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DOCTORAL THESIS

COGNITIVE DEVELOPMENT OF PRESCHOOL CHILDREN THROUGH OUTDOOR ACTIVITY PROGRAMS

ABSTRACT

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INTRODUCTION

Dynamism, the need to adapt and the set of changes in the evolution of society are real challenges that the educational system in our country is trying to cope with successfully. Although we live in the age of digitalization, its nature and role are more relevant than ever in the education system. Therefore, attempts are being made to reconnect with the environment by using elements from nature in the educational process.

Outdoor education is not an innovative concept, but has deep roots in the evolution of education systems around the world. As far back as Antiquity, the philosopher Aristotle emphasized that learning must begin with what is familiar and tangible to the child, and that nature is that primordial space for exploration and discovery. Direct observation and unmediated experience are, in his view, the solid foundation of authentic knowledge (Allaby, 2018).

Leonardo da Vinci expresses his belief in the infinite potential of nature as an inexhaustible source of learning in a quote in which he recognizes its undeniable value: *'What I see in nature is endless learning'* (Richter, 1970). Nature is a teacher who is constantly doing his job for all past, present and future generations, and every moment spent in the natural environment can be seen as a real lesson in teaching new knowledge, because nature is a constant source of information for successive generations.

The influence of this thinking has been perpetuated over the centuries, manifesting itself in various pedagogical approaches. In the 18th century, Jean-Jacques Rousseau brought to the forefront the idea of nature as the supreme teacher, proposing that children's education should take place in the natural environment, away from the artificial influences of society. His concept of 'negative education' involved giving children the freedom to explore and learn from their own experiences under the discreet guidance of the educator (Bertram, 2020).

In the early twentieth century, visionary educators such as Maria Montessori continued to emphasize the importance of connecting with nature in the educational process. Observation and direct experience, including gardening and plant-care activities, were promoted as essential ways to develop cognitive skills and build responsibility in young children (Lillard, 2018).

Over the centuries, nature has been a defining environment through which individuals have learned and developed and continues to be a positive influence in this regard today. Therefore, children, regardless of age, have always valued outdoor activities, as a change of learning environment brings motivation, innovation and excitement.

In today's context, dominated by technology and accelerated urbanization, the return to nature in the educational process takes on new dimensions and meaning. Recent studies in neuroscience confirm what educators such as Montessori intuited long ago: direct contact with nature stimulates children's cognitive, emotional and social development in ways that artificial environments cannot replicate.

In recent decades, the outdoor education movement has gained momentum worldwide, with numerous initiatives and programs aimed at reintegrating nature into the educational process. Scandinavian countries have developed successful models such as 'forest kindergartens', where children spend most of their time outdoors, whatever the weather. These approaches have proven effective not only for cognitive development, but also for building resilience, creativity and collaboration skills.

In Romania, although outdoor education is still in the development stage, there is growing interest in integrating it into the formal education system. Recent educational policies that align with Romania's 2030 National Strategy for Sustainable Development recognize the importance of this approach, and many educators and preschools are implementing programs that capitalize on natural resources in the learning process (Romanian Government, 2018).

The choice of the theme entitled *Cognitive development of preschool children through outdoor activity programs* springs from a deep conviction: nature is the ultimate laboratory of human learning. While conventional classrooms limit the child's experience to artificial walls and standardized teaching materials, the natural environment opens infinite horizons of discovery and understanding. Every leaf, every rock, every atmospheric phenomenon becomes a living lesson, pulsing with meaning and inviting authentic exploration.

This doctoral thesis addresses a topical issue in the field of early childhood education: the development of cognitive skills of preschoolers through the implementation of structured programs of outdoor activities.

The scientific relevance of this topic is supported by a substantial body of recent research that highlights, on the one hand, the negative consequences of prolonged exposure to closed

environments and excessive use of digital technology and, on the other hand, the benefits of educational experiences in the natural environment on children's cognitive and socio-emotional development. Longitudinal studies conducted in various cultural and educational contexts demonstrate that systematic interaction with the outdoor environment facilitates the development of higher cognitive processes, stimulates epistemic curiosity and strengthens the fundamental cognitive structures of preschoolers. In this context, this paper aims to investigate and empirically validate, in the paradigm of experimental educational research, the effects of implementing structured outdoor activity programs on the cognitive development of preschool children in the Romanian educational system.

The practical impact of the research is significant, providing teachers, educational decision makers and parents with a set of methodological tools, didactic strategies and scientifically validated programs to optimize the educational process. The study proposes concrete solutions for the integration of outdoor activities into the national pre-school curriculum, presenting both the theoretical and epistemological foundations of this approach, as well as practical applications, methodological indications and quantifiable results of the implementation of intervention programs.

The paper is structured in two complementary parts. The first part, the theoretical grounding, comprises three chapters that analyze in depth the key concepts and theories relevant to cognitive development in preschool, explore the determinant role of the environment in children's cognitive stimulation, and present the pedagogical approach to the design of outdoor learning activities. This section establishes the conceptual framework and scientific arguments that underpin the subsequent empirical research.

The second part of the thesis, dedicated to applied research, presents the methodological design of the investigation, detailing the premises, operational objectives, working hypotheses and methodology used. The intervention programs implemented are described and analyzed and the results obtained are interpreted, highlighting the correlations and effects of outdoor activities on the cognitive parameters assessed in preschool children. The research conclusions summarize the theoretical and practical implications of the study, providing well-founded recommendations for optimizing the preschool curriculum through the systematic integration of outdoor activities.

Through its integrative approach, which combines the rigorous theoretical grounding with empirical research and practical applications, this doctoral thesis aims to contribute to the

innovation and improvement of educational strategies in preschool education in Romania, capitalizing on the formative potential of the natural environment in the cognitive development of children.

PART I - THEORETICAL BACKGROUND

CHAPTER I

COGNITIVE DEVELOPMENT AT PRESCHOOL AGE

The meaning of the concept of development

In the contemporary educational context, the concept of development takes on multiple meanings, reflecting not only the acquisition of theoretical notions, but also the formation of skills necessary for successful integration into the present social dynamics.

Deac (2016) states that human development is a dynamic and continuous transformation that presents physical, cognitive, social and emotional changes. On the other hand, Mih (2010, pp. 50-51) defines development as "the totality of successive changes that an individual undergoes throughout his or her entire life (i.e. from the moment of conception to the moment of death)". In the context of human development, each dimension - physical, social, emotional and cognitive - is interdependent and influences the overall development of the individual.

I.2. Cognitive abilities at preschool age. Conceptual delimitations

Cognitive abilities are mental and intellectual skills that enable individuals to process information, think, solve problems and make decisions. These skills do not stand in isolation, but interact and play an essential role in learning.

I.2.1. Thinking

Thinking is seen as a cognitive process that enables individuals to understand, abstract and generate solutions in various situations (Neisser, 2012). According to Holyoak and Morrison (2012), thinking involves the fundamental cognitive operations necessary for reasoning, decision making and problem solving. In a similar perspective, Sternberg and Sternberg (2016) define thinking as the set of mechanisms through which information is processed, organized, and used to understand the world and act accordingly. Anderson (2020) also defines thinking as the result of the interaction between memory, attention and logic.

I.2.2. Ability to think critically

Critical thinking is an important dimension of the cognitive process. Although educational research argues that critical thinking skills develop in a more thorough form in later life, studies

indicate that pre-school children may show early signs of the presence of this ability. Research in this area points to the early onset of critical thinking as early as 3 years of age.

I.2.3. Problem-solving skills

At the same time as the thinking process matures, problem-solving ability also develops in pre-school children, which in turn is influenced by several interacting factors. According to Piaget (1952), one of these factors is *age*. He emphasizes that problem-solving skills gradually become more complex as children grow older.

I.2.4. Making associations

A relevant indicator of children's cognitive development is the ability to make associations. This ability supports information processing, cognitive flexibility and the development of executive functions, and plays an important role in the formation of language and logical-mathematical thinking (Deater & Dodge, 1997).

I.3. Theories of cognitive development - fundamental approaches and implications for early childhood education

Theories of cognitive development are conceptual frameworks that explain the developmental processes of thinking and understanding in children. They provide different perspectives on how cognitive structures and mental abilities are formed and progress, and form the scientific basis for educational interventions and practices in early childhood.

Jean Piaget's theory of cognitive development

Among the many approaches to cognitive development, the theory proposed by Jean Piaget represents a fundamental landmark in understanding this process. In Piaget's view, cognitive development is a staged process, with each stage representing a stage of development, marked by specific features. The four stages described by J. Piaget are: 1. The sensorimotor stage (birth-2 years). 2. The pre-operational stage (2- to 7 years). 3. The concrete operational stage (7- to 11/12 years). 4. The formal operational stage (11/12- to 15/16 years) (Piaget, 1952).

The Piagetian paradigm has a significant contribution to make to the design and development of the educational process of pre-school children. In line with the ideas promoted in the theory, during this stage, preschool children's daily program should not lack opportunities for using their imagination and creativity, often demonstrated during symbolic play.

Lev Vîgotsky's theory of the zone of proximal development

A complementary theory of cognitive development, Lev Vîgotsky's theory of the zone of proximal development emphasizes the role of social interaction and guidance from adults or older children in the learning process. The area of proxedevelopment refers to the differences between what a child is able to accomplish without help and what he or she is able to accomplish with adult support. In this context, Vîgotsky emphasized the importance of social relations and cultural context in the development of cognitive abilities (Vîgotsky, 1930/1994).

Zone theory has positive influences in the field of early education. The principles supported by its theoretical framework are centered on the organization of an instructional-educational environment that supports children's cognitive development and provides opportunities for exploration in different social contexts.

John R. Anderson's theory of information processing

In the context of preschool children's cognitive development, the information processing theory (Anderson, 1976) also stands out. This theory emphasizes how children (and humans in general) process information and how they develop cognitive skills such as thinking, attention and memory as they grow up and relate to the outside world. It examines how children form the ability to concentrate on relevant information and organize their thoughts and knowledge to perform cognitive tasks.

According to information processing theory, activities in early childhood education should focus on the development of fundamental cognitive skills and facilitate an environment conducive to learning through exploration and interaction .

William T. Greenough's theory of neural connections

In terms of studies and research related to children's cognitive development, Greenough's theory of neural connections is also noteworthy, which emphasizes the importance of the environment and the experiences it provides in brain development.

In the pre-school context, the creation of a stimulating and interactive learning environment has positive effects on the formation of neural connections and on preparing children for future stages of learning.

Dynamic-relational systems theory by Ester Thelen and Linda B. Smith

As a comprehensive and complex domain, cognitive development in children is also studied by Thelen and Smith, who explain this process from a dynamic-relational systems perspective (1994). The theory emphasizes motor and perceptual development in children highlighting the complex interaction between the cognitive system, motor skills and perception. Cognitive development is closely related to physical and sensory development. According to this theory, development is not a linear and static process but is characterized by variability and change.

