Development of Information Technology Competence in Pre-school and Pre-primary School Teachers During the Education Process

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Abstract-This article discusses the significance of digital technologies in education and how they should be integrated into the learning process. While technologies can serve as valuable tools in education, their effective application in working with preschool and pre-primary children poses challenges due to children's developmental characteristics, specific needs, and educators' competencies in integrating information technologies (IT) into the learning process. The study aims to assess the expression of IT competence among preschool and pre-primary educators. The research methods include scientific literature and document analysis, a written survey (questionnaire), and both quantitative and qualitative data analysis. The analysis of scientific literature and documents highlights that preschool and pre-primary educators' IT competence encompasses key abilities such as digital content creation, digital communication, safety, and problem-solving. Essential skills include using IT applications and digital tools (computers, tablets, interactive whiteboards) to enhance children's artistic expression and writing skills, as well as understanding and effectively communicating digital terminology to children. The study also identifies opportunities for integrating IT into the learning process, such as educational games, video content viewing, online collaboration, information retrieval, content creation, and voice recording exploration. Empirical findings reveal that most respondents can define IT competence and recognize its increasing importance. Interactive floors and interactive whiteboards are the most commonly used digital tools in early childhood education. However, educators often face challenges such as a lack of IT resources, slow internet connectivity, limited time for IT use, and insufficient knowledge or time for professional development. IT is frequently used for exploring e-books, fairy tales, maps, educational videos, and online information searches. However, tools such as voice recorders, printers, and cameras are rarely utilized, and activities such as creating presentations, illustrations, remote communication, and playing educational games remain infrequent.

Keywords — IT competence, digital literacy, preschool and pre-primary educator, information technology.

I. INTRODUCTION

A. Relevance of the topic.

The field of information technology is rapidly evolving, requiring continuous adaptation to new developments [1]. Rodzevičiūtė [2] highlights that transformations within the education system also influence the role of educators. In modern education, the competencies, abilities, and IT skills of educators have become crucial factors in the learning process [3]. Digital technologies play a key role in enhancing the efficiency of the educational process and providing access to new resources, fostering the development of children's critical thinking, independence, and collaboration skills [4]. Additionally, the incorporation of IT in education contributes to the overall improvement of teaching and learning processes, making education more engaging and effective [5]. Digital literacy competence benefits children by enabling them to keep up with innovations and apply IT appropriately from an early age, potentially offering greater advantages than traditional teaching methods [6]. Advancements in IT provide students in educational institutions with broader learning opportunities [7]. The use of IT in educational institutions enhances children's digital literacy, increases motivation, and improves learning outcomes [8]. The educational significance of children's computer culture is linked to the contexts shaping their experiences within different domains of digital culture — gaming, informational, and communicative [9]. Through these experiences, adults gain insight into children's digital world, understanding its value

for child development. This perspective helps educators adopt new roles, such as consultants, facilitators, and mediators, while recognizing children as active creators of digital culture [10]. Many scholars emphasize the importance of IT in education, contributing to the understanding of its meaningful integration across various subjects [11]. Research also explores the necessity of IT competence for professional careers [12], the impact of modern learning tools on 5–6-year-old children's play and the significance of IT in education [13, 14]. Studies further examine international experiences in implementing ICT in education and pedagogical approaches to organizing lessons with interactive teaching tools, such as the "ActivInspire" system [16].

Although technology can be a valuable tool in the learning process, its effective use for preschool and pre-primary children presents challenges due to their developmental characteristics and needs. The application of IT in early childhood education depends on educators' digital literacy and their ability to adapt technological tools to children's developmental stages. IT can be utilized in various preschool activities, serving as a supportive tool in music lessons, games, artistic tasks, early numeracy learning, and other educational contexts [6].

B. Research problem

Various documents highlight the significance of digital technologies in education and how they should be implemented in educational institutions. However, as years go by, IT is rapidly advancing, with new tools and various programs emerging. These changes create a need to ascertain how educators today are practically applying information technologies in the children's educational process.

While technology is a valuable educational tool, its use in preschool and pre-primary education presents challenges due to children's developmental needs.

