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DEVELOPING DIGITAL SKILLS IN PRESCHOOLERS THROUGH BLENDED LEARNING ACTIVITIES

Scientific Director,
Prof. Univ. Dr. STAN NICOLAE-CRISTIAN

PhD student,
PAVELEA (TODERIC) ONIȚA-MARIA

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ARGUMENT

Education can be defined as a process organized according to specific objectives, aimed at preparing individuals for integration and adaptation into social life (Albulescu & Catalano, 2020, p. 119). From Sorin Cristea's perspective (2000), a prospective approach in education aims at developing competencies, skills, as well as cognitive, affective, and psychomotor structures, considered essential for meeting the future needs of society. Digital education has become a major topic of interest, attracting attention not only from teachers but also from governments, companies, and European Union institutions, against the backdrop of recent socio-economic transformations and the rapid advancement of technologies. It plays an essential role in the transformation process of the educational system, facilitating the development of digital culture and the skills necessary for managing information and communication in contemporary society.

A 2020 report by the European Commission highlights that organizing educational activities in a hybrid format, known **as** blended learning**,** represented a solution adopted by schools to manage difficult periods, such as that generated by the COVID-19 pandemic. This health crisis accelerated the process of education digitalization, forcing both teachers and students to discover and adopt new methods for transmitting information and interacting in the online environment, following the sudden closure of educational institutions. Technological evolution occurred rapidly, impacting both the professional sphere and personal life. The suspension of physical classes amplified existing challenges within the educational system, highlighting discrepancies between students who have access to digital resources and those from disadvantaged backgrounds who face difficulties in using technology. During this period, children spent significantly more time in front of screens, leading to an increase in interactions and socialization in the virtual space.

The rapid transition was challenging, further complicated by difficulties such as limited access to technology and a low level of digital skills. Individuals from disadvantaged backgrounds were affected both by the absence of face-to-face interactions and by the lack of technological, human, or social resources. Conversely, individuals who enjoyed the advantages of technology continued to use digital devices to enhance their digital skills. The pandemic brought about a major transformation in the educational system. Both the internet and digital devices contributed to improving the quality of education. The majority of people began to consider that mobile phone use did not necessarily involve unproductive activities but could also have educational value.

Accelerated digitalization brought opportunities for children and teachers in schools with a high level of educational resources but posed a challenge for disadvantaged ones, who faced difficulties in access and adaptation. Teachers encountered pedagogical difficulties related to the use of online platforms and tools. For everyone, the lack of human contact had a negative impact on their professional and personal development. Therefore, this research will focus on the development of digital skills in preschoolers through blended learning activities.

CHAPTER I

DIGITAL EDUCATION THROUGH BLENDED LEARNING ACTIVITIES

I.1. Digital education - From Opportunity to Necessity

Traditional education places a strong emphasis on theoretical aspects, but in the current context, this is no longer enough. With the evolution of society, online learning has become an indispensable component of the educational process. Research literature clearly indicates the widespread use of digital technology by preschool children, especially touchscreen devices, which are by far the most popular. This could be due to the intuitive interface offered by touchscreen tablets, the ease of installing new applications, and increased portability. The expansion of the use of digital technology in the daily routine of young children is an aspect that parents and teachers cannot ignore (Mantilla & Edward, 2019). Studies show that preschoolers easily become familiar with digital devices before being exposed to books (Hopkins et al., 2013; Hooft Graafland, 2018).

It is well known that the new generation easily uses technology, but we must ask: What impact does this use have on early development? This question has sparked a heated debate among parents, educators, and researchers. Some argue that technology provides easy and quick access to a huge amount of information and can improve children's learning experiences. Others express concerns about the possible negative effects on their social, cognitive, and physical development. We know that digital technologies are reaching new levels of development and spread with each passing day, so ignoring them cannot be an adequate response. A viable solution would be to find a balance between e-Learning and traditional teaching methods, thus allowing children to build their future through digital learning, guided by parents and teachers.

The COVID-19 pandemic has posed a major global challenge, generating both challenges and opportunities. In the field of education, it has highlighted both the strengths and vulnerabilities of education systems, accelerating the need to develop digital skills. In response to these changes, the European Union has adopted the Digital Education Action Plan (2021–2027), with the aim of supporting education and training systems in the Member States. This plan proposes a long-term strategic vision, focused on the development of digital education. The Digital Education Action Plan underlines the importance of integrating digital

technologies into teaching, learning, and digital skills training for all citizens. The pandemic has highlighted the differences between institutions that have invested in the development of digital infrastructure and those that have not.

Digital education has generated the need to develop digital skills among teachers. Teachers and educators have had to adapt quickly, effectively mastering the use of digital platforms and tools to ensure the continuity of the learning process. They have had to learn to create virtual classrooms, adapt their teaching materials for the online environment, use assessment tools, and provide technical support to both students and parents. This transition has required openness to new technologies, perseverance, and the ability to adapt to constant changes. In this context, digital education has been an essential factor in the development of teachers' digital skills, contributing to increasing efficiency and flexibility in the teaching-learning process.

In conclusion, education in the digital age brings both challenges and opportunities. Technology is changing the paradigm of education, offering new ways of learning and development. However, it is important to be aware of the risks associated with the use of technology and to ensure that students develop the digital skills necessary to adapt to the new demands of today's society. Technology-based education plays a crucial role in preparing students for the future, emphasizing the need for responsible and conscious use of digital tools. At the same time, it is essential that the educational process encourages the development of critical thinking, creativity, and problem-solving skills, thus providing students with the necessary tools to effectively adapt to the accelerated pace of change in the digital environment.

I.1.1 Digital competence

The 21st century is defined by the presence of technology, with computers, tablets, and smartphones becoming indispensable tools for most people, including educational institutions worldwide. Technology plays an increasingly important role in the learning and development of children from the earliest years of life, contributing to diversifying and optimizing educational experiences. Being competent in the digital world involves not only accessing information, but also using it effectively and responsibly. The European Digital Competence Framework defines five essential areas for a "digitally competent" citizen: information processing, communication, content creation, safety, and problem solving. Although access to technology is an essential factor in the development of these skills, using a

computer without adequate guidance does not automatically ensure their formation. Therefore, the integration of technology in education must be supported by well-structured learning strategies adapted to the needs of each user. The development of digital skills, both among teachers and young people, has become essential to face the challenges of the information age. Acquiring these skills improves the educational process and aims to effectively prepare future generations for a constantly changing world.

The concept of digital competence broadly refers to the ability of a teacher to effectively use computers and other technologies in the teaching and learning process. This competence not only allows teachers to create interactive and engaging lessons, but also to guide students towards a responsible use of technology, providing them with advice on online safety, managing digital resources, and protecting personal information. Digital competence is based on essential digital skills, including accessing, evaluating, and storing information, as well as facilitating collaboration and knowledge exchange via the internet. Thus, it becomes an essential tool for modern education, contributing to the formation of responsible and digitally literate individuals.

Children of the current generation grow up in a digitalized environment, and the frequent use of technology influences their way of thinking and perception of the world. The virtual environment offers them a space for exploration and interaction, often creating the illusion of a world without limits. The rapid evolution of technology determines a continuous learning process, which extends throughout life. Technological tools not only facilitate access to information, but also contribute to the formation and shaping of each person's personality, influencing the way we think, communicate and relate to reality.

Promoting the development of digital skills in young children requires a coordinated effort, which includes the provision of hardware in educational institutions, the professional development of teachers, as well as supporting the integration and implementation of the use of digital tools in the curriculum (Hooft Graafland, 2018).

Ability is defined as the acquired capacity of an individual to perform an activity that requires skill, proficiency, dexterity, precision, and finesse. It is formed through practice and is influenced by various factors, among which intelligence plays a leading role (Bocoș, Răduț-Taciu, Stan, Chiș, & Andronache, 2016, p. 16).

In conclusion, the evolution of technology and its integration into all areas have required the educational system to adapt to new requirements and challenges for schools, teachers, and those involved in their training. The teaching profession will not be replaced by

technology but rather supported by modern tools that facilitate the organization of the educational process, communication, access to information, and teaching methods.

I.2. Blended learning in preschoolers

According to the guide *Blended Learning in School Education*, developed by the European Commission in June 2020, blended learning is defined as a hybrid approach that combines classroom learning with distance learning. The integration of technology into education began as early as the 1960s, but the term "blended learning" was officially introduced in 1999. In English, "blended" means "mixed" or "combined," and "learning" refers to the learning process, which explains the origin of the term used in Romanian to describe this educational method.

The concept of blended learning began to emerge at the end of the 20th century. It refers to the direct interaction between teachers and students, supported by computer-assisted instruction. It is very likely that this model will become predominant in the future. The development of technology has led to the emergence of a rich array of tools, including social and informational networks, collaborative editing platforms, and virtual classrooms. Blended learning is a model of formal education in which children learn through a combination of online activities and traditional face-to-face instruction, having a certain degree of control over the time, place, and pace of their learning process. The term "blended learning" does not have a single, universally agreed-upon definition, but it broadly refers to the combination of traditional and online teaching methods. Although it is not a new approach to education, blended learning gained prominence during the closure of schools caused by the pandemic. This learning method allows teachers to design programs that best align with their pedagogical objectives. It has become essential because it combines the advantages of digital technologies with classic in-person teaching methods, contributing to a more flexible and adaptable educational process suited to contemporary challenges. Blended learning also facilitates easier interaction between students and teachers through the use of technology. Teachers are better able to monitor the instructional process, while students can personalize their learning experiences. Moreover, blended learning provides an interactive environment that enhances and streamlines the learning process. It offers children opportunities to interact, collaborate, and exchange experiences both online and in face-to-face settings. Furthermore, it allows each child to progress at a pace that matches their individual level and capabilities.

Garrison and Kanuka (2004) define blended learning as the careful integration of learning experiences conducted face-to-face in the classroom with those in the online environment. The effectiveness of this type of learning depends on the alternation between teacher-guided activities and those conducted individually through the use of online applications.

In conclusion, the term "blended learning" incorporates face-to-face, teacher-led instruction along with digital technology, using specific resources to provide students with a personalized educational path. Teachers who use blended learning can achieve differentiation and individualization in the instruction of daily activities. This model offers a new educational experience by integrating technology under the guidance of teachers. Given that many schools have expanded their integration of digital tools during the pandemic, the term "blended learning" has gained increasing popularity in education.