Referring to the concepts promoted by the dynamic-relational systems theory in the context of early childhood education, we affirm that learning environments promote positive interactions, adaptability and effective communication.

Albert Bandura's social learning theory

In addition to the cognitive theories outlined throughout this paper, social learning theory brings to the fore the interactional dimension of human development. The individual does not develop in isolation, but in the midst of a complex social environment full of interactions, patterns and influences.

The social learning theory proposed by Albert Bandura is a landmark in the implementation of educational interventions for pre-school age children. The fundamental theoretical concepts developed by Bandura state that preschoolers assimilate behavioral patterns through observational and imitative-reproductive processes.

Edward O. Wilson's biophilic theory

The biophilic theory conceptualized and developed by Wilson (1984) reinforces the idea that humans possess a natural and universal inclination to seek connections with the natural environment and diverse life forms. Wilson (1984) argues that this orientation is not accidental, but is the result of an evolutionary process that has favored the survival and development of the human species over generations. From this perspective, contact with nature constitutes a central element in human evolution, significantly influencing the cognitive, social and emotional development of the individual.

The educational implications of this theory suggest the need to design learning spaces that incorporate elements from nature and provide opportunities for direct interaction with the natural environment. Such educational environments stimulate children's natural curiosity, facilitate

experiential learning and help to cultivate an attitude of respect and responsibility towards the environment, which are essential in the context of contemporary environmental challenges.

David Kolb's experiential learning theory

David Kolb's experiential learning theory is an influential conceptual model in the field of education, providing a framework for understanding how direct experiences contribute to the construction of knowledge. Developed in the 1970s and further refined, this theory emphasizes the cyclical nature of learning as a transformational process (Kolb, 1984).

The implementation of the theoretical principles developed by Kolb in educational programs for preschoolers generates significant positive effects on the trajectory of their cognitive development, contributing to the consolidation of fundamental mental processes and the formation of operational structures used for further learning (Edwards et al., 2020).

Francisco Varela, Evan Thompson and Eleanor Rosch's theory of enactivism

Complementing previous theoretical perspectives, the enactivism paradigm makes a distinct contribution to understanding the process of cognitive development in early education. Developed by Varela, Thompson & Rosch (1991) and subsequently by Gallagher (2017), this approach transcends the traditional conception of cognition as an exclusively mental process, proposing an integrative view in which cognition emerges from the dynamic interaction between the organism and the environment.

The application of enactivism theory to activities carried out in the outdoor environment by preschoolers highlights how children's cognitive development is intrinsically linked to direct experiences with the environment. Active perception, physical interaction with the environment and autonomy in learning are defining aspects in the formation of preschoolers' cognitive abilities.

I.4. Indicators of cognitive development at pre-school age and ways of achieving them

The Curriculum for Early Childhood Education (2019) proposes the development of key competences, reflected in the indicators associated with the learning milestones:

Benchmark I - Cause and Effect

The child is supported to understand the link between actions and their consequences, developing logical thinking and the ability to anticipate.

Challenge II - Observation and comparison

The aim is to stimulate observation and analytical thinking by identifying similarities and differences between events and actions.

Strand III - Building new experiences

The child learns to build on previous experiences to face new situations, a process facilitated by interactive activities and varied contexts, including the outdoor environment.

These indicators guide the design of personalized, active and relevant educational experiences that support the preschool child's holistic development.

CHAPTER II

THE ROLE OF THE OUTDOOR ENVIRONMENT IN COGNITIVE DEVELOPMENT OF CHILDREN PRESCHOOLERS

Under the influence of the cognitive theories presented, we consider it important to emphasize the role of the learning environment as a determining factor in the development of the educational process. Lăscuș (2001) defines the school educational environment as the set of physical, human and conceptual elements specific to each educational institution; their unique and distinct combination confers the identity and specific character of the school.

II.1.Contribution of the indoor environment to the cognitive development of pre-school children

The indoor educational environment in which educational activities take place during the pre-school period is the classroom. Lăscuș (2002) characterizes the group room as a physical and social environment specific to pre-school education institutions, designed for carrying out instructional-educational activities under the coordination of teaching staff, with the aim of achieving educational objectives. In line with this vision, the *Curriculum for Early Childhood Education* (2019) suggests that educators choose a richly experiential formative environment in order to achieve the aims of early education.

II.2. The role of the outdoor environment in the cognitive development of preschoolers

Classrooms, by their structured and organized nature, represent a formal setting for educational activities, but the outdoor environment offers the possibility to extend this setting, facilitating more active learning and a direct connection with the surrounding reality. Outdoor activities contribute to the development of skills and competences that cannot always be nurtured indoors, promoting integrated and experiential learning.

The school's outdoor spaces and community resources are essential elements in a holistic educational process, capable of supporting the diversification of teaching strategies and providing pre-schoolers with learning opportunities that go beyond the traditional confines of the classroom.

II.3. Impact of multisensory stimulation in the outdoor environment

Multisensory stimulation through outdoor activities refers to the provision of educational experiences that simultaneously activate multiple sensory channels: visual, auditory, tactile, olfactory and gustatory. In the context of outdoor activities, intrinsic motivation is an important factor in creating an environment conducive to cognitive development. Children are naturally motivated to explore their surroundings, discover causal relationships and find solutions to concrete problems. Activities such as collecting and classifying leaves according to observable criteria help to develop rational thinking and conceptual categorization skills (Piaget, 1952).

II.4. Outdoor educational paradigms. Perspective of educational alternatives

Multisensory stimulation in the natural environment is a facilitator in the development of cognitive skills in preschoolers, providing experiential learning opportunities that are impossible in the formal classroom setting.

This subchapter highlights the connections between Reggio Emilia, Montessori, Waldorf and Forest Kindergarten pedagogical approaches and their effects on cognitive development through outdoor activities.

II.4.1. Waldorf pedagogy

From a historical perspective, outdoor education has its deep roots in the Waldorf pedagogical approach. Developed by Rudolf Steiner at the beginning of the 20th century, Waldorf pedagogy is one of the first modern educational alternatives that systematically integrated outdoor activities as an essential part of the educational process. The Waldorf approach was founded on the principle of "head, heart and hands", aiming at the holistic development of the child, including through direct contact with elements of the natural environment (Ullrich, 2008).

II.4.2. Montessori pedagogy

An alternative pedagogical model is the Montessori approach. Developed by Maria Montessori in the first decades of the last century, this educational methodology offers a different perspective that, although initially intended for formal indoor spaces, integrated and exploited the formative value of experiences in nature to stimulate infant cognitive development (Montessori, 2017).

Maria Montessori believed that the outdoor environment offered unique opportunities for children's intellectual development: 'When the child goes outdoors, he comes into contact with the

whole world. These periods of outdoor activity are essential for intensive development" (Montessori, 2007, p. 69).

II.4.3. Reggio Emilia

In addition to the educational alternatives presented above, the Reggio Emilia approach offers a distinct perspective on the cognitive potential of outdoor activities for preschoolers. Developed after World War II in the Italian town of Reggio Emilia under the guidance of Loris Malaguzzi, this pedagogy conceptualizes the natural environment as a "third educator" alongside the adult and the collective of children (Edwards et al., 2012).

The Reggio Emilia philosophy recognizes the outdoor environment as a privileged space for inquiry and discovery. Outdoor experiences "are not treated as mere recreational breaks, but as authentic opportunities for inquiry and knowledge building, where children can explore complex natural phenomena through the use of the 'hundred languages' of expression and understanding" (Gandini, 2012, p. 43).

II.4.4. Forest Schools

The Forest Schools movement offers a distinctive educational model that positions the natural environment as the very foundation of cognitive development. Originating in Scandinavian countries and subsequently developed in the UK and other regions, this approach is characterized by regular, long-term sessions in natural settings where children benefit from structured freedom and experiential learning (O'Brien, 2009).

II.5. Relaxation, Quiet and Learning Garden

The concept of the *Garden of Relaxation, Quietness and Learning* (abbreviated as GRLI) represents an innovative approach in the Romanian preschool education landscape that capitalizes on structured interaction with the natural environment to optimize cognitive development. This pedagogical initiative integrates principles from educational neuroscience and experiential education methodologies, adapted to the specific national curriculum (Șovar & Antonescu, 2018). From a methodological perspective, GRLI implements the experiential learning cycle developed by Kolb, reconfigured for the cognitive specificity of preschoolers.

CHAPTER III
DESIGNING LEARNING ACTIVITIES
OUTDOOR LEARNING ACTIVITIES

Early childhood education, recognized as a national priority in the National Education Law (11/2011, 198/04.07.2023) and operationalized by the *Curriculum for Early Education* (2019), is the foundation for the harmonious development of the child's personality, constituting the first stage of the Romanian educational system, with a holistic approach, focused on the developmental needs of the child.

III. 1. Analysis of curricular documents for early childhood education - premises in shaping outdoor learning experiences

Taking into account the conceptualizations presented, it is necessary to analyze how the principles advocated by the mentioned authors are translated into educational practice and their contribution to the early formative process.

III.2. Analysis of *the Curriculum for Early Education*

Activities in kindergarten are carried out according to the provisions of *the Curriculum for Early Education* (2019), "*a* tool for optimizing children's educational experience" (p. 4). The mentioned document outlines pedagogical directions to support children's holistic development through educational and care strategies that facilitate the full realization of individual potential, while giving teachers the flexibility to adapt their methods according to the interests, requirements and specific abilities of each preschooler (*Curriculum for Early Education*, 2019).

III.3. The methodological path in the development and implementation of outdoor learning activities

The methodological pathway for the development and implementation of these activities requires a structured approach that capitalizes on the educational potential of outdoor spaces and responds to the developmental needs of pre-school children. The following aspects are considered:

1. Provision of a simulating and safe space
2. Setting the objectives
3. Choosing a theme

4. The actual implementation of the activities
5. Conducting the outdoor assessment.

III.4. Pedagogical measures to ensure physical and emotional integrity in outdoor activities

Planning outdoor activities requires an objective assessment of both the educational potential and the specific limitations of such experiences. Teaching staff need to adopt an evidence-based approach to identifying, assessing and managing limiting factors and potential risks.

The implementation of educational programs in the natural environment encounters various obstacles that influence the optimal learning process. Adverse weather conditions can disrupt the planning and continuity of educational experiences, and seasonal variability restricts access to certain types of activities and requires curricular adaptations. Accessibility is a relevant limitation for pre-school children with special educational needs. Undesignated grounds can present physical barriers that restrict equitable participation, contrary to the principles of inclusive education (Stanton-Chapman & Schmidt, 2017). From a logistical perspective, factors such as distance from preschool facilities, transportation, and the need for additional resources create administrative and financial constraints that reduce the frequency and complexity of implemented outdoor activities.