C. Research object

The expression of information technology competencies among preschool and pre-primary educators in the educational process.

D. Research aim

To ascertain the expression of information technology competencies among preschool and pre-primary educators in the educational process.

E. Research objectives:

1. To discuss the information technology competencies of preschool and pre-primary educators and the possibilities for applying information technologies in the children's educational process.

2. To determine how preschool and pre-primary educators practically apply information technologies in the educational process.

F. Research methods:

Analysis of scientific literature and documents, written surveys, quantitative and qualitative data analysis.

It is evident that, over time and with the rapid advancement of new technologies, the priority directions and objectives of various fields, including education, are changing. The fast-paced world drives the need for innovative learning methods, while the application of information technology (IT) is accelerating. The expansion of modern information technologies is particularly relevant in the educational process. Educational institutions are rapidly integrating various IT tools, creating opportunities for changes in the educational process, facilitating the implementation of open learning policies, enhancing the effectiveness of distance education, and ensuring greater flexibility in learning organization [8].

Information technologies play an exceptionally important role in today's world, permeating almost all aspects of an individual's life, including work, learning, home life, and social interactions. The greatest value of information technologies lies not in the technologies themselves but in the new opportunities they create. In this rapidly changing era, educators should remain flexible, embrace emerging innovations, and integrate them into the educational process [16]. The evolution of information technologies will continue to reshape the education system, redefine the role of the teacher, and transform learning environments [17].

Global transformations necessitate continuous professional development for educators, encouraging them to enhance existing competencies and acquire new ones. Ensuring a successful teaching and learning process now requires more than just professional expertise; increasing emphasis is placed on teachers' ability to prepare students for life, including social skills and career education. Consequently, new teaching methods, assessment techniques, and evolving teacher roles necessitate an adaptive approach to education [20].

Children of Generation Alpha were born into a world where information technologies are highly developed. This generation has a strong connection to IT, demonstrating remarkable proficiency in their use. Compared to Generation Z, Generation Alpha will take the next step in utilizing technology. Furthermore, virtual spaces and online learning will become even more integral to their educational experience [1, 21].

The evolving roles of educators in the modern education system are inseparable from new professional competencies related to the use of information technologies, both in their own learning and in the instruction of students [14].

The Description of Teacher and Student Support Specialist Competencies (2023) [22] identifies four key areas of competencies relevant to educators: professional behavior, collaborative engagement, emotional-motivational, and cognitive competencies. Information technology competence is classified as a component of the cognitive domain.

In today's context, information technology competence is highly relevant, making it essential to understand its key components. The Competency Development Framework

[3] defines digital competence as "the motivation and ability to use digital technologies to perform tasks, learn, solve problems, work, communicate, collaborate, manage information, and create and share digital content effectively, appropriately, safely, critically, independently, and ethically." The Teacher and Student Support Specialist Competency Framework [22] further specifies the core components of information technology competence: digital content, digital communication, digital safety, and problem-solving. These components, along with their descriptions, are presented in Table I.

TABLE I.   COMPONENTS OF INFORMATION TECHNOLOGYCOMPETENCIES AND THEIR CONTENT

IT Competency Components	Content of IT Competency Components
Digital Content	Creates and works with digital content in various forms and formats, including searching, filtering (selecting), analyzing, and critically evaluating digital content. Manages, restructures, integrates, and automates content processing. Explains copyright and licensing regulations related to digital content.
Digital Communication	Communicates and collaborates using digital technologies, including social and civic engagement in the digital space. Adheres to universally recognized network etiquette, manages digital identity, protects personal and others' reputations online, and handles information presented through digital means.
Digital Safety	Uses digital technologies securely, protects personal data and privacy in the digital environment, ensures the environmentally responsible use of digital technologies, and safely operates digital devices and information systems.
Problem Solving	Creatively utilizes digital technologies to solve problems, including addressing technical and technological issues in computing (information) systems, critically evaluating possible solutions, selecting appropriate digital technologies, and assessing one's digital competence while identifying skill gaps.