I.3. Main Tools for developing Digital Skills in Preschoolers

Romanian society is in a constant process of evolution, making a significant transformation in education inevitable. Today's children are continuously exposed to technology and have quick access to information through the use of phones, smart TVs, and tablets in their daily activities. In the educational environment, they become more motivated and engaged when traditional methods are enriched or partially replaced with strategies that integrate new technologies. With the help of digital tools, innovation-driven learning is fostered, making education much more accessible and personalized. Educational principles in kindergartens have evolved from child-centered approaches to strategies focused on individualization. The shift of the teaching process to the online environment caught many students and teachers unprepared, lacking the digital skills or tools necessary to adapt to these changes. In the current context, the world is undergoing a continuous digital transformation, and the need to access information through computers has become essential. Contemporary society is evolving into an information-based community, where technology plays a crucial role in education. It stimulates the desire for knowledge and contributes to the development of digital skills, offering young people a varied and future-oriented education.

A well-informed society is more innovative because it nurtures educated and competitive individuals capable of addressing complex challenges. Access to information encourages people to engage in research and development in order to find solutions to increasingly sophisticated problems.

The video projector is a digital tool that transmits video information in real time as animated images from a computer to a screen. It is widely used in conferences, classrooms, and presentations. The connection between the computer and the video projector can be made via a dedicated cable provided with the device.

In conclusion, digital tools serve as valuable support in the educational process, contributing to the development of digital skills from the preschool stage. By using them, educators can adapt content in an accessible and attractive way, facilitating learning in a format that is both current and relevant to children's future needs.Digital tools can enrich the learning experiences of young children, but their effectiveness depends on how well they are integrated into the teaching process. The implementation of online learning required careful preparation, focusing on adapting and organizing content, as well as providing the necessary resources for effective training. The transition to digital education has further highlighted the importance of digital skills in the learning process.

I.4. Form of blended learning activitites

I.4.1. E-learning

In the 21st century, technology has become indispensable in everyday life. Technological devices also have a significant impact on the field of education, providing additional opportunities and benefits in the learning process. The terms "electronic learning (e-Learning)" and "mobile learning (m-learning)" are often used in a complementary way to define technology-based learning.

Electronic learning can serve as both an alternative and a complement to traditional education, while mobile learning acts as a complementary method to both traditional and electronic learning.

E-Learning offers a crucial opportunity for many young children to engage in valuable learning experiences through online technologies. Numerous studies have demonstrated the positive impact of e-Learning in helping children form mental images and retain essential information. The integration and promotion of this concept in early education can have a positive effect on the development of children's perceptions and educational experiences.

I.4.2. Mobile learning (m-learning)

Mobile learning emerged with the development of portable technologies and mobile devices. Mobile devices are among the most widely used technologies in education (Kokkalia et al., 2016). The most common and preferred among them are smartphones, tablets, and PDAs.

Learning through the use of personal mobile devices is a method of delivering information that replaces traditional books and notes with compact devices designed to allow quick and easy access to educational content.

M-Learning offers children various ways to connect their daily experiences to abstract knowledge, promoting a deeper understanding of different subjects. It also increases the likelihood that children will make connections between their own observations and the information obtained through mobile digital technology, thereby enhancing their conceptual understanding.

I.5. Essential Aspects of Early Learning and Development from Birth to 7 years

Fundamental Milestones in Early Childhood Learning and Development from Birth to 7 Years is a key document for developing a system that integrates services dedicated to the education, care, and protection of children at this critical stage of life. These milestones are designed to support child growth and development, both within the family environment and other educational settings, ensuring an optimal transition to school. Individuals involved in the growth, education, and development of young children use the *Fundamental Milestones in Early Childhood Learning and Development* (referred to as RFIDT) as an essential tool to better understand the expectations regarding children's evolution and to effectively support them in the learning and development process. Each child has their own pace of growth and learning, meaning that not all children will reach the same levels of performance at the same time. Additionally, the RFIDT highlights the importance of the environment in which a child grows, emphasizing the critical roles of the family, community, and environmental factors in their development. The family, in particular, remains a fundamental pillar in supporting and shaping a child's development throughout their life. This document emphasizes that all children have the capacity to learn and progress in their development, regardless of their physical or emotional particularities, previous experiences, or cultural heritage.

I.6 Analysis of the Early Childhood Education Curriculum

The curriculum for early childhood education, approved through Order No. 4694/02.08.2019 issued by the Ministry of Education, regulates both the pre-school level (3 months – 3 years) and the preschool level (3 – 6 years). This curriculum is based on the concept of early childhood education, placing the child at the center of attention, with an emphasis on the child's needs and interests.

The curriculum for preschool education is structured as follows: the purposes (general and specific objectives), the contents, the instructional time, and the recommendations for learning and assessment strategies for small, medium, large, and preparatory groups (ages 3–5 and 5–6/7 years). This curriculum is built upon the *Fundamental Milestones in Early Learning and Development of the Child*, which served as the foundation for its development. Moreover, it represents a key source for establishing both general and specific objectives. The general objectives define the skills that must be developed during preschool education across five areas of development, while the specific objectives are detailed for each specific theme and experiential area.

From a structural point of view, the present curriculum is characterized by:

1. Extension – Engages preschoolers in diverse learning experiences across multiple domains of experience (Linguistic and Literary, Scientific, Socio-Human, Psychomotor, Aesthetic, and Creative domains).
2. Balance – Ensures an integrated approach to each domain of experience, taking into account both their interdependence and their coherence with the overall curriculum.
3. Relevance – Aligns with both the immediate and future needs of preschoolers, thus supporting their understanding of the world in which they live.
4. Differentiation – Supports the development and expression of individual characteristics, even among preschool children of the same age.
5. Progression and Continuity – Ensures a smooth transition between learning stages and educational cycles, fostering constant development.

I.7. Comparative Analysis Between the National Education Law no. 1/2011 and Law no. 198/2023, from the Perspective of Digital Education

Over time, Romanian education has undergone multiple legislative changes, which have influenced not only aspects related to the school curriculum and the rights and duties of

teachers, but also the development of digital education. The latter still holds significant potential for improvement and diversification. An essential objective that must be considered is the development of preschoolers' digital skills.

It is well known that, since 2011, with the entry into force of the National Education Law No. 1/2011, the Ministry of Education has been obligated to develop the Virtual School Library and the School e-Learning Platform, the first tools aimed at accelerating the digitalization of education. Thus, Article 70, paragraph 2, constituted the starting point for the creation of these platforms, stipulating the inclusion of essential digital resources to support the teaching process, such as curricula, sample lessons for each theme, methodological guides, and sample assessment tests. These digital resources are protected under Law No. 8/1996 on Copyright and Related Rights, as subsequently amended and supplemented. Law No. 109/2020 complements this article, assigning the Ministry of Education the responsibility of providing the necessary infrastructure to connect students and teachers to the Virtual School Library and the School e-Learning Platform.

Education Law No. 198/2023, in Article 62, provides for the establishment of the Romanian National Center for Distance Learning (CNRID), which will utilize open educational resources, including the Virtual School Library and the School e-Learning Platform *We Learn in Romania*. These platforms will contain, at a minimum, the following materials: school programs, sample lessons for each topic in the school programs, methodological guides, and examples of assessment tests.

In a context where traditional libraries have been largely replaced by the internet, especially during the pandemic, the virtual library has become an essential means of providing quick access to a wide range of books. Its main advantage is continuous accessibility, 24 hours a day, without the need for physical travel, provided that an internet connection is available. Digital resources are protected under Law No. 8/1996 on Copyright and Related Rights, as amended and supplemented. According to Article 84, paragraph (2) of the same law, the use of innovative technologies and techniques in teaching, assessment, and learning processes is encouraged. During the pandemic, these technologies proved essential for the rapid and efficient transmission of information.

I.8. The History of Digital Education

Digital education continues to evolve in various ways, with a particular focus on supporting teachers in the learning process. Technology is constantly transforming the way we play, grow, and communicate, so it is natural that digital education generates numerous

opportunities for innovation in learning methods. Today, digital technology not only creates new learning opportunities but also facilitates access to information and personalizes the educational process.

The history of digital education is characterized by constant and rapid evolution, reflecting technological advances and societal changes that shape the future. From the old computers with floppy drives, we have moved to a reality where artificial intelligence has taken hold. The pace at which digital education is evolving continues to accelerate, and people are eager to embrace it. The history of digital education is well-documented, with numerous examples of technology integration into teaching and learning. Film and radio began to be integrated into schools in the late 1890s and the 1920s, respectively. Television was introduced around 1950. However, their adoption in rural, regional, and remote areas occurred more slowly. Importantly, these technologies were initially available only in households and were not specifically dedicated to the education sector. All three were enthusiastically introduced as potential tools for learning and teaching. It was believed that each technology would open up classrooms to the rest of the world and revolutionize education.

Despite the high expectations, these three technologies were used in a limited way within the teaching and learning process. The discrepancy between the expected integration of technology in education and its actual application was largely due to tensions between educational policy directives and societal perceptions of teaching and learning. At that time, the educational environment shaped both behavior and the learning process. Children were considered "empty vessels" that needed to be filled with fundamental notions, such as the alphabet or the multiplication table. The available technologies were perceived as suitable only for mechanical forms of instruction.

CHAPTER II. SPECIFIC APPROACHES TO DIGITAL EDUCATION IN PRESCHOOL DEVELOPMENT

II.1. Children and the Internet. A Balanced Approach in Preschoolers Depelovment

We live in an ever-evolving digital age, where children are increasingly exposed to the virtual world, with quick and easy access to electronic devices and online platforms. The Internet is made up of a multitude of networks, each connecting various computers that

communicate with one another. It does not refer to individual components or devices, but rather represents the interconnectedness of all computers, tablets, phones, and other devices. Today, the Internet has become an inexhaustible source of information, facilitating rapid communication between people across long distances.