Recognizing these pedagogical limitations allows teachers to develop compensatory strategies and integrate outdoor experiences into a balanced educational framework that capitalizes on the specific advantages of learning in the natural environment while minimizing the inherent restrictions of this approach.

III.5. Reference practices in the international context of outdoor education

Education systems in different countries have developed effective strategies for implementing outdoor education at pre-school level, demonstrating significant results in stimulating cognitive development. These models offer valuable insights for optimizing educational practices in the natural environment.

In the Nordic countries, the forest kindergarten concept ('skovbørnehave' in Denmark, 'I Ur och Skur' in Sweden) is an educational model with remarkable results. Danish preschoolers spend 4-6 hours a day in the natural environment, regardless of weather conditions, under the

principle "there is no such thing as bad weather, only bad clothing" (Williams-Siegfredsen, 2017, p. 56).

Japan is implementing the "mori-no-yōchien" (forest kindergartens) system for 3-6 year olds, based on the "satoyama" philosophy. Preschoolers participate in weekly activities in specially designed natural spaces, where they use natural building materials, observe biological cycles and practice nature-inspired art.

Germany has developed the "Waldkinkindergarten" (Forest Kindergarten) concept for 3-6 year olds, characterized by the absence of conventional indoor spaces and the exclusive use of natural materials.

The UK implements the Forest Schools program adapted for pre-school age (3-5 years old), based on weekly sessions in natural spaces adjacent to kindergartens.

New Zealand integrates indigenous Maori knowledge into the Bush Kinder program for preschoolers. Activities include traditional nature stories, observing natural cycles and exploring the concept of 'kaitiakitanga' (responsible stewardship).

Canada has developed "Nature Kindergartens" programs for 4-5 year olds, initially implemented in British Columbia. Preschoolers participate in activities such as mapping natural spaces, identifying animal tracks, ice and water experiments and orienteering games.

The effectiveness of these strategies in stimulating cognitive development in preschoolers is confirmed by longitudinal and comparative studies, providing the scientific basis for their adaptation and implementation in diverse educational contexts.

III.6. Valorization of outdoor educational models in the context of the Romanian preschool system

The analysis of the implementation of international outdoor education models in the Romanian preschool system reveals a fragmented and unsystematized adoption. The local educational context presents peculiarities that influence the process of transfer and adaptation of these pedagogical practices.

The Curriculum for Early Childhood Education (2019) establishes the normative framework that allows the integration of experiences in the natural environment, mentioning the possibility of developing experiential domains through activities carried out in various spaces, including the outdoors. Although this provision creates the formal premises for the implementation of outdoor education, the document does not provide sufficient specific methodological tools or

indications on the allocation of resources necessary for a systematic application in educational practice.

III.7. Making the most of the existing institutional framework: *the Green Week* and *School Differently* programs as opportunities for implementing activities in the natural environment

Green Week is an educational initiative dedicated to the promotion of environmental education and sustainable development in the context of pre-school institutions. This educational programme provides an organized framework for involving children in environmentally themed activities, facilitating authentic learning experiences in direct contact with nature. Through its holistic and interdisciplinary approach, *Green Week* contributes significantly to stimulating the cognitive development of pre-school children, in a context that capitalizes on the resources of the natural environment and the active presence of various categories of educational partners. Officially implemented in the Romanian educational system by the Order of the Ministry of Education no. 3.505/31.03.2022, *Green Week* has become an integral part of compulsory educational activities.

The School Differently is a national educational initiative that provides an organized framework for non-formal activities, including in the natural environment, facilitating the cognitive development of preschoolers through alternative experiences. The program's contribution to cognitive development in an outdoor context is manifested through the exploratory expeditions in the vicinity of kindergartens, the involvement of specialists from various fields and methodological freedom in the design of activities. The longitudinal study conducted by Dumitrescu et al. (2019) demonstrated improvements in attention and cognitive flexibility in preschoolers participating in structured activities in the natural environment, within the framework of the *Different School* program.

PART II
EXPERIMENTAL PEDAGOGICAL RESEARCH: DEVELOPMENT OF COGNITIVE SKILLS IN PRESCHOOL CHILDREN THROUGH OUTDOOR ACTIVITY PROGRAMS
CHAPTER IV. RESEARCH DESIGN

IV.1. Research background and context

This experimental research approach aimed to integrate an intervention program applicable to the middle-school age group into the teaching activity carried out in pre-school education, in order to develop cognitive skills through outdoor activities. The educational program, designed in the context of the research as an experimental intervention, ensures both the traversal of the three categories of activities (abbreviated: ALA, ADE, ADP) found in the *Curriculum for Early Childhood Education* (2019), and the creation of the necessary context for optimizing cognitive processes through outdoor activities.

A close analysis of the current curriculum documents for preschool education reveals an insufficient capitalization of the educational potential of the outdoor environment. Although *the Early Childhood Curriculum* (2019) mentions the natural environment as a source of learning, there is no systematic and explicit approach to how outdoor activities can be integrated into educational practice with the aim of optimizing cognitive skills. This methodological lacuna limits the full capitalization of natural contexts in the development of preschoolers' cognitive abilities, constituting an additional argument for the necessity of the present research.

The methodological letter for the 2021-2022 school year (Ministry of Education, 2021) signaled the need to diversify learning contexts, citing the value of outdoor activities for children's holistic development. However, concrete methodological aspects of designing and implementing systematic programs of outdoor activities focused on cognitive stimulation remain underdeveloped. This normative framework, while recognizing the importance of outdoor education, requires scientifically grounded methodological developments, to which this research aims to contribute.

Therefore, the following premises were made:

1. Informal and natural contexts outside the institutional kindergarten setting, such as family activities, games in parks, nature excursions and interactions with diverse communities, offer significant opportunities for the stimulation and cognitive development of preschool children, representing the necessary complement to formal education and contributing decisively to their preparation for the transition to primary education.
2. The literature confirms the positive influence of experiential learning in the natural environment on the development of fundamental cognitive skills.
3. Through activities that promote active exploration and direct interaction with the natural environment, the principles of integrated learning and at the same time child-centeredness are supported, and thus participation in educational activities will also be a source of satisfaction for pre-school children through discovery, autonomy, competence and connection with nature.
4. The inadequate operationalization of outdoor activities in current curricular documents represents an opportunity for the development of innovative methodological proposals to optimize the use of the natural environment in the cognitive stimulation of preschoolers.

IV.2. Research aims and objectives

The aim of the research was to identify the effectiveness of the experimental intervention program based on outoor activities in the development of cognitive skills, with applicability to children of middle preschool age.

The research objectives are as follows:

1. To implement an experimental intervention program based on outdoor learning activities, complementary to curricular activities, aimed at the development of cognitive skills of middle preschoolers.
2. Analysis of cognitive development indicators following the application of the intervention program, following two comparative perspectives: the internal evolution of the experimental group (by comparing the pre-intervention results with the post-intervention results) and the differences between the performances of the experimental and control groups.

3. To develop theoretical models for a strategic approach to integrating outdoor learning activities into the daily routine of the kindergarten, designed to guide teachers in stimulating and developing cognitive skills in children of middle preschool age.

Research questions

1. What impact does the outdoor activities program have on the cognitive development of middle preschoolers?
2. How does the level of cognitive abilities differ between preschoolers who participate in outdoor activities and those who follow the regular educational program?
3. What specific cognitive changes occur in preschoolers in the experimental group after participating in the outdoor activities program?
4. How can outdoor activities be effectively integrated into the daily kindergarten program for cognitive stimulation of preschoolers?
5. What effects does the natural environment have on learning processes and cognitive motivation in preschoolers in the middle group?

IV.4. Research hypotheses

General research **hypothesis**: The implementation of an intervention program consisting of a system of outdoor learning activities in compliance with *the Curriculum for Early Education* (2019) contributes to better development of cognitive abilities of middle preschoolers (4-5 years).

Secondary hypotheses

The secondary hypotheses of the research were derived from the general hypothesis and formulated based on the unmediated connection between the experimental intervention approach and the dependent variables (indicators of cognitive development).

Hypothesis 1: The implementation of an intervention program consisting of a system of outdoor learning activities, under the conditions of compliance with *the Curriculum for Early Education* (2019), contributes to better development of the abilities to realize relations, operations and logical inferences of children of middle preschool age (4-5 years).

Hypothesis 2: The implementation of an intervention program consisting of a system of outdoor learning activities, under the conditions of compliance with *the Curriculum for Early Education* (2019), contributes to better development of problem-solving skills of children of middle preschool age (4-5 years).

Hypothesis 3: The implementation of an intervention program consisting of a system of outdoor learning activities, under the conditions of compliance with *the Curriculum for Early Education* (2019), contributes to better development of children's (4-5 years) middle preschool age (4-5 years) children's abilities to understand causal relationships.

Hypothesis 4: The implementation of an intervention program consisting of a system of outdoor learning activities, under the conditions of compliance with *the Curriculum for Early Education* (2019), contributes to better development of observation and comparison skills of children of middle preschool age (4-5 years).

IV.5. Research variables

The independent variable is represented by: the experimental intervention program consisting of the 10 outdoor learning activities carried out in compliance with *the Curriculum for Early Education* (2019).

The dependent variable is the development of cognitive skills in preschoolers through outdoor activity programs. These skills are measured through the following indicators:

1. The first indicator of cognitive development is the set of relationships, operations and logical inferences, which assesses preschoolers' ability to make logical connections, categorize items and draw conclusions based on available information.
2. The second indicator of cognitive development, problem-solving skills, measures the ability of preschoolers to find solutions to challenges encountered in the natural environment.
3. The third indicator of cognitive development is the ability to understand causal relationships, which assesses how preschoolers perceive cause and effect.

4. The fourth indicator of cognitive development is observation and comparison skills, which measure the ability of pre-schoolers to identify similarities and differences between elements in the environment

The cognitive development indicators selected for the assessment of pre-school children represent the operational translation of curricular goals and reflect a systemic approach to the educational process. The selection of these indicators was made in accordance with the developmental dimensions and behaviors stipulated in the *Curriculum for Early Education* (2019), aiming at their determinant role in the assessment of cognitive progress and their cross-cutting nature in relation to the experiential domains.

IV.6. Participant samples

The research involved a sample of 131 pre-school children in the middle group at the "Dumbrava Minunată" extended program kindergarten in Reșița, divided into two distinct groups: the experimental sample consisting of 66 children and the control sample consisting of 65 children. This distribution was made in order to allow a rigorous comparison of the impact of the outdoor activities program on the cognitive development of preschool children. The convenience sample method was used due to the accessibility and availability of the children within the time and logistical framework imposed by the school calendar and the research program.

