Grandma's Games Project: Bridging Tradition and Technology Mediated Education

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***Abstract* – This article presents a project entitled "Grandma's games", following a research idea to enrich the educational process of K9 students by introducing the traditional children games of our ancestors in the learning environment, revived and adapted for modern students with the aid of information and communication technology. While creating a strong connection between our heritage and the modern educational trends, the project's intention goes beyond mere fulfilment of educational goals, striving to increase the interest and motivation of primary education students to develop their creativity and originality while learning, with respect of their own personal preferences and cultural heritage. The "Grandma's games" research project engaged twelve traditional games in the educational activities at primary schools from both rural and non-rural environments in Republic of Macedonia. Descriptive statistics was applied on the data set sampled from the extensive survey conducted among teachers in these schools, to illustrate the benefits from the application of the Grandma's games in educational process.**

***Keywords* – Game based learning, computer games, primary education, survey**

1. Introduction

The rapid development of the information and communication technologies in the last decades resulted in emergence of many pedagogical approaches utilizing the latest technology and appropriate tools in the modern educational process. Different research studies explore utilization of the technology in education, yet its application in practice is still questionable [1], [2]. The actual technology integration plays a substantial role in the educational process of the modern students, but still it strongly depends on teacher's possibilities to adapt and change teaching practices and believes towards modern educational trends [3], [4]. Therefore finding a way for successful integration of the traditional and modern educational approaches can result in a substantial improvement of the educational practice and acceptance by the modern students.

In this context, the "Grandma's games" project, introduces the traditional children's games of our ancestors in the learning process in primary schools, adapted and integrated with the modern computer technology to create a successful bridge between the old and new generations while linking the traditional educational values from our ancestors to the modern students. In our approach, we recognize the traditional game as a great transfer knowledge tool which motivates children to learn through direct experiences within the game world. Through the study of grandparents' games our research purpose goes beyond mere fulfilment of educational goals, extending to build a communication bridge between students from different regions and cultures, overcoming "the negative sides of passive cyber games" and reviving the old traditional games with creative use of technology.

One of the major downsides of the modern computer technology is that the children spend substantial time in front of PCs or TVs, neglecting the positive aspects of the face to face traditional gaming. In our educational approach we overcome these downsides by using the traditional face to face games as a working methodology while utilizing computers as a learning tool which is closer to the affinities of the modern students. The project brings holistic approach to the educational practice with K9 students, successfully integrating the traditional games in the state's learning curriculum. Besides the educational advantages, the traditional face to face games bring more ecological and healthier patterns in the child development.

We see this project as a cultural journey bringing a new spirit of vividness, enthusiasm, motivation and positive "I can do that" attitude among students while learning. We believe we can utilize the benefits of technology in a different way, while carefully fostering the traditional symbols and authentic values close to the new generations.

The next section of this paper gives an overview of the current research and literature on games and game based learning. Description of the Grandma's games project, project activities aims and benefits are presented in the section three. The descriptive analysis, produced results and conclusions regarding the collected data are illustrated in section four.

Impact on education, social aspects and impact on teachers and broader educational community are given in section five and section six respectively, and the last section concludes the paper.

2. Related work

The most common meaning of the word "game" is a fun activity involving one or more participants [5], [6]. Although the games are primarily played for fun [7], [8], they can engage educational and inspiring elements for the participants and address some of the challenges that educational systems face [9], [10]. The games had an exquisite role in the human history while preserving and transferring the traditional and cultural values, valuable knowledge and customs for many generations of different ethnic groups throughout the years.

The Piaget theory [11], [12], for the game and the intellectual development claims that the two key factors for intellectual development of a child are the game and the processing of information. This theory recognizes imitation as learning method and memorizing strategy, and drama as an assimilation strategy.

Game Based Learning (GBL) [13] emerged as a branch of educational games dealing with applications that enhance the learning process. The educational games are designed to balance between the educational quality of the learning subject and the game, regarding the ability of the gamer to apply and retain the adopted knowledge in the real world. The games often contain elements of fantasy engaging the gamers to learn through stories [14], [15]. Educational video games can be a motivating force and foster development processes in the child consciousness. The success of the strategic games is due to the active involvement and interaction of the gamer, crucial for gaining experience.