From this perspective, the Internet helps us communicate, share ideas, feelings, and experiences, as well as access and facilitate education. Indeed, the Internet is a vast source of information that particularly attracts young people. Globally, a child accesses the Internet for the first time in a fraction of a second. When used appropriately, the Internet can broaden horizons and stimulate creativity. The amount of time children spend daily in front of a computer significantly influences how their brains will respond in the future to real-world challenges and how they will process the information they depend on. The most rapid brain development occurs during the first two to three years of life. During this period (0–3 years), it is recommended to limit exposure to technology, as approximately 80% of brain development takes place at this stage. Healthy brain development relies on learning through direct experiences, such as manipulating toys, exploring various objects through touch and smell, and participating in activities shaped by a secure attachment relationship with a parent. Without such a relationship—and in the context of excessive exposure to technology without parental guidance—delays may occur in the development of language, motor skills, and the ability to process abstract information. In essence, access to the Internet influences brain architecture, and its effects can be either beneficial or harmful, depending on the amount of time spent in front of screens and the types of activities engaged in. Raising and educating a child in a world where new technologies are omnipresent has become an increasing challenge for both parents and teachers.

The education that children receive both at school and at home plays a crucial role in shaping their character and behavior within society. It is clear that young children are highly receptive to phones, gadgets, applications, and games. If we fail to provide children with meaningful experiences related to the online environment, generational gaps will inevitably emerge. Integrating the Internet into children's lives is not necessarily at odds with learning, playing, or exercising; on the contrary, it can serve as a valuable tool for supporting and enriching all these activities. The most important factor in successfully integrating the Internet into children's lives is the role of the adult. Adults must carefully manage both the benefits of digitalization and the risks associated with exploring the online world. Children do not yet possess the full knowledge, skills, or resources necessary to navigate the Internet safely.

II.2. The Difference Between Digital Education and Internet Use in Preschooler Development

Digital technologies have transformed personal lifestyles and introduced new challenges into everyday life, influencing various domains, including education. In the current context, marked by the rapid evolution of digitalization, acquiring knowledge through the use of computers has become essential. Modern society is increasingly moving toward an information-based community, where technology plays a crucial role in the educational process. As a result, developing digital skills is no longer merely an advantage but a necessity, providing young people with diverse opportunities to prepare for the future. A well-informed society is more innovative, as it nurtures educated and competitive individuals capable of addressing a wide range of tasks. Easy access to information encourages people to engage in research and development, thereby contributing to the discovery of solutions to complex societal problems.

The education and development of preschool children have changed significantly over the past decade. Classrooms are increasingly well-equipped with technology, and teachers now have the opportunity to experiment with innovative learning methods. Not only is the classroom environment transforming, but teaching methods are also evolving to adapt to the new ways in which children prefer to learn. If we were to ask parents who raised their children before the 2000s about how tech-savvy today's young children are, most would say that children are passionate about technology and find using a smartphone both pleasant and intuitive. Integrating technology and the Internet into children's educational processes is essential for supporting their learning and development in a constructive and effective manner.

Digital education and the Internet are distinct concepts in the context of child development, yet they are closely interconnected. Digital education is not limited to surfing the Internet or playing games; rather, it involves using digital technology as a tool to facilitate the development of preschoolers. Without access to the Internet, digital education would not be possible. How could we use educational platforms without connecting our phones or computers to the Internet? This concept goes beyond simple Internet usage, encompassing a wide range of digital resources and applications. It refers to the integration of digital technology into education, with the aim of supporting the development of the skills necessary for adapting to future society.

II.3. The Preschooler's Development Process Under the Auspices of Digital Education

The COVID-19 pandemic has brought about significant transformations in the field of early childhood education. To adapt the learning process to the new circumstances, preschool teachers in Romania were required to adopt online learning methods.

The experiences of a child's early years are crucial, as they significantly influence future development. Education, in general, represents the first step in a child's formation, and any object or event encountered in their life can shape their educational path. From smartphones and tablets to smart devices and interactive games, technology has become an integral part of the environment in which children grow and develop. This reality poses a major challenge: adapting the educational process to meet the needs and expectations of 21st-century children, who have easy access to a vast array of digital resources.

Integrating technology into education can bring numerous benefits, including the personalization of learning, the development of essential digital skills, and the stimulation of creativity (Keengwe & Onchwari, 2009). Early childhood education, in its broadest sense, refers to the learning and development processes that occur during the first years of a child's life. This stage is critical for the formation of cognitive, linguistic, social, and digital skills. The integration of technology into early childhood education has become an increasingly emphasized trend; however, excessive screen time can negatively impact children's cognitive and social development. Digital technologies are already a significant component of the educational process and can no longer be ignored, but it is essential that they are used in a balanced manner and adapted to the needs of preschoolers. Sound and animation capture children's attention and contribute to increased engagement in learning. For a child in the 1980s, a computer was probably not considered an ideal learning tool, but today's children view technology as a clear advantage. Whereas traditional education predominantly relied on expository teaching methods, modern education focuses on student-centered approaches. Quality learning is now promoted, tailored to the needs and capabilities of each student. The digital age is transforming the learning process by placing the student at the center of teaching and learning activities in schools. Interactive lessons represent one of the most important educational innovations, enhancing learning without replacing the essential role of the teacher, regardless of whether instruction is delivered online or offline.

II.4. Developing Digital Skills in Preschoolers in the Age of Artificial Intelligence

In modern society, digital skills are becoming increasingly essential. In recent years, artificial intelligence (AI) has advanced significantly, and its integration into education has become a growing trend, with the potential to greatly enhance the learning process. As a key component of society's digital transformation, AI holds strategic value in the field of education and is a priority for the European Union. It represents a part of the future that is already embedded in our present. However, it is crucial to identify effective ways to harness AI so that students can acquire essential digital skills. Originally introduced in the post-war era for the development of intelligent machines, AI has since evolved to improve a wide range of tools across multiple sectors, including education.

Human curiosity about brain function has led to the creation of intelligent programs capable of simulating cognitive processes. AI refers to the ability of software to replicate human thinking as accurately as possible, with the aim of analyzing data and generating relevant responses across various domains. With the support of AI, learning is becoming increasingly accessible. Students no longer need to spend hours searching in a reading center to acquire knowledge—this can now be done from home via any internet-connected device. Added to this are smart boards and communication platforms that connect parents, children, and teachers more efficiently. Initially, AI was designed to perform simple tasks. However, as the need to solve more complex problems grew, general artificial intelligence was developed. This type of AI is capable of adapting and learning autonomously, without direct human intervention. General AI has since branched into three major areas: machine learning, deep learning, and neural networks.

II.5. Conceptual Distinctions Among Preschooler Generations: Baby Boomers, X, Millennials, Z, Alpha

People born within the same chronological, social, and historical context are referred to as a generation (Twenge et al., 2010). Generation theory suggests that individuals born in the same generation tend to share similar characteristics and core behavioral profiles. Research on generational groups has highlighted the evolving career needs and expectations among those currently active in the labor market, including Baby Boomers, Generation X and Millennials or Generation Y.

Generations of preschoolers	Year of birth
Boomers	1945-1965
Generation X	1965-1979
Generation Y (Millennials)	1980-1995
Generation Z	1997-2012
Generation Alpha or Google Kids	2013-present

Table 1.II Generations of preschoolers. Adapted from Pew Research Center (2019). Available at: https://www.pewresearch.org/fact-tank/2019/01/17/where-millennials-end-and-generation-z-begins/

II.6. The Impact of Digital Applications from Romania on the Educational Process

We live in an increasingly connected world, where digital experiences have become an integral part of our daily lives—whether at work, at school, or at home. Technology is evolving rapidly, bringing both risks and opportunities, and is present in nearly every aspect of our lives, compelling us to recognize its growing importance. Children are beginning to use digital applications at increasingly younger ages, and many are already proficient with advanced gadgets before they even learn how to dress themselves.

Learning in the virtual environment is a field marked by both diversity and complexity. Electronic devices facilitate communication and support the learning process. When we view technology as an educational tool, it is important to recognize that preschoolers are not only learning letters and numbers, but also developing essential skills, such as understanding how others think and react. Through the use of digital applications, children create, play, and interact online from an early age. However, this early engagement may expose them to digital content and services that are not always tailored to their specific needs. The year 2020 brought digital applications and platforms to the forefront, showcasing their full potential in supporting the teaching–learning–assessment process at a distance.

All activities had to be rethought in order to support the educational process in a virtual environment. Technology in kindergarten positively impacts the quality of children's play and learning, promoting creativity, curiosity, exploration, collaboration, and problem-solving—thus contributing to cognitive development (Judge, Puckett & Bell, 2006; UNESCO, 2010). Given the rapid advancement of technology and its increasing presence in

the lives of young children, questions have emerged regarding its integration from the preschool age. There are differing opinions on the use of digital applications in kindergartens. Some specialists argue that excessive exposure to technology may have long-term negative effects on children's physical, emotional, and intellectual development. On the other hand, a report by the Organization for Economic Cooperation and Development (OECD) highlights that most countries encourage the use of information and communication technologies (ICT) among preschoolers to support their development (Bakia, Murphy, Anderson & Trinidad, 2011). Most educators agree that digital applications have become a key element in children's daily lives. Children spend considerable time in front of computers, phones, or tablets, prompting the need to explore how these tools can be transformed into effective learning resources. Some studies suggest that teachers with more than ten years of experience tend to hold more reserved views regarding the successful integration of digital applications into preschool education. Technology should be integrated into classroom activities and the curriculum throughout the day—not treated as a separate activity. Teaching and learning supported by digital applications can bring meaningful changes to the educational system, but such changes require thoughtful planning and intentional implementation to be truly effective.

A digital application is "a program or set of programs intended for teachers, which allows the creation or retrieval of materials" (Catalano, Scuturici & Moldovan, 2021, p. 230). To ensure the effective integration of digital applications into teaching practices, several key steps should be followed:

a) Using digital applications for educational purposes to achieve the learning objectives outlined in the curriculum;

b) Complementing classroom learning activities with digital applications that can be used at home as a supplement;

c) Expanding the child's learning experience by offering digital applications as an option to enrich and enhance learning.

