

Teacher's perspectives on digital tools in preschool education

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Abstract

The study focuses on utilizing digital technologies within the context of preschool education in the Czech Republic, as viewed through the lens of kindergarten teachers. The objective was to find out teachers' perspectives on using digital technologies with a focus on language development in preschools from the point of view of Czech teachers. The survey method was used for data collection. Responses were collected from 80 preschool teachers from the Czech Republic using an online questionnaire; data was analyzed and discussed quantitatively in descriptive analysis. The study revealed that preschool establishments demonstrate a relatively commendable level of digital technology provisioning, which has grown recently with the help of financial subsidies from the government. However, teachers state that there is a lack of management support for effectively integrating them into the curriculum. The survey revealed that they also have to deal with the organizational arrangements of children when using digital technologies, given the number of children in classes. In our study, we paid special attention to areas of language competence that had developed. It was found that teachers prefer applications with simple language development competencies as opposed to complex language skills. They also prefer to use applications that children can use independently. In conclusion, teachers mostly have a positive attitude towards their utilization, under the condition of limiting their use in time and type of content.

1 Introduction

As digital technologies are becoming a crucial part of our lives, rapid development and transformation of daily experience pressure members of our society to be able to navigate and live in this environment. To respond to the need to develop essential skills, the Czech government aims to create an educational environment that will lead its pupils and teachers toward facilitating digital literacy and computational thinking at all levels of education. Therefore, kindergarten teachers are required to integrate digital technologies into their class activities accordingly. This research focuses on what digital tools teachers use and how they use them to support preschool children's language development in class.

Our children are born into the digital world, which shapes their experience, the nature of social relations, communication, and style of play (Prensky, 2001). They learn how to control different

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technologies at a surprisingly fast pace. However, the ability to operate devices is not connected to their ability to understand the deeper context of their use. A child's understanding of the possible dangers and consequences of using technology is limited by the level of cognitive capacity and experience (Chaudron et al., 2017). Concerns about the use of digital technologies by children are most often associated with excessive use and poor-quality media (Johnston, 2021) and, according to studies, might result in impaired physical development (Zormanová, 2022), negative self-regulation skills (Topçu & Dinçer, 2022), sleep problems (Limone & Toto, 2021), obsessive behavior and possible addiction (Suresh & Tiwari, 2022).

In current research, the emphasis is on the positive influence of technology on learning and development. Through digital play, young children's engagement with digital technologies can support imagination, collaboration, and self-determination (Schriever, 2021; Sakr, 2022). From the earliest age, children are able to demonstrate creativity and agency in digital space (Murcia et al., 2020). The role of schools and teachers in this process lies in promoting the responsible and meaningful use of technologies to manage children's needs and interests (Schriever, 2021). Adopting digital technologies in education is considered a promising solution to prepare young children for the demands of modern society (Selwyn, 2010; Sek & Kakadiy, 2010).

Current studies emphasize the importance of supporting the agency and self-regulation of children while using digital technologies from a young age (Johnston, 2021). According to Chiong & Shuler (2010), a personalized and individual learning experience while using digital tools is one of the great opportunities to support the development of autonomy and independence. Ho, Chung, and Lin (2012) suggest that incorporating interactive visual elements into educational programs can improve learning motivation, attitudes, and accessibility. Children should be given the opportunity to choose and determine their own course of action. Play elements can offer the chance to experiment with rules, boundaries, and emotions (Lee & Hammer, 2011). As players gain a sense of mastery and control over their devices, it enables them to shape their interactions with technology based on their beliefs and capabilities, particularly in narrative-focused games providing a meaningful and immersive experience (Tanenbaum & Tanenbaum, 2010).

