Teoretická studie

USING ICT IN EDUCATION OF PRESCHOOL CHILDREN

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Abstract
Digital technologies have become a regular part of lives of even preschool children. They can primarily come across them in their families, but they can also play an important role in education. To integrate a computer successfully into preschool education requires suitable engagement of pedagogues who are computer literate and who then become familiar with suitable educational programs and change their existing methods of work. Nursery schools in the Moravian-Silesian region have already been equipped with computers and research has shown that they are used in educating children. The pedagogues could have improved their knowledge and skills by taking part in courses focused on using information technologies in education of preschool children. Information technologies represent another method of children education. They primarily help children develop individually and they can be beneficial when education children with specific educational needs. When using computers, possible risks and negative effects have to be considered as well.

Keywords: preschool education, information technologies, educational program, pedagogical worker

1 Introduction

Computers have become an everyday tool in human life. They play an important role in each profession and they enable education. Information technologies attract children and today's generation is called "digital generation" or sometimes even "cyberkids". Children come across computers in their families which are equipped with mobile devices more and more. Children younger than eight years spend less time watching television and more time with smart phones and iPads (Rideout, 2013).

Research oriented at using computers by children focus on six aspects of child's development: social development, dependence on sex, emotional development, cognitive development, thinking, and physical development (Mohammed, 2012). It has been found out that using computers by young children brings positive results in the area of increased mathematical thinking and memory, easier cognitive development, improved ability to solve problems, social interaction, and language skills (Gulay, 2011; Mohammad, 2012).

Dissenters of using computers in early childhood education point at harmfulness of long-term sitting by a computer from health, social, and emotional points of view (Mohammed, 2012). There has been research on the dependence of prosocial and aggressive behaviour upon the time spent by a computer, and the dependence of such behaviour upon what the children aged five to six do respectively. The research has shown that the level of prosocial behaviour is better in children who have worked with a computer for less than a year. The longer the time of using a computer, the worse prosocial behaviour and the higher aggressive behaviour was proved. An increase in aggressive behaviour was monitored in children who were used to using a computer daily and didn't use it for education, but rather for surfing the Internet (Gulay, 2011).

Technologies that are suitable for development have not been included into today's classrooms yet. This covers both instructional technology and assistive technology. Instructional technologies mean such classroom tools that to support instructional: effectiveness (i. e. helping the young child to do things in a better way), efficiency (i. e. helping the child do things faster or of better quality), and appeal (i. e. better involving the child in learning). Assistive technology represents any tool that helps a disabled child to do things they would not do without the tool at an expected level of performance. Both technologies are critical to support children's participation in planned classroom activities. However, the challenge of how to develop the needed knowledge and

skills best among practitioners to include them in the curriculum is a matter of future.

Professional pedagogues that are supposed to use both instructional and assistive technology effectively with young disabled children in classroom settings must:

- develop a basic understanding of technology and its potential contributions to education,
- demonstrate some proficiency in using appropriate technologies to create classroom instructional supports,
- actually create and implement instructional activities and products using the technology. (Parette et al., 2013)

In 2012, the National Association for the Education of Young Children (NAEYC) in cooperation with the Fred Rogers Center released a joint position statement on the use of technology and interactive media in early childhood programs.

Their joint statement claims:

- When used intentionally and appropriately, technology and interactive media are effective tools to support learning and development.
- Intentional use requires early childhood teachers and administrators to have information and resources regarding the nature of these tools and the implications of their use with children.
- Limitations on the use of technology and media are important.
- Special considerations must be given to the use of technology with infants and toddlers.
- Attention to digital citizenship and equitable access is essential.
- Ongoing research and professional development are needed. (Technology and Interactive Media as Tools in Early Childhood Programs Serving Children from Birth through Age 8, 2012)

In order to effectively use interactive technologies in nursery schools, NAEYC recommends:

- Allow children to freely explore touch screens loaded with a wide variety of developmentally appropriate interactive media experiences that are well designed and enhance feelings of success.
- Provide opportunities for children to begin to explore and feel comfortable using “traditional” mouse and keyboard computers to use Websites or look up answers with a search engine.
- Capture photos of block buildings or artwork that children have created; videotape

dramatic play to replay for children.