CHAPTER III. THE USE OF DIGITAL APPLICATIONS IN PRESCHOOLERS THROUGH BLENDED LEARNING ACTIVITIES

III.1. Forms of Blended Learning Activities for Preschoolers Through the Development of Digital Applications

The learning process is inherently complex. The use of technology in education to introduce learning materials has proven to be both relatively easy and highly effective. Today,

the wide variety of digital applications brings both diversity and utility to the educational process, enriching teaching and learning experiences. Digital applications significantly contribute to the improvement of education, particularly through blended learning activities. When applied in early childhood education, blended learning through digital applications includes distance learning supported by digital technologies, the use of technical resources such as audio and video files, and the integration of visual materials to enhance the educational process.

Blended learning is a modern and flexible concept based on innovative teaching methods, integrating both classroom and online learning. This approach combines traditional learning strategies with digital tools to enhance educational outcomes. The use of digital applications in teaching is particularly beneficial for learning foreign languages, practicing practical skills, and developing digital competencies. Although digital applications became widely adopted with the shift to online education, they continue to be successfully integrated into traditional classroom settings. For preschoolers, blended learning can be implemented through digital applications that complement face-to-face teaching and learning activities. Developing and using digital applications among young children is an effective and engaging way to cultivate digital skills. Most digital applications offer learning experiences rooted in exploration and discovery, stimulating children's curiosity and fostering autonomy in the learning process. Digital tools also enable personalized learning, making educational content more accessible and adaptable to each child's pace and preferences. In recent years, children have become active users of digital technologies, as these tools encourage them to think critically, explore independently, and discover new information—moving beyond passive information intake. Traditional teaching methods do not always keep pace with technological advances. The blended learning model supports educators by creating a bridge between conventional and technology-enhanced learning strategies. This model, by combining classroom and remote learning, promotes the use of digital applications and contributes to a more enjoyable and engaging educational environment.However, for young learners, the success of blended learning strongly depends on the support provided by parents. Their role is crucial in guiding, adapting, and supervising technology-based learning to ensure it is both effective and developmentally appropriate.

III.2. Comparative Approach to Platforms and Digital Applications Successfully Implemented in Preschool Education

The year 2020 will be remembered as a year that profoundly transformed all aspects of life, both in terms of the educational process and from a social and emotional perspective. Education was one of the most affected sectors, undergoing a significant transformation. The pandemic brought digital tools to the forefront—tools that had previously been viewed as either harmful or ineffective for instructional purposes, but which suddenly became central to the educational experience. Everyone—children, parents, and teachers—had to adapt rapidly to these changes. The challenges were numerous and included poor-quality equipment, weak internet connectivity, and a lack of sufficient digital training for both students and educators. The Romanian education system had to confront these difficulties, striving to find solutions to ensure the continuity of learning. Technology has since become an essential factor in reshaping how young people acquire knowledge, playing a pivotal role in the evolution of modern education.

In the 21st century, technology skills are essential, and the COVID-19 pandemic has underscored their importance—even among early childhood educators. As a result, many kindergartens in Romania are now equipped with at least one computer used in the educational process, as "computer-assisted instruction further enhances children's interest in novelty" (SMART-Edu, 2020, p. 18). According to the methodological provisions outlined in the Early Childhood Education Curriculum (2019), digital technologies can be integrated into all daily activities, taking into account the children's age level and the recommendations of specialists. These technologies are to be used as tools that facilitate and support child development, rather than as ends in themselves.

Digital applications have proven essential in supporting the learning process, playing a crucial role in managing the challenges of the pandemic and adapting to new educational requirements. During this time, numerous digital applications and platforms—especially those dedicated to education—were developed and implemented to facilitate distance teaching and learning. One of the most widely used applications in preschool education was Zoom, which enabled the organization of online lessons, maintained interaction between children and educators, and helped adapt the educational process to the digital environment.

III.3. Digital Applications Developed for Preschoolers Through Artificial Intelligence

Artificial intelligence (AI) in kindergarten has the potential to significantly contribute to the innovation of teaching practices and the provision of quality education. It represents an interdisciplinary approach that supports the transformation and modernization of the learning process. One of the key advantages of using AI is the ability to personalize the learning experience for each child. Digital applications become valuable educational tools when teachers—particularly those passionate about technology—integrate them into their activities with children. Autonomous vehicles, smart home appliances, robotic toys, and virtual assistants are just a few examples of AI-based technologies that are increasingly interacting with people, including children, in private, educational, and public settings. Integrating activities that promote 21st-century skills into the learning process helps digital natives develop abstract thinking and apply it in an organized, purposeful way. The most effective AI strategies are designed to address the specific needs of children. For instance, children diagnosed with autism spectrum disorder often respond positively to embedded technologies such as AI-powered robots, which present promising opportunities for personalized learning and support. In an increasingly digitalized era—where children are naturally drawn to technology—AI-based digital applications can support educators in fostering a balanced and healthy relationship between children and technology.

The Early Childhood Education Curriculum, developed by the Ministry of Education in 2019, emphasizes that tablets and computers can be used at various times throughout the day through the didactic method of computer-assisted instruction. Educational activities that integrate modern technology contribute significantly to the development of preschoolers' digital skills. The use of digital applications in online environments increases children's interest in the learning process. Today, children are not only growing up alongside the evolution of computers and smartphones—they are growing up in the age of artificial intelligence (AI). AI-based applications have become increasingly important in our daily lives, demonstrating that technology is no longer a separate element but an integral part of who we are. Artificial intelligence has advanced rapidly, and in recent years, a growing number of educational applications based on AI have emerged. These tools not only provide children with engaging and enjoyable experiences but also expand their horizons and support the development of digital competencies. Everyone who uses AI-based digital applications can benefit from powerful and memorable experiences. However, it is essential to

acknowledge that children may not always use these applications strictly for educational purposes. Without proper guidance and supervision, there is a risk that their interaction with AI tools may deviate from the intended learning objectives.

CHAPTER IV
THE PSYCHOPEDAGOGICAL EXPERIMENT

IV.1 Design research

The investigative approach undertaken falls within the category of action research.

IV.1.1 Purpose of the research

The purpose of this research was to study the impact of implementation, through blended activities learning program "ROBOKIDS" on the development of digital skills in preschoolers. The program integrated digital applications (" Wordwall " , " Zoho Show", " Jigsaw Planet ", " Bee-Bot ", " Canva ", " AutoDraw ") with introductory programming elements.

IV.1.2 Research Objectives

- ✓ Implementation of the educational program: "ROBOKIDS" (" Wordwall ", " Zoho Show", " Jigsaw Planet ", "," Bee-Bot ", " Canva ", " AutoDraw ") ;
- ✓ Analysis of the level of development of digital skills obtained through the educational program: "ROBOKIDS" (" Wordwall ", " Zoho Show ", " Jigsaw Planet ", ", " Bee-Bot ", " Canva ", " AutoDraw ") within blended activities learning in preschoolers;

IV.1.3. Research hypothesis

The experimental approach aims to verify the following hypothesis:

Implementation of the educational program "ROBOKIDS" (" Wordwall " , " Zoho Show " , " Jigsaw Planet " , " Bee-Bot ", " Canva ", " AutoDraw ") through blended activities learning determines the development of preschoolers' digital skills.

IV.1.4. Research variables

Independent variable :

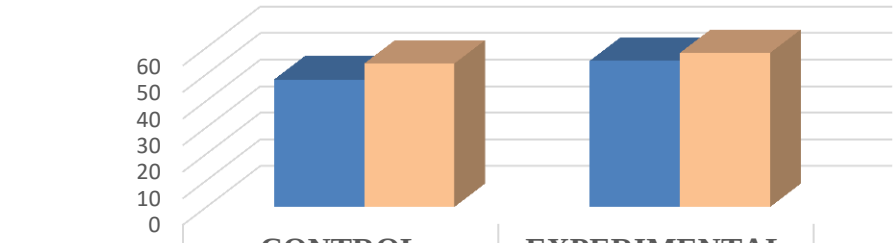
- Implementation of the educational program "ROBOKIDS" (" Wordwall ", " Zoho Show", " Jigsaw Planet ", "," Bee-Bot ", " Canva ", " AutoDraw ") through blended activities learning

Dependent variable :

- The level of development of preschoolers' digital skills

IV.2 . Subject sample

Our research involved 215 older preschool children (5-6 years old). Thus, in the control group, 48 male preschoolers and 54 female preschoolers were included, while in the experimental group, the number of male preschoolers was 55 and that of female preschoolers was 58.



	CONTROL GROUP	EXPERIMENTAL GROUP
MALE	48	55
FEMALE	54	58

Figure 1.IV. Distribution of participants by gender

IV.3. Content Sample

The content sample was emphasized through an experimental intervention aimed at creating an interactive and engaging learning environment for children. The blended learning activities were designed to combine traditional teaching methods with digital technology, providing a modern educational experience tailored to the needs of the students.

The beginning of autumn was marked by activities designed to foster children's curiosity and creativity. “Autumn Basket” invited the little ones on a sensory journey through the world of seasonal fruits and vegetables, using both real materials and digital applications to explore shapes, colors, and names. “Rich Autumn” continued this theme, encouraging children to express their thoughts and emotions through the *ChatterPix Kids* application.

Once the children became familiar with the learning environment, “Kindergarten and Its Rules” offered them the opportunity to discover classroom behavior rules in an interactive way, using presentations and custom designs created with *Canva* and *PowerPoint*. During this

period, imagination was also put to the test through the **"**Guess Your Favorite Character" activity, where children were challenged to recognize storybook characters using applications such as *Wordwall* and *Canva*.

November was dedicated to creative and musical activities. "Colorful Gloves" allowed children to experiment with colors and textures through a combination of painting and digital puzzles. "Let's Sing Our Names" transformed learning into a rhythmic and enjoyable game, using Typatone and YouTube to associate sounds with names.

To combine storytelling with technology, the "Crickets and the Ant" activity offered an interactive experience in which children explored the fairy tale through 3D images and AR applications, enhancing both their creativity and logical thinking. At the end of autumn, "End of Autumn" created a reflective atmosphere about the changing season, using the AutoDraw application.

December brought the magic of the holidays, with activities designed to bring the spirit of Christmas into the classroom. "Christmas Tree" was a hands-on activity where children combined traditional crafts with digital elements, while "In Search of Santa Claus" turned the learning hour into an adventure with the help of the *Bee-Bot* robot.