Authors Maya and Paul Pivec concluded that the proper design of a game based learning scenario, besides presenting funny activity to the gamer, should engage action and consequence as a method to achieve learning through reflection [16], [17]. A game used for learning should involve the gamers in a motivating environment, providing fun in the educational activities [18], [19].

The effects of the games on cognitive development have been investigated in [13]. The research is focused on the positive and negative effects of the video games for Nintendo and PlayStation, playing roles, simulation in developing strategies, mosaic in education, etc. The educational aspect of the games comes into focus when development of important skills as strategic thinking, creativity and cooperation is concerned [20], [21], [22].

Taxonomy of the theories, methods, qualitative and quantitative analysis of the games used for educational purposes is given in [23]. The research gives a meta-analysis resulting from comparative analysis of 89 educational games, concluding that the GBL has great potential to enhance the learning and motivational qualities of the students. But the real challenges of learning through game emerge when the content and the skills adopted through the game should be reused outside the gaming context and environment [24].

The novelty of our approach is that specific games are selected, which children, their parents or grandparents played without the use of technology, enhanced through proper implementation of modern computer technology and adopted accordingly in the every-day learning process. Following this approach primary schools can more effectively achieve the curriculum objectives, while improving child mental and physical development through promotion of healthier patterns for children's physical and emotional development. Furthermore this novel approach increases the motivation and enthusiasm for learning, promotes multicultural communication and tolerance and creates innovative teaching/ learning practices.

3. 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 manual 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 self-evaluation and develop the ability to ask critical questions and lead productive discussion.

A short summary of each game, its application in the class, skills developed while playing and the technology used are given in the Table 1.

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.

This project introduced new ways of learning, which focused on "learning by doing" [9] while all participants were inspired by the motto "Let's play games, let's be friends, let's learn together!"

Table 1. Description of the games used in Grandma's games project

Game	Short description	Application	Skills	Technology used
Zavor	Player throws a stone in a distance as close as possible to a predefined line.	Math	length measurement, position of parallel lines, metric conversion	Electronic version on xBox with MS Kinect
Steel	Player hits the 'steel' (short wooden stick) with a longer wooden stick and blows it in the air. The players from the opposite team try to catch the 'steel'.	Math	linear measures	Electronic version on xBox with MS Kinect
Lady	Ordering pebbles on a predefined schema trying to create checkers.	Math	collinear and non-collinear points, geometric shapes, types of triangles	MS Paint, MS PowerPoint, MS Publisher
Match-box	Hitting a matchbox marked with scores on each side. The player with highest summary of scores wins the game.	Math	arithmetic operations	MS Excel, MS Publisher
Hop-scotch	A geometric shape divided in fields marked with number is drawn on the playground. Players jump from one field to another on one foot.	Art, Languages	expression and creation, media culture, role play, drama	MS Movie Maker, MS Publisher

Five stones	Five pebbles are thrown upwards according to the game rules. The player tries to catch the stones until some falls down.	Art, Languages	verbal and written communication	MSN messenger, Skype MS Publisher
String	A long string is twisted and modeled with players hands in order to create different shapes.	Art, Languages,	cotton, wad, production of the threads and strings, drama, poems	MS One Note, MSN Messenger
Bzzz	A player turned back opposite the other players tries to figure out which one touched his hand.	Art, Languages	development of senses, verbal and narrative expression	MSN Messenger, Skype
Mosque	Five flat stones placed one over the other are forming a tower. Each team tries to hit the tower of the other team with a ball.	Sociology, History	mosque, multicultural values, expression and creation	Auto Collage, Photo Synth, Skype
Hide and seek	A player closes his eyes and waits until others hide. Than he seeks and discloses the hidden players	Sociology, History	development of mental and motor skills, senses and verbal expression	Photo Synth, MS One Note
JaninoJanino	The players stand in line or circle. Every player tries to jump before the player in front of him.	Sociology, History	multicultural values, team play	Photo Synth, MS One Note
Ring	A player holds a ring between his palms, and tries to leave the ring in somebody else's palms while other players try to guess where the ring is left.	Sociology, History	development of mental and motor skills	Auto Collage, Photo Synth, MS One Note

4. Analysis and results

To investigate the educational benefits of the Grandma's games project, we conducted a survey among 88 teachers involved in the project, teaching maths, languages, art, sociology and history classes. Participants were of multi-ethnic background and different geographical areas across the country.

