

# Exploring Czech Educational Programs for Language Development in Early Childhood: A Comprehensive Analysis

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## Abstract

The research focuses on a comprehensive analysis and comparison of available digital programs utilized in preschools in the Czech Republic. Building upon a survey involving 80 preschool teachers, we identified the digital tools used for language development in Czech preschools. It was found that the most commonly used tools were interactive programs and applications that children engage with using digital aids such as interactive television, projectors, or tablets. The objective of this study was to compare the digital technology programs utilized by teachers and evaluate their effectiveness in fostering early language development. It was discovered that these programs often enhance multiple aspects of cognitive skill development (e.g., memory, logical reasoning, attention, knowledge level) however they frequently fail to provide adequate motivation for children to persist with the tasks. This study proposes the significance of use of digital technologies in education while incorporating gamification elements. Adding story features, interactive elements, the ability to progress at one's own pace and rewards system to further explore their impact on the motivation and engagement of preschool children in language learning.

**Keywords:** Digital learning, language development, preschool, early childhood, education.

## 1. Introduction

Rapidly advancing digitalization of society plays a key role in the transformation of the economy and society. In order to be able to respond to these rapid changes, the Czech Republic aims to create an educational environment that will lead its pupils and teachers towards facilitation of digital literacy and computational thinking. The use of digitization in education is one of the key elements in preschools according to the Education Strategy of the Czech Republic until 2030+ (ES 2030+) which objective is to modernize the system and balance the inequalities between individual regions with the help of digital technologies. In connection with ES 2030+ and growing financial support of schools, digital learning technologies are increasingly being used across all educational levels in Czech Republic.

Studies suggest, that unlike passive media such as television, touch-screen digital tools are an interactive medium that activates the child [1, 2]. In relation to findings, our goal is to engage all participants of the educational reality in the development of the educational application. The aim of the study is to identify what features of the

proposed educational digital programs are interesting and motivating for preschool children to acquire new knowledge in the field of language. As we build our findings on previous research which included responses from a survey with 80 preschool teachers from the Czech Republic.

### 1.1 Technologies in Early Childhood

The inclusion of technologies in early childhood is accompanied by concerns about their excessive use during a crucial period of brain and cognitive development [3]. Excessive exposure of young children to media and technology can result in dangerous consequences such as attention deficit disorders [4], [5], behavior disorders [6], impaired physical development [7] and communication skills [3]. Recent studies offer a more complex perspective on the relationship between children and technology. They are not viewed as passive users and victims of media [8]. Media and new technologies are constantly changing the way, how children communicate, play and learn [9], [10]. Studies show, that from the earliest age, children are able to demonstrate creativity and agency in digital space [11], in addition, multimedia

elements affect more of the child's senses and contribute to maintaining attention [1].

As so called 'digital natives' [12] children are born into the digital world and are very quickly able to learn to control different technologies. That does not imply that they can be left unattended as they cannot fully navigate it yet. The ability to understand digital world, internet and technologies is limited by their cognitive capacity and experience [13]. This is where the key role of adults and educators enters the picture. Murcia, Pepper et al. [11] suggest that the teacher's own creativity in education and teaching style might play a significant role in influencing young pupil's creative thinking and the use of technologies. However, teachers attitude towards usage of such technologies is often the main factor that plays significant role in incorporating them into school environment [9, 26].

Preschool age provides every educator with a unique opportunity to motivate children to learn with the power of play. According to theory of Kopřiva [24] the key conditions for maintaining a child's intrinsic motivation and learning might be meaningfulness, cooperation, free choice and feedback. The integration of digital technologies into traditional teaching methods and teaching forms brings more possibilities for fulfillment of these conditions, as children are motivated to engage in their own pace and according to their interests [1].

## **1.2 Language Development and Digital Technology in Preschool**

Children of preschool age experience rapid growth in lexicon, vocabulary and social skills [14]. As an important part of socialization, social contact and communication are the key processes that help children develop their language competence. Appropriate educational programs can also have a positive effect on the development of verbal competence and vocabulary of preschool children [15], [16]. Studies show that digital tools were successfully used to improve literacy skills and engagement in learning such as storytelling interactive books [17], digital cards to improve reading and pronunciation [18] or vocabulary with the help of gaming applications [15]. Digital technologies might also be used in the correction of children's language and speech therapy [19].