1.1 Digital education in Czech context

According to the implemented Strategy for the Education Policy of the Czech Republic up to 2030+ (Strategy 2030+), critical and responsible use of digital technologies in and out of the classroom is the key element to raising information and data literacy, communication, and collaboration, media literacy, safety in the online environment, as well as problem-solving and critical thinking. In connection with Strategy 2030+ and the growing financial support of schools, digital learning technologies are increasingly being used across all educational levels. Czech preschools are not an exception. In 2022, the Ministry of Education released special funds to acquire digital teaching aids. Support in the amount of 4.3 billion crowns was distributed to all kindergartens, primary and secondary schools, and conservatories established by the region, municipality, or voluntary association of municipalities. This intervention's financial source was the National Recovery Plan funds from the European Union - Next Generation EU fund. School principals were given relative freedom in choosing digital teaching aids. However, it was mandatory for schools to use this financial amount within the specified rules. The aim was to help schools buy digital learning tools that would be used in teaching and would help prepare students for their future professional or personal lives in the digital world.

However, The practical implications of preschool children's digital competencies remain absent

within the state documents. The Framework Educational Programme for Pre-school Education (FEP PE, 2021) determines the main requirements, conditions, and regulations of institutions instructing preschool-aged children. These regulations are binding for education in all pre-school institutions and represent the basic ground for assembling the school education programs and their realization. The absence of a definition of digital competencies is an apparent deficiency that should be corrected in the future. As it might create uncertainty about the actual use of technologies for educational purposes in the preschool curriculum. In the year 2024, FEP PE is currently undergoing revisions.

The type of tools available influence how they are incorporated into practice and might play a role in teachers' attitudes towards technologies and their perceived value in education (Webb & Cox, 2004). Otterborn, Schönborn, and Hultén (2019) recent study suggests that teachers find children's activity and influence as both a positive and a difficult aspect of using digital tools. On the one hand, there are concerns for the child's well-being and safety; on the other is the child's agency in the digital space.

Czech preschools' most prominent digital tools are interactive touch-screen devices such as interactive whiteboards, projectors, and interactive TV (Dosedla & Picka, 2019). According to the authors, interactive whiteboards can be used well in kindergartens as they already offer suitable technology that enables work and fun for the little ones. It is possible to work directly with fingers and not only with often heavy and large pens and, unlike pure projection, activates children. The blackboard, therefore, contributes to their active involvement in the learning activity, and the internet connection offers a wide variety of online digital learning materials (Dobiáš, 2019). As part of the digitization call, other multimedia, including tablets and digital microscopes, are also supported (Dosedla & Picka, 2019), 3D printers (Kloski & Kloski, 2017), or VR glasses (Dobiáš, 2019). In the Czech context, robotic toys, such as BeeBot, Ozobot, and Lightbot, are also considered by some authors as part of digital technologies education (Maněnová & Pekárková, 2020; Vaníček, 2016).

1.2 Digital technologies and language competences

The *Framework Educational Program for Preschool Education* (FEP PE) provides the basis for developing language competencies in preschool age. The fundamental purpose of education is the development of speech activities and language skills – receptive and productive, the development of communicative (verbal and nonverbal) skills, and the adoption of empiric knowledge and skills preceding reading and writing.

In the context of language education, digital technologies contribute to the development of digital competence, digital literacy, media literacy, and internet literacy, which are integral competencies for effective language learning. The shift from traditional writing tools to digital devices also highlights the importance of considering the motor-perceptual differences and haptic affordance of different writing modalities, which can impact cognitive performances in linguistic tasks (Cerni, 2014). Studies show that appropriate educational programs can positively affect the development of preschool children's verbal competence and vocabulary (Chiong & Shuler, 2010; Ponti, 2023; Fisch et al., 2002).

Language skills in pre-primary education are influenced by complex areas such as verbal understanding, verbal creativity, lexicon, and vocabulary complexity (Goto Butler, 2022, etc.), interaction and communication (Harangus & Kovacs, 2022), improve literacy skills and

engagement (Husbye et al., 2012), reading and pronunciation (Lumbin et al., 2023). Digital technologies might also be used to correct children's language and speech therapy (Vindece & Usca, 2020; Mytsyk, 2023; Toki & Pange, 2010).