The objectives of the survey were to investigate the effects of Grandma's games on the following educational aspects:

- The usability of the Grandma's games for realization of educational objectives;
- The educational benefits from the games;
- The behavioural benefits from the games.

The questions were accordingly classified into five categories:

(1) General data concerning the teachers age, gender, working experience, geographic area of the school, the teaching subject and the use of Information and Communications Technology (ICT) for teaching in the class;

(2) Data concerning the usability of Grandma's games for educational objectives, activities in which the Grandma's games were used in the classes, and the frequency of use of the Grandma's games for teaching;

(3) Data concerning the educational benefits related to knowledge adoption, motivation, knowledge application and knowledge durability;

(4) Data regarding the behavioural benefits among students related to cooperation, team work, constructive atmosphere and active inclusion of the students in the class;

(5) Data regarding the behavioural benefits between student and the teacher related to student's independent work, interactivity, facilitation, encouragement and development of critical thought.

We used SPSS statistical software [25] to perform series of statistical tests on the collected data sets, in order to research the hypotheses regarding the usability of the Grandma's games for achieving educational objectives, and the educational and behavioural benefits from the Grandma's games in general.

4.1. Usefulness of the Grandma's games for achieving educational objectives

According to the K9 classification in our country, lower classes include the first five grades of K9 students, and the upper classes include the next four grades. Therefore speaking of level of education we classify first five grades in lower and last four in upper level. From the total of 88 teachers included in the Grandma's games project, 85(96.6%) found the games useful for achieving educational objectives. Only 3(4%) teachers found that the project did not fulfil the educational goals as expected. Table 2 summarizes the distribution of the answers depending on the level of education, geographic area and the ethnicity of the participants involved in the project.

The Grandma's games were used in different context for the following activities on class: for fun, introduction to lesson, teaching/learning and knowledge repetition. The teachers could use the games for one or more activities depending on their personal choice.

4.2. Educational benefits

Educational benefits from the Grandma's games were classified in four categories: knowledge adoption, motivation, knowledge application and knowledge durability. Each category of educational benefits was evaluated by the teachers with scores [1 – 5], where 1 is the highest score and 5 the lowest. The summary of the descriptive statistics performed on data set of collected scores by category is given in Table 3.

The mean scores for all categories indicate that teachers perceived high benefits from the applied games regarding the educational goals.

We performed twelve Mann-Whitney U tests [26], [27] having knowledge adoption, motivation, knowledge application and knowledge durability as dependant variables grouped by geographic area, level of education and ethnicity as independent variables, with confidence level of 95% (alpha 0.05). Each test produced p-value greater than alpha value, confirming no statistically significant difference in distribution of mean scores for educational benefits between different geographic areas, level of education, and ethnicity. This means that the traditional games used in this project can be successfully applied to enhance the educational process in primary schools across the country, regardless the geographic area, level of education and ethnicity.

Table 2. The usefulness of Grandma's games for educational objectives

Are Grandma's Games useful for learning?		Level of education		Geographic area		Ethnicity		Total
		Lower	Upper	Rural	Non-rural	Macedonian	Other	
Yes	Count (%)	72 (96%)	13 (100%)	19 (100%)	66 (96%)	69 (97%)	16 (94%)	85 (96%)
No	Count (%)	3 (4%)	0 (0%)	0 (0%)	3 (4%)	2 (3%)	1 (6%)	3 (4%)
Total	Count (%)	75 (100%)	13 (100%)	19 (100%)	69 (100%)	71 (100%)	17 (100%)	88 (100%)

Table 3. Descriptive statistics on educational benefits

Educational benefit	Number of cases	Minimum	Maximum	Mean score	Std. Deviation
Motivation	87	1	3	1.30	.573
Knowledge Adoption	87	1	3	1.34	.546
Application	88	1	3	1.31	.511
Knowledge Durability	88	1	3	1.30	.550

4.3. Behavioral benefits regarding student's relationships

Behavioural benefits from the games regarding the relationships among students were classified as: cooperation, team work, level of aggressive behaviour, inclusion on class and constructive behaviour. Each benefit by category is scored from the teachers with scores from the domain {increased, decreased, not-changed}. The descriptive statistics on collected data sets of scores is summarized in Table 4.

