

DIGITIZED CHILDREN'S GAMES FROM THE PAST IN FUNCTION OF THE REALIZATION OF THE MATEMATICS CURRICULUM IN PRIMARY EDUCATION

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Cultural development of the modern society, scientific technological and technical level today is a challenge for teachers, where they should respect the traditional didactic principles in the implementation of the teaching process, but, in the same time to think how to convert modern trends in skills of 21st century skills that will be appropriate to the content and organization of contemporary teaching. This paper analyzes the curriculum for mathematics First, Second and Third grade for nine years basic education in terms of the possibility of applying their performances within digitized children's games from the past, as future potential founding in learning through games. It is an innovative approach to the creative use of children's games last century and their digitization of modern ICT. As Kinect and Xbox offer a way to respect the basic principles of didactic, to implement the same as Game Based Learning, where with physical activity offers students the option to digitize and already forgotten kids games as part of the cultural heritage of the world globally. The variety of games and their different rules, playground space, materials with which they play offering multidimensional approach in realization of the purpose of teaching almost all subjects, according to the ages and opportunities of the students and their individual development characteristics. Mathematics curriculum springs, based on the main laws of teaching that is significantly affect the overall teaching process in all components of its organization.

Keywords: digitized games, math, basic education, curriculum

Games have been played for fun and entertainment through the human history, but were also recognized as a potential learning tool (Oblinger, 2004; Paraskeva, Mysirlaki & Papagianni, 2010). The social activities and collaboration during game-play can be used in the educational environment to increase students' involvement in learning process, since sharing one's

ideas and responding to others' reactions sharpens thinking and deepens understanding (Chickering, Gamson & Poulsen, 1989; Chizhik, 2001). Furthermore, the active engagement of the student through learning by doing, goal-oriented and constructivist learning activities creates an experiential learning environment which increases the level of students' achievements (Prensky, 2001).

On the other hand, the rapid development of the emerging technologies in the last decade has increased their implementation in different areas of modern society. Information and Communication Technology (ICT) provides resources and different tools, which extend opportunities for creation, management and distribution of information among involved parties. Therefore ICT may highly contribute in the field of education, where communication of knowledge and information is extremely relevant, while creating a powerful learning environment which can improve students' learning experience and enhance teaching methods. These new technologies can provide benefits for teachers to increase effectiveness and flexibility, support easier planning and lessons preparation, while adapting the learning content to new ideas. The integration of computer games in the learning environment can combine the positive aspects of learning through game-play incorporated with latest technologies towards higher level of cognitive learning outcomes (Wang, Liu & Li, 2011; Wu et al., 2012). Due to tremendous popularity of computer games, especially among young population, students' motivation can be increased while learning in a technology-enhanced setting and student-centered environment, compared to the traditional classroom.

Still, there are different aspects which are significant while designing and planning technology-enhanced learning systems which can include computer games as an instructional tool. Some of the instructional design issues related to learning goals, like authentic vs. abstract problem solving (Collins, 1996), can influence the final success of the learning process. Furthermore, the real implementation of the technology and game-play in the education demands changes in teaching style, changes in learning approaches, instructional guidelines and access to information (Watson, 2001; Rice, 2007; Ketelhut & Schifter, 2011).

In this study, we explore the curriculum for mathematics First, Second and Third grade for nine years basic education in terms of the possibility of applying their performances within digitized children's games from the past, as future potential founding in learning through games and these games are implemented through different technological tools, making an interactive learning experience for the young population in their classroom activities.

This article is organized as follows: section 2 provides related literature and the novelty of our approach, following a research idea to enrich the educational process, "Grandma's games" presents a project entitled by introducing the traditional children games of our ancestors in the learning environment is presented in section 3, section 4 provides actual analyses of the curriculum for First, Second and Third grade for nine years basic education in R.Macedonia, while section 5 concludes the article.

