DIGITAL TECHNOLOGY IN EDUCATION-SKILLS DEVELOPMENT THROUGH PLAY

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ABSTRACT:
INTRODUCTION IN THE EDUCATIONAL SYSTEM OF DIGITAL TECHNOLOGIES FOR LEARNING IS DONE IN AN INCREASINGLY SMALL AGE AND IS ALREADY A NECESSITY OF THE 21ST CENTURY. THIS ARTICLE PRESENTS ASPECTS REGARDING THE ADVANTAGES AND HOW TO USE THE SOFTWARE CONTAINING EDUCATIONAL GAMES IN THE PROCESS OF EDUCATION OF CHILDREN (BE THEY AUXILIARY MATERIALS FOR THE LEARNING PROCESS OR DIGITAL MANUALS).

KEY WORDS: COMPETENCIES, EDUCATION, DIGITAL TECHNOLOGY

INTRODUCTION

Competencies at early ages

The 21st century competencies are considered those skills that ensure portability acquisitions. Transferable skills are considered, in some authors opinion, as follows: planning, oral communication, written communication, managing one's own learning, information management, time management, presentation skills, problem solving, critical thinking, decision making, coping with multiple tasks, IT skills, research skills, professional development, evaluation[3]. Transferable skills integration activities are varied, starting with the school and continuing with the personal and professional. Competence development presumes a chronological approach whose effectiveness depends on the age at which formative programs are implemented. Previous studies in educating emotional intelligence showed that human brain takes the most time to become completely mature. While each area of the brain develops in a different way during childhood, onset of puberty marks one of the most tempestuous periods of specialization in the brain. Several of brain areas involved in emotional life matures more slowly: sensory areas mature in infancy, puberty peripheral system and the frontal lobes, where the self is manifested emotional understanding and refined reaction continues to develop until by the end of adolescence, at 16 to 18 years. Habits of controlling emotions, repeated in childhood and adolescence helps to shape

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this circuit. In these circumstances, childhood is a crucial opportunity for modelling emotional propensities of the individual, because habits acquired in childhood are included in neural architecture and synaptic networks are difficult to change later[4]. Developing key skills of emotional intelligence knows her critical periods, each of which is an opportunity to help the child to acquire beneficial emotional habits, knowing that every subsequent correctives involve considerable effort and an uncertain success. A study conducted on children having 6 years old confirmed the necessity to introduce improvement programs beginning with very young ages, when, owing to the malleability of forming psychical structures, the results registered by implementing such programs are both conclusive and pertinent[5,6,7].

Software educational games and their role in education

Children feel and think differently from adults. The world perceived by them is different, and their conduct is guided by their own moral and ethical principles. To educate children well, we must understand, we need to know how they perceive, how they think about and how they represent reality. The level of abstraction of the children is limited, no matter how many details of these processes they would send. Thus, if it manages to recreate the visual illustration of an abstract the child will understand and realize what before seemed impossible. This is one of the major roles of the use of digital technology in the education of children, educational software in particular.

Digital technology involves two major parts:

- Hardware - The assembly of components and devices that form an electronic computing system[8] (computers, tablets, interactive whiteboards, other devices used as input data environments - eg PitiClic Pad, etc.).

- Software - set of information necessary for the operation of a computer (operating system, programming languages, application programs etc. [9].

When we say digital technology for learning, we refer to all assembly hardware and software technologies used in the classroom or at home in the educational process.

We focus on children in preschool and primary education. Always true statement: Children play. Researchers show that the game is the dominant form of child work, the most revealing for his mentality and for his future development. Until school age, the game is the exclusive form of his behaviour. The game always has a functional value immediate or delayed. He prepares many adjustments and fixes precious competences of the child. The game is an expression of the work performed spontaneous, for pleasure and it is full of satisfaction. Vigorous children play all the time, changes slightly their interests, preferences and the game direction. When their interest is aroused, they enter into collective games, developing their sociability.

Garvey[10] presents a number of features of the game:

- the game is essentially associated with pleasant and positive affect.
- is an activity performed for its own sake, it's rewarding itself and not dependent on achieving goals outside of game situations.

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[4] Goleman, D.; Inteligenţa emoţională. Cheia succesului în viaţă, Bucureşti: Curtea veche, 2001, p.274.

