

GAME-BASED TEACHING IN HISTORY – CASE STUDY IN BULGARIAN SCHOOLS

Valentina Terzieva

*Institute of Information and Communication Technologies - Bulgarian Academy of Sciences
(BULGARIA)*

Abstract

Nowadays, the teaching process is based on Information and Communication Technologies (ICT) largely. Thus, many diverse technology-enhanced approaches are enabled as well as digital tools transform traditional education. Further, with the rapid penetration of innovative technologies and ubiquitous digitalization, computer games are becoming an integral part of the everyday life of contemporary generation and the social culture as a whole. Digital games in all platforms (web-based, console, computer or mobile device) not only gain increasing popularity but also are a daily routine for adolescents and young adults. Notwithstanding most of the games are intended for fun and entertainment, their ability to attract users to play many hours can find another more meaningful application – effective facilitation of the learning process while providing an engaging and motivating experience. The process of integration of games into activity with the purpose other than fun is known as gamification. The massive penetration of games in all areas urges teachers to begin to understand their potential in teaching. Its better understanding is essential for the effectiveness of game-based learning (GBL) in all school subjects, not only in science, engineering, and mathematics but also in social sciences. Many studies explore and analyse the use of information technology by teachers and their impact on the educational process and teaching methods. Often, technology resources such as digital educational games are a source of information and knowledge and thus can substitute traditional textbooks or workbook, just as other e-learning resources. Games can have an essential impact on the education process, as they are able to present learning material in such a way that to engage and motivate learners. However, the role of gamification in school education is narrow explored and understand. Hence, there is a demand for extensive research on the issues related to the incorporation of educational games in teaching different learning subjects.

The data behind the current study are from two surveys, held recently in Bulgaria. Thus, the author investigates and analyses the findings from both national-wide surveys and addresses two main topics: First, the paper aims to explore the survey-based data concerning the need for games intended for school education in Bulgaria and to provide a meaningful understanding of the gamification potential as a way for promoting students' learning. Second, the study examines and compares in particular, teachers and students' views of game-based learning in history subject. The paper outlines some issues about the use of computer games in classroom practice and especially in history classes. The opinions of history teachers and middle school students concerning the regularity of the use of GBL in teaching, the frequency of playing educational games and assessment of their usefulness are presented. Statistical analysis on the impact of educational video games on many learning aspects and their appropriateness for the teaching-learning process in different school subjects is also provided. The study offers a discussion about the development of educational computer games and their integration in teaching practice as an innovative tool for motivating and engaging learners in the educational process.

Keywords: educational games, games-based learning, survey, history, APOGEE project.

1 INTRODUCTION

Recently, with the rapid penetration of information and communication technologies (ICT) and ubiquitous digitalization of our life, computer games have become an integral part of the socio-economical culture. Digital games in all platforms (web-based, console, computer or smartphone) gain increasing popularity [1]. Notwithstanding most of them are intended for fun and entertainment, their ability to attract users to play many hours can have another application – to facilitate learning process effectively, while providing an engaging and motivating experience [2].

Much research suggests that education in the information age should be technology-enhanced so that to promote learning among digital generation [3]. Nowadays, students usually are not attracted by

conventional education methods, and they need to be provided with more engaging, fun and motivating learning experiences. One of the possible technology solutions is educational video games [4]. Hence, their potential for improving learners' engagement have to be understood by educational authorities. In recent years, the trend of gamification (i.e. the use of game elements and techniques in nongame context) has dramatically increased [5]. The process can be viewed as an innovation in education for promoting engaged learning behaviour to enhance students' participation and performance. The game-based learning (GBL) use some game elements - points, scoreboards, badges to stimulate learners' interest and competition while acquiring new knowledge and skills [6].

The findings from many surveys indicate many beneficial aspects of GBL and video games such as improving student engagement and increasing their active work in classrooms; providing a student-centred learning environment and last but not least – facilitating teaching process and strengthening focus on learners [2, 7, 8].