- Celebrate children's accomplishments with digital media displayed on a digital projector or on a classroom Website.
- Incorporate assistive technologies as appropriate for children with special needs and/or developmental delays.
- Record children's stories about their paintings or their play; make digital audio or video files to document their progress.
- Explore digital storytelling with children. Co-create digital books with photos of the children's play or work; attach digital audio files with the child as the narrator. (Effective Classroom Practice: Preschoolers and Kindergarteners, 2012)

Pedagogues must understand the potential of using computers in education prior to starting using such a form. Only then they can successfully use a computer as a tool for development of children's skills. Pedagogues themselves decide on when and how to integrate a computer into education and they make use of the possibilities. A successful integration of computers into education of preschool children depends on teacher's abilities and a suitable integration into curricula while using its possibilities as a tool for learning. A computer can make learning entertaining and funny and it can bring children their own experience, creativity and discovery. (Mohammad, 2012)

The participating teachers claimed that computer-assisted education is beneficial in providing lots of audio-visual, interesting points as well as in developing hand coordination. The teachers claim that they use computer software actively in most activities of preschool education. Computers in preschool education represent a new concept. Computers seen in every part of life are the most important technological devices of our century that contains all intellectual reservoirs. In general, the use of computers in the teaching-learning process can be divided in two; having a teaching role and a learner role.

When selecting Computer Assisted Education (CAE) software for preschool education, we must attentively consider the following points:

- language of software,
- software must be designed according to opinions of experts in assessment and evaluation, development and preschool education,
- colours used for designing must be designed in a way

that captures the attention of children,
- animations, objects that used in software must be convenient to children's level,
- software must be in a quality level that gets the attention of children and motivate them to interact with CAE,
- software must be effective in tending the children to the point they will learn,
- instructions used in software must be given audibly with an approach that children might be illiterate,
- software must be designed in a form that they can use without getting help of an adult,
- it must be designed in a form that enthusiasts and excites the children with its visual and audial stimulus as a natural need of CAE. (Kol, 2012)

The New Primary Curriculum in the United Kingdom in the year 2009 highlighted that ICT (Information and Communication Technologies) should play the key role of children's early learning experiences. Implementation of such activities means that ICT and play must be integrated into the curriculum for young children. Many areas where play and ICT appear to function harmoniously rely on a definition of ICT that reaches beyond the desktop computer. As an example, we can mention touch technology or the role of technological toys in socio-dramatic play.

Playful, positive experiences with computers could help to ensure that children leave their formative years with a positive disposition towards ICT that will servethem well as they progress into the formal stages of their education. The benefits of play for early learning are well documented and it is generally accepted that play promotes children's development across domains. (Howard et al., 2012)

Technologies are successfully used in educating young children with special educational needs. Individual approach enables using an iPad and a suitable application.

Technologies as iPads bring in flexibility in places where teaching and learning may occur thanks to their portability and abundance of educational apps for early childhood is available at no or low cost. Additionally, if an iPad is not used, other tablet devices could be utilized. There is a number of opportunities to meet children's preferences, strengths, and needs with developmentally suitable apps that establish relationships between the abstract and everyday technologies relating to mathematics, science, and engineering. Four important principles were considered when choosing apps for preschoolers, especially ones with disabilities:

- The student should be the source of the action to make the outcome more scientific.
- The students should be able to see cause and effect relationships by changing the beginning action and seeing how it reflects the outcome.
- The outcome of changing the variable must be observable to the preschooler.
- The action and reaction must happen immediately for the child to see and make connections between the cause and effect. (Aronin, 2013)

2 Preschool education in the Czech Republic

Preschool education in the Czech Republic is usually organised for children aged three to six years. Children in the year before beginning their compulsory school attendance are given preference in the acceptance process. Preparatory forms of elementary school are established for socially disadvantaged children aged 5+.

Nursery school is organisationally divided into classes. There is a possibility to place children of the same or different age in a class and thus create homogenous or heterogeneous classes. In the same way, it is possible to place children with special educational needs into a class of a common nursery school and create an integrated class.

Institutional preschool education aims at complementing family upbringing and in close connection with providing the child with an environment full of multi-aspect and adequate stimuli for its active development and learning. Preschool education should meaningfully enrich child's daily programme during its preschool years and provide the child with professional care.