Source: Compiled by the authors of the study based on the Competency Development Description, 2022

It is essential to recognize that early childhood and pre-primary education teachers should integrate information technologies into the learning process, as outlined in the *General Pre-Primary Education Program* (2022) [23]. Consequently, educators in these levels must be proficient in IT terminology, use it effectively, and be able to convey information to children. By utilizing IT tools and software, teachers should foster children's numeracy skills and artistic expression. They must also understand the operational principles of various digital technologies, such as cameras, computers, tablets, and interactive whiteboards, and be competent in their application. Therefore, the development of IT competencies among educators presents a significant challenge in early childhood education.

When addressing the integration of information technologies in pre-school education, it is important to consider whether pre-school and pre-primary children can develop IT competencies and, if so, at what level. Recent scientific advances, international recommendations, and national strategies — such as Lithuania 2030 and the Agreement on Lithuanian Education Policy (2021–2030) — have influenced the expansion of competencies in education. In response to these developments, the 2023 revision of the General Pre-Primary Education Program introduced digital competence as one of the key competency areas.

In pre-school education, digital competence is understood as the ability to use digital technologies effectively, safely, critically, and ethically for learning, problem-solving, communication, collaboration, information management, and content creation. It encompasses four main components: digital content creation, digital communication, digital safety, and problem-solving.

The General Pre-Primary Education Program [23] emphasizes that, through play and participation in various activities, children gradually learn to use digital devices and technologies responsibly, search for information, create basic digital content (such as drawings or short videos), and engage in digital communication and collaboration. Thus, in pre-school education, IT competence refers to the initial and developmentally appropriate use of digital technologies, supporting the gradual acquisition of digital literacy skills from an early age.

The application of information technologies in the educational process and the opportunities they provide have the potential to address emerging societal development challenges. As a result, a significant increase in the implementation and expansion of information technologies in education is currently being observed [25]. The widespread availability of IT offers new ways to enhance learning [26].

In the past, information exchange between teachers and parents primarily occurred through verbal communication. However, in contemporary times, electronic communication has become increasingly prevalent. The use of electronic gradebooks aims to facilitate teachers' work, ensure the timely dissemination of useful information to students and their parents, and actively engage them in the school community's activities and continuous dialogue, thereby enhancing the quality of children's education [27].

Modern parents are more inclined to collaborate with educators through information technologies rather than face-to-face interactions. Advancements in information technologies encourage communication between parents and teachers through electronic mail, mobile phones, websites, social networks, and messaging applications [28].

Educators also incorporate information technologies into the learning process, providing numerous benefits to

children. The *Guidelines for the Development of Informatics and Information Technology Education 2014–2020* [24] highlight that children are introduced to information technologies even before they start school. The guidelines also indicate that recent advancements in IT have led to increased opportunities and a broader application of technologies for personal needs (*Guidelines for the Development of Informatics and Information Technology Education 2014–2020*) [24].

The *General Pre-Primary Education Program* [23] states that through play and participation in various activities, children learn to use digital devices, tools, and technologies responsibly, safely, and ethically while engaging in digital communication. By utilizing available digital technologies—such as tablets, smartphones, interactive screens, and educational applications children explore digital content, search for information, draw, create, engage in educational games, and investigate their surroundings (e.g., maps, nearby objects, and natural phenomena). Additionally, they begin to develop basic digital content, such as music and video recordings, and experiment with technology for communication and collaboration while sharing their experiences. Furthermore, the program highlights that children have the opportunity to prepare and present brief reports, illustrate narratives using information technologies, and use applications for step counting and other interactive activities.

TABLE II. POSSIBILITIES OF USING INFORMATION TECHNOLOGIES IN CHLIDREN'S EDUCATIONAL PROCESS

Areas of Learning	Educational Methods Utilizing Information Technologies
Digital Content Creation and Exploration	Creation of short messages and illustrations [29].
	Basic digital content creation e.g., video recordings [23].
	Use of a camera to capture moments for experimentation [10, 30].
	Exploration of Printer Capabilities [30, 23].
Learning and Information Research on the Internet	Playing educational games [29].
	Exploration of electronic fairy tale books [29].
	Listening to and watching narrated fairy tales online [30].
	Investigating various maps, objects, and phenomena online [31].
	Conducting online information searches [30, 3].
Audio Recording and Analysis	Utilizing a voice recorder to explore voice recording capabilities [22].
Communication and Collaboration	Remote communication and collaboration, e.g., during various projects [23].