The research in Bulgaria on the potential of gamification, and its effect in a learning context, until now is limited [9]. However, the role of gamification in school education has to be examined. Therefore, a comprehensive survey in schools nationwide has been held in the scope of the scientific project: "Learning data analytics for ICT resource integration in Bulgarian schools" [10]. It explores the current state of the use of innovative technology tools (including educational games) in an educational context and provides insights into the need for gamification for enhancing students' learning. The second survey investigates the potential of educational video game mazes for teaching as a part of the project APOGEE [11]. Both surveys gather quantitative and qualitative data related to the application of computer games in school education in Bulgaria. Further, they enable to assess the essential issues and provide a thorough understanding of the teachers' and students views on the considered questions. The current paper focuses on presenting findings from these surveys concerning GBL. Particularly, it addresses teachers' and student opinions on the use of educational video games in schools and especially in teaching history.

2 BACKGROUND WORKS

Games as a teaching tool have long been present in educational approaches. Initially, traditional games have been part of human growth and contribute to gaining experience through non-formal training. Nowadays, traditional games turn into digital and further into serious games that tend to be used more and more widely in many areas of our digital society. Much research points out a positive influence of GBL on students. They can learn easier while being attracted and engaged in educational content during playing and having fun [5]. Except for learning, digital games can be a tool for a formative assessment in teachers' practices as is presented in [6, 12]. The innovative approach to GBL is smart adaptive educational games that offer some adaptation to the players' performance [13].

2.1 Games in School Education

At an international scale, back in 2002-2003, an informal study explores the practice of using a computer and video games in schools and findings were indicative [2]: Digital games used in the classroom are usually educational, unlike "pure" entertainment games. Computer games prevail, though some schools also use console video games mainly for fun or as a reward for good behaviour. Simple simulation games are the most commonly used (e.g., Sim City and Roller Coaster Tycoon). Generally, educational video games are more often used in the US, Europe and Australia, while in the UK these games are practiced experimentally or as part of research projects.

Examination of opinions of both in-service and school teachers regarding games that can be beside for fun and also a training tool that provokes students' interest by immersing in a particular knowledge area traces the game's use and impact on the learning process [14]. The findings show that GBL is a valuable approach to bring students into classrooms and to motivate them to learn through modern technologies. However, only less than half of respondents rely on games in teaching, while the majority prefers to use them just in the appropriate situations because of their apparent beneficial impact on learners. The teachers think that games should not be a primary learning approach but a reward for a well-done task and sometimes a demonstration of more complex subjects, as well as a training resource for pupils with special educational needs.

2.2 Games for Teaching History

Usually, traditional lessons in history are hard and boring for today's students, so they are not interested in the subject matter. Thus, the use of educational video games in teaching can boost the interest in history subject. The research proposes a model for the design and development of a methodology for GBL aimed at this topic [15]. The authors point out that interactive digital games can foster the learning process, especially among young learners. The similar approach for design, development, implementation, and evaluation of digital games is offered in [16].

Another study indicates three significant outcomes related to the use of the educational video game "Making History" to teach lessons about World War II in high schools [17]. It proves that games can improve student engagement and increase activeness; they can be a student-centred learning environment; they can effectively be used if facilitate teachers and allow improved focusing on the learning process.

Learning games can be a form of assessment of the understanding of a historical period, by tasks that require to bring together the different parts that form events [18]. The game, designed on the Unity 3D platform, is targeted at elementary school pupils, who find the necessary built-in information about the life and significant facts related to historical events.

2.3 Games for Teaching History in Bulgaria

An empirical research provides valuable guides on how to practice game-based teaching by adaption of existing commercial video games for the educational context [19]. These suggestions can show the way how the following Bulgarian historical computer games, although not developed with education in mind, to be also used for teaching purpose. Examples of the best ones, with skilfully intertwine historical facts and events in the plot and storytelling are the followings: *Knights of Honour* – an in-depth strategy evolving into a historically authentic Medieval Europe. The player immerses into socio-economic life of a chosen kingdom. *Tzar: The Burden of the Crown* – strategy games with an original fantasy world based on actual historical facts. *Khan Wars* – competitive strategy game with an immersion in medieval world where the player chooses between many different options, and then, in the midst of historical events and facts, is fighting to defend justice in the kingdom.