2 Method

This study employed a *mixed research design* using a survey method to collect data from preschool teachers. An online survey questionnaire was sent to pre-primary schools and teachers and shared through social media. The participants' individual answers are included in the findings section. This study aims to determine what digital technologies preschools are equipped with and how teachers include them in their classes. The subsequent objective was to find out perspectives on the features of educational programs and to evaluate the importance of various application features for use in preschool education. Based on the research objectives, 3 research questions were identified.

Question 1: What types of digital technologies are used in preschool education?

Question 2: How do teachers include digital technologies in the classroom?

- What is the organization of pupils while using the digital tools?
- Which areas of language development are usually influenced by teachers when using digital tools?

Question 3: What features of educational applications do teachers consider the most useful for preschool children?

2.1 Participants and procedure

The self-selection method was used to involve the participants in the sampling method (Lee, 2001; Khazaal, van Singer & al. 2014). An online link was created and shared through social media (Facebook and Instagram). Link to the questionnaire was also sent through e-mail to preschools in the Czech Republic. Responses were collected from N=80 respondents who work as preschool teachers.

2.2 Data collection

The *questionnaire* was created using the Microsoft Forms application and consisted of three sections to provide answers to research questions (the survey form is attached in Appendix 1). The first part of the questionnaire aims to discover what types of digital technologies kindergartens are equipped with. Options from which participants could choose answers were compiled on the basis of available literature. In the second part, the branching method was used in the questionnaire. Depending on the choice of tools (between a robotic tool and a touch-screen tool), the participants were redirected to a section of questions to understand their use better. It was, however, possible to answer both sets of questions if the participant chose from both categories. This direction was used to better distinguish between robotic toys and interactive screen media use. The questionnaire was accessible online through a link from September 2023 to December 2023. Data was collected and discussed quantitatively using descriptive analysis. Responses were processed through the utilization of absolute frequency and relative frequency counts.

2.5 Validity, reliability, and ethical considerations

The questionnaire items were designed to capture various aspects of teachers' experiences with digital technologies. Teachers were provided with detailed information about the research

objectives and procedures before participation. They were assured of voluntary participation and must consent before completing the questionnaire. Measures were taken to ensure the confidentiality of participants' responses. No identifying information was collected, and data were anonymized before analysis to protect teachers' privacy.

3 Findings

3.1 Question 1

What types of digital technologies are used in preschool education?

In the survey, respondents had unlimited options to choose from various digital tools. In Table 1, the results show that an average of 2,2 answers per 1 person was selected. The number of answers suggests that respondents utilize, on average, at least 2 - 3 different types of digital devices in their lessons. All answers of participants who offered more than one option were evaluated

Table 1 Types of digital technologies used in preschools: descriptive statistics (N=80)

Item	Abs.Fq.	Rel.Fq.
Robotic toys for programming	48	63%
Tablet	36	45%
Interactive projector	35	45%
Digital microscope	22	29%
Interactive TV	11	14%
3D pen	10	13%
Digital camera	7	9%
3D printer	1	1%
Others	5	6%

Abs. Fq. - absolute frequency

Rel. Fq. - relative frequency

Respondents mostly work with interactive **robotic toys** (63%), which help children develop coding language skills to solve tasks by moving the toy. Teachers were encouraged to write about the specific robotic toys they used in their classrooms. The answers included robotic toys like Bee-Bot, Botley, Smart train, robotic mouse, and robotic unicorn. The next category includes **touch-screen and interactive screen devices**, such as tablets (45%), interactive projectors (45%), and interactive TV devices (14%). The others mention using digital tools such as microscope (29%) and 3D pen (13%). While using interactive screen devices, teachers were asked to name specific programs and applications they usually use on these devices in class. Answers mostly consisted of Czech educational applications such as Colorful Stones, ČTEdu, Flashcards, Hravouka, Alfik, etc. Respondents also mentioned creating their own activities using Smart Boards or PowerPoint. Respondents say projectors can also be passive media devices to watch movies and videos.