Source: *Compiled by the authors of the study based on the analyzed scientific literature and documents*

Thus, there are numerous opportunities for educators to integrate information technologies into their teaching practices. Among these are the use of electronic gradebooks, email communication, and various other IT

applications in the children's learning and development process.

II. MATERIALS AND METHODS

The empirical research was conducted in March 2024. The aim of this study was to determine how preschool and pre-primary education teachers practically apply information technologies in the educational process.

To assess the expression of information technology competencies among preschool and pre-primary education teachers in the educational process, a quantitative research approach was employed, using a written survey as the primary method. The written survey is one of the most commonly used data collection methods in sociological research [32]. This method was chosen due to its several advantages: respondents could independently select the time and place for completing the survey, the response time was less constrained, and participants had the opportunity to carefully consider their answers. Furthermore, the method ensured greater privacy, eliminating any discomfort that might arise in face-to-face interviews. Selecting a written survey increased the likelihood of receiving more open and sincere responses [33].

To achieve the research objective, a questionnaire survey was conducted. The questionnaire was hosted on the online platform www.apklausa.lt. It consisted of 15 questions: 11 closed-ended questions with predefined response options—allowing respondents to select one or multiple answers—and 4 open-ended questions, enabling respondents to express their opinions. The questions were formulated to collect data essential for the study, primarily based on a review of scientific literature. The key research questions aimed to gather data on the following aspects: the information technology competencies that preschool and pre-primary education teachers perceive themselves to have; the extent to which they integrate information technologies into the educational process; and the perceived lack of information technology resources in preschool education institutions.

The survey targeted teachers working with preschool and pre-primary-aged children. The study involved preschool and pre-primary education teachers from educational institutions in Alytus city and district municipalities. According to data from the 2022–2023 academic year, there are approximately 481 preschool educators in Alytus city and district. The sample size was determined using standard statistical parameters, with a confidence level set at 95% and a margin of error of ±7%. Statistical analysis indicated that a minimum sample of 145 respondents would provide a reliable representation of the total educator population.

A total of 145 questionnaires were distributed, and 102 completed responses were received, resulting in a 70.3% response rate. In social science research methodology, this response rate is considered sufficient to ensure data representativeness [36]. The achieved sample size provided statistically valid parameters to meet the study's research objectives.

The study adhered to all ethical principles necessary to ensure research integrity. Respect for confidentiality and anonymity was maintained throughout the process. The questionnaire included a statement explaining that respondents' answers would be used only in an aggregated form and that no personal data would be disclosed. The most fundamental ethical principle of honesty was upheld throughout the study, ensuring that all presented data were accurate and not manipulated [33].

III. RESULTS AND DISCUSSION

The study aimed to determine whether preschool and pre-primary educators are familiar with various digital technology terminologies, use them in practice, and can effectively convey related information to children. Additionally, it sought to assess their ability to develop children's writing skills through information technology tools and various software programs, employ digital applications to enhance children's artistic expression, and understand as well as operate different digital devices such as cameras, computers, tablets, and interactive whiteboards.

Respondents were asked to indicate their level of agreement with the provided statements. The research findings revealed that the majority of surveyed educators (76.7%) agreed or strongly agreed with statements regarding their knowledge and use of digital technology terminology. Furthermore, 78.8% demonstrated an understanding of and the ability to operate computers, tablets, and interactive whiteboards, indicating a high level of familiarity with information technology.

According to the *Description of Preschool Children's Achievements* (2016), educators must possess a strong understanding of digital technology terminology and be proficient in using various digital tools, such as computers, tablets, and interactive whiteboards, to effectively support children's skill development. Moreover, educators need to be knowledgeable about programs designed for developing writing skills and enhancing artistic competencies, as well as proficient in their application.