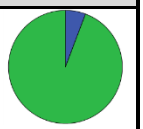
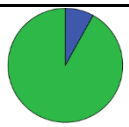
The statistics showed that teachers observed significant increase in cooperation, team work, inclusion on class and constructive atmosphere, and decrease in aggressive behaviour among students when Grandma's games were applied on classes.

4.4. Behavioral benefits regarding student-teacher relationships

Behavioural benefits on students and teachers relationship were classified as: independent work, interactivity, facilitation on classes, encouragement and development of critical thought. The values used to score each benefit are from the domain {increased, decreased, not-changed}. The descriptive statistics on collected data set of scores by category is summarized in Table 5.

The statistic results showed that the application of Grandma's games resulted in increase in all the observed aspects regarding student-teacher relationship, as perceived by the teachers involved in the project.

Table 4. Descriptive statistics on behavioral benefits among students

Behavioral benefit among students	Value	Frequency	(%)
			
Cooperation			
	Decreased	0	0%
	Not-changed	5	5.7%
	Increased	82	94.3%
Team Work			
	Decreased	0	0%
	Not-changed	7	8%
	Increased	80	92%

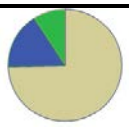
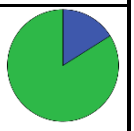
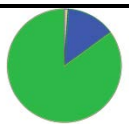
Aggressive Behavior			
	Decreased	65	74.7%
	Not-changed	14	16.1%
	Increased	8	9.2%
Inclusion			
	Decreased	0	0%
	Not-changed	14	16.1%
	Increased	73	83.9%
Constructive Atmosphere			
	Decreased	1	1.1%
	Not-changed	12	13.8%
	Increased	74	85.1%

Table 5. Descriptive statistics on behavioural benefits regarding student-teacher relationship

Behavioral benefit regarding student-teacher relationship	Value	Frequency	(%)
Independent work	Decreased	3	3.4%
	Not-changed	17	19.57%
	Increased	67	77%
Interactivity	Decreased	0	0%
	Not-changed	15	17.2%
	Increased	72	82.85%
Facilitation	Decreased	0	0%
	Not-changed	24	27.6%
	Increased	63	72.4%
Encouragement	Decreased	2	2.3%
	Not-changed	12	13.8%
	Increased	73	83.9%
Critical thought	Decreased	3	3.4%
	Not-changed	12	13.8%
	Increased	72	82.8%

5. Impact on educational and social aspects

The project activities were realized within blended learning environment [28] applying interactive playing/gaming methods, adopting knowledge outside the classroom walls in the courtyard, but also using computer aided modern technology tools to implement various workshops, to participate in videoconferencing sessions, to create video records etc.

Some project activities were conducted using collaborative learning techniques [29], involving mentor students and working in groups, thus making a joint effort to solve a problem or task presented through games as working methodology.

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 web site http://www.grandmasgames.org, 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 Kinect, 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 pears in rural regions and vice versa, getting acquainted with their lifestyle and tradition besides realization of the main educational goals.

6. Impact on teachers and school community

This project introduced new ways of learning and teaching focused on "learning by doing", while the project's participants were driven by the motto "Let's play games, let's be friends, let's learn together!" It created opportunities to learn and apply knowledge in a real environment, thus supporting and facilitating the learning process. The games were successfully integrated in the learning curricula and teaching plans, recognizing the Grandma's games as a proper learning tool which also aids to personal development of students.

On the other hand, this project created a cultural journey and intercultural dialogue among involved teachers and colleagues. The project success raised interest among municipalities in the country to involve additional primary schools in the project. The videoconferencing sessions proved collaboration activities which were not previously present between these schools, thus connecting teachers and students in virtual learning environment regardless of their geographic location. Throughout the project, the technology and tradition were linked together towards a common goal to learn through physical activity, promoting health-related behaviour changes in educational process in the classroom.

7. Conclusion

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 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 [30].

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