The findings revealed that preschool establishments demonstrate a relatively commendable level of digital technology provisioning. Teachers were encouraged to give individual comments to answer this. Some responders specified that they were motivated to buy more digital tools and robotic tools because of the finances from recent grants. *“If we did not get the subsidy, we probably would not have bought them.”* (T67). From the individual comments, we can also observe common thinking themes about using digital technologies in kindergarten. While most teachers stated that they have mostly positive attitudes towards their use, 8 participants (T8, T16, T20, T24, T29, T49, T51, T55) commented that it should be used in moderation. According to teachers, digital technologies can be *“effective and modern”* (T18), *“diversify and enrich educational work”* (T31) and *“the children like working with them”* (T53). Some participants stated that they are not necessary in

schools (T44, T15) and that “*children need to be developed in this direction as well*” (T26).

3.2 Question 2

How do teachers include digital technologies in the classroom?

- What is the organization of pupils while using the digital tools?
- Which areas of language development are usually influenced when using digital tools by teachers?

Subsequent questions were focused on the frequency of use and type of class organization while using the tool. Teachers estimated the time during which they integrate digital tools during class activities. Using the branching method in the questionnaire between robotic toys and interactive touch screens (including tablets, interactive projectors, and interactive TV), two sets of data were collected to differentiate between the two types. It was, however, possible to answer both sets of questions if the participant chose from both categories. While using the branching sets of questions, N=29 participants answered questions regarding Robotic toys, while N=63 answered questions regarding interactive touch-screen tools.

Table 2 During which activities do teachers use the tools? descriptive statistics

Organization	Robotic toys(N = 29)	Interactive screen tools (N = 65)
Tools are accessible all-day	12 (41%)	11 (17%)
Used only during free activities	8 (28%)	9 (14%)
Used only during guided activities	5 (17%)	41 (63%)
We do not use them	1 (3%)	1 (2%)
Others	3 (10%)	3 (5%)

Table 3 What is the most common way for the class to organize while using this tool? descriptive statistics

Organization	Robotic toys (N = 29)	Interactive screen tools (N = 65)
Collective (all children play at the same time)	0	14 (22%)
Frontal (one works, others watch)	3 (10%)	13 (20%)
Group activity (in small groups)	19 (66%)	25 (38%)
Individual activity	7 (24%)	12 (18%)
We do not use them	0	1 (2%)

Results show that robotic toys are mostly accessible to children all day (41%), it is not common to use them specifically during guided activities (17%). Participants who chose “Others” (3) specified that the toys are used *on demand* during free and guided activities. T20 stated: “*We will start work in a guided activity, the children can continue independently during the day as part of an unguided.*” Teachers also observed children playing with robotic tools in smaller groups (66%). From the answers, it is apparent that they are not used collectively – probably because only one or two toys are available for children in the class.

Regarding interactive screen tools (tablets, projectors, and interactive TV), 63% of participants use them specifically during guided activities. It is not common for children to have access to them throughout the day (17%). From the category of “Others”, teachers stated that the tools are used “*Whenever we need*” (T21). Two teachers also stated that they are used in more types of organizations (T5, T54). Regarding the organization of children, the group activity is used by 38% of participants. However, other types of organization are also used, such as collective (22%), frontal (20%) and individual (18%).

In the individual comments, organizational problems accompanying the use of technologies are also mentioned. T2 adds: „*It must be explained to the child individually; from the beginning, the constant*

presence of the teacher or an assistant is necessary. In a class with other children, this tool is so interesting for others that they do not want to engage in other activities offered, they shout at each other and want to give advice to the given child, but this is counterproductive, but at least the children's communication skills are fulfilled."