The study results confirm that educators possess the necessary competencies to successfully integrate information technologies into the educational process. Specifically, 64.3% of respondents reported using information technology tools to develop children's writing skills, while 64% employed IT applications to support and enhance children's artistic expression.

The research also sought to evaluate the specific competencies of preschool and pre-primary educators in utilizing information technologies. Respondents were asked to assess their proficiency in performing the following tasks: *communicating using information technologies, collaborating through information technologies, utilizing modern technologies to create digital content (e.g., video recordings), practicing safe behavior in digital environments, protecting sensitive digital content and ensuring the confidentiality of children's information and achievements.* Educators were

required to indicate their level of proficiency in these areas using the following scale: *"Highly proficient," "Proficient," "Neither proficient nor unproficient," "Not proficient," "Completely not proficient."*

The analysis of the study results suggests that the majority of surveyed educators possess digital literacy competencies. Respondents' answers indicate that nearly all educators are capable of communicating, collaborating, and performing various tasks using information and communication technologies (ICT). Specifically, 39.8% of respondents reported excellent communication skills through ICT, while 58.2% indicated effective communication abilities, with no significant difficulties observed in this area. Collaboration via ICT was reported as excellent by 39.2% and proficient by 46.4% of respondents, with none indicating difficulties. Additionally, 84% of respondents demonstrated proficiency in utilizing modern technologies and creating digital content, while only 4.1% encountered certain challenges. Furthermore, 88.6% of educators reported competency in safe online behavior, with no respondents indicating a complete lack of ability in this area. A total of 87.2% stated that they could effectively protect confidential information and sensitive content. These results align with the requirements outlined in the *Description of Teacher Professional Competencies* (2021) [3], which specifies that a digitally literate educator must be capable of communication, digital content creation, safe online practices, and critical evaluation of media content. Thus, the surveyed educators demonstrate strong readiness in utilizing ICT and are well-prepared to impart these skills to their students.

Another key objective of the study was to examine the opportunities preschool and pre-primary educators provide for children to engage with ICT. Educators were asked to indicate how frequently they enable children to use ICT in the learning process.

Survey results indicate that children most commonly engage with ICT by listening to and watching narrated fairy tales online (52.2%), exploring maps and various phenomena (82.6%), searching for information on the internet, and watching educational videos (69.6%). Less frequently used activities include exploring voice recorders (34.8%), utilizing printer functions (39.1%), and using digital cameras for capturing moments (30.4%). Additionally, children are less likely to create short presentations and illustrations, communicate and collaborate remotely (e.g., by participating in projects), or play educational games online.

The only activity with an evenly distributed response pattern was the creation of simple digital content (e.g., video recordings). Some respondents reported providing this opportunity to children quite frequently, while others indicated that children do not engage in such activities at all.

An open-ended survey question sought to identify the ICT tools used by preschool and pre-primary educators in the learning process: *"What ICT tools do you use in early*

childhood education?" The responses from 102 educators revealed that interactive whiteboards are the most frequently used tool (68.6%), followed by computers (44.1%). A smaller proportion of respondents reported using interactive floors (21.6%), mobile phones (20.6%), and tablets (15.7%). Projectors were used infrequently (11.8%), while smart robots were mentioned by only 2.0% of respondents.

The analysis suggests that educators increasingly integrate computers into the learning process, with interactive whiteboards being the most popular tool. In contrast, projectors, smart robots, and printers are used very rarely or not mentioned at all, which may indicate lower demand or limited availability of these technologies.

Educators were also asked to identify ICT shortages in their institutions: *"What ICT tools are lacking in your institution?"*

Survey results indicate that interactive whiteboards (26.5%) and tablets (25.5%) were the most frequently mentioned shortages. Some respondents also pointed to a lack of interactive floors (12.7%). A smaller proportion (6.9%) indicated a need for better computers, while only a few (2.0%) noted a shortage of printers.

A notable 24.5% of respondents stated that their institution currently has sufficient ICT resources. However, many educators expressed a desire for increased access to ICT tools, not only within the institution but also in each classroom, ensuring at least one device per group.