The attractiveness of digital technology for young children creates many opportunities for teachers to include them in their work. A study by Angeline Lillard and her students Sierra Eisen [20] found that preschoolers who used educational tablet apps had better self-directed learning, motivation, and achievement compared to those who used traditional toys. According to study by Chiong & Shuler [15] the key success factors of educational programs are interactivity, attractiveness and form that corresponds to the cognitive abilities of the specific age group for which they are intended.

Schools traditionally offer more formal and external opportunities to motivate children [21], but in order to fulfill the condition of meaningfulness, children must be given the opportunity to choose and determine their own course of action. Play elements can offer the child the chance to experiment with rules, boundaries and emotions [22]. Feedback gives the child information about the procedure and the results of his activities and efforts. However, it is important to monitor the conditions under which this feedback is provided and how it can drive learning behavior. Teachers need to carefully choose the type of games and how to include them in syllabus to provide meaningful content with element of fun in it [23].

## **2. Research progress**

The research was conducted in two phases. The goal of the process was to identify which educational applications are most often used in preschools in the Czech Republic. In the next phase, the key features of the selected educational applications were identified. In connection to key success factors of educational programs [15], [24], pre-test group (PTG) was assembled, to determine which features of the applications are attractive for the age group. The goal was to identify what characteristics motivate children to continue playing the game.

### **2.1 Pre-survey phase: Identifying Educational Applications**

Using survey distributed to 80 preschools teachers in the Czech Republic, four educational applications have been identified. These platforms are employed by teachers in the education of preschool children using digital technologies, most

commonly in the form of tablets, interactive televisions, and projectors. As part of the research, teachers were prompted to enumerate the most frequently used applications and educational programs utilized for the language development of preschool children.

**Table 1. Teacher's responses regarding usage of digital applications in preschool classes. Relative and absolute frequency using text analysis in K-Words. N=80**

Word	Rel.Fq.	Abs.Fq	EffectSize
Colorful	94736,84	27	100
Stones	87719,3	25	99,99
CTEdu	21052,63	6	100
download	14035,09	4	100
CTD	14035,09	4	100
application	14035,09	4	99,13

Analysis of responses revealed that the highly popular Czech application, iSchool<sup>1</sup> (*Abs.Fq* = 27) by Colorful (*Abs.Fq* = 27) Stones (*Abs.Fq* = 25) Ltd., emerged most frequently. iSchool serves as an interactive extension to printed publications released under this brand.

Educators also mentioned ČTEdu<sup>2</sup>, (*Abs.Fq* = 6) an interactive program offered as an extension of the Czech public television's educational program, also called CTD (*Abs. Fq* = 4). The survey identified two sources as the most frequently cited by teachers when selecting educational resources. Additionally, it was found that teachers also create their own educational materials for digital technologies using readily available programs.

Among the educational applications tested in the research, two were further selected based on respondents' mentions. Firstly, Czech application Alfík<sup>3</sup> (*Abs.Fq* = 3), focusing on creating interactive tests for preschool children. Another was the interactive encyclopedia Hravouka<sup>4</sup> (*Abs.Fq* = 2), through which children can explore nature accompanied by the main character—a mouse discovering the world around it. Using interactive elements (such as free mouse movement in the environment and the ability to click on prompts to reveal new information), this application offers

children the freedom to choose their own direction and pace of learning.

## 2.2 Testing phase: Applications Review

PTG consisted of 42 children from a preschools in the Central Bohemian Region, Czech Republic. The 42 respondents (25M, 17F), age 4 and 7 years participated in the testing phase of the chosen applications.

**Table 2. Average age of participants by gender with standard deviation**

gender	mean	SD
Male	5.68	1.01
Female	5.29	1.07

Three interactive screen-touch tablets were available, on which the selected applications were pre-installed or opened from the web environment using a link. Apps used: Colorful Stones (iSchool), ČT Edu (web), Alfík (web), Hravouka (app).

Each respondent had their own tablet at their disposal, on which they played games independently. Adult help was provided only at the child's request in case of technical difficulties, misunderstanding of the game's requirements or other requests. Each respondent had 10 minutes per application, within this time limit the researcher explained the controls and game options.

Time distribution:

**Part 1:** Introduction (3 minutes). Explanation of the game environment and application controls (for applications with multiple games, showing the options and choosing a specific activity according to the child's wishes)

**Part 2:** Free play (7 minutes). Free play with the possibility of changing the activity according to the child's wishes

**Part 3:** Survey phase (no time limit)

The games were presented in the order of which they appeared in the results of a questionnaire survey with kindergarten teachers. After the time limit expired, the child was given time to rest, if necessary. After, another application was opened. The condition was that the child tested all the applications in one day.