In March 2005, the Ministry of Education, Youth and Sports issued the Framework Education Programme for Preschool Education, which builds on the Framework Programme for Preschool Education published already in 2001. The Framework Education Programme for Preschool Education (FEP PE) specifies the main requirements, conditions and rules for the institutional education of children of preschool age. These rules relate to the pedagogical activities taking place in educational institutions included in the network of schools and educational facilities. They are binding for preschool education in nursery schools, in nursery schools with a programme adapted to the special needs of children and in preparatory forms of elementary schools.

Since 1st September 2007, schools have been supposed to act in compliance with the FEP PE. Nursery schools can have their programmes focused on aesthetic activities, movement activities,

ecology etc. (Preschool Education in the CR)

Education must be closely related with individual needs and abilities of individual children, including specific educational needs. A didactic style of nursery school children education should be based on the principle of educational offer, individual choice, and active participation of the child. One of possible ways to meet such objectives of preschool education is to use information technology, which enables individual, pair, or team work of children as well as work of the pedagogue with the whole group of children. A suitable way is to use educational software designed for a given age group hand in hand with an interactive board and active engagement of all children into educational activities, which are carried in a playful and entertaining form.

Based on the contract of the Ministry of Education, Youth and Sports and company IBM, nursery schools were equipped with special computer stations KidSmart. Project "KidSmart Early Learning Programme" has been running for years and enables to use child computer stations equipped with special software for educational purposes. The workplace consists of a colourful plastic house with a computer, monitor, child computer mouse, keyboard, speakers, voice set with a microphone, and a printer inside. The computer workplace is ergonomically adjusted to preschool children and complies with all psycho-hygienic norms.

Computer programs in child computer KidSmart are very easy to control, tasks and their solution are not systematically repeated. Children must look for creative solutions every time they use the computer. The software teaches the children basics of mathematics and logic (Millie's Maths House), time indication and spatial imagination (Trudy's Time and Place House), natural science (Sammy's Science House), and language expression and cooperation (Bailey's Book House, Stanley's Sticker Stories).

The objective of the "KidSmart Early Learning Programme" is to make children familiar with information technology, which will become a necessary part of their future lives. They acquire information and learn by playing. Educational programs form a part of nursery school educational activities, they help develop mathematical terminology, learning scientific skills, time determination, geographical knowledge, skills of mapping, direction determination, creativity, imagination, skills of problem solving. All of that is carried out while meeting both safety and suitable methods of work with information technology. (Kocourek, 2008)

The pedagogues should be able to handle basic operation with a computer and be willing to use a computer in educational activities. Prior to using computers in classrooms, they have to think of computer's meaningful use, its benefits for the children, and its role in individual thematic areas. They consider its use for controlled and spontaneous learning and activities. A computer is used in combination with other common methods.

It is advised to enable children aged 4+ to have access to a computer. At this age, they are already able to independently control certain programs and understand certain relationships. Of course, there will be differences between the children, which must be considered by the pedagogues. Access can also be granted to younger children if they have already had some experience with a computer and if they want to try new programs or games. When a child is working at computer, it must always be under supervision of an adult as the child could have problems with using the keyboard or manipulating mouse. The pedagogue or parent chooses such programs from the menu that are the most suitable for the child with respect to its individual abilities. The adult must also supervise the way the child is working at a computer and advise the child in the case of problem occurrence.

If a child is working at a computer, it is highly necessary to follow the time. The recommended time depends on child's age. Children aged 3 are recommended to spent 10 minutes at the most, children aged 4.5+ can be allowed 15 minutes more. Children aged 5 can spend about 20 minutes and aged 6 maximally 30 minutes per day. The time to be spent at a computer should be agreed with the child in advance and then use a device to measure the time, e.g. hourglass or timer. Children working at a computer should also intersperse this work with exercising or walks similarly to with any other sitting activity.

A computer designed for educating should be located into a classroom of the nursery school. The pedagogue can use an educational program or activity right into the lesson plan, he is to operate the computer and arouses children's appropriate reactions and answers. The children can also work at the computer individually, they take turns and the pedagogue only supervises and solves possible problems. The pedagogue also monitors children's behaviour, time spent at the computer, how many children are at the computer, whether they control it correctly, etc.

Some nursery schools already have a computer with an interactive board or a computer, projection screen and data projector. In order to effectively use such technolo-

gies, the pedagogues must be able to control them and suitable integrate methodology of their use in education. This led to creation of educational courses to mediate this information to nursery schools teachers.