Related literature

The educational process should be constantly improved to reach higher level of students' perceived knowledge according to their potential. Therefore different approaches, methodologies and teaching practices must be adopted and put into practice so positive results can be achieved at the end. The ICT

offers different perspective, but some studies (Reynolds, Treharne & Tripp, 2003; Bauer & Kenton, 2005; Chen, 2008) already show that teachers are not integrating technology sufficiently as a teaching/learning tool. Teachers are generally very professional and are committed to provide quality education to their pupils, but these studies show several problems which usually occur when new technologies and changes have to be introduced in the educational process.

On the other hand, the social constructivist theory (Vygotsky, 1978) suggests that unlike the conventional lecturer, the teacher should create a context for learning which will engage the students in interesting activities that encourages and facilitates learning. The constructivist approach stresses that knowledge is constructed by children from their own experiences, such as via problem-solving tasks, games and simulations. Having in mind that the student's knowledge is actively constructed by the student himself, learning outcomes significantly depend on the students' internal motivation to understand and promote the learning process. Since the content that needs to be learned by students is not always motivating to them, it makes sense to merge the content of learning and the motivation of games (Prensky, 2001; Squire, 2003; Tüzün et al., 2009). The computer-simulated games and learning have increased their mutual connection in the recent years. Different games were developed to provide instructional, problem solving challenges and testing of specific skills (Paraskeva, Mysirlaki & Papagianni, 2010; Curran K, George, 2012). Graphical representation, models and modeling are very helpful to learning (Lehrer & Schauble, 2005; Abubakar, Mutalib & Permadi, 2013) because they allow certain aspects of students' experience to be incorporated in the problem solving, making the abstract problem more concrete and understandable to the students. Games possess interesting graphical representation and are usually built on certain models, which makes them appropriate for the learning process. Despite the advantages that game-playing can contribute to the learning process, there is also an important gap between theory and practice for effective integration of games in the educational programs, due to different barriers for implementation (Deubel, 2002; Rice, 2007). Although certain skills, such as problem-solving ability increase within a game, the real challenge comes when these skills and learned content have to be used outside of the gaming environment (Egenfeldt-Nielson, 2007). Different studies (Egenfeldt-Nielson, 2007; Curtis & Lawson, 2002) have shown modest to low evidence, when gamed learning skills or content are transferred outside of the digital environment.

We believe that the idea of learning through games can improve the learning process, if the computer games are developed to incorporate adequate pedagogical components, based on didactic principals as highly organized and properly guided pupils' activities. We follow this idea in this study, while trying to present research findings that support it. The learned skills and content through such learning activities can be successfully transferred outside of the gaming environment with increased students' motivation.

The Grandma's games project

Twelve traditional "Grandma's games" were included in this project, aiming to achieve a set of learning goals among K9 students at primary schools from both rural and non-rural regions across the country, as well as different ethnic and religious background. The project activities were coordinated with the state's primary education curriculum, applying interactive

playing/gaming methods, adopting knowledge outside the classroom walls, organizing various workshops, and using the computer technology as an auxiliary tool to the learning activities. A special manual was developed instructing the teachers how to coordinate project activities with the regular lectures from the predetermined curriculum. This manual¹ contained the necessary lesson plans and games' instructions applicable for all ages of K9 students, thus unifying the learning process among different schools. Since the project researched the advantages in different type of classes including math, history, sociology, languages and art, a specific traditional game was selected and utilized in each class according to the context and learning objectives. Students were also involved in the research of the old and forgotten outdoor games, wrote about them with the help of their grandparents, prepared a video demonstrating how each game is played and shared it with the fellow students from another school.

Therefore this project created a multicultural bridge among students and teachers, promoting preservation of cultural heritage and traditional values. Through the games the students were gradually introduced into different situations, helping to develop their critical thinking by:

- considering how they can influence their classmates to prefer face to face outdoor activities instead of spending their time in front of IT devices and social networks;
- recognizing the advantages for learning while playing the traditional games and establishing a logical links between the each game and the required objectives;
- Interpreting the findings, perform selfevaluation and develop the ability to ask critical questions and lead productive discussion.

