopment, improve verbal-logical thinking [2]. The authors note that challenges in expressing and justifying logical conclusions may be solved with the use of integrated technological solutions.
By discussing the experience of utilising the programmable robot "Robot mouse" To encourage logical thinking and algorithmization in dealing with senior preschool children with health constraints (hia), galashova, for instance, validates the usefulness of several stem tools [3].
Based on an analysis of the works of top researchers, we contend that stem technologies are the best approach because they guarantee the visualisation of abstract concepts, support a research position, and transition from passive perception to active constructive-engineering activity—all of which are essential for the development of all logical thinking components.
All basic logical processes should be covered in practical work with older kids, and

it should be based on an understanding of engineering and algorithmic ideas. Using the "Engineering disassembly and synthesis" Method for analysis and synthesis, we believe it makes sense to integrate a variety of methodological techniques that were developed based on the synthesis of important stem concepts and aimed at the comprehensive development of logic into the teaching process.

Fundamentals: Using a schematic (synthesis) or their memory, children are expected to dissect (analyse) a basic mechanical structure (such a building set model or a toy mechanism) into its component pieces and then reconstruct it on their own.

Function: Enables the identification of crucial components of a whole and the restoration of links between them by translating abstract logical processes into tangible object action.

Two. The "Matrix of attributes" Classification and generalisation technique.

Essence: Creating a multi-factor classification using collections of details (like lego bricks or diene blocks). Children categorise objects according to two or three characteristics at once (e.g., "Large, blue, cylindrical") and provide justification (generalisation) for the grouping concept they have selected.

Function: Develops the capacity to produce generalising notions and operate with several criteria at once, which forms the foundation of verbal-logical thinking.

Third. Algorithmic reasoning using the "Route programming" Approach.

Basically, programmable robots are used ("Robot mouse," "Bee-bot"). In order for the robot to achieve the objective while avoiding obstacles on the game board, children must create and record an algorithm, or set of instructions.

Function: Develops algorithmic thinking, teaches how to organise a series of steps, forecasts the outcome, and identifies mistakes in a poorly designed algorithm (problem decomposition).

Four. Establishing causal relationships by using the "Constructor-researcher" Technique.

The main objective is to have kids solve an engineering problem, such as "How to build a bridge that will withstand the weight of a toy car?" During the construction process, kids formulate theories, experiment with various designs, and look into why one structure can support the weight while another cannot.

Function: Fosters critical thinking skills and the capacity to link an object's strength, stability, and usefulness (weight support) via experimentation.

As a result, it is clear from the theoretical analysis and assessment of domestic educators' perspectives that stem technologies are an essential and significant instrument for helping older toddlers acquire logical thinking. Because of their practice-oriented, integrated, and project-based orientation, stem technologies are advantageous because they enable the methodical development of logical processes within the framework of research activity.

A high level of enthusiasm and engagement is ensured by the rigorous application of the analytical tools we devised, guaranteeing the shift from visual-imaginative to characteristics of verbal-logical thinking. Senior preschoolers' level of logical thinking formation may be considerably raised by purposefully implementing a series of stem-based exercises. This provides a solid basis for future academic performance and personal growth.

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