[5] Brazelton, T. B.; Heart Start: Emotional Foundations of School Readiness. Arlington: National Center for Clinical Infant Programs, 1992.

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[8] DEX Online; accesed April 2014, http://dexonline.ro/definitie/hardware.

[9] DEX Online; accesed April 2014, http://dexonline.ro/definitie/software.

[10] Garvey, C.; Play. Enlarged Edition, (Harvard University Press, 1980), 4.

- spontaneous and voluntary and is not caused or controlled by someone else.
- requires active involvement of participants
- not the same as real life and not to be taken in the strict sense.

The development of technology and the creation of digital games initiate a new domain of research for usage of educational software games in educational process. Papert[11] says that software games teaches children that some forms of learning are very fast, highly compelling and rewarding by comparison with classical learning can be slow and boring. Boyle[12] points out that game can produce engagement and delight in learning that thus provides a powerful environment for learning environments. Moreover, studies have demonstrated that computer games can improve thinking if they are carefully selected[13]. As a result, many researchers have developed games for educational purposes[14].

MAIN TEXT
Digital technology in educational process

The world of today is a changed one. We are surrounded by technology, our children are born and grow up together with technology, but as a paradox, the technology is not very present in our schools, in our educational process. The adoption of educational games during the educational process in the classroom remains limited[15]. But it is a reality that it is increasingly more difficult for a teacher to make a child to be concentrate during the educational process. But this is not because the children have an inability to be focused or to have attention to the lesson as they are accused. The same children are much focused afterschool when they are playing games on digital devices or when they are watching stories or cartoons on TV or on digital devices. So, there are not changes in our children or students attention capabilities, but there are changes in their tolerance and needs. The today children, "digital natives" as they are called by Marc Prensky in 2001[16] are focused only on what interests them and on things that treat them as individuals, not as a part of a group or class. They are "native speakers" of the digital languages of the computers. They want to have control over their own learning processes. The possibility of choice, the personalization and individualization are now a necessity for children and young people. So, it is a reality that the teachers should adapt their lessons, should include digital technology in educational process. They should change lesson planning, resource allocation and lesson delivery in order to align with their students' learning preference.

Key reasons for using digital games for learning

According to Prensky[17] there are two key reasons for design and usage of digital educational games in learning process:

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[11] Papert, S.; *The Children's Machine: Rethinking School in the Age of the Computers*, New York: Basic Books, 1993.

[12] Boyle, T.; *Design for Multimedia Learning*, London: Prentice Hall, 1997.

[13] Aliya, S. K.; *The role of computer games in the development of theoretical analysis, flexibility and reflective thinking in children: A longitudinal study,* International Journal of Psychophysiology, 2002, 45-149.

[14] Conati, C., Zhou, X.; *Modeling students' emotions from cognitive appraisal in educational games*, S. A. Cerri, G. Gouarderes, & F. Paraguacu (Eds.), Proceedings of the Intelligent Tutoring Systems 2002, Lecture Notes in Computer Science, 2363, Berlin Heidelberg: Springer, 944-954

[15] De Grove F., Bourgonjon J., Looy J. V.; Digital games in the classroom? A contextual approach to teachers' adoption intention of digital games in formal education, Computers in Human Behavior 28 (2012) 2023–2033

[16] Prensky M., Digital Game-based Learning, New York: McGraw-Hill, 2001.

[17] Prensky M.; Computer games and learning; digital game-based learning, 2006, accesed Sept. 2014, http://www.itu.dk/people/jrbe/DMOK/Artikler/Computer%20games%20and%20learning%202006.pdf.

1. Our learners have changed radically growing up with technology
2. These learners need to be motivated in new ways, according to their new needs.

The motivation of children is very important as a prerequisite for further intellectual development. They should be motivated enough to stick to the learning process to the end of a class, lesson, session. It is very important that the new generation has a new form of entertainment that is perfectly synchronized with their preferences and abilities, digital games. These digital games can be used as vehicles for learning "serious" content and subjects.

Arguments for using digital educational games

Despite classical education, the usage of digital educational games in learning process combine together more motivating elements, we never found in any other medium.