RESEARCH GROUP	Experimental group	Control group	Total number of pre-school children
	66 preschoolers	65 preschoolers	131 preschoolers

Table IV.1. Description of the group of subjects

Intervention program

The independent variable is concretized in a program of outdoor activities.

The experimental intervention program used in the research consists of 10 structured didactic activities and a concluding activity in which the preschoolers have the opportunity to give feedback about their experience in the outdoor environment. It ran at a frequency of one activity

per week from March to May 2024. The thematic contents and the way of their implementation are aimed at optimizing the development of cognitive skills in preschool-aged children, while taking into account the fact that the activities in the kindergarten are aimed at the integrated development of the behaviors mentioned in the progress assessment sheet.

Taking advantage of the natural environment as an educational space, the proposed activities have been designed to stimulate fundamental cognitive processes (attention, memory, logical thinking, executive functions) through direct, multisensory and interactive experiences, tailored to the specific needs of 4-5 year-old preschoolers.

The themes of the outdoor activities and the proposed period for their realization are presented in Table IV.3.

	Period	**Name of the outdoor activity**
1	March 4-10, 2024	Freely chosen games and activities. Building *Sand blocks*
2	March 11-17, 2024	Activities by experiential domain: Science domain. Environmental Knowledge *What happens to trees in the spring?*
3	March 18-24, 2024	Activities by experiential domains: Science domain. Math activity *Big leaves and little leaves*
4	March 25-31, 2024	Freely chosen games and activities. Building *Flower pots*
5	April 1-7, 2024	Activities by experiential domains: Science domain. Environmental Knowledge *Where does rainwater go?*
6	April 8-14, 2024	Activities by experiential areas: Science. Environmental Knowledge *How can we filter water using elements from nature?*
7	April 15-21, 2024	Activities by experiential areas: Science. Environmental Knowledge *Planting trees in the forest*

8	April 22-28, 2024	Activities by experiential areas: Science. Environmental Knowledge *How can we make a fire using white stones?*
9	May 13- May 17, 2024	Freely chosen games and activities. Arts *Insects on pebbles*
10	May 20- May 24, 2024	Freely chosen games and activities. Arts *Drawing with charcoal*

Table IV.2. Activities of the intervention program

The direct observation method consisted of recording children's behaviors and reactions during outdoor activities in an observation grid. The observation grid provided an objective framework for assessing the set of behaviors considered essential for the cognitive domain (according to the Sheet for the assessment of individual progress of the child before entering primary school and the document *Fundamental milestones in learning and development of the child from birth to 6/7 years*).

During the course of the research, the progress made by the pre-school children was systematically recorded in the children's observation notebook. The structure of this tool was adapted in order to facilitate the tracking of behaviours and cognitive skills developed as a result of participation in organized outdoor activities. The observation booklet was adjusted to include indicators, designed to highlight the contribution of outdoor activities to the development of cognitive skills.

The testing method facilitated a more complete picture of preschool children's cognitive development through their participation in outdoor activities. Pedagogical evaluation tests were used, concretized in worksheets, carried out by the children at the end of the outdoor activities, obtaining an assessment of how outdoor activities contributed to the cognitive development of preschool children.

Also, in order to obtain the most objective data, standardized tests were applied, which included items targeting a series of cognitive and communication skills. The tests are presented below:

Denver Test II (APPENDIX 3) - a screening tool for the assessment of a child's overall development, with a focus on early cognitive skills;

Portage Test (ANNEX 2) - comprehensive assessment of cognitive development, including related aspects such as language, motor skills, self-care and social interaction;

The Goodenough-Harris test (ANNEX 4) - a graphical test based on the child's drawing, used to estimate the level of intellectual development and to analyze cognitive complexity;

The activity product analysis method helped to complement the data obtained using the other research methods and tools, allowing a detailed assessment of the progress and difficulties encountered by the children during outdoor activities by examining the practical work they did (constructions made of natural materials, sand drawings, pebble paintings, results of experiments).

The pedagogical experiment formed the basis of the research focused on the development of cognitive skills in preschool children through outdoor activities. The experiment was designed to investigate the impact of outdoor activities on the cognitive development of preschool children and the extent to which participation in this type of activities contributes to optimizing the development of cognitive skills in preschool children, by highlighting the cognitive progress achieved as a result of implementing the outdoor activities program.

In order to operationalize the aforementioned research methods and to ensure a rigorous process of data collection, the following tools were used in the present investigative approach:

1. Systematic Observation Grid (ANNEX 1). This tool has been developed in line with current curricular provisions and the principles of pre-school assessment, incorporating specific indicators from the *Sheet for the assessment of individual child progress prior to entry into primary education* and from the document *Key Milestones in Child Learning and Development from birth to 6/7 years*. The grid allowed the objective and systematic recording of cognitive behaviors manifested by preschoolers in outdoor contexts, facilitating the assessment of skills such as: spatio-temporal orientation, ability to identify causal relationships, flexibility of thinking and level of voluntary attention. The tool was validated by expert judgment, evaluated by teachers with

experience in early childhood education and adapted following a preliminary piloting phase.

2. The Preschool Observation Notebook, used in this research (ANNEX 5), is a longitudinal monitoring tool, structured along dimensions of cognitive development relevant to the activities carried out in the natural environment. The observation notebook was configured in such a way as to allow the systematic documentation of the cognitive development of the subjects, including dedicated headings for: spontaneous manifestations of cognitive curiosity, exploration strategies used, level of autonomy in problem solving, metacognitive behaviors and transfer of acquisitions between the outdoor and indoor environments. This tool facilitated the collection of qualitative data that nuanced the impact of natural experiences on cognitive processes.
3. Pedagogical assessment tests. The set of pedagogical tests was designed to assess cognitive acquisitions resulting from participation in the outdoor program. They took the form of thematic worksheets, specifically designed to reflect the content addressed in the natural context and to allow the assessment of cognitive transfer. Content validity was ensured by reference to the specific curricular objectives of the middle group, and fidelity by the consistent application of assessment criteria.

Standardized developmental assessment instruments. The following standardized instruments were used to ensure the objectivity of measurements and comparability of results:

1. Portage Scale (ANNEX 2) - a comprehensive developmental assessment tool, adapted and validated for the Romanian population, which includes dedicated sections for cognitive, language, self-care, socialization and motor assessment. The scale allows precise measurement of developmental level and identification of areas of near development, essential for planning individualized educational interventions.
2. Denver Test II (APPENDIX 3) - a screening battery with demonstrated validity and fidelity, which assesses a child's overall development on four major dimensions: personal-social, adaptive fine motor, language and gross motor. In the context of the present research, the focus was on items targeting cognitive and adaptive functions.
3. Goodenough-Harris test (APPENDIX 4) - a standardized test, based on the analysis of the human figure drawing, which allows the assessment of the level of intellectual development, perceptual-motor maturity and body schema. The test offers the

possibility to calculate a development coefficient, facilitating pre- and post-intervention comparisons.

4. The Reynell scale (ANNEX 5) - a standardized instrument that assesses the receptive and expressive components of language, providing valuable information about cognitive development through the lens of language skills. The scale was used to assess the impact of outdoor activities on the cognitive processes involved in language acquisition and use.

Data obtained from the measurement were processed, organized and analyzed for graphical representation and hypothesis testing. We used the SPSS26 program to analyze the statistical significance of differences between the experimental and control groups. Before interpretation, we verified the correctness and authenticity of the information collected through tests and questionnaires using the validation functions of the same statistical program.

Research stages

A) The pre-experimental stage forms the methodological basis of our study "Development of cognitive skills through outdoor activity programs", an investigation carried out in the context of pre-school education, with a specific focus on children in the middle school group. This preliminary stage included a series of preparatory actions that ensured the scientific validity of the subsequent intervention.

B) Experimental stage. In the research *Cognitive development of preschoolers through outdoor activity programs*, the experimental stage was the core of the actual implementation of the formative intervention, representing the practical application of the program designed in the pre-experimental stage.

The experimental intervention program was carried out during March-May 2023-2024, the direct beneficiaries being the preschoolers of the experimental group. The pedagogical intervention encompassed a structured set of outdoor activities specifically designed to stimulate cognitive development, which were carried out on a weekly basis as part of the kindergarten's educational program.

C) Post-experimental phase. In the post-experimental stage, after the completion of the 10 outdoor activities of the experimental intervention program, we applied the instruments for assessing the level of cognitive development to both groups of subjects. The assessments were

administered to the sampled preschoolers at the end of May 2024, after the end of the intervention program.

D) Retest Phase. In this final stage, a retest of the experimental group was conducted at the beginning of the following school year, after the summer vacation, to assess the persistence and stability of the effects of the outdoor activity-based intervention program on preschoolers' cognitive development. The retest used the same instruments as in the previous phases, thus ensuring comparability of results and providing a longitudinal perspective on the impact of the program.

IV.9. Research ethics considerations

The research design was based on the fundamental principles of ethics, namely autonomy or showing respect for others, benefit or acting for the gain of others, obligation to do no harm, and justice (Mureșan, 2019).

There are at least two ethical dimensions to be considered in a research endeavor, namely, "procedural ethics" which is concerned with the approval from a committee/authorities/competent persons to carry out the action by involving individuals and "ethics in practice" which is concerned with the aspects of the research endeavor (Guillemin & Gillam, 2004).

As a consequence, the whole investigative process should comply with the specific ethical norms of academic research and the deontological principles of scientific activity, taking into account the special status of the participants - pre-school children, a group that requires increased protection measures and an adapted approach in the context of any study (Iluț, 2009).

CHAPTER V
RESEARCH RESULTS

V.1. Pre-experimental research results

The initial assessment tests were applied to the 131 preschoolers included in the pedagogical research (experimental group and control group) and the following cognitive skills were considered:

1. Relationships, operations and logical inferences (A1), which assesses the preschoolers' ability to make logical connections, categorize items and draw conclusions based on the available information.
2. Problem solving skills (A2), which measures the ability of pre-schoolers to find solutions to challenges encountered in the natural environment.
3. Understanding causal relationships (A3), which assesses how preschoolers perceive connections between actions and consequences in nature.
4. Observation and comparison skills (A4), which measure the ability of pre-schoolers to identify similarities and differences between elements in the environment.

To assess these cognitive skills, standardized tests were administered: the Denver II Test, the Portage Test and the Goodenough-Harris Test, the Reynell Test adapted to assess these skills, with the aim of identifying the stage of development prior to the experimental intervention and to draw conclusions about the impact of outdoor activities on the development of cognitive skills in middle group preschoolers

The two samples of subjects were equivalent in terms of origin and gender distribution. The groups were correlated and can be said to have approximately the same demographic characteristics.

The application of the assessment instruments and the input of the results into the SPSS program was necessary to perform the comparative analysis between the experimental and control groups, thus verifying the initial equivalence of the groups.