Blended activities learning for preschoolers took into account the following:

- ❖ Blended activities learning were planned in accordance with curriculum themes, experiential areas , annual plans and thematic projects;
- ❖ Planning blended activities learning were carried out weekly, giving teachers the opportunity to improve them systematically;
- ❖ Respecting the age and gender characteristics of preschoolers;
- ❖ Developing the desire for knowledge and curiosity of preschoolers;

The proposed blended learning activities were carried out between October and December 2024, with a total of 10 activities**,** one per week, integrated into the daily educational schedule of the institutions involved.

IV.4. Child assessment scale by the teacher

The Teacher-Child Rating Scale was designed to be used by preschool teachers participating in the experiment to assess the level of digital skill development in preschoolers. This research instrument was structured in two parts: an introductory section and a descriptive section.

The introductory part includes data referring to: country, kindergarten, teacher, child's name and surname, biological gender, group, preschooler's age, and the descriptive part concerns the 17 items monitored. The teacher's task involved ticking the box corresponding to the observed preschooler's ability level (1-4): 1. Level reduced , 2. Level medium , 3. Level high , 4. Level very high .

Target domain	Item
Digital skills	1. Correctly uses the mouse in various digital activities.
	2. Correctly uses the power on/off button on a phone or tablet during digital activities.
	3. Correctly uses the keyboard on a phone or tablet.
	4. Successfully completes tasks within digital applications.
	5. Completes digital puzzles by placing the correct pieces to form a whole image.
	6. Appropriately uses the functions and tools of the interactive whiteboard.
	7. Handles the level of difficulty of tasks proposed by digital applications.
	8. Successfully completes activities aimed at developing digital skills.
	9. Demonstrates focus and concentration while using digital applications.
	10. Verbalizes the actions performed while completing tasks within digital applications.
	11. Anticipates the steps required to complete tasks in digital applications.
	12. Applies knowledge and information from other experiential domains (language and communication, science, aesthetic and creative domains) within digital applications.
	13. Shows interest and attraction toward digital applications used on phone/tablet.
	14. Completes complex tasks in digital applications when using the blended learning method.
	15. Applies digital skills in digital applications practiced at home through the blended learning method.
	16. Uses basic algorithm elements when coding robots.

	17. Uses didactic materials in learning contexts that support the development of digital skills.

Table 3. IV. Description of the Teacher-Completed Child Assessment Scale

IV.5 Presentation of Pre-Test Results

The first item on the scale assessing the level of digital skill development in preschoolers referred to the correct use of the mouse across various digital activities. The results obtained for this aspect are presented below.

Figure 2.IV. Graphical representation of the pre-test data for the control group related to Item No. 1: Correctly uses the mouse in various digital activities

Item 1	Very Low Level	Medium Level	High Level	Very High Level	Total
Frequency	7	51	21	23	102
Percetages	6.86%	50.00%	20.59%	22.55%	100.00%

Table 4.IV.: Tabular presentation of pre-test data for the control group related to item no. 1 of the scale regarding the level of development of digital skills: *Correctly uses the mouse in various digital activities.*

As can be seen in the table above, within the control group, only 22.55% of the subjects demonstrated a very high level of development in the ability to correctly use the mouse in digital activities, while exactly 50.00% of them displayed a medium level of skill development in this area.

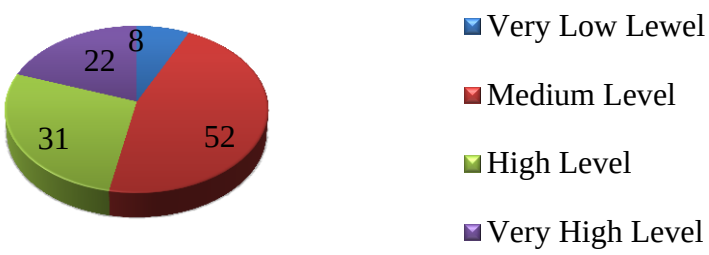


Figure 3.IV. Graphical representation of the pre-test data for the experimental group related to Item No. 1 on the scale assessing the level of digital skill development: *Correctly uses the mouse in various digital activities.*

ITEM 1	Very Low Lewel	Medium Level	High Level	Very High Level	Total
Frequency	8	52	31	22	113
Percentages	7,0796%	46,0177%	27,4336%	19,4690%	100,00%

Table 5.IV.: Tabular presentation of pre-test data for the experimental group related to item no. 1 of the scale assessing the level of digital skill development: *Correctly uses the mouse in various digital activities*.

Regarding the experimental group, the data in Table 5.IV. indicate that a very high level of the ability to properly use the mouse in digital activities is found in 19.47% of children, most of them (46.02%) having an average level of development of this ability.

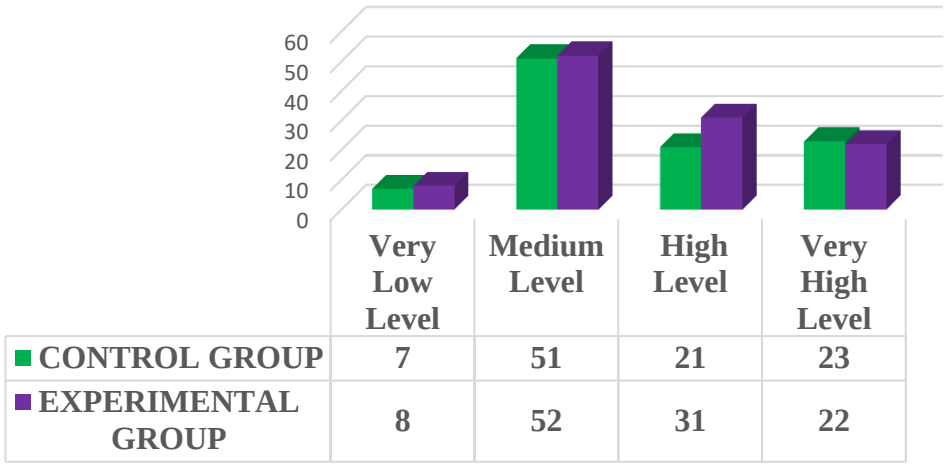


Figure 4.IV.. Comparative graphic representation of the pre-test data related to item no. 1 of the scale assessing the level of digital skill development: *Correctly uses the mouse in various digital activities*.

ITEM 1	CONTROL GROUP		EXPERIMENTAL GROUP	
VERY LOW LEVEL	*7*	*6.86%*	*8*	*7.08%*
MEDIUM LEVEL	*51*	*50.00%*	*52*	*46.02%*
HIGH LEVEL	*21*	*20.59%*	*31*	*27.43%*
VERY HIGH LEVEL	*23*	*22.55%*	*22*	*19.47%*
TOTAL	102	100.0%	113	100.0%

Table 6.IV.: Comparative tabular presentation of pre-test data related to item no. 1 of the scale assessing the level of digital skill development: *Correctly uses the mouse in various digital activities*.

	Value	Asymptotic Significance	
Pearson Chi-Square ($\chi 2$)	$\chi 2$=6.528	p= .686	P > 0.05

Table 7.IV.: Statistical significance of the difference between the control and experimental groups regarding item no. 1

The comparative analysis of the level of development in correctly using the mouse across various digital activities between children in the control group and those in the experimental group, as presented in Table 7.IV, shows that their performance levels are relatively similar. The recorded differences are not statistically significant (Table 7.IV, χ^2 = 6.528, p = .686, p > 0.05).

The second item on the scale assessing the level of digital skill development in preschoolers referred to the correct use of the power button (on/off) on a phone or tablet during digital activities. The results obtained for this aspect are presented below.

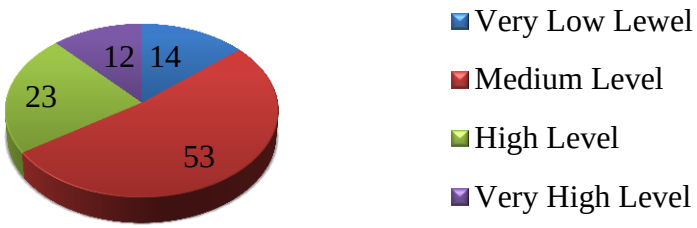


Figure 5.IV. Graphical representation of the pre-test data for the control group related to Item No. 2 on the scale assessing the level of digital skill development: *Correctly uses the power on/off button on a phone or tablet during digital activities.*

Item 2	Very Low Level	Medium level	High level	Very high level	Total
Frequency	14	53	23	12	102
Percentages	13.73%	51.96%	22.55%	11.76%	100.00%

Table 8.IV.: Tabular presentation of pre-test data for the control group related to item no. 2 of the scale assessing the level of digital skill development: *Correctly uses the power on/off button on a phone or tablet during digital activities.*

According to the data presented in the table above, in the control group only 11.76% of children demonstrate a very high level of development of the ability to correctly use the on/off button on the phone or tablet in digital activities, while the majority (51.96%) are at an average level of development of this skill.

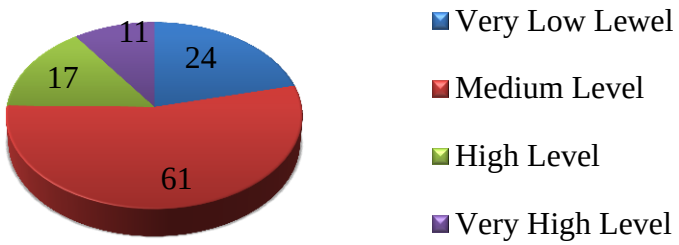
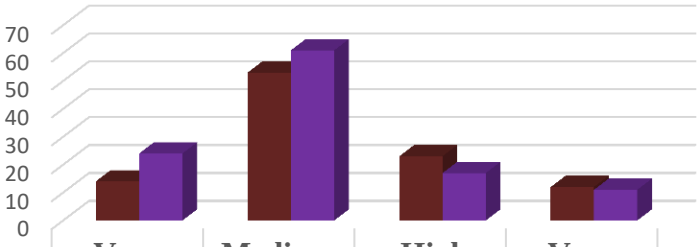


Figure 6.IV.. Graphical representation of the pre-test data for the experimental group related to item no. 2 of the scale regarding the level of development of digital skills: *Correctly uses the on/off button of the phone/tablet in digital activities*

Item 2	Very Low Level	Medium level	High level	Very high level	Total
Frequency	24	61	17	11	113
Percentages	21.24%	53.98%	15.04%	9.74%	100.00%

Table 9.IV.: Tabular presentation of pre-test data for the experimental group related to item no. 2 of the scale regarding the level of development of digital skills: *Correctly uses the on/off button of the phone/tablet in digital activities*

For the experimental group, the data in Table 9.IV show that only 9.74% of children demonstrate a very high level of ability to correctly use the power button on a phone or tablet during digital activities, while the majority (53.98%) show an average level of development of this skill.