3 Courses aimed at using information technology in nursery schools

The course for teachers were started in 2012 as a part of project "Zvyšování odborných kompetencí pracovníků škol a školských zařízení v MSK v oblasti matematiky, VT a využívání ICT ve školách" (*Increasing professional competencies of school institutions staff in the Moravian-Silesian region in the area of mathematics, informatics and using information and communication technologies in schools*) The aim of the project was preparation and realisation of education courses and workshops to support professional development of school institutions staff in the area of mathematics, informatics and using information and communication technologies in schools. Once taking part in the courses, the pedagogues should have an increased level of integrating information technology into their own lesson plans. They should also have increased competences in ICT to prove their practical knowledge in a form of preparatory courses for certificate "European Computer Driving Licence" (ECDL). The project was also focused on non-pedagogical staff in order to increase effective use of ICT in schools. (ZOKIM, 2012)

Every course was supplied with a new distance study material in a pre-defined extent. The text of the study material contained distance features, assignments, stop and checks, tasks to think over, examples, recommended literature, etc. Some courses were supported by a multimedia component using software for interactive boards or other applications enabling to create multimedia in .avi or .mpeg formats. This study material included particular examples, demonstrations from the text study material, and interactive exercises or presentations.

The tutors also elaborated a supplementary e-learning course using Learning management System (LMS) Moodle. Such an e-course included all created study materials, study guides, tasks, exercises, and a forum served as a communication tool between the participants and the tutor. The study materials uploaded to the Moodle course enabled to study individually, including submitting assignments. The presence part of the course was in a form of four afternoon seminars in a computer classroom, where the tutor presented the prepared study materials, discussed the current topic, and

replied to participants' questions. The participants carried out practical exercises, elaborated assigned tasks, or searched additional information.

The introductory course "Hrajeme si s počítačem" (*Playing with a computer*) was focused on an issue of using information technology in education. It stemmed from Framework Education Programme for Pre-school Education, from theoretical knowledge on educating talented children and children with specific educational needs. Alternative ways of educating children using information technology were proposed. The teachers were familiarised with basic rules of safety and hygiene when working at a computer and their attention was also drawn to certain risks. The course was focused on practical mastering of work at a computer, applications for preparing own educational materials, and using internet portals and educational programs suitable for preschool children.

The course "Kreslení a poznávání s využitím počítače v předškolním vzdělávání" (*Painting and learning using a computer in preschool education*) was primarily focused on the area of painting. Painting in preschool age develops imagination and its level relates to child's intellectual development. Computer painting develops fine motor skills of children, it enables them to paint easily and colour basic geometric shapes, which are difficult for children to paint them by hand due to their regular shape. The painting program also enables to simply change sizes, colours, shapes, to group or divide objects. Observing images, looking for differences, or their completion develops observing skills and spatial imagination.

The Framework Education Programme for Preschool Education served as a basis for requirements on child's education, which could have been elaborated using painting programs as well as knowledge which can be developed using educational programs. The content of the course was focused on painting program "Malování" (*Painting*), which is suitable even for preschool children. The course participants used "Malování" to create their own educational materials. Those can be used right in their activities with children in nursery schools if they are equipped with a data projector or an interactive board. The created samples can also serve as examples for individual work of children at a computer. Children mastering working with a mouse can redesign the images, join the painted elements, colour the created objects, or use other functions and application to create images.

The course "Využití vzdělávacích programů pro práci s dětmi v mateřské škole" (*Using educa-*

tional programs for work with children in nursery schools) was focused on individual educational programs designed for education of preschool children. Intergrating them requires professional development, which considers child's age, graphical attractiveness and understandability. Educational programs focus on developing basic skills, such as graphical distinguishing, observing, sorting, motion tracking, developing numeric expression, assigning the number of objects, geometric shape distinguishing, thinking, speaking, memorising, etc. the choice of various alternatives and difficulties enables to adjust the tasks to the age and knowledge of the child. It enables to start with the easiest tasks and only when they are successfully completed to advance to a higher level. Thus, educational programs can be individually used for various age groups and adjust them to specific requirements of the child.

A wide range of tasks and various levels of difficulty enabled the course participants to realise the extent of the required knowledge and skills of children of various age groups and the ways how to achieve them. The teachers received suggestions for work with children in nursery schools as well as evaluated suitability of integrating educational programs into their lessons.