Statistics	*Experimental group*	*Control group*
N Valid	66	65
Mean	85.2	84.8

Median	83.0	82.5

Table V.1. Initial test results - mean and median - for experimental and control groups

In Table V.1 we have included the main descriptive statistical parameters, which will be used in the subsequent analysis to illustrate the distribution and direction of the evolution of the scores obtained on the cognitive dimensions evaluated. Analyzing the data, we note the almost perfect similarity between the two samples according to the statistical values, with a mean score of 85.2 for the experimental group and 84.8 for the control group, respectively. These results indicate an equivalent starting point in terms of the level of cognitive development for both groups.

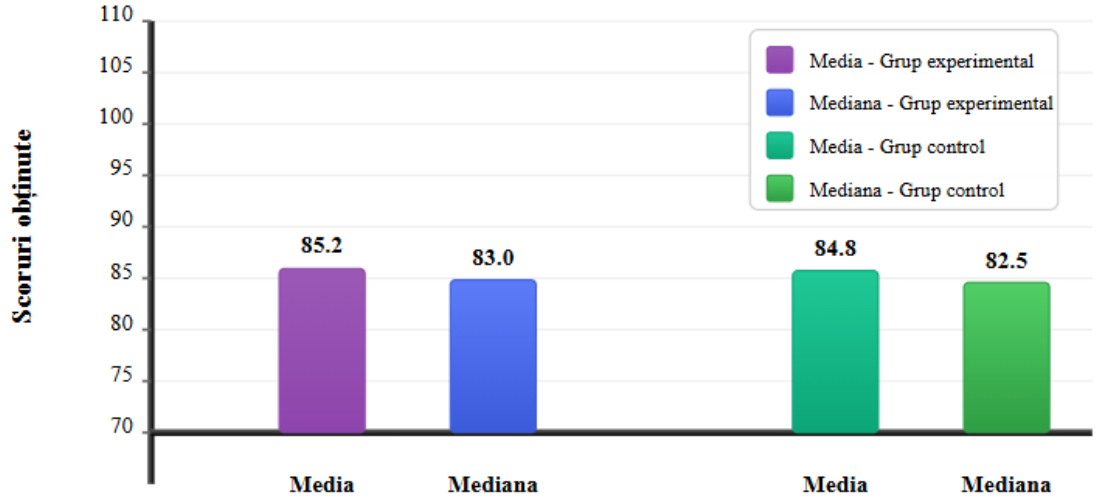

Figure V.1. Results of baseline testing - mean and median for the experimental and control groups in the pre-experimental stage

Note: The differences between the mean and median results are not statistically significant ($p > 0.05$), which confirms the homogeneity of the two groups at baseline assessment

Figure V.1 illustrates the results of the initial assessment of the level of cognitive development of the preschoolers included in the study. The scores presented reflect the overall performance of the subjects, highlighting the general cognitive abilities assessed in the pre-experimental stage. Values are expressed on a scale from 0 to 120 points, where higher scores indicate a higher level of cognitive development. The mean of 85.2 for the experimental group and 84.8 for the control group represent comparable values, typical of normal development for the age

group studied. The absence of statistically significant differences between the two groups (p>0.05) confirms the initial equivalence of the groups of subjects, an essential aspect for the validity of the experimental approach and for the correct interpretation of the results that will be obtained in the subsequent stages of the research.

	Levene's test for equality of variances		t test for equality of means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Standard error of difference	95% confidence interval	
								Lower limit	Upper limit
Assumed equal variances	0.157	0.693	0.352	129	0.726	0.400	1.136	-1.848	2.648
Unassumed equal variances			0.352	128.982	0.726	0.400	1.136	-1.849	2.649

Table V.2. t-test results for independent samples

The t-test for independent samples (t(129)=0.352, p=0.726) shows that the difference of 0.400 between the means of the two groups is not statistically significant, the p-value being much

higher than the 0.05 threshold. The 95% confidence interval for the difference in means [-1.848; 2.648] includes the value zero, which confirms the lack of statistical significance.

On the basis of these analyses, we can confidently conclude that there are no significant differences between the initial assessment results of the experimental and control groups.

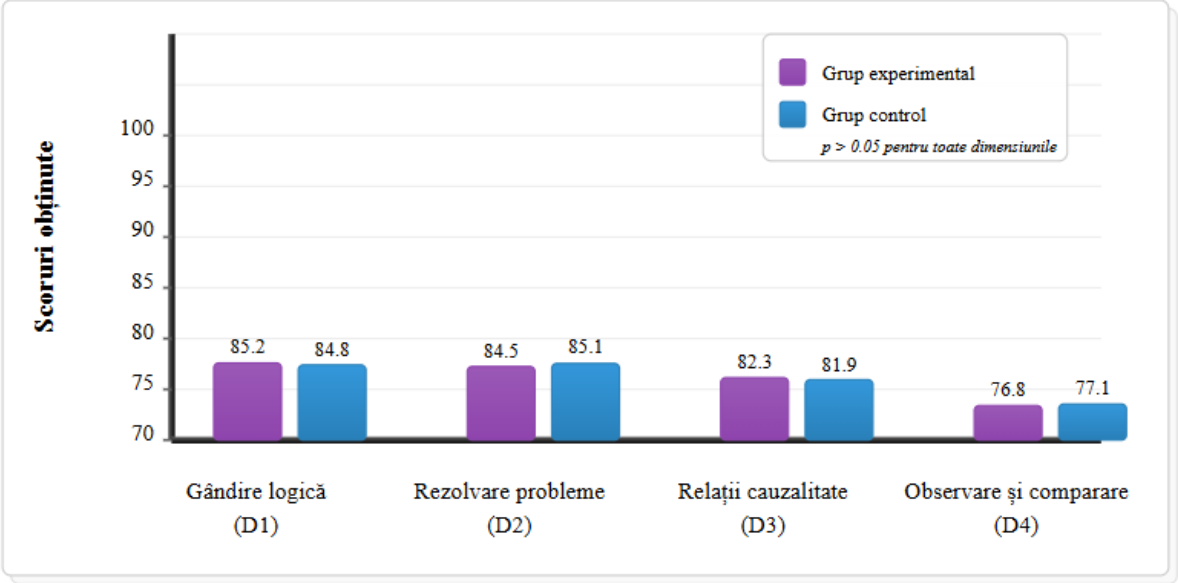

Figure V.2. Comparison of the level of development of cognitive skills assessed at the pre-experimental stage for the experimental and control groups

Note: ANOVA analysis confirms the absence of significant differences between groups for all cognitive skills assessed.

Results obtained in the post-experimental phase

The results for the four cognitive abilities assessed in the post-experimental stage, by groups included in the research, are presented in Table 37.

Cognitive abilities	Mean value Control group	Mean value Experimental group
Logical thinking	86.2	97.3
Problem solving	87.3	96.8
Understanding causal relationships	84.2	95.7
Observing and comparing	80.7	92.4
Overall average	84.6	95.6

Table V.3. Mean values of the scores obtained in the cognitive development indicators, by groups of subjects

F test: values between 26.87 and 33.86
p = 0.001 (for all abilities)
η² between 0.17 and 0.21 (strong effect)

On the basis of the data presented in Table V.12., it can be seen that suggestive differences appear in the mean cognitive ability scores between the two groups, with greater differences being recorded for logical thinking skills (11.1 points) and for observation and comparison skills (11.7 points). Significant differences were also recorded for the other two skills: problem solving (9.5 points) and understanding causal relationships (11.5 points). In other words, for all four cognitive skills, the experimental group performed more than 11% better than the control group, and for observing and comparing skills the difference was about 14.5%.

These differences are strongly statistically significant, with F(1; 129) test values ranging from 26.87 (for logical thinking) to 33.86 (for observation and comparison), with a $p = 0.001$ for all the skills assessed, values well below the established maximum significance threshold ($p < 0.05$). Consequently, the statistical data obtained lead us to accept the alternative hypothesis, which supports the existence of statistically significant differences in the performance of the children in the experimental group compared to the control group, as evidenced by their different scores.

Effect sizes, calculated by partial eta squared (η^2), range between 0.17 and 0.21 for the four skills, considerably exceeding the threshold of 0.14 indicating a strong effect (according to Cohen, 1988). These values emphasize the substantial impact of the experiential activities program in the natural environment on the development of cognitive abilities of preschoolers in the experimental group.

Thus, the statistical analysis confirms the effectiveness of the outdoor activity-based educational intervention in optimizing all four cognitive abilities investigated in middle-aged preschoolers.

Data obtained from the participant groups were processed using the SPSS statistical software package.

The aggregated results for the four indicators and the average of their values across groups of subjects are presented in Figure V.7.

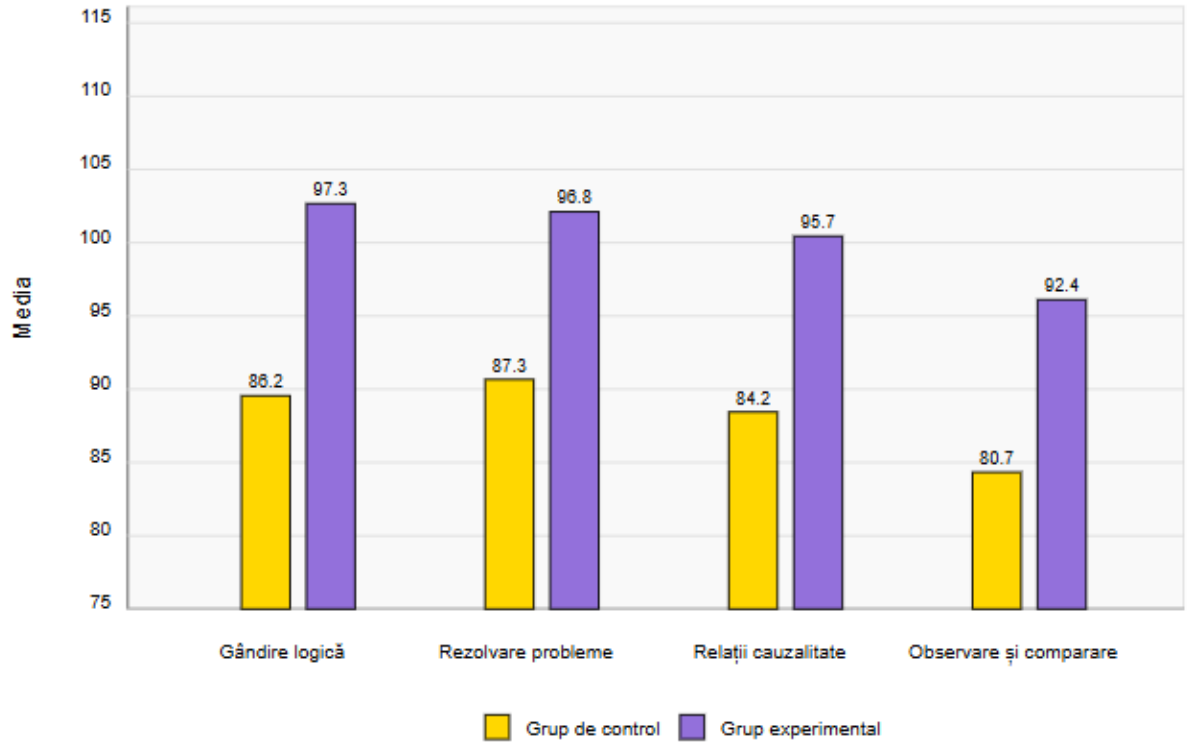

Figure V.3. Mean scores of the indicators of cognitive skills development for the two groups of subjects

Analysis of results on the development of logical thinking skills

Hypothesis 1: The implementation of a system of outdoor learning activities, while complying with *the Curriculum for Early Education* (2019), contributes to better development of the skills of realizing logical relations, operations and inferences of children of middle preschool age (4-5 years).