Table 1 - *Motivating elements of digital educational games*[18]

Crt. No	Games characteristic	Motivating argument
1	They are a form of fun.	It gives enjoyment and pleasure.
2	They are a form of play.	It gives intense involvement.
3	They have rules.	It gives structured thinking.
4	They are interactive.	It gives us action, doing.
5	They are adaptive.	It gives us flow.
6	They have outcomes and rapid feedback.	It gives us learning.
7	They have win states.	It gives us ego gratification.
8	They have conflict / competition / challenge / opposition.	It gives us adrenaline.
9	They have interaction / connections between players.	It gives us social group.
10	They have characters and story.	It gives us emotion.

The levels of learning in educational digital games

Prensky[19] defined five levels in which learning happens in educational computer games:

- Level 1: Learning How
- Level 2: Learning What
- Level 3: Learning Why
- Level 4: Learning Where
- Level 5: Learning When

Level 1: Learning How

This is the most explicit level of learning. When a child plays a game, he learns how to do something. It is about learning some concrete notions (ex: how to solve an exercise, how to make pair by dragging pieces, how to defend, how to make words or sentences etc.) or

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[18]Prensky M.; Computer games and learning; digital game-based learning, 2006, accesed Sept. 2014, http://www.itu.dk/people/jrbe/DMOK/Artikler/Computer%20games%20and%20learning%202006.pdf.
[19]Prensky M.; Computer games and learning; digital game-based learning, 2006, accesed Sept. 2014, http://www.itu.dk/people/jrbe/DMOK/Artikler/Computer%20games%20and%20learning%202006.pdf.

about learn abilities which could help him in real world (ex: moving a Tetris or Puzzle piece the child enhance spatial orientation etc.).

The children not only learn how, they practice over and over until the learning is consolidated and becomes a "second nature".

Level 2: Learning What

In this second level, pupils learn what to do and what not to do. They learn rules, they learn to have a structures mind, they learn think and choose in different situations. Many times children learn by trying. They try to do everything and then, they are waiting to see the results and learn what they should do in every situation to complete the task.

Level 3: Learning Why

At this level, the children learn why to do something, learn strategy. The strategy depends of content, rules, flow. The children learn in some cases what is the best decision and why they should take it. There are lessons that will have an important impact in real-life as: cause and effect, long term winning vs. short term gains, complex behaviour, the benefit of order, second-order consequences, the persistence value.

Level 4: Learning Where

This level is the context level; the child learns where he is, learns about the game world and acquires cultural metaphors and images to use in describing the real world. There are many characters in games and the child learn to deal with them, there are many cultural details, there are maybe more cultures and relevant symbols.

Level 5: Learning When /Whether

This level, When and Weather involves the non-conscious emotional messages, the moral decisions. The child should decide whether doing something is good or wrong. The pupil learns to issue moral decisions.

Characteristics of educational game those are important to achieve the purpose of learning

Most of digital educational games are not really games for gamer's perspectives. They are placed in a recent created category named „edutainment" (educational + entertainment). They are multimedia games, used for multimedia learning, for learning from words and pictures[20]. It's quite hard to combine the technique of designing games with the educational part because the pleasure and fun of game should be kept and the content should be educational, so by definition „serious". So, here we have some characteristics that should have a digital educational game in order to have a good impact in learning process:

1. The existence of the triad: image, sound and text that allows children to retain a high percentage of the information;
2. The usage of appropriate colours to stimulate cognitive process of children;
3. Gradual presentation of the content to ensure better learning;
4. The existence of a large amount of content to be presented to children in different random tasks in order to permit the children to play many times with different content;
5. The random arrangement of the elements on the window of working activities in order to minimize the risk to be memorized the position of elements and not the notions;
6. The verification of solutions together visually and with sounds, allowing the child to follow and understand what was wrong;
7. The existence of messages of encouragement, even in case of failure. They are motivating elements for learning;

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[20]Mayer, R. E. Multimedia Learning, (New York: Cambridge University Press, 2001), 3.

8. The existence of the possibility to view the correct answer to enable self-learning for children;
9. The existence of the avatar/characters placed on the same age level with the child, for it to feel attracted and can even identify and communicate the information necessary to learning;
10. The existence of a module for recording the playing results, so it can be viewed any time the progress made in the process of learning.

These characteristics make difference between different digital educational games. It is recommended to be used in learning process the software products that have most of the listed characteristics in order to have a good impact on children even they are auxiliary materials or digital manuals.