Table 4 Which areas of language development are influenced by digital tools? Descriptive statistics (N=80)

Item	Abs.Fq.	Rel.Fq.
Vocabulary development	46	60%
Word memory	45	58%
Object naming	39	51%
Verbal comprehension	36	47%
Working with words	30	39%
Compiling a story according to stimuli	23	30%
Logopedic level	16	21%
Communication	10	13%
Syntactic level	9	12%
To none of the above	0	0%

Abs. Fq. - absolute frequency

Rel. Fq. - relative frequency

Teachers further evaluated how digital tools can be used specifically to develop language competencies. All answers of participants who offered more than one option were evaluated. They could choose a maximum of 5 items from the options, which focused on different areas of the language. Digital tools are mainly used for vocabulary (60% of respondents), memory (58%), and object naming (51%). More complex parts of language development, such as communication (13%) or syntactic (12%), are not usually targeted.

3.3 Question 3

What features of educational applications teachers consider as the most useful for education preschool children?

Respondents chose from 10 options that represented a wide range of different attributes of educational applications. The options were based on the relevant literature stated in the Introduction. The features options are audio-visual (audio elements and graphics), content (story, composition of tasks and games), user control (interactivity, user simplicity), and player agency (the ability to proceed at your own pace, determine goals, and choose games). In their selection, the teachers were limited to a maximum number of 5 ticked options that they considered the most important.

Table 5 Key features of the educational application from the perspective of teachers. Descriptive statistics (N=80)

Item	Abs.Fq.	Rel. Fq.
The possibility to proceed at your own pace	40	52%
Easy user control	38	49%
Interactive elements	32	42%
Inclusion of creative tasks	25	32%
Simple visual elements	22	29%
Colourful graphics	18	23%
Interesting story	16	21%
Sound effects	13	17%
The possibility to choose your own games	13	17%
Monitor your own progress	13	17%
Alternating games and tasks	9	12%

Abs. Fq. - absolute frequency

Rel. Fq. - relative frequency

Table 5 shows that the most frequently selected area was the ability to proceed at one's own pace (52% of respondents), followed by easy user control (49% of respondents) and interactive elements such as the ability to drag, rotate and respond to touch (42% of respondents). Next in the ranking were the involvement of creative tasks (32% of respondents) and the simplicity of visual elements (29% of respondents). Teachers selected features across different categories, but most preferred characteristics related to the application's ease of use, simplicity, and interactivity. All answers of participants who offered more than one option were evaluated.

4 Discussion and conclusion

In the study, we asked ourselves the following questions: What types of digital technologies are used in preschool education? This research has shown that digital technologies are an established part of preschool education. In our study, all participating respondents use at least one technology. This is in line with the findings of the Slovak research by Petranová and Burianová (2014), where all participants also reported frequent (84.6%) or occasional (15.4%) use of digital technologies in preschool education. The survey reveals various digital tools used in preschool education, including robotic toys for programming, tablets, interactive projectors, digital microscopes, interactive TVs, 3D pens, digital cameras, and 3D printers. Robotics toys for programming are the most common sat-down digital technology, with 63% of respondents utilizing them. These high preferences may be related to the benefits of using robotic programmable toys at the preschool age. First, it helps develop programming skills in young children, which are considered key skills in the 21st century (Simonsmeier et al., 2023). In addition, tactile robotic toys are more accessible and playful for young children, allowing for a more engaging learning experience (Barragán-Sánchez et al., 2022).

Various circumstances influence the use of specific toys. Teachers' practices and beliefs are key in implementing digital tools in classroom activities (Webb & Cox, 2004). In our study, it turned out that robotic toys are typically available throughout the day and used during unguided or free activities in small group settings. Touch-screen devices like tablets and projectors are used during guided group activities. Organizational challenges arise due to the individual steed small-group focus of digital tools in classrooms with larger student capacities. Konca and Erden's study (2021) pointed out that preschool teachers mainly use technologies to prepare materials for activities and gather other content. According to our findings, including digital technologies in classroom activities is often a regular part of educational activities. It is, however, important to identify what activities they are used for in preschools. Teachers tend to use interactive screen devices for educational purposes, utilizing different educational programs and applications.

The use of technology in schools can be directly related to the attitude towards digital technologies. In a Jordanian study, Alomyan and Alelaimat (2021) showed that digital technologies are more willingly used by teachers who have a higher education (teachers with a bachelor's degree use it more often than teachers without a degree) and a sense of their own competence. An Indonesian study by Ismail (2023) clarifies that the combination of a teacher's self-concept, self-efficacy, and ICT-related subjective self is a reliable predictor of digital technology use in kindergarten.