A specially developed educational game with levels of knowledge dedicated to history of Bulgaria is a free web-based game *Thracian treasure*. Its goal is to reveal the location, type and creation time of the ten most famous Thracian treasures found on our lands [20]. Another educational game – *Bulgarian Kings* focuses on a chronological arrangement of portrays of the most famous kings from the first and second Bulgarian kingdom [21]. Despite being rather simple, these games can be useful as an educational resource in teaching history in primary and middle schools. Furthermore, educational games focused on mother language, national history, ethnology or geography, besides for training, play an essential role also in the development of young people. Recent studies show that such games contribute to building a common culture and national identity [22, 23].

3 METHODOLOGY

The current study is based on two surveys that recently have been held in Bulgarian schools. In the first one, conducted during the school year 2017/ 2018, more than 1600 teachers and about 9000 students share their viewpoints on the implementation of ICT resources and educational games in schools [10]. It is an extensive survey, entirely held online. The design of questionnaires is focused both on teachers and students. For collecting a more selective data four different questionnaires aimed at teachers and primary, middle and secondary school pupils are developed. The spread of survey covers all regions of the country, so this fact and having in mind a large number of participants show that it is somewhat nationally representative. Thus, the findings reveal a credible picture of the examined issues. This paper presents some of the survey results concerning the use of educational games in the teaching process.

The second survey, held in the first half of 2018 in the scope of project APOGEE, explores especially the use of educational video games in teaching context [11]. The total number of respondents are 208 teachers and 665 students from schools across the country. The object of this survey is the use of educational video games in school education in Bulgaria. In particular, it examines two main issues: first – the needs and preferences of the target users (teachers and students) concerning several attributes of specific types of educational video games, and second – the teachers' requirements to the platform for the construction and automatic generation of educational maze games. The survey

comprises two online quantitative questionnaires, purposely designed regarding abovementioned issues and targeted at teachers and students. The researchers approbate the initial set of questions on a seminar for presenting the first prototype of an educational maze game “Asenevtsi”. After the demonstration, the structured interviews and discussions with teachers help researchers to make the final version of the survey. The teachers’ suggestions and valuable ideas for game content, didactic tasks and possible application in various pedagogical contexts are useful directions in the process of design and development of the next version of the game.

4 RESULTS

This paper presents findings of both surveys exploring the actual need and use of educational games in teaching social sciences and in particular history subject in Bulgarian schools. This issue is examined both from teachers and students’ points of view.

4.1 Need for Games aimed in Teaching History

In particular, this study analyses the opinions of teachers in history (57) that participate in the first survey. The review of findings begins with the necessary conditions for the application of GBL – the availability of computers and educational video games. Figure 1 presents the technological tools used in history lessons.

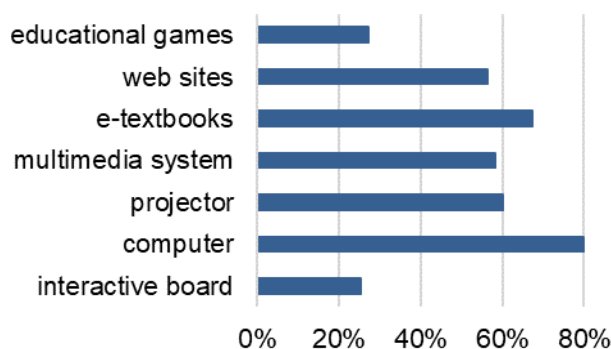


Figure 1 Use of technology tools in teaching history

Majority of teachers use computers and digital version of textbooks, about 60% also rely on projectors, multimedia, and websites to illustrate the learning material. Only 27% of respondents practice GBL by using both computer and traditional games. Nevertheless, the availability of computers in classrooms is a prerequisite for more often involving educational video games. The survey also reveals the views of history teachers on the appropriate age for introducing educational games in teaching practice. According to a quarter of respondents, it should be in preschool age, and for nearly half – at primary school.