The findings suggest that while some educators do not experience a shortage of ICT tools, many recognize the growing need for interactive whiteboards and tablets in the learning process. Additionally, a number of respondents highlighted the importance of making ICT tools more accessible to children in their daily activities.

When asked about the challenges they face in integrating ICT into early childhood education (*"What difficulties do you encounter when using ICT in early childhood education?"*), responses revealed that 23.5% of educators experience no difficulties in applying ICT. However, 22.5% reported a lack of knowledge, training, or practical examples of ICT application. A smaller proportion (11.8%) mentioned time constraints, and a very small percentage (6.9%) cited occasional poor internet connectivity in their institutions.

The survey results indicate that while some educators face no difficulties, a significant proportion perceive a lack of training and practical guidance, emphasizing the need to strengthen their digital competencies. Additionally, time constraints and technical issues, such as weak internet connectivity, may hinder the effective use of ICT in education. These findings suggest that successful ICT integration requires not only better equipment but also continuous methodological and technical support for educators.

To understand how educators could improve their ICT skills, the survey included the question: *"In your opinion, what would help educators gain more knowledge about using ICT?"*

The responses indicate that educators highly value opportunities to acquire additional ICT knowledge. The majority (38%) expressed a preference for participating in institution-based training, online courses, digital literacy improvement programs, or knowledge-sharing sessions with colleagues. A significantly smaller proportion (7%) indicated interest in formal ICT studies.

The findings suggest that educators are motivated to enhance their ICT competencies, with the most preferred learning methods being in-house training, remote learning courses, and digital literacy programs. This indicates a strong preference for practical and accessible learning opportunities. Additionally, the low preference for formal ICT studies suggests that educators favor short-term, immediately applicable learning formats over long-term academic programs.

IV. CONCULSIONS

1. The analysis of scientific literature and documents reveals that the rapidly changing pace of life fosters the integration of information technologies into children's education. Consequently, educators must continuously develop their digital competencies, which have become an integral part of their professional activities.

IT competency encompasses not only digital content creation, communication, and ensuring cybersecurity but also problem-solving and the application of various technological tools, such as computers, interactive whiteboards, and tablets, for educational purposes.

To effectively integrate IT into the learning process, educators should utilize educational games, video materials, e-books, project-based collaboration, information retrieval, and the creation of basic digital content.

2. The results of the empirical study confirm that educators recognize the importance of IT competency — most acknowledge the significance of digital skills and agree that this competency is becoming increasingly relevant in the educational process.

The most frequently used tools for children's learning are interactive whiteboards and interactive floors; however, educators face various challenges, including a lack of IT resources, slow internet connectivity, limited usage time, and a shortage of knowledge and time.

It is observed that IT applications in the educational process are diverse — educators primarily use technology for interactive activities, such as reading e-books, watching video materials, and searching for information online.

However, certain tools, such as voice recorders, cameras, and printers, are used less frequently in the learning process. Additionally, digital content creation, remote collaboration, and the use of online educational games remain relatively underutilized.

The study highlights the growing recognition of IT's importance in education and underscores the need to enhance access to both technological resources and training opportunities.

3. Based on the identified challenges and needs, the following recommendations are proposed to enhance IT integration in early childhood education:

For the Education Departments of Alytus City and Alytus District Municipalities: Conduct a comprehensive needs assessment of IT resources across municipal educational institutions to identify and address existing resource gaps. Develop inter-institutional collaboration programs to facilitate the sharing of IT resources and best practices among preschools.

For Pre-school Institutions: Implement systematic professional development programs that focus on practical IT skills and their pedagogical applications. Establish communities of practice where IT-enthusiast educators can mentor their colleagues and share innovative approaches. Create structured feedback mechanisms to monitor the challenges and successes of IT implementation.

For Teacher Training Institutions (Professional Development Center of Kaunas Kolegija Higher Education Institution, Alytus Division): Organize thematic and practical training programs for preschool and pre-primary education teachers. These programs should focus on developing both digital competencies and pedagogical strategies for using technology in early childhood education.