	Very Low Level	Medium Level	High Level	Very High Level
CONTROL GROUP	14	53	23	12
EXPERIMENTAL GROUP	24	61	17	11

Figure 7.IV.. Comparative graphic representation of the pre-test data related to item no. 2 of the scale regarding the level of development of digital skills: *Correctly uses the on/off button of the phone/tablet in digital activities*

ITEM 2	CONTROL GROUP		EXPERIMENTAL GROUP	
VERY LOW LEVEL	*14*	*13.73%*	*24*	*21.24%*
MEDIUM LEVEL	*53*	*51.96%*	*61*	*53.98%*
HIGH LEVEL	*23*	*22.55%*	*17*	*15.04%*
VERY HIGH LEVEL	*12*	*11.76%*	*11*	*9.74%*
TOTAL	102	100.0%	113	100.0%

Table 10.IV.: Comparative tabular presentation of pre-test data related to item no. 2 of the scale regarding the level of development of digital skills: *Correctly uses the on/off button of the phone/tablet in digital activities*

	Value	Asymptotic Significance	
Pearson Chi-Square ($\chi 2$)	$\chi 2$=13.963	p= .124	P > 0.05

Table 11.IV.: Statistical significance of the difference between the control and experimental groups regarding item no. 2

The comparative analysis of the level of development in the ability to correctly use the on/off button on a phone or tablet during digital activities, among children in the control group and those in the experimental group, reveals relatively similar values. According to the data presented in the table above, the observed differences are not statistically significant (Table 11.IV, $\chi^2 = 13.963$, $p = .124$, $p > 0.05$).

The third item on the scale assessing the level of development of preschoolers' digital skills referred to the correct use of the keyboard on a phone or tablet during digital activities. The results obtained for this aspect are presented below.

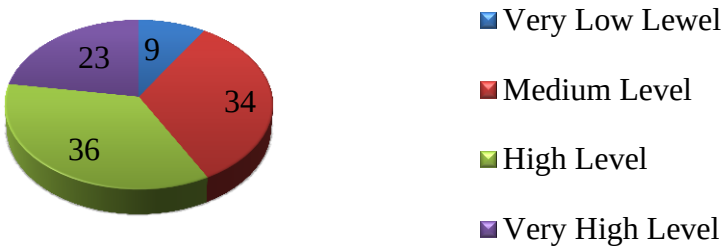


Figure 8.IV.. Graphical representation of the pre-test data for the control group related to item no. 3 of the scale regarding the level of development of digital skills: *Correctly uses the keyboard on a phone or tablet*

Item 3	Very Low Level	Medium level	High Level	Very High level	Total
Frequency	9	34	36	23	102
Percentages	8.82%	33.33%	35.30%	22.55%	100.00%

Table no. 12.IV.: Tabular presentation of data for the control group from the pre-test related to item no. 3 of the scale regarding the level of development of digital skills: *Correctly uses the keyboard on a phone or tablet*

According to the data presented in the table above, only 22.55% of children in the control group demonstrate a very high level of ability to correctly use the keyboard on a phone or tablet, while 33.33% show an average level of development of this skill.

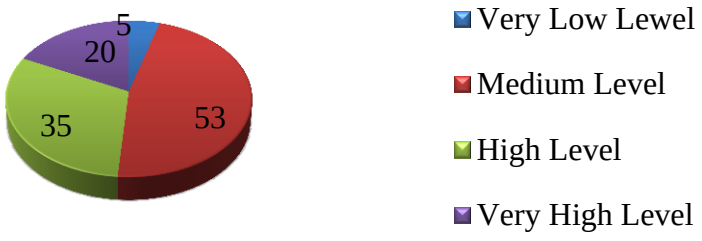


Figure 9.IV.. Graphical representation of the pre-test data for the experimental group related to item no. 3 of the scale regarding the level of development of digital skills: *Correctly uses the keyboard on a phone or tablet*

Item 3	Very Low Level	Medium level	High level	Very high level	Total
Frequency	5	53	35	20	113
Percentages	4.43%	46.90%	30.97%	17.70%	100.00%

Table 13.IV.: Tabular presentation of data for the experimental group from the pre-test related to item no. 3 of the scale regarding the level of development of digital skills: *Correctly uses the keyboard on a phone or tablet*

The information in the table above indicates that in the experimental group, only 17.70% of children demonstrate a very high level of ability to correctly use the keyboard on a phone or tablet, while 46.90% show an average level of development of this skill.

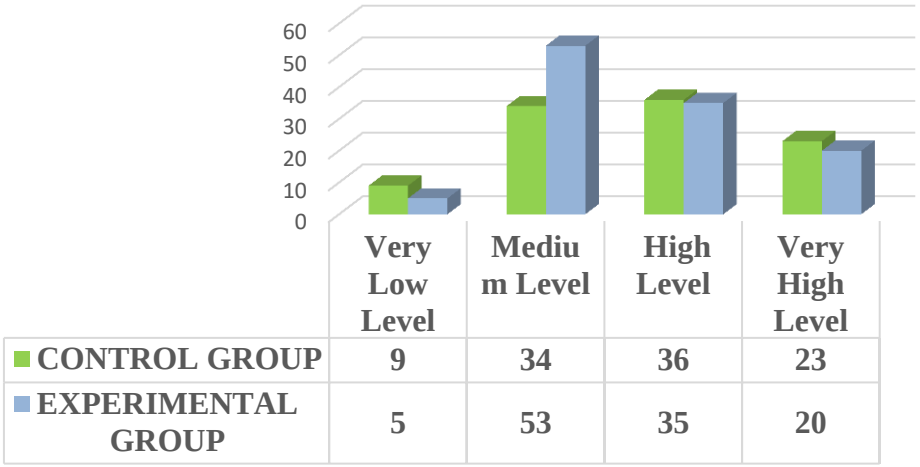


Figure 10.IV.. Comparative graphic representation of the pre-test data related to item no. 3 of the scale regarding the level of development of digital skills: *Correctly uses the keyboard on a phone or tablet*

ITEM 3	CONTROL GROUP		EXPERIMENTAL GROUP	
VERY LOW LEVEL	*9*	*8.82%*	*5*	*4.43%*
MEDIUM LEVEL	*34*	*33.33%*	*53*	*46.90%*
HIGH LEVEL	*36*	*35.30%*	*35*	*30.97%*
VERY HIGH LEVEL	*23*	*22.55%*	*20*	*17.70%*
TOTAL	102	100.0%	113	100.0%

Table 14.IV.: Comparative tabular presentation of pre-test data related to item no. 3 of the scale regarding the level of development of digital skills: *Correctly uses the keyboard on a phone or tablet*

	Value	Asymptotic Significance	
Pearson Chi-Square (χ2)	2=7,510	p= .276	P > 0.05

Table 15.IV.: Statistical significance of the difference between the control and experimental groups regarding item no. 3

The comparative analysis of the level of development in correctly using the keyboard on a phone or tablet among children in the control group and those in the experimental group, as shown by the data presented in Table 15.IV, indicates that their performance levels are approximately similar. The recorded differences are not statistically significant (Table 15.IV, $\chi^2 = 7.510$, $p = .276$, $p > 0.05$).

IV.6. Presentation of the experimental intervention

Calendar month	**Week number**	**Blended activities learning**
October 2024	Week 1	Activity No. 1: "Autumn Basket" Digital materials and applications: interactive whiteboard, video projector, Jigsaw Planet app , Piktochart app , Picker Wheel app , phone, pictures, fruit basket;
	Week 2	Activity No. 2: "Rich Autumn" Digital materials and applications: interactive whiteboard, ChatterPix app Kids ;
	Week 3	Application No. 3: ,,Kindergarten and its rules" Digital materials and applications: interactive whiteboard, Canva application , PowerPoint application;
	Week 4	Activity No. 4: "Guess your favorite character" Digital materials and applications: interactive whiteboard, Wordwall and Canva app , ChatterPix Kids , images from stories;
November 2024	Week 5	Activity No. 5: "Colored Gloves" Digital materials and applications: interactive whiteboard, Digital Puzzle application, Picker Wheel application , watercolors, brushes, rollers , A1 white sheets;

	Week 6	Activity No. 6: "Let's sing our names" Digital materials and applications: interactive whiteboard, Typatone application, Youtube website
	Week 7	Activity No. 7: "The Crickets and the Ant" Digital materials and applications: interactive whiteboard, Ar Viewer application, Zoho Show application , 3D images, tablets;
	Week 8	Application No. 8: "End of Autumn" Digital materials and applications: interactive whiteboard, AutoDraw application ;
December 2024	Week 9	Activity No. 9: "Christmas Tree" Digital materials and applications: interactive whiteboard, Puzzle Factory application , scissors, colored paper, stars, colored dots;
	Week 10	Application no.10 : " In Search of Santa Claus" Digital materials and applications: colors, " Bee-Bot ", flashcards

IV.7. Presentation of the results obtained in the post-test stage

The first item on the scale assessing the level of development of preschoolers' digital skills in the post-test referred to the correct use of the mouse in digital activities. The results obtained for this item are presented below.