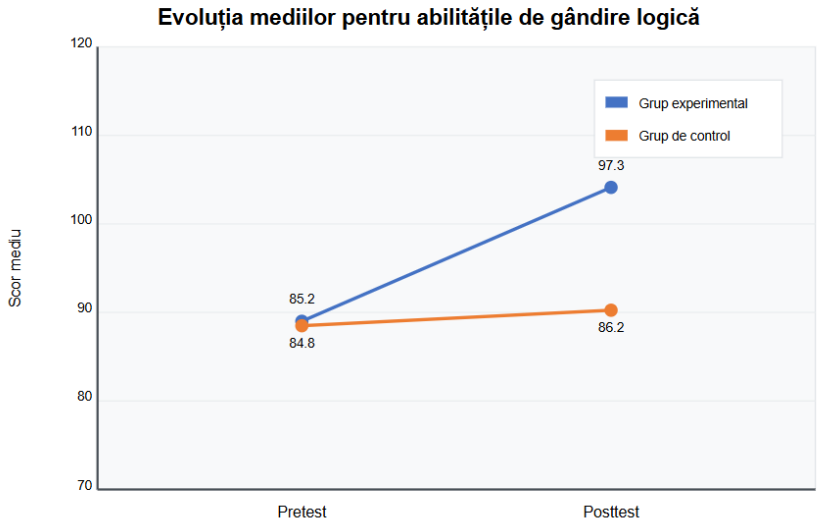

Figure V.4. Evolution of the means of logical thinking indicators for the two groups

From the data presented in Figure V.9., it can be seen that in the initial evaluation stage (pretest), the two groups performed similarly: the average of the experimental group was 85.2 and that of the control group was 84.8. However, in the final evaluation stage (posttest), the difference between the averages of the two groups increased considerably: 97.3 for the experimental group compared to 86.2 for the control group, which represents a difference of 11.1 points.

Hypothesis 2: The implementation of a system of outdoor learning activities, while complying with *the Curriculum for Early Childhood Education* (2019), contributes to a better development of problem-solving skills of children of middle preschool age (4-5 years).

To test this hypothesis, we assessed the problem-solving skills of preschoolers at pretest and posttest stages, comparing the development of the experimental group with that of the control group.

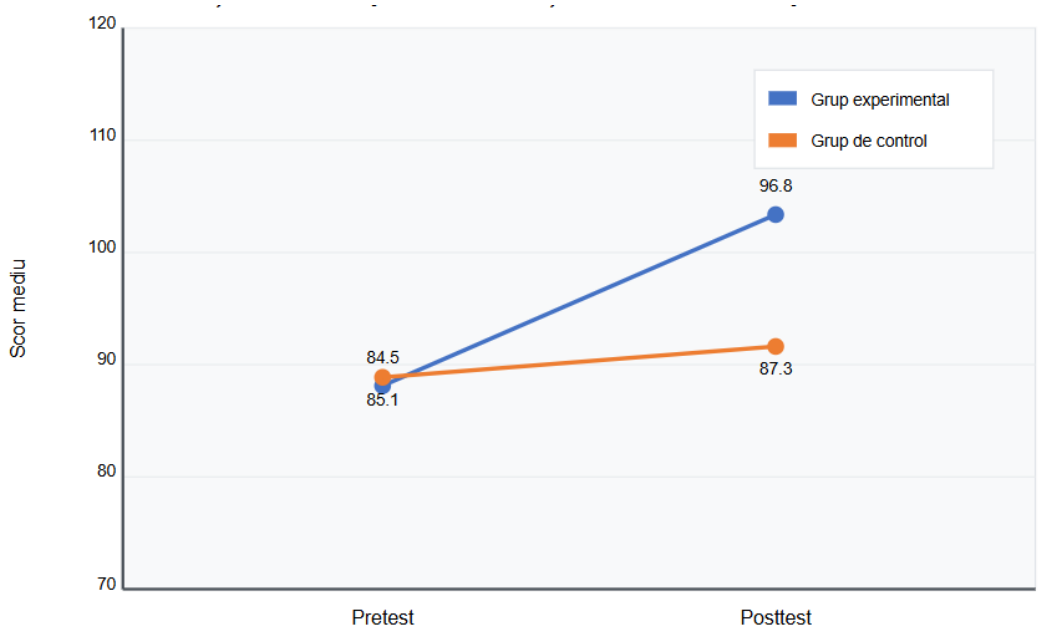

Figure V.5. Evolution of means for problem solving skills

Analyzing the data in Figure V.12, we observe that in the initial evaluation stage (pretest), the two groups performed similarly, with a slight difference in favor of the control group (85.1 versus 84.5). In the final evaluation stage (posttest), however, the difference between the means of the two groups reversed and increased considerably: 96.8 for the experimental group versus 87.3 for the control group, which represents a difference of 9.5 points. This differential development suggests a positive impact of the experiential intervention program in the natural environment on the development of problem-solving skills.

Hypothesis 3: The implementation of a system of outdoor learning activities, while complying with *the Curriculum for Early Childhood Education* (2019), contributes to a better development of children's (4-5 years old) middle preschoolers' (4-5 years old) ability to understand causal relationships.

To test this hypothesis, we assessed preschoolers' ability to understand and interpret cause-and-effect relationships by comparing the performance of the experimental group with that of the control group at pretest and posttest stages.

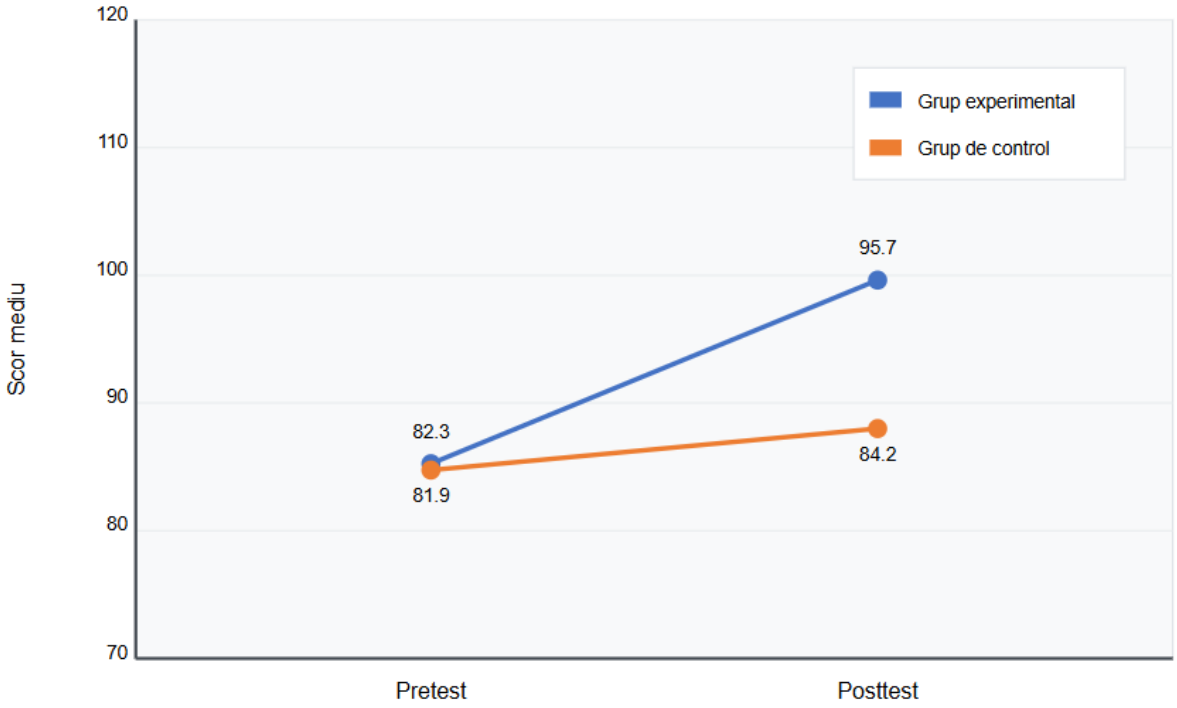

Figure V.6. Interaction effect for skills in understanding causal relationships

Analyzing the data in Figure V.14, we observe that in the initial assessment stage (pretest), the two groups performed very close: 82.3 for the experimental group and 81.9 for the control group. However, in the final evaluation stage (post-test), the difference between the means of the two groups increased substantially: 95.7 for the experimental group compared to 84.2 for the control group, which represents a difference of 11.5 points.

Hypothesis 4: The implementation of a system of outdoor learning activities, while complying with *the Curriculum for Early Education* (2019), contributes to a better development of observation and comparison skills in children of middle preschool age (4-5 years).