These recommendations aim to create a sustainable ecosystem for developing digital competencies, addressing both infrastructural needs and pedagogical skills, while aligning with national education strategies and the evolving demands of 21st-century early childhood education.

REFERENCES

[1] A. Targamadzė, Virtualusis mokymasis. Teorija ir praktika. Kaunas: Vitae Litera, 2020.

[2] E. Rodzevičiūtė, "Mokytojų organizavimo kompetencijos raiška edukacinėje praktikoje," Pedagogika, pp. 42-46, 2006.

[3] "Kompetencijų raidos aprašas," Mar. 10, 2022. [Online]. Available: https://emokykla.lt/upload/EMOKYKLA/BP/2022-03-10/1%20priedas.%20Kompetencijų%20raidos%20aprašas_04-22.pdf [Accessed: Mar. 3, 2025]

[4] Z. G. Shatri, "Advantages and disadvantages of using information technology in learning process of students," J. Turkish Sci. Educ., vol. 17, no. 3, pp. 420–428, 2020. https://doi.org/10.36681/

[5] K. Nekrašaitė and T. Petkus, "Informacinių technologijų naudojimas mokymui," Information & Media, vol. 50, pp. 112–116, 2009.

[6] M. Guney, "Information and communication technologies in the pre-school period," Current Acad. Stud. Educ. Sci., vol. 138, 2021.

[7] J. Moskvina, "Skaitmeninis mokymas-Lietuva tarp kitų Europos Sąjungos šalių," Acta Paedagogica Vilnensia, vol. 47, pp. 52–68, 2021.

[8] Ž. Labutė and I. Žemaitaitytė, "Informacinių komunikacinių technologijų pritaikymo galimybės socialinio ugdymo pamokose," Societal Studies, vol. 7, no. 2, pp. 292–304, 2015.

[9] D. Lupu and A. R. Laurenţiu, "Using new communication and information technologies in preschool education," Procedia - Social and Behavioral Sciences, vol. 187, pp. 206–210, 2015.

[10] P. Jucevičienė and V. Brazdeikis, "Pedagogo IKT kompetencijos dinamiškos struktūros pagrindimas," Socialiniai mokslai, no. 2, pp. 70-81, 2003.

[11] G. Gedvilienė, V. Bortkevičienė, and R. Bortkevičius, "IVT kompetencijos reikmė piliečių profesinėje karjeroje," Role Higher Educ. Inst. Soc., pp. 58, 2014.

[12] V. S. Glebuvienė and A. L. Tarasonienė, "Šiuolaikinės informacinės technologijos ir vaikų žaidimai," Pedagogika, vol. 89, pp. 70–74, 2008.

[13] A. Juodaitytė and E. Šaparnytė, "Vaikų kompiuterinės kultūros komunikacinio diskurso empirinis tyrimas," Acta Paedagogica Vilnensia, vol. 21, pp. 101–116, 2008.

[14] V. Laurutis, A. Gumuliauskienė, and E. Šaparnytė, "Informacinių ir komunikacinių technologijų integravimo švietimo sistemoje tendencijos nuolatinio mokymosi kontekste," Pedagogika, pp. 112-123, 2003.

[15] V. Dagienė and E. Kurilovas, "Informacinių ir komunikacinių technologijų diegimo švietime patirties Lietuvoje ir užsienio šalyse lyginamoji analizė," Pedagogika, pp. 112-118, 2009.

[16] J. Dudaitė and R. Prakapas, "Lietuvos mokytojų, dirbančių su „ActivInspire" interaktyviąja sistema, patirtys organizuojant pamokos darbą," Social Inquiry into Well-Being, vol. 14, no. 2, pp. 199–209, 2016. https://doi.org/10.13165/SD-16-14-2-06

[17] M. Ally, "Competency profile of the digital and online teacher in future education," Int. Rev. Res. Open Distrib. Learn., vol. 20, no. 2, 2019. https://doi.org/10.19173/irrodl.v20i2.4206

[18] A. Lukošius, E. Erminas, G. Alšauskas, and E. Gotautienė, "IT taikymas mokymosi procese," Verslas, Technologijos, Biomedicina: Inovacijų Įžvalgos, vol. 1, pp. 259-269, 2020.