Practical example

As ways to use educational software can enunciate some corresponding to different realities encountered in educational establishments.

If the class is equipped with a number of digital equipments (computers / tablets) equals the number of students, it is an ideal case. In this case, each student will have his own program.

Even in this case, the recommendation is to group two children at a workstation/tablet, at least part of the activities. Thus, working in groups, children will be able to develop team spirit, will learn to rely on their comrades, will learn to share knowledge, and do not become individualists. The teacher can use the video projector to project the image on a screen and to explain the functionality and the purpose of each activity. Then the children will resolve themselves the activity.

If there are fewer digital equipments (workstations / tablets) in the classroom, children can be divided into working groups (recommended maximum of 3 in a group) and each group will work on a computer. In this case, the teacher can use the video projector to project the image on a screen and to explain the functionality and the purpose of each activity, too. Then the children will resolve themselves the activity.

If there in one computer classroom, the teacher will use the video projector to project the image on a screen. It will explain the function and purpose of each activity, then solve the task with students.

According with the level of pupils digital competences and with the lesson scope, the teacher should choose the teaching method, a classic one (pencil/paper), a modern one (using digital technology) or a mixed one (classic combined with digital). The recommendation is to use both methods in the classroom, according with pupils needs and expectations in order to create a good motivation for learning. The digital technology is only a tool for the teacher in order to help to create new learning opportunities and motivation.

There is presented below a practical example for learning addition and subtraction of 1, 2 units between 0-10. During the lesson, the teacher can choose between the following ways of teaching:

Table 2 – Different methods for teaching

Crt. No.	Method	When it is recommended to use
1	Classic paper and pencil	
2	Using a computer educational game with keyboard data entry	It is recommended when the additional purpose of the teacher is to help pupils to learn to write and read and the relation cause/effect.
3	Using a computer educational game with strictly use the mouse	It is recommended when the additional purpose of the teacher is to help pupils to learn to use the mouse, to exercise the small movements of fingers for writing, to learn to associate a cause with the effect.
4	Using a computer educational game with data entry using external input devices (eg "PitiClic Pad" – a device that permits the data entry by making steps on a pad. Every step on a pad is like a mouse click.)	It is recommended when the additional purpose of the teacher is to help pupils to learn spatial orientation and the relation cause/effect. It is recommended for active pupils.
5	Using an educational game on tablet	It is recommended when the additional purpose of the teacher is to exercise the small movements of fingers for writing, to learn to associate a cause with the effect. If the program uses a virtual keyboard, the students learn in addition letters/numbers.
6	Using an educational game on an interactive whiteboard	It is recommended when the purpose of teacher is to work with groups of children.

CONCLUSION

Digital game successfully completes the traditional game in making the child's learning. Collins & al.[21] conducted three multinational studies including analyses of trends in more than 20 nations in order to examine the impact of children's use of computers in school and conclude that "given a good teacher willing to be an innovator with computer use, a positive impact on children's higher level cognitive functioning seems to occur". There are many advantages for children and for teachers if the usage of modern technologies in classroom will be constant.

Advantages for using educational software for children
- Improving school performance;
- Positively changing attitudes towards the use of technology;
- Increase in concentration, attention and motivation due to interactivity, animation multimedia content for children without disabilities and those with disabilities;

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[21]Collis B. A., Knezek G. A., Lai K. W., Miyashita K. T., Pelgrum W. J., Plomp T, Sakamoto T.; Children and Computers in School, (New York: Routledge, 2013), 64.

- Understanding abstract concepts, phenomena that can be easily understood through virtual experiments;
- Obtaining immediate feedback, quickly and efficiently;
- Reducing the time to research and study;
- Reducing routine activities;
- Stimulating intellectual activity, improving competitiveness, the development of logical thinking, the spirit of observation, visual memory, and voluntary attention;
- Stimulating active involvement of children in learning, reading, writing;
- Emerging opportunities for individual learning, self-paced.

Advantages for using educational software for teachers
- Getting attention and increased concentration of children due to animation and sounds;
- Increase student motivation for learning concepts;
- Increasing the performance of children;
- Reduction of time in order to provide feedback (for process evaluation) training materials to support teaching;
- Able to accommodate the rapid changes and new knowledge in various fields and their use through educational software;
- Creation of interdisciplinary in teaching and assessment;
- Reducing routine activities.

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