A summary of each game, its application in the class, skills developed while playing and the technology used are given in the Manuel for Teachers. During the class activities, different methods have been implemented to achieve planned learning objectives: the WebQuest method, brainstorming, general discussion, role playing, use of community resources (while organizing a school visit for the grandparents and participation in different community events), mind walk, learn from each other (while performing videoconference between schools from different regions), PRES method (Point, Reason, Example, Summarize), working in groups, etc. These activities helped students to develop communication skills, learned about artistic expression and get familiar with different traditions regarding multi-ethnic variety of the participants in the games. Some of the classroom activities included videoconferencing sessions using MSN messenger and Skype as a technology tool thus bridging the distance between rural and non-rural regions. During the language classes, students were able to develop different linguistics skills (phonetic, morphological, syntactic, lexical and spelling) while playing the proper grandma's game. They used modern technology to record, make video from the sessions and photo albums on their computers. During the art classes, students developed their sense of forms in open space and used technology to develop their drawing skills. Mathematical concepts were taught according to the cognitive skills and abilities of the students, while solving specific problems via different games thus enhancing the process of logical thinking, ability to analyse, synthesize abstractions and generalization in a pleasant and stimulating learning environment.

¹ http://issuu.com/vasileva_marina/docs/teachers_manual_marina_vasileva

This project introduced new ways of learning, which focused on “learning by doing” while all participants were inspired by the motto “Let’s play games, let’s be friends, let’s learn together!” Besides the successful achievement of the learning goals according to the state curriculum, students developed additional skills, such as writing a research report while conducting interviews, sharing knowledge via videoconferencing sessions with their peers, learned how to be mentors, how to calculate a perimeter of objects in nature, etc. Students creatively designed a learning portfolio containing the games’ rules and recorded videos for each game.

The recorded videos and other games’ resources were published on the [Teacher Channel](#), <http://grandmasgames.blogspot.com/>, and <https://www.facebook.com/GrandmasGames> and involving students in web design and editing process with creative modern software tools. The project activities created a bridge between learning and gaming, using technology as a tool, thus creating a connection between the world in which students live and the way they learn about the world. The project was enriched with additional activities that added value to the project outcome such as: students’ competition for best Grandma’s games song, best drawing for the poster, best drawing on character image of the game “Zavor” on MS Kinect², best quiz while performing self-evaluation of the perceived knowledge, etc. Besides expected educational benefits, certain social aspects also emerged during the project activities, rendering even greater pedagogical attention. During the play, students learned to discuss and form opinions, make decisions, develop critical and creative thinking for problem solving. Through games they were able to memorize and reproduce movements, develop different motor skills and learn to be tolerant, self-reflective while developing a sense of “fair play” and tolerance to others. The games brought into light some unexpected social aspects, while some overweight and shy children usually reserved during regular class activities, showed an obvious enthusiasm and courage to take active role in the games and accompanying activities. Regarding the multicultural aspect, our experience proved that the games are an extraordinary tool to bridge and bring closer the different cultures and traditions among participants. Although the participants in the Grandma’s games project came from variety of ethnical backgrounds, they all approached the games with the same eager and commitment. During the project, some joint activities were organized where groups of students visited their peers in rural regions and vice versa, getting acquainted with their lifestyle and tradition besides realization of the main educational goals.

Picture. Game “Zavor” played during a metric conversion class



² <http://www.youtube.com/watch?v=J1zDfgv4qIk>



Analysis of the curriculum of the International Cambridge Center for teaching programs (Cambridge International Examination Centre).

From September 2014 year in all the schools in the Republic Macedonia begins the study of subjects Math and Science according to the International Centre for the Cambridge curriculum (Cambridge International Examination Centre). It curricula for students from first to third grade of nine years basic education, which provide an excellent basis for further stages of the education of students and offer continuous development following the best educational systems in the world.

Teachers received a "Guide for Teachers' tips for quality planning and implementation of lessons and guidance for planning instruction during the school year.