To test this hypothesis, we assessed the preschoolers' observation and comparison skills at pretest and posttest stages, aiming to identify any differences

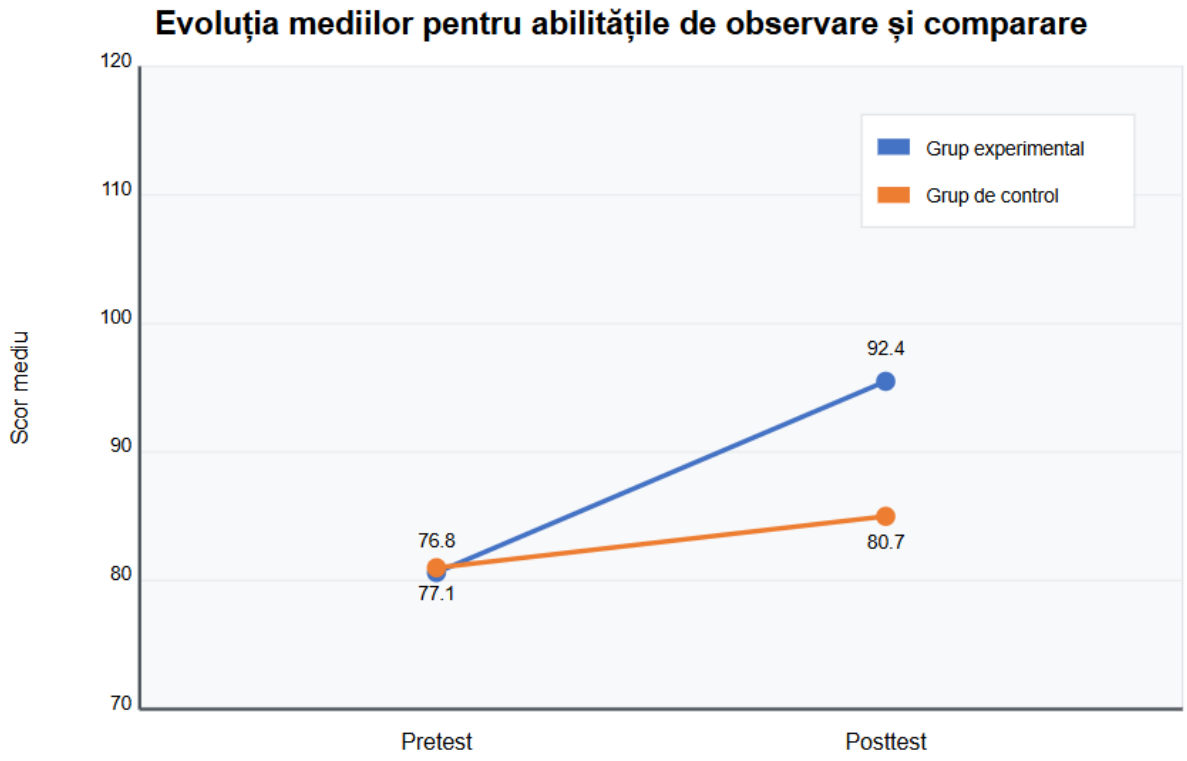

Figure V.7. Evolution of means for observation and comparison skills

Analyzing the data in Figure V.15., we observe that in the initial assessment stage (pretest), the two groups performed very similarly: 76.8 for the experimental group and 77.1 for the control group, with a small difference in favor of the control group. In the final evaluation stage (post-test), the difference between the means of the two groups reversed and increased substantially: 92.4 for the experimental group compared to 80.7 for the control group, a difference of 11.7 points.

The analysis of the results obtained in the post-experimental phase demonstrates the effectiveness of the experiential intervention program in the natural environment for the development of all four cognitive dimensions investigated. For an overview of the effects of the intervention, we present below a summary of the comparative results between the experimental and control groups.

Cognitive ability	Group	Pre-test		Posttest		Difference	F(1; 129)	p	η^2

		M	SD	M	SD	M			
Logical thinking	Experimental	85.2	7.5	97.3	6.4	12.1	26.87	0.001	0.17
	Control	84.8	7.3	86.2	7.1	1.4			
Problem solving	Experimental	84.5	7.2	96.8	6.7	12.3	29.84	0.001	0.19
	Control	85.1	7.0	87.3	6.9	2.2			
Understanding causal relationships	Experimental	82.3	7.8	95.7	6.5	13.4	31.77	0.001	0.20
	Control	81.9	7.5	84.2	7.8	2.3			
Observation and comparison	Experimental	76.8	8.2	92.4	7.6	15.6	33.86	0.001	0.21
	Control	77.1	7.9	80.7	8.1	3.6			

Table V.3. Summary of comparative results between experimental and control groups

As the results in Table V.36. indicate, for all four cognitive skills investigated, the experimental group showed a significantly greater improvement in performance between the pretest and posttest stages compared to the control group.

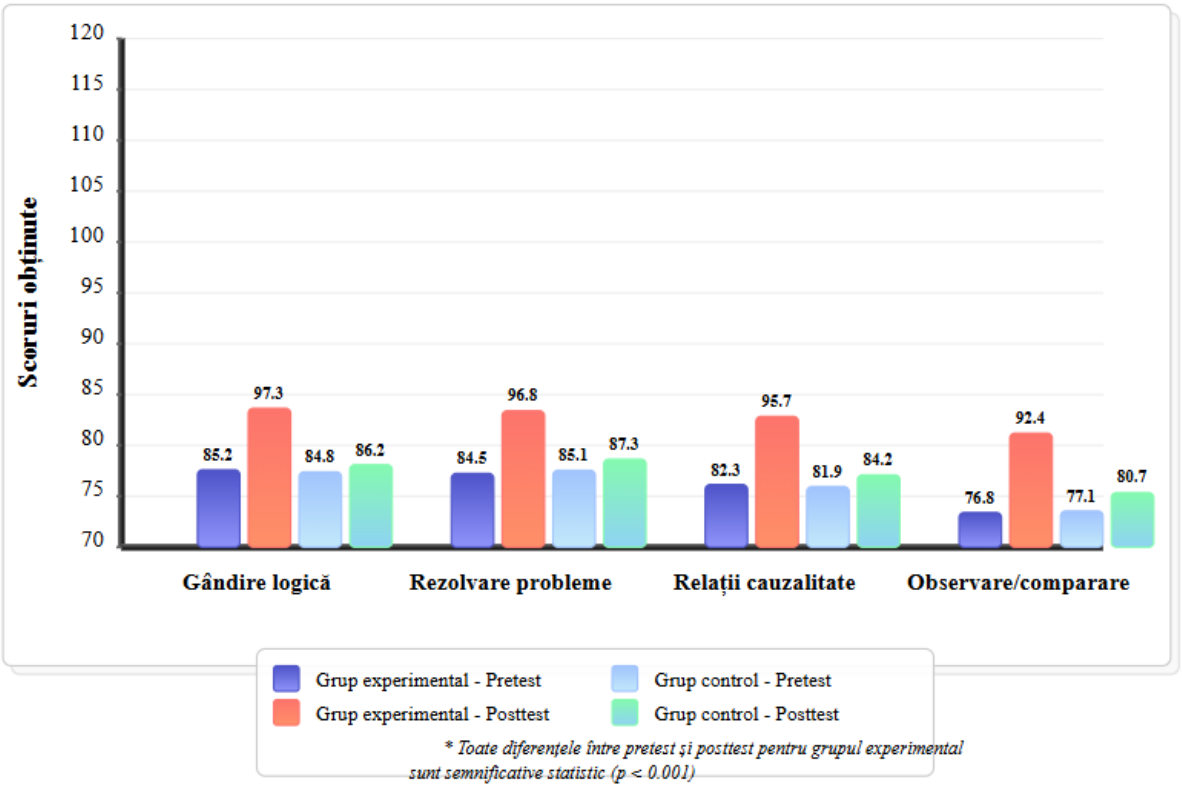

Figure V.8. Summary of the evolution of cognitive skills in middle-aged preschoolers. Comparison of pretest and posttest results for the experimental and control groups

The differences between the increases recorded by the two groups are substantial:

1. For logical thinking skills, the experimental group showed an improvement of 12.1 points, compared to only 1.4 points for the control group.
2. For problem-solving skills, the increase was 12.3 points for the experimental group, compared to 2.2 points for the control group.
3. For the ability to understand causal relationships, the difference is even more evident: 13.4 points for the experimental group, compared to only 2.3 points for the control group.
4. The biggest difference is observed for observation and comparison skills: 15.6 points for the experimental group compared to 3.6 points for the control group.

The interaction effects between the time of assessment and the group of belonging are strongly significant for all the cognitive dimensions analyzed, with effect sizes (η^2) ranging

between 0.17 and 0.21, values considered large according to the standard criteria in the literature (Cohen, 1988).

These results clearly confirm the hypotheses of our research, highlighting that the implementation of a system of experiential activities in the natural environment contributes significantly to the development of cognitive abilities of 4-5 year old preschoolers. The differences in the development of the two groups are too large to be attributed to chance or natural maturation, thus demonstrating the effectiveness of the implemented educational program.

From a pedagogical perspective, the obtained results highlight the importance of experiential learning and direct contact with nature for the cognitive development of preschool children. The natural environment provides an authentic learning context, rich in sensory and cognitive stimuli, which facilitates the development of fundamental mental operations: classification, comparison, seriation, causal relationships, problem solving.

In conclusion, the results of our research demonstrate that experiential activities carried out in the natural environment have a significantly positive impact on preschoolers' cognitive abilities, confirming all four hypotheses initially formulated. These results may constitute a strong argument for integrating outdoor activities more frequently into the preschool curriculum as a way to optimize children's cognitive development.

V.3. Results of the retest phase

In order to assess the stability and sustainability of the effects of the outdoor-based intervention program, a follow-up (retest) phase was carried out at the beginning of September 2024, approximately 4 months after the end of the program (May 2024).

After analyzing the data obtained in the follow-up (retesting) phase conducted in early September 2024, the following results were found:

The data collected in the follow-up stage demonstrate significant maintenance of the cognitive acquisitions developed through the outdoor activities program. The experimental group continued to show a higher level of cognitive performance compared to the control group, with statistically significant differences ($p<0.01$) for most of the dimensions assessed:

Cognitive ability	Mean difference GE-GC (post-test)	Mean difference GE-GC (follow-up)	Maintenance of effect (%)

Selective attention	2.83	2.76	97.5%
Visual memory	3.12	2.95	94.6%
Cognitive flexibility	2.57	2.41	93.8%
Logical thinking	2.94	2.85	96.9%
Problem solving ability	3.05	2.87	94.1%
Overall cognitive score	2.90	2.77	95.5%

Table V.4. Comparison between post-test and follow-up results

V.4. Experimental research conclusions

The analysis of the results obtained in our research on the impact of experiential activities in the natural environment on the cognitive development of preschoolers aged 4-5 years led to the following conclusions:

With regard to the skills of realizing relations, operations and logical inferences, preschoolers in the experimental group showed significant progress (12.1 points increase) compared to those in the control group (1.4 points increase). The interaction between the time of assessment and the group of belonging was highly significant ($F(1;129)=26.87$, $p=0.001$, $\eta^2=0.17$), thus confirming the first hypothesis of the research. Direct interaction with nature favored the development of logical thinking in preschoolers more effectively than classical learning methods.

Regarding problem solving skills, the results showed a substantial improvement in the preschoolers who participated in the outdoor activities program. The difference between the increase registered by the experimental group (12.3 points) and the control group (2.2 points) was statistically significant ($F(1;129)=29.84$, $p=0.001$, $\eta^2=0.19$), thus validating the second hypothesis of the research. Natural contexts provided genuine opportunities for developing problem-solving strategies in concrete situations.