Motives for use may not only be intrinsic but may also be extrinsic. In the study by Petranová and

Burianová (2014), approximately half of the respondents were motivated by educational policies. In general, external circumstances can also be a catalyst for the use of digital technologies. A study by Ismail (2023) confirms that COVID-19 has triggered an increased need and willingness to introduce digital technologies into kindergartens. In the Czech Republic, recent could also play a role in financial support from the Ministry of Education towards digitization, which has helped schools to expand and possibly add new equipment of their choice.

In our study, we paid special attention to areas of language competence that had developed. Kindergarten teachers were found to use various areas of native language competence that are developed using digital devices, including vocabulary development, word memory, object naming, verbal comprehension, working with words, compiling stories according to stimuli, logopedic level, communication, and syntactic level. among the options provided, teachers primaries focus on vocabulary development (60% of respondents), word memory (58%), and object naming skills (51%) when incorporating digital tools into language development. More complex language processes such as verbal comprehension, story compilation, and communication were lower in ranking as they mostly use different means when focusing on this area of language skills. Why such a difference? Perhaps because lexical knowledge's breadth and depth are important indicators of language competence (Sun & Yin, 2022). Perhaps the reason is pragmatic; existing digital tools provide a rich environment for language learning and can enhance early language learning through activities such as displaying pictures, practicing letters, and connecting words with their sound/image; tools for these competencies are available (Nikolopoulou, 2020). Perhaps the teachers do not have enough knowledge about developing more complex language phenomena, such as syntax or pronunciation, because they do not specialize in speech therapy. However, this is only a hypothetical consideration for which we do not have data.

Teachers need to carefully choose the type of digital tools and how to include them in the syllabus to provide meaningful content with an element of fun (Williyam et al., 2016). Our study found that teachers prefer to use digital tools that children can use independently at their own pace. This approach might help to develop children's independence in technology control. Inclusion of creative tasks and interactive elements is also helpful to motivate children in their learning experience. Responders had mostly a positive attitude towards using digital technologies in class, provided that these activities are included meaningfully and in a limited amount during the day.

4.1 Limitations and future directions

The chosen data acquisition strategy and research tool have its limits. Using the self-selection method limits the research results as respondents could decide whether or not to complete the questionnaire regarding digital technologies in kindergarten. It can be assumed that this self-selection bias led to the fact that teachers who do not use technology in kindergarten or have a rather negative attitude towards it might not be sufficiently represented in the set. As the respondents were self-selected on a voluntary basis, the number of participants was lower than expected. In future research, broader data inquisition techniques should be used.

This study aimed to determine how teachers include digital technologies within their classes. However, through the limited view of the questionnaire, we cannot acquire complex data about classroom practices. Extensive data collection using a simple questionnaire implies a limited depth of knowledge and involves certain risks of bias: Respondents may answer incorrectly or in a distorted way for various reasons, including memory bias, ambiguity in the questions, or trying to

present themselves in a better light (Kaczmarek et al., 2018).

For future research, more in-depth investigation into the inclusion of digital tools into class syllabuses regarding children's language development should be carried out. Our research offers only a limited view into classroom organization while using digital tools. We also cannot conclude the impact of digital applications on language development as the data is collected from teachers' points of view.

5 Statement of researchers

The authors declare that they have no conflicts of interest regarding this research.

5.1 Researchers contribution rate statement

This research article has been collaboratively authored by Petra Boumová, Jana Marie Havigerová and Jana Stránská. The specific contributions of each author are outlined as follows:

Petra Boumová (60%): project coordinator, data collection, writer, revisions

Jana Marie Havigerová (30%): methodology design and methodology, performed statistical analysis, Contributed to the writing and critical revision of the manuscript

Jana Stránská (10%): assisted in data collection and initial analysis

5.2 Conflict statement

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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