Predominantly, history teachers don't usually practice GBL. Figure 2 a) shows that only a few of them (13%) use educational games very often (almost in each lesson) or often (ones per week). It should be mentioned that about a third of respondents did not answer, probably they did not know the concept of teaching history through games. Notwithstanding history teachers relatively rarely use educational games, more than half of them consider games as extremely (29%) or very useful (22%) for the learning process (Figure 2 b). Despite this, a third of teachers rarely use educational games and a quarter even has almost never been used such. The reasons for these findings are multiple – the main ones are lack of computer equipment, the need for teachers’ training and, last but not least, the shortage of appropriate games, designed for learning. According to the comments of respondents, a significant factor for successful gamification of the learning process appears to be the plot and the content of the education games. They have to correspond to the learning content and also to match the sequence of the lessons and include all the topics on a given subject. The benefits of games can increase if there is functionality for providing additional information to the more interested students.

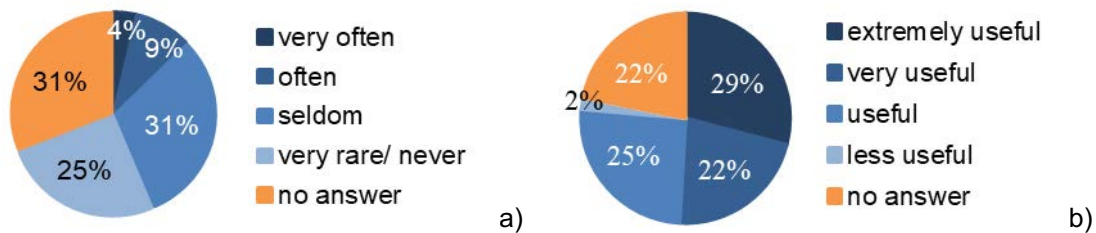


Figure 2. Teachers view: use frequency (a) and usefulness (b) of educational games in history

Another issue explored is whether it is likely, the history teachers to join in the process of development of e-learning resources or educational games. Only 5% have already been involved in such activity, while nearly equal are those who responded positively (46%) and negatively (49%). The most often reasons cited are lack of time or technology skills needed. The survey findings show that only a few history teachers (9%) can create learning games [9]. Nevertheless, teachers relatively high self-assess their competence to use modern technology tools in a teaching context. Only 4% admit not having any ICT skills, while the above half have some skills, but not enough to create by themselves computer resources or games. However, 23% of respondents have very-good and 21% even excellent ICT skills, so it is highly likely to be involved in the development of educational games.

In a parallel questionnaire, students in the middle schools share their opinions on the use of new technologies in classrooms. Teenagers appreciate themselves with significantly higher ICT skills than their teachers. About 36% assert to have excellent and 43% very good computer literacy. Most of the 5-7 grade students (61%) that participated in the survey admit using very rarely (1 or 2 times a year) or never educational games in history lessons. Only 15% of respondents play at least once a month, and 13% - almost every week. Very few (11%) are those who play such games very often.

4.2 Educational Video Games in History

4.2.1 Project APOGEE

The APOGEE project aims at the creation of an open software platform for construction and automatic generation of smart adaptive player-centric educational video games by teachers without programming skills. Further, it will be validated by the creation of game prototypes in the context of Bulgarian history and their testing in classroom teaching. The software development platform APOGEE is based on the Maze Builder tool in Unity 3D platform, intended for the creation of serious games. The purpose of the first prototype of educational maze game “Asenevtsi”, presenting the medieval history of Bulgaria, is to demonstrate how complex learning matter and facts can be interpreted through several built-in didactic mini-games in a fun environment (Figure 3). The game consists of different rooms, which have tasks related to the particular historical context. Thus, the game offers learning activities and delivers educational content, during the gameplay. A demonstrative video [24] of the game, as well as free web-based version of the educational maze game “Asenevtsi” is available at the project’s site [11].