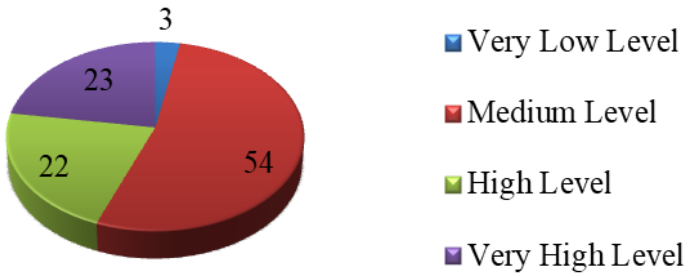


Figure 53.IV. Graphical representation of post-test data for the control group related to item no. 1 of the scale regarding the level of development of digital skills: *Correctly uses the mouse in various digital activities*

Item 1	Very Low level	Medium level	High level	Very high level	Total
Frequency	3	54	22	23	102
Percetanges	2.94%	52.94%	21.57%	22.55%	100.00%

Table 72.IV.: Tabular presentation of post-test data for the control group related to item no. 1 of the scale regarding the level of development of digital skills: *Correctly uses the mouse in various digital activities*

As shown in the table above, only 22.55% of the children in the control group demonstrate a very high level of ability to correctly use the mouse in digital activities, while half of them (52.94%) show an average level of development of this skill.

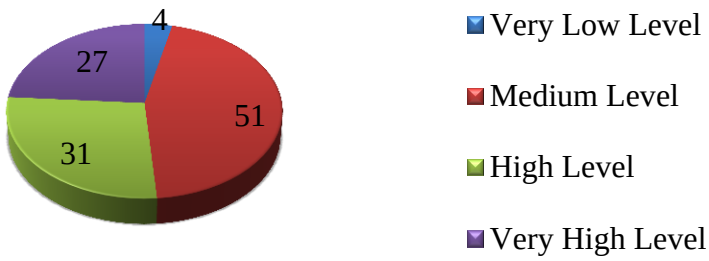


Figure 54.IV. Graphical representation of post-test data for the experimental group related to item no. 1 of the scale regarding the level of development of digital skills: *Correctly uses the mouse in various digital activities*

Item 1	Very Low level	Medium level	High level	Very high level	Total
Frequency	4	51	31	27	113
Percentages	3.54%	45.13%	27.44%	23.89%	100.00%

Table 73.IV.: Tabular presentation of post-test data for the experimental group related to item no. 1 of the scale regarding the level of development of digital skills: *Correctly uses the mouse in various digital activities*

For the experimental group, the data in Table 73.IV indicate that 23.89% of children demonstrate a very high level of ability to correctly use the mouse in digital activities, while the majority (45.13%) show an average level of development of this skill.

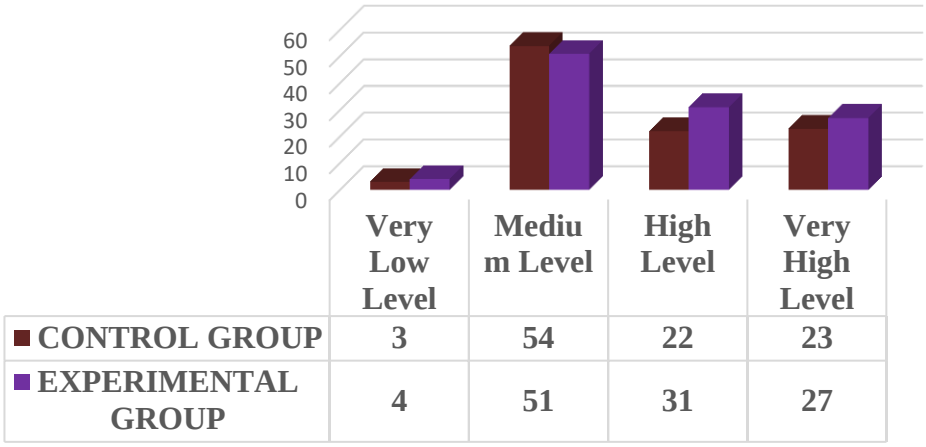


Figure 55.IV.. Comparative graphic representation of post-test data related to item no. 1 of the scale regarding the level of development of digital skills: *Correctly uses the mouse in various digital activities*

ITEM 1	CONTROL GROUP		EXPERIMENTAL GROUP	
VERY LOW LEVEL	*3*	*2.94%*	*4*	*3.54%*
MEDIUM LEVEL	*54*	*52.94%*	*51*	*45.13%*
HIGH LEVEL	*22*	*21.57%*	*31*	*27.44%*
VERY HIGH LEVEL	*23*	*22.55%*	*27*	*23.89%*
TOTAL	102	100.0%	113	100.0%

Table 74.IV.: Comparative tabular presentation of post-test data related to item no. 1 of the scale regarding the level of development of digital skills: *Correctly uses the mouse in various digital activities*

	Value	Asymptotic Significance	
Pearson Chi-Square ($\chi 2$)	$\chi 2=4.003$	p= .676	P > 0.05

Table 75.IV.: Statistical significance of the difference between the control and experimental groups regarding item no. 1

The results regarding the level of development in correctly using the mouse in various digital activities among children in the control group and those in the experimental group, as shown by the data presented in Table 75.IV, are approximately similar. The recorded differences are not statistically significant (Table 75.IV, $\chi^2 = 4.003$, $p = .676$, $p > 0.05$).

The second item on the scale regarding the level of development of preschoolers' digital skills was the one regarding the correct use of the phone/tablet on/off button in digital activities. We present the results obtained regarding this aspect.

Figure 56.IV.. Graphical representation of post-test data for the control group related to item no. 2 of the scale regarding the level of development of digital skills: *Correctly uses the on/off button of the phone/tablet in digital activities*

Item 2	Very Low level	Medium level	High level	Very high level	Total
Frequency	10	49	29	14	102
Percentages	9.80%	48.04%	28.43%	13.73%	100.00%

Table 76.IV.: Tabular presentation of post-test data for the control group related to item no. 2 of the scale regarding the level of development of digital skills: *Correctly uses the on/off button of the phone/tablet in digital activities*

According to the data presented in the table above, only 13.73% of children in the control group demonstrate a very high level of development in the ability to correctly use the on/off button on a phone or tablet during digital activities, while the majority (48.04%) show an average level of development of this skill.

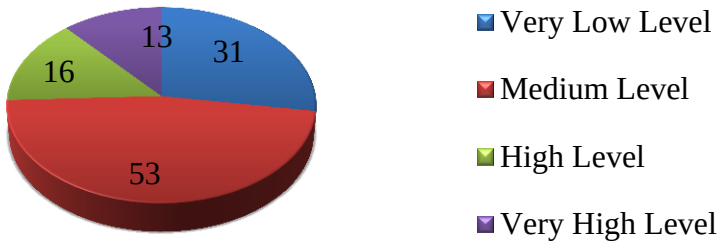


Figure 57.IV.. Graphical representation of the post-test data for the experimental group related to item no. 2 of the scale regarding the level of development of digital skills: *Correctly uses the on/off button of the phone/tablet in digital activities*

Item 2	Very Low level	Medium level	High level	Very high level	Total
Frequency	31	53	16	13	113
Percentages	27.43%	46.90%	14.16%	11.51%	100.00%

Table 77.IV.: Tabular presentation of post-test data for the experimental group related to item no. 2 of the scale regarding the level of development of digital skills: *Correctly uses the on/off button of the phone/tablet in digital activities*

In the table above, only 11.50% of children in the experimental group demonstrate a very high level of development in the ability to correctly use the on/off button on a phone or tablet during digital activities, while the majority (46.90%) show an average level of development of this skill.

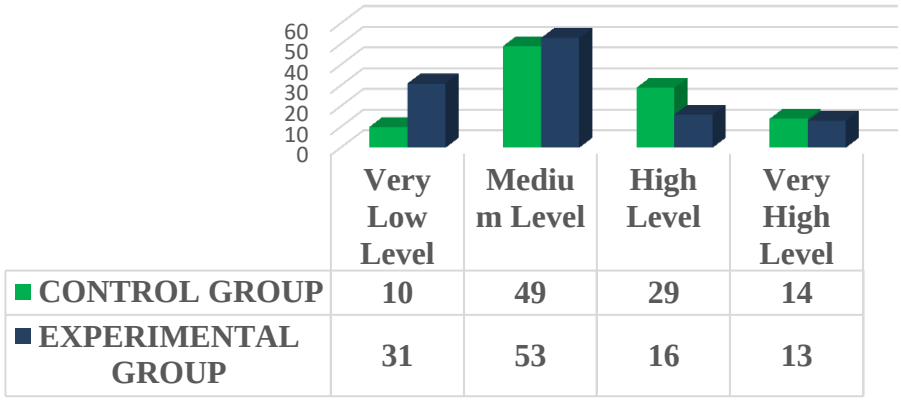


Figure 58.IV.. Comparative graphic representation of post-test data related to item no. 2 of the scale regarding the level of development of digital skills: *Correctly uses the on/off button of the phone/tablet in digital activities*

ITEM 2	CONTROL GROUP		EXPERIMENTAL GROUP	
VERY LOW LEVEL	*10*	*9.80%*	*31*	*27.43%*
MEDIUM LEVEL	*49*	*48.04%*	*53*	*46.90%*
HIGH LEVEL	*29*	*28.43%*	*16*	*14.16%*
VERY HIGH LEVEL	*14*	*13.73%*	*13*	*11.51%*
TOTAL	102	100.0%	113	100.0%

Table 78.IV.: Comparative tabular presentation of post-test data related to item no. 2 of the scale regarding the level of development of digital skills: *Correctly uses the on/off button of the phone/tablet in digital activities*

	Value	Asymptotic Significance	
Pearson Chi-Square (χ2)	χ2=7.694	p= .261	P > 0.05

Table 79.IV.: Statistical significance of the difference between the control and experimental groups regarding item no. 2

The comparative analysis of the level of development regarding the ability to correctly use the phone or tablet's on/off button in digital activities, between children in the control group and those in the experimental group, reveals relatively similar values. According to the data presented in Table 79.IV, the observed differences are not statistically significant (Table 79.IV, $\chi^2 = 7.694$, $p = .261$, $p > 0.05$).

The third item of the scale regarding the level of development of preschoolers' digital skills was the one regarding the correct use of the phone/tablet keyboard in digital activities. We present the results obtained regarding this aspect.