## 2.3 The Survey Phase

When the initial tested ended, PGT was asked questions. The goal of the questions was to find out what are the essential features of the

<sup>1</sup> <https://www.hrajeme-si.cz/12-iskolicka>

<sup>2</sup> <https://edu.ceskatelevize.cz/>

<sup>3</sup> <https://alficek.programalf.com/index.html?lng=cz>

<sup>4</sup> <https://hravouka.circusatos.com/>

applications from the point of view of preschool children. To better orient the children, they were presented with illustrative images from individual applications, which the children could manipulate, and sort as needed (*Figure 1 – 4*). Before starting the interview, the researcher introduced each application again and made sure that the children recognized the individual programs. The selection of questions was made to correspond to the 4 areas of key conditions for maintaining child's intrinsic motivation and learning from the theory of Kopřiva [24]. As children are motivated by not only content, but also possibility to choose their own path a receive positive feedback. The questions were focused on areas of audio-visual presentation (audio elements and graphics), content (story, composition of tasks and games), user control (interactivity, user simplicity) and players agency (the ability to proceed at your own pace, determine goals and choose games) [15].

#### Questions:

Q1. Visual Elements. Choose the game that you think looked the nicest of all.

Q2. Content. Choose the game in which you enjoyed the tasks the most.

Q3. Player Agency. In which game was it best for you to choose what you wanted to do?

Q4. Attractivity. Sort the games according to how you liked them. From the one you liked the most to the one you liked the least.

Q5. Motivation. Which game do you want to play again? Why?

Visual cards (*Figure 1 – 4*) were placed in front of the children, which represented individual applications. According to the instructions, the respondents chose one application or sorted the cards according to the assignment. Shifting was recorded in a record sheet. If the respondent selected a specific application, it was assigned 1 point, the others 0 points. For questions where the respondents were tasked with ranking the applications, they were assigned points from 0 to 3 points after completing the task. To complete the questionnaire, the children were motivated to give a verbal answer to question 5 in order to identify the reasons why the respondent would like to continue the game.

### 3. Results

#### 3.1 Key Elements (Q1 – Q3)

**Table 3. Average rating of individual applications, questions Q1 - Q3**

Application	Q1	Q2	Q3
iSchool	0,24	0,29	0,14
ČT Edu	0,26	0,40	0,33
Alfik	0,05	0,14	0,05
Hravouka	0,40	0,12	0,43

#### Q1. Visual elements.

According to respondents, the educational application with the best visual elements Q1 was Hravouka ( $m = 0.40$ ). This application is based on the motifs of the cartoon encyclopedia from the illustrator Tereza Vostradovska. The richly illustrated game introduces the cycle of nature around the burrow, in the forest, by the pond and in the garden through the main character - a mouse who explores the world around. The hand-drawn illustrations are playful with natural colors and clean drawing which makes it comprehensible and attractive for preschoolers. While iSchool and CTedu had similar results, Alfik ( $m = 0.05$ ) had the lowest score, as it uses simple pictures and photos, often from different sources and offers no distinctive art style.

#### Q2. Content

The content Q2 focused on the composition and offer of games. Respondents were tasked with choosing the application with the most interesting tasks. An interesting and varied distribution of tasks is one of the key elements by which the player can be motivated to continue the game they have started [15]. By alternating and offering different activities, it is possible to attract attention of the child. At the same time, it is attractive for children to discover new possibilities and tasks. The overall winner in this category is CTedu ( $m = 0.40$ ). The app had variety of tasks on different levels of difficulty. Children could choose between simple interactive games and more complex tasks. The system of choosing the game was also interactive and had visual presentation that children could understand very well. Alfik ( $m = 0.14$ ) had less variety, mostly offering simple games like puzzles and matching pictures. As for Hravouka ( $m = 0.12$ ), there is a very small selection of tasks, since it is mostly an interactive

encyclopedia meant for exploring rather than completing tasks.

### Q3. Player Agency

Possibility of free game and choosing your own adventure is another of the key elements in gamification theory [22]. In this area, the clear winner was the Hravouka ( $m = 0.43$ ), which offered children a freedom of movement in the comprehensive and imaginative world of the main mouse-hero. The interactivity of the world and free reign to discover its small details was very attractive to children.