In terms of skills in understanding causal relationships, statistical analysis revealed a significant difference between the development of the experimental group (13.4 points increase)

and the control group (2.3 points increase), with the interaction being strongly significant ($F(1;129)=31.77$, $p=0.001$, $\eta^2=0.20$). This result confirms the third research hypothesis and emphasizes the value of the natural environment as a source of directly observable causal phenomena.

Observation and comparison skills showed the most pronounced improvement following the educational intervention. Preschoolers in the experimental group improved by 15.6 points, compared to only 3.6 points in the control group, the difference being statistically significant ($F(1;129)=33.86$, $p=0.001$, $\eta^2=0.21$). This result validates the fourth hypothesis of the research and demonstrates the particular effectiveness of direct contact with nature for the development of perceptual abilities.

The effect sizes (η^2 between 0.17 and 0.21) indicate a strong impact of the educational intervention for all the cognitive abilities assessed, according to the standards established in the literature. The consistency of the results for all four cognitive skills investigated reinforces the internal validity of the research and demonstrates the generalized positive effect of outdoor education on the cognitive development of preschoolers.

Systematic implementation of activities in the natural environment, following the principles of *the Curriculum for Early Childhood Education* (2019), proved to be an effective strategy for optimizing cognitive skill development in 4-5 year old preschoolers, providing an empirically validated model for preschool educational practice.

In conclusion, our research provides strong empirical evidence for the significant contribution of experiential activities in the natural environment to the development of preschoolers' cognitive skills, supporting the need for their systematic integration into the kindergarten educational program.

CONCLUSIONS

The research on the implementation of outdoor activities in the kindergarten educational program revealed significant results that emphasize the value of this pedagogical approach. The program of outdoor activities developed and implemented over the course of 10 weeks from March to May 2024 demonstrated the positive impact of these educational experiences on the development of preschool children in the middle kindergarten group.

The research findings fully confirm the validity of the hypotheses initially formulated.

Hypothesis 1 is validated by the evident progress in the abilities to realize relations, operations and logical inferences. The preschoolers in the experimental group demonstrated an increased ability to make connections between phenomena and to operate with abstract concepts from concrete experiences in the natural environment. These logical abilities were manifested in more structured thinking and an increased ability to formulate reasoning based on direct observations.

Hypothesis 2 is confirmed by significantly improved problem-solving skills. Children exposed to the intervention program approached problematic situations with greater confidence and flexibility, developing diverse and creative strategies. The varied natural contexts provided authentic challenges that stimulated alternative thinking and encouraged innovative approaches to finding solutions.

Hypothesis 3 is validated by the evident development of the ability to understand causal relationships. Preschoolers made progress in identifying and explaining cause-effect connections, demonstrating a deeper understanding of natural processes. Activities such as observing seasonal transformations, experimenting with water and exploring natural cycles were instrumental in forming these essential cognitive structures.

Hypothesis 4 is confirmed by the remarkable progress in observation and comparison skills. Children in the experimental group showed increased attention to detail, enhanced perceptual discrimination and developed comparative analysis skills. Direct contact with the diversity of natural elements facilitated systematic practice of these fundamental skills for further cognitive development.

The program of outdoor activities developed in this research can serve as a valuable methodological guide for preschool teachers. Each activity is structured with clear objectives, necessary resources, stages of realization and suggestions for evaluation, which facilitates their implementation by educators, regardless of their previous experience in outdoor education. The practical dimension of the program, tested under real-life conditions with a group of pre-school children, provides credibility and direct applicability in similar educational contexts. The value of the methodological guide lies in the accessibility and adaptability of the proposed activities.

In conclusion, the program of outdoor activities for preschoolers developed and tested in this research opens new perspectives for educational practice and demonstrates the feasibility of systematically integrating outdoor experiences in early childhood education in Romania. Based on international research and adapted to the local context, this program represents a practical tool for educators and a source of inspiration for the development of educational policies that recognize the undeniable value of nature as a learning environment.

BIBLIOGRAPHY

- Allaby, M. (2018) *Aristotle: Understanding the natural world*. Rosen Publishing Group.
- Anderson, J. R. (1976). *Cognitive Psychology and Its Implications*. W. H. Freeman.
- Coates, J. K., & Pimlott-Wilson, H. (2019). Learning while playing: Children's Forest School experiences in the UK. *British Educational Research Journal, 45*(1), 21-40. https://doi.org/10.1002/berj.3491
- Deac, G. (2016). Getting children ready for school. In L. Stan (coord.), *Early childhood education. Problems and solutions.* Iași: Editura Polirom.
- Deater-Deckard, K., & Dodge, K. A. (1997). Externalizing behavior problems and discipline revisited: Nonlinear effects and variation by culture, context, and gender. *Psychological Inquiry, 8*, 161-175. https://scholars.duke.edu/publication/658227
- Edwards, C., Forman, G., & Gandini, L. (Eds.). 2012. *The hundred languages of children: The Reggio Emilia experience in transformation* (3rd ed.). Praeger. https://doi.org/10.5860/choice.50-2164
- Gallagher Vasile, M. (2019). The educational potential of rural environments in preschoolers' cognitive development: an ethnographic study. *Romanian Sociology, 17*(2), 125-142.
- Gandini, L. (2012). History, ideas, and basic principles: An interview with Loris Malaguzzi. In C. Edwards, L. Gandini, & G. Forman (Eds.), *The hundred languages of children: The Reggio Emilia experience in transformation* (3rd ed., pp. 27-71). Praeger.
- Holyoak, K. J., & Morrison, R. G. (Eds.). 2012. *The Oxford handbook of thinking and reasoning*. Oxford University Press.
- Katz, L. G. (1998). What can we learn from Reggio Emilia? In C. Edwards, L. Gandini, & G. G. Forman (Eds.), *The hundred languages of children: The Reggio Emilia approach to early childhood education* (2nd ed., pp. 27-45). Ablex Publishing.
- Kolb, D. A., Boyatzis, R. E., & Mainemelis, C. (2001). Experiential learning theory: Previous research and new directions. In R. J. Sternberg & L. F. Zhang (Eds.), *Perspectives on thinking, learning, and cognitive styles* (pp. 227-247). Lawrence Erlbaum Associates.
- Lillard, A. S. (2018) *Montessori*: *The science behind genius*. Humanitas Publishing.

- Mih, V. (2010). *Educational psychology*. Editura ASCR.
- Ministry of Education (2011). *National Education Law No.1/ 05.01.2011*. București. https://www.edu.ro/sites/default/files/legea-educatiei_actualizata%20august%202018.pdf
- Ministry of Education (2021). *Scrisoare metodică. 2021-2022, Year of professional learning communities.* Order of the Minister of Education no.33774/05.10.2021. https://www.isjbn.ro/sites/default/files/documente/2021-10/Scrisoare%20metodica-invatamant%20prescolar-2021-2022.pdf
- Ministry of Education (2022) *Methodical letter, 2022-2023. play, respect and joy.* Order of the Minister of Education no.2389/30.09.2022.https://cdn.edupedu.ro/wp-content/uploads/2022/10/SCRISOARE-METODICA-2022-2023.pdf
- Ministry of Education (2023) *Methodical letter. 2023-2024. About Rost in Education...* OrdinulMinistrului Educației nr. 31.815/25.10.2023. https://www.edu.ro/sites/default/files/_fi%C8%99iere/InvatamantPreuniversitar/scrisori_metodice/educatie_timpurie/Scrisoare_metodica_educatie_timpurie_2023.pdf
- Ministry of Education (2023). *Lei Învățământului Preuniversitar no 198/05.07.2023*. București.https://edu.ro/sites/default/files/_fi%C8%99iere/Minister/2023/Legi_educatie_Romania_educata/legi_monitor/Legea_invatamantului_preuniversitar_nr_198.pdf
- Ministry of Education (2024). *Early childhood education (pre-primary education + preschool education).* https://www.edu.ro/educatie_timpurie
- Ministry of National Education (2016). *of the child from birth to 7 years.* Order of the Minister of National Education No. 203851/2010.https://www.edu.ro/sites/default/files/_fi%C8%99iere/InvatamantPreuniversitar/2016/pre scolar/ORDIN%203851_2010_ANEXA_RFIDT.pdf
- Ministry of National Education (2019). *Curriculum for Early Education*. *Anexă la Ordinul ministrului Educației Naționale nr. 4694/02.08.2019*. București.
- Ministerul Educației, Cercetării și Tineretului (2008). *Guide de bune practici pentru educația temprana a copiilor entre 3 și 6/7 anni.* București. https://www.isj.sv.edu.ro/images/Docs/Discipline/invatamnat_preprimar/2017/Documenatii_curriculare_si_metodice/Ghid_de_bune_practici_3-6-7_ani.pdf

- Ministry of Education (2022). *Ordinul nr. 3.505/31.03.2022 privind implementarea programa nacional "Săptămâna Verde" în unitățile de învățământ preuniversitar*. Official Gazette of Romania, Part I.
- Montessori, M. (2007). *The absorbent mind* (C. A. Claremont, Trans.). Oxford: ABC-Clio Ltd. (Original work published in 1949).
- Montessori, M. (2017). The Montessori Method: Scientific Pedagogy as Applied to Child Education in "The Children's Houses" (Original paper published 1912).
- Neisser, U. (2012). *Cognitive psychology: Classic edition*. Psychology Press. https://doi.org/10.4324/9780203644065
- O'Brien, L. (2009) Learning outdoors: The Forest School approach. *Education 3-13, 37*(1), 45-60. https://doi.org/10.1080/03004270802291798
- Peterson, K., & Kolb, D. A. (2018). Implementing Kolb's experiential learning cycle in preschool settings: A practical approach. *Early Years Education, 26*(4), 389-402. https://doi.org/10.1080/09575146.2018.1450936
- Piaget, J. (1952). *The origins of intelligence in children*. New York: International Universities Press. http://www.pitt.edu/~strauss/origins_r.pdf. http://www.pitt.edu/~strauss/origins_r.pdf.
- Richter, I. A. (Ed.). 1970. *The notebooks of Leonardo da Vinci* (R. Linscott, Trans.). Oxford University Press.
- Stanton-Chapman, T. L., & Schmidt, E. L. (2017). Caregiver perceptions of inclusive playgrounds targeting toddlers and preschoolers with disabilities: Has recent international and national policy improved overall satisfaction? *Journal of Research in Special Educational Needs, 17*(4), 237-246.
- Ullrich, H. (2008). *Rudolf Steiner*. Continuum International Publishing Group.
- Varela, F. J., Thompson, E., & Rosch, E. (1991). *The embodied mind: Cognitive science and human experience*. MIT Press.
- Vîgotsky, L. (1930/1994). The Socialist alteration of Man. In R. vam der Veer & J. Valsiner (eds.), *Vygotsky Reader*. London: Blackwell.
- Williams-Siegfredsen, J. (2017). *Understanding the Danish forest school approach: Early years education in practice* (2nd ed.). Routledge.