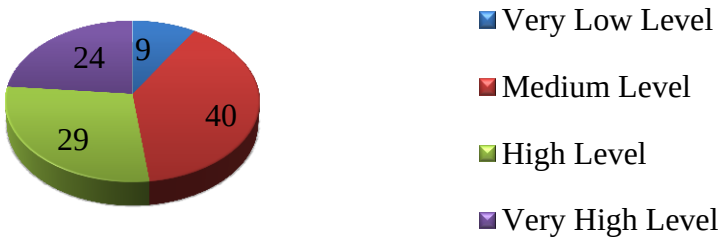


Figure 59.IV.. Graphical representation of the post-test data for the control group related to item no. 3 of the scale regarding the level of development of digital skills: *Correctly uses the keyboard on a phone or tablet*

Item 3	Very Low level	Medium level	High level	Very high level	Total
Frequency	9	40	29	24	102
Percentages	8.82%	39.22%	28.43%	23.53%	100.00%

Table 80.IV.: Tabular presentation of data for the control group from the post-test related to item no. 3 of the scale regarding the level of development of digital skills: *Correctly uses the keyboard on a phone or tablet*

The data in the previous table show that, within the control group, only 23.53% of children correctly use the keyboard on a phone or tablet at a very high level, while 39.22% demonstrate an average level of development regarding this item.

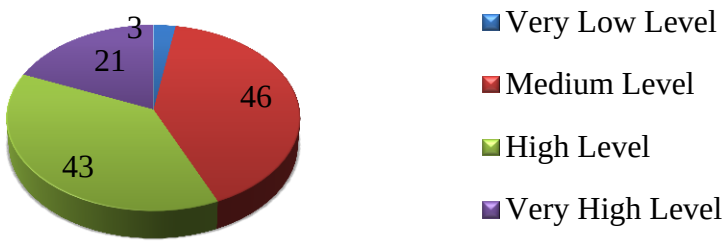


Figure 60.IV.Graphical representation of the post-test data for the experimental group related to item no. 3 of the scale regarding the level of development of digital skills: *Correctly uses the keyboard on a phone or tablet*

Item 3	Very Low level	Medium level	High level	Very high level	Total
Frequency	3	46	43	21	113
Percentages	2.65%	40.71%	38.05%	18.59%	100.00%

Table 81.IV.: Tabular presentation of data for the experimental group from the post-test related to item no. 3 of the scale regarding the level of development of digital skills: *Correctly uses the keyboard on a phone or tablet*

On the other hand, within the experimental group, only 18.59% of children correctly use the keyboard on a phone or tablet at a very high level, while 40.71% demonstrate an average level of development regarding this item.

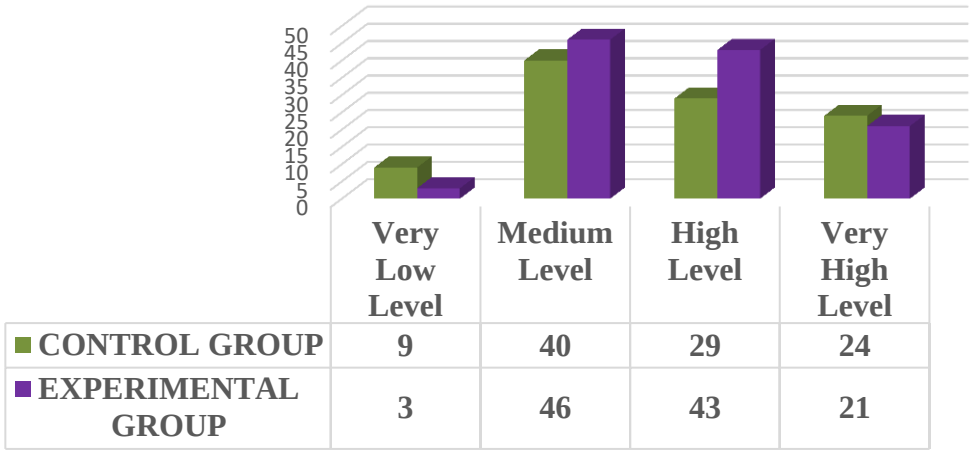


Figure 61.II.. Comparative graphic representation of post-test data related to item no. 3 of the scale regarding the level of development of digital skills: *Correctly uses the keyboard on a phone or tablet*

ITEM 3	CONTROL GROUP		EXPERIMENTAL GROUP	
VERY LOW LEVEL	*9*	*8.82%*	*3*	*2.65%*
MEDIUM LEVEL	*40*	*39.22%*	*46*	*40.71%*
HIGH LEVEL	*29*	*28.43%*	*43*	*38.05%*
VERY HIGH LEVEL	*24*	*28.53%*	*21*	*18.59%*
TOTAL	102	100.0%	113	100.0%

Table 82.IV.: Comparative tabular presentation of post-test data related to item no. 3 of the scale regarding the level of development of digital skills: *Correctly uses the keyboard on a phone or tablet*

	Value	Asymptotic Significance	
Pearson Chi-Square ($\chi 2$)	$\chi 2$=7.639	p= .265	P > 0.05

Table 83.IV.: Statistical significance of the difference between the control and experimental groups regarding item no. 3

The comparative analysis of the level of development in correctly using the keyboard on a phone or tablet among children in the control group and those in the experimental group, as shown in Table 83.IV, indicates that their performance levels are approximately similar, with no statistically significant differences recorded (Table 83.IV, $\chi^2 = 7.639$, p = .265, p > 0.05).

CHAPTER V
PSYCHO-PEDAGOGICAL RESEARCH CONCLUSIONS, LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

As previously stated, our investigation was based on the hypothesis that implementing the educational program 'ROBOKIDS in Kindergarten' (using platforms such as Wordwall, Zoho Show, Bee-Bot, Jigsaw Planet, Canva, and AutoDraw) through the blended learning method significantly contributes to the development of digital skills in preschoolers. To test this hypothesis, we used the research instrument Teacher's Child Rating Scale (developed by us) to assess the preschoolers participating in the experiment. We present below, in synthetic form, the results obtained as a result of our research.

Subscale 1: Correct Use of Digital Devices

This subscale measures the child's ability to correctly handle digital devices, which is essential for participation in blended learning activities. It primarily refers to the ability to use

digital tools—such as phones, tablets, laptops, or interactive whiteboards—accurately and efficiently for educational purposes, within the proposed activities.

Table 140.IV presents the comparative pretest-posttest results for the items corresponding to the subscale Correct Use of Digital Devices.

ITEM	CONTROL GROUP – EXPERIMENTAL GROUP PRE-TEST COMPARISON	COMPARISON CONTROL GROUP – EXPERIMENTAL GROUP POST-TEST
1. Correctly uses the mouse in various digital activities.	$\chi 2$=6.528, p= .686 P > 0.05	$\chi 2$=4.003, p= .676, P > 0.05
2. Correctly uses the power on/off button on a phone or tablet during digital activities.	χ^2 = 13.963, p = .124, P > 0.05	χ^2 = 7.694, p = .261, P > 0.05
3. Correctly uses the keyboard on a phone or tablet.	$\chi 2$=7.510, p= .276, P > 0.05	$\chi 2$=7.639, p= .265, P > 0.05
4. Successfully completes tasks within digital applications.	$\chi 2$=11.721, p= .237, P > 0.05	χ^2 = 25.041, p = .003, P < 0.05

Table 140.V Presents the comparative pretest–posttest results for the items corresponding to the subscale *Correct Use of Digital Devices*.

As shown in the table above, at the pre-test stage, no statistically significant differences were recorded between the experimental and control groups for any of the four items in the subscale Correct Use of Digital Devices. This situation remained the same in the post-test stage, with the exception of Item 4 – completing the required tasks within digital applications – where the experimental group outperformed the control group significantly.

We attribute the lack of statistically significant differences between the experimental and control groups in the post-test stage for the other three items to the fact that, even during the pre-test stage, most participants had already demonstrated relatively high levels of performance in terms of correctly using the mouse in various digital activities, properly operating the phone/tablet power button during digital tasks, and accurately using the phone or tablet keyboard.

Subscale 2: Ability to Perform Tasks and Interact Effectively with Digital Applications

This subscale assesses the child’s ability to correctly complete tasks required by digital applications, as well as to interact effectively with them in order to achieve the intended outcomes.

Table 141.V presents the comparative pretest–posttest results for the items corresponding to the subscale Ability to Perform Tasks and Interact Effectively with Digital Applications.

ITEM	CONTROL LOT – EXPERIMENTAL LOT PRE-TEST COMPARISON	COMPARISON CONTROL LOT – EXPERIMENTAL LOT POST-TEST
5. Completes digital puzzles by placing the correct pieces to form a whole image.	$\chi 2$=3.628, p= .727, P > 0.05	χ^2 = 17.541, p = .034, P < 0.05
10. Verbalizes the actions performed while completing tasks within digital applications.	χ^2 = 10.550, p = .262, P > 0.05	χ^2 = 15.550, p = .039, P<0.05
11. Anticipates the steps required to complete tasks in digital applications.	χ^2 = 5.590, p = .771, P > 0.05	χ^2 = 14.939, p = .041, P<0.05
14. Completes complex tasks in digital applications when using the blended learning method.	χ^2 = 11.167, p = .234, P > 0.05	χ^2 = 16.556, p = .033, P<0.05

Table 141.V. Comparative pretest-posttest situation for items corresponding to the subscale Ability to Perform Tasks and Interact Effectively with Digital Applications

In summary, given that in 11 out of the 17 items on the evaluation scale the subjects in the experimental group achieved statistically significantly higher performances compared to those in the control group, we can state that our hypothesis — according to which the implementation of a system of digital activities in the form of the educational program *"ROBOKIDS in Kindergarten"* (*Wordwall, Zoho Show, Jigsaw Planet, Bee-Bot, Canva, Autodraw*) would enhance the development of preschoolers' digital skills — is partially confirmed.

With regard to the limitations of the research, these were mainly represented by the relatively small number of participants involved in the study, the fact that the sample was not nationally representative, the relatively short duration of the experimental intervention, and the fact that the evaluation scale used to assess preschoolers' digital skills was neither standardized nor adapted to the specific characteristics of the studied school population.
As future research directions, I propose both refining and standardizing the evaluation scale for preschoolers' digital skills, as well as extending the investigation to a regional or even national level.

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