Information technologies to be used in nursery schools for education:

- Portable computer and data projector – the devices can be easily transported.
- Digital camera – documenting children's activity, products or activities at school and outside.
- Scanner – digitalising painted materials, e. g. children's works and their presentation on the school web site or sending them to competitions.
- Printer – printing out materials for work with children or their products.
- Interactive board – activating children and making educational activities illustrative.
- SMART Table – an interactive table where children use their fingers to move digital objects or photographs as well as paint in digital ink on table's surface.
- Digital and programmable toys, which develop skills of problem solving, understanding geometric terminology, and cooperation, e. g. Bee-Bot.
- PowerPoint – creating presentations with multimedia educational objects using text (better as individual letter and digits), images and sounds.

- Programs for voice processing – materials for preschool children must be accompanied with sound instructions how to work with the prepared material.
- Methodical instructions for the prepared material, suggestions for further use or possibility of further changes.

4 Discussion

In order to find out the state of using computers in nursery schools, a questionnaire was created. The survey involved 32 pedagogical and non-pedagogical workers from 21 nursery schools in the Moravian-Silesian region, Czech Republic. Every nursery school is equipped with a computer, 81 % of the nursery schools have more than one computer, primarily a desktop (71 %), but there are also portable systems and KidSmart computers. In most cases, the computer is located the headmaster's office (71 %) ad it is used for administrative purposes. However, it is also used for educational activities (81 %), mostly by a pedagogical worker (29 %) and children themselves. The teachers claim that they use a computer for education once a week depending on children's wish, needs of class educational programme, or if there are suitable educational source available to supplement the discussed topic. Only four nursery schools dispose of an interactive board (19 %), but some nursery schools consider its purchase.

Mostly used are educational programs designed for preschool children education, less often internet sources, fairy tales and songs on specialised portals. The teachers claim that the benefits of using computers on preschool education are as follows:

- Wide range and diversity of educational materials; education is more attractive and entertaining.
- Getting familiar with technology that is part of our lives. They learn new things in another way.
- Smooth transition from preschool to school education, where computers and interactive boards are a common thing.
- Development of children in the area of versatile mental development, mathematical thinking, logical thinking, language and polytechnic education.
- Learning to concentrate, manipulate and coordinate hands and eyes, patience, to make fast decisions, spatial orientation, to keep to the rules.
- Educational programs are professionally prepared materials. They have a wide range

of ways to practice in an interesting and playful form.
- Showing activities and phenomena that they cannot come across so easily in real life.
- Children with special educational needs benefit fin individual approach and enhanced communication.
- Special computer programs could help in prevention and correction of specific learning disabilities.

However, the teachers are also aware of problems that can arise when using computers:
- Less physical activities of children. Children could get used to a sedentary way of spending their free time, they can have health problems.
- Children communicate less, their imagination and fantasy shrinks, they have limited vocabulary and worse spoken expression.
- Children can interchange fiction and reality. A long-term use can result in being dependent on a computer.
- Children immersed in a game do not want to finish the game or learning at a computer.

5 Conclusion

Preschool children come across technologies serving for education and fun more and more frequently in their daily lives. If digital technologies are adjusted to the child's age, educational programs can be used. While playing, they develop premathematical and prereading skills, offer countless alternatives of tasks, manipulation with objects, letters or digits. Developing children's skills commonly relies on primary training, using a computer should play a secondary role with a possibility of an individual approach to specific capabilities of the child. Working at a computer is entertaining, it suitably supplements other activities in preschool education.

Nursery schools should primarily use didactic programs and games which help children discover the new, develop logical thinking, support speed and decisiveness, practice perception and orientation. Nursery schools can be the place where children from socially disadvantaged families can experience working at a computer. Integrating computers must be anchored in school education programme and subsequently elaborated in class education programmes. Integrating a particular educational program must be carefully considered in relation to child's age.

The risk of using computers in education is eliminated if quality educational programs are used, computers are used with respect to child's development, children are

not overloaded with computers, and if such programs are only an alternative method in education. It is recommended to set rules of school, class and time of working at a computer and their strict keeping. Effective use of information technologies in education can be brought only by pedagogical workers who are computer literate and have abilities to innovate their educational methods.

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