As for other apps, CTedu ( $m = 0.33$ ) had intuitive and simple system to choose the section of tasks, which users could play, while iSchool ( $m = 0.14$ ) and Alfik ( $m = 0.05$ ) had complicated system of choosing the games. Two later apps also had a set sequence of tasks that repeated several times. If the child was not interested in repeating, it was more difficult for them to return to the original menu and choose a new game. Therefore, it often happened that the player would be forced to repeat tasks.

### 3.2 Personal preferences

**Table 4. Average rating of individual applications, questions Q4 – Q5**

Application	Q4	Q5
iSchool	1,83	0,26
ČT Edu	1,79	0,36
Alfik	0,79	0,02
Hravouka	1,60	0,33

For the overall attractivity score, the three applications had very similar results as there are almost no significant differences between them in the score. iSchool ( $m = 1.83$ ) with the highest score had average results in Q1-Q3. In the subsequent interview, participants stated, that they prefer this app mostly because it is familiar to them and they have played it in the past in their preschool. CTedu ( $m = 1.79$ ) had high score in Q2 (content) while Hravouka ( $m = 1.60$ ) excelled in Q1 (visuals) and Q3 (player agency). Alfik ( $m = 0.79$ ) application had the lowest score in all of the scores which corresponds with the attractivity score Q4 and Q5.

## 4. Conclusion

The aim of this study was primarily to gain an understanding of how children view educational

apps selected by their teachers. The study suggests that the use of gamification elements [26] in educational apps can affect learning-related behaviors and motivate young children to play and learn more. For player to have active participation we also connected to theory of Kopriva [24], who suggested the inclusion of free choice, feedback and meaningfulness of learning. The results suggest, three primary contributions towards the theory.

Firstly, children prefer educational applications with interesting and interactive content. From the overall score of the tested applications, three of them (iSchool, CTedu, Hravouka) had similar results in personal preferences rating. The game controls were intuitive and interactive. Therefore an educational application should have engaging content and simple controls and a friendly user interface suitable for a specific age group.

Secondly, interesting visuals and interactivity play major role in attractivity, despite less content. As discovered in the rating of Hravouka, we can see higher scores in overall rating despite the application being mostly interactive encyclopedia. Despite the lack of games and tasks, the application had high scores in all other categories. As stated, active playing and the decision-making process is motivating for children and engaging.

Thirdly, children not only choose attractivity from the point of content of visuals, but also other elements are in play, such as previous knowledge of the app. iSchool application had the highest score in Q4 which despite its average rating in other categories was mainly attributed to previous experience of children with this application.

Teachers and children have little space to develop educational programs and applications [25]. Also, teachers can feel insufficiently prepared to use digital technologies in classroom [2]. However, in order to create attractive yet effective applications, it is necessary that all parties are involved in their development. This project aims to include all the participants of the education process. Teachers' perspective and experience is necessary to contribute to the development of an educational apps with game-like features as a part of language intervention program. However, it is also important to see the applications form the point of view of young children.

In the future, this project will explore whether and how language skills can be influenced in areas such as verbal understanding, verbal creativity, lexical and vocabulary complexity with the help of gaming apps. Taking a comprehensive approach, this study will hopefully serve as the first step towards a future experimental project to explore how educational apps with gamification features can be used to influence verbal competences and executive functions of preschool children and increase their motivation for further learning.

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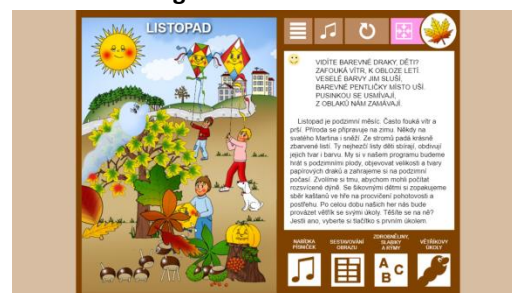
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## Figures:

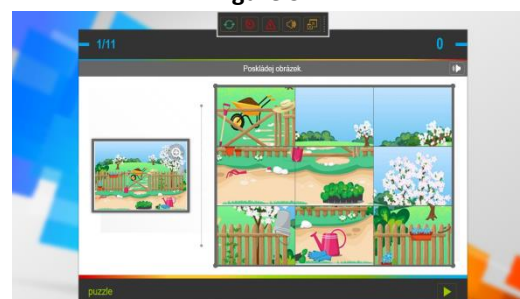
**Figure 1: Colorful Stones**



**Figure 2: ČTEdu**



**Figure 3: Alfik**



**Figure 4: Hravouka**