[19] M. Ally, "Competency profile of the digital and online teacher in future education," Int. Rev. Res. Open Distrib. Learn., vol. 20, no. 2, 2019. https://doi.org/10.19173/irrodl.v20i2.4206

[20] G. Gedvilienė, R. Laužackas, and V. Tūtlys, "Mokytojų kvalifikacijos tobulinimo poreikiai," 2010.

[21] V. Targamadzė, "Z karta: charakteristika ir ugdymo metodologinės linkmės įžvalga," Tiltai, no. 4, pp. 95-104, 2014.

[22] "Mokytojų ir pagalbos specialistų mokiniui kompetencijų aprašas", Nov. 27, 2023. [Online]. Available: https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/e8d855a08d6111eea791d94269904d9b?jfwid=-1l7zm5mf0 [Accessed: Mar. 3, 2025]

[23] "Ikimokyklinio ugdymo programos gairės", Sep. 4, 2023. [Online]. Available: https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/76bb8f404b5911ee8185e4f3ad07094a?jfwid=f5arm3g7r [Accessed: Mar. 3, 2025]

[24] "Informatikos, informacinių technologijų ugdymi 2014-2020 metų strategijos gairės", [2014] [Online]. Available: https://www.upc.smm.lt/ugdymas/dokumentai/svarstomi/it/Informatikos_ir_IT_ugdymo_nuo_2015_m._gaires_2012-05-21.pdf [Accessed: Mar. 3, 2025]

[25] G. Tolutienė and S. Puškorius, "Informacinių ir komunikacinių technologijų taikymas švietime: besimokančių suaugusiųjų požiūrio tyrimas," Tiltai, no. 3, pp. 123-140, 2014.

[26] J. Groff, "Technology-rich innovative learning environments," OCED CERI Innov. Learn. Environ. Proj., vol. 2013, pp. 1-30, 2013.

[27] V. Chreptavičienė, "Elektroninis dienynas-tėvų ir mokyklos bendradarbiavimo inovacija: galimybės ir problemos," Socialiniai mokslai, no. 2, pp. 71-84, 2010.

[28] R. Kondratavičienė, "Ikimokyklinio ugdymo įstaigų pedagogų ir tėvų bendradarbiavimas," Ikimokyklinio ir Priešmokyklinio Ugdymo Pedagogų Rengimo Problematika, p. 109, 2016.

[29] A. Juodaitytė & E. Šaparnytė, "Vaikų kompiuterinės kultūros komunikacinio diskurso empirinis tyrimas," Acta Paedagogica Vilnensia, vol. 21, pp. 101–116, 2008.

[30] A. Augustinienė, R. Burinskienė, & I. Kajokienė, "Priešmokyklinio amžiaus vaikų kalbos įgūdžių ugdymas taikant edukacines technologijas," 2013.

[31] J. Dudaitė, R. Dačiulytė, & J. Navickaitė, "Lietuvos suaugusiųjų raštingumo sąsaja su įsitvirtinimu darbo rinkoje ir mokymusi visą gyvenimą," 2022.

[32] K. Kardelis, Mokslinių tyrimų metodologija ir metodai. Vilnius: Mokslo ir enciklopedijų leidybos centras, 2016.

[33] N. M. Preradović, G. Lešin, and D. Boras, "The role and attitudes of kindergarten educators in ICT-supported early childhood education," TEM J., vol. 6, no. 1, pp. 162-172, 2017.

[34] F. Qi, "Application of new media technology in the information teaching of preschool education," in Proc. Int. Conf. Soc. Sci., May 2021, pp. 157-163.

[35] T. Sabaliauskas, D. Bukantaitė, and K. Pukelis, "Mokytojų informacinių ir komunikacinių technologijų kompetencijų sričių projektavimas," Prof. Rengimas: Tyrimai ir Realijos, no. 12, pp. 152-165, 2006.

[36] Krejcie, R. V., & Morgan, D. W. (1970). Determining Sample Size for Research Activities. Educational and Psychological Measurement, 30(3), 607–610.