The guide gives a clear introduction to the themes of learning, helping teachers to optimize student learning. At the same time, the manual offers advice and monitoring of the activities of group or individuals in the implementation of the curriculum. Great emphasis is placed on feedback received by the teacher from the student about a specific teaching goal. The feedback shows how student progress on the curriculum and is a good indicator for both the teacher and the parents.

The manual is complemented with date for:

- Creating of the planning ;
- Preparation and delivery of lesson;
- sharing learning objectives;
- formative assessment;
- effective use of the questions.

The main characteristics of the adapted curriculum for the subjects mathematics are:

1. *Spiral Curriculum* – students learn a particular topic, but later in the classroom go back to the same topic again and learn it at a higher level and in a different context. In this way, allowing students to consolidate and build up the knowledge which they already learned.
2. *Scientific Research* – The purpose of this feature is to guide the students on the right path to become future "scientists". The programs include researches that encourage students to ask questions themselves to come up with an answer through the support of teachers. This is a proven method that math classes are becoming interesting for students, and learned knowledge remain. Also, curricula allow students to develop critical thinking, to think and to use the evidence.

3. *Problem Solving* – Students will easily learn that mathematics is important and will help them solve problems in everyday life.

The curriculum for Mathematics is divided into five areas: *numbers, mathematical operations, geometry, measurement, working with data and solving problems* and it will be realized by a fund of 5 classes per week or 180 classes per year. This curriculum focuses on the principles, schemes, systems, functions and relationships so that students can apply mathematical knowledge and develop a comprehensive understanding of the subject. The successful application of the adapted curriculum in mathematics from first to third grade Bureau for Development of Education held training for primary school teachers in the country, according to program and agenda aligned with the International Centre for the Cambridge curriculum (Cambridge International Examination Centre).

The application and implementation of the adapted curriculum for Mathematics of the International Centre for of the Cambridge curriculum (Cambridge International Examination Centre) important part is the information and communication technology (ICT), which is a useful resource in developing the knowledge, skills and understanding among students. ICT should increase the quality of teaching. Teachers will have the opportunity to choose and use the most appropriate and most effective ICT sources³. The spirit of of the project activities for Granmas games are in accordance with the methodology which is based on the curriculum of Cambridge 4 Ex:

- Experience
- Explore
- Explain
- Experiment

Methodology on the planning of the teaching and research activities created in before mentioned manual "Grandma's Games & Manuel for Teachers ", completely fit with this latest program which from September 2014 will be implemented in all the schools in the Republic Macedonia.

Conclusions

The Grandma's games emerged from an idea to realize an educational project which focuses on knowledge transfer and traditional values to the students, while promoting healthier physical and emotional development of the young population. Under direction of the teachers, students conducted research on their grandparents games, wrote about them, played the games, created electronic records of the activities, collaborated with students from other schools, while bringing the tradition and modern computer aided technology in education. The teachers linked each game to specific curriculum objectives, offering students a new opportunity for integrated learning, encouraging creativity and imagination during learning through games. The project involved twelve Grandma's games incorporated in the teaching activities at primary schools with multi-ethnic population from both rural and non-rural environments in Republic of Macedonia. A survey was conducted among teachers involved in the project to investigate the effects of the Grandma's games on educational and social aspects among students. The descriptive statistics performed on the collected data set showed that

³ <http://bro.gov.mk/?q=mk/node/163>

teachers perceived multiple benefits from the games included in the curricula in both educational and social aspects. Therefore the project's success and its results can stimulate educational institutions in different parts of the world to look into their tradition and cultural heritage, revive old and forgotten children's game and include them in the teaching practice. The Grandma's games project won the European Grand Prize in the Educators' Choice category in Microsoft's Innovative Education Forum held in 2011, in Moscow. Grandma's games also became the 1st runner-up in the same category at the Microsoft PIL 2011 Global Forum in Washington DC.⁴

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⁴ <http://daily.mk/vesti/makedonskite-babini-igri-predizvik-za-majkrosoft>

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