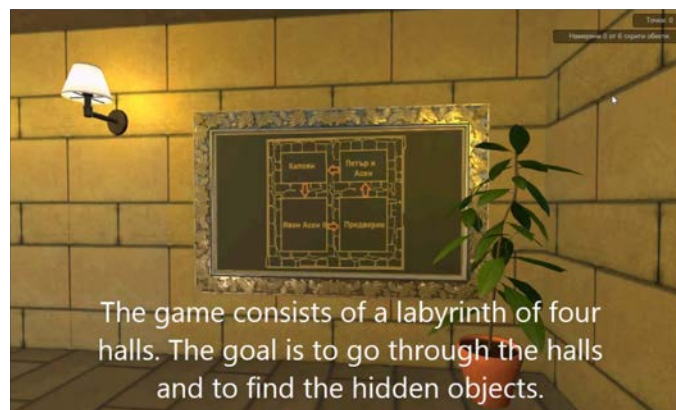


Figure 3. Screenshot of the game “Asenevtsi”.

4.2.2 Survey's findings

This section presents in brief, some of the survey findings related to the analysis and comparison of the answers of target groups of students and teachers on several common questions. Reported here are mainly the results concerning 64 (30.8%) of responded teachers that teach history or in primary school, as the latter usually teach all subjects, including those related to history at early school years. The target group students from primary and middle school (up to 15 years old) are 357 (54%). The age distribution of the considered group of students is as follows: up to 12 years old – 8%, 13 years old – 9%, 14 years old – 33% and 50% – 15 years old. The average age is $M = 14.18$ years ($SD = 1.28$). The number of boys and girls is almost equal, respectively 179 and 178. The average school mark is $M = 4.88$ on a six-point scale where 6 is excellent. About a half (48%) of these students play games up to one hour per week, while the others nearly equally play 2-6 hours or more than 7 hours. The profile of students indicates that both girls and boys like playing games, yet the majority of girls play only up to an hour per week, while the opposite – a half of boys spend 7 and more hours per week entertaining themselves with computer games. Thus, more or less, computer games are part of the daily routine of students, hence their natural aptitude for playing can be more meaningful if they are provided with appropriate educational games.

Above half of the students answer "definitely yes" and "rather yes" on the question if educational games would help them to learn. Languages and history are among the subjects where students think that GBL would be most beneficial (Figure 4). This finding shows the potential for widespread employment of educational games, as the digital generation is ready to accept this new learning tool.

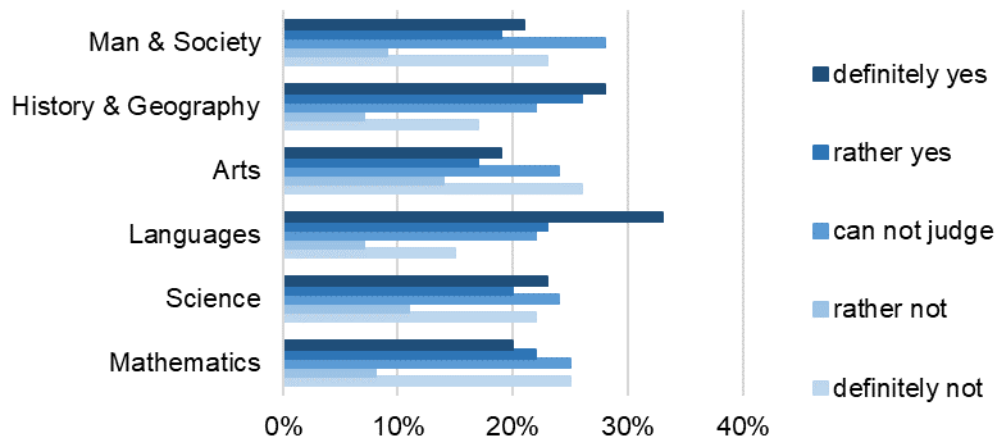


Figure 4. Students view: Which learning subjects would help you the educational games?

The survey shows that students rarely play educational games both at home or at school. GBL is still not the usual case, especially in the history-related subjects (Figure 5). The majority has never been learning by playing such games. This finding asserts the need for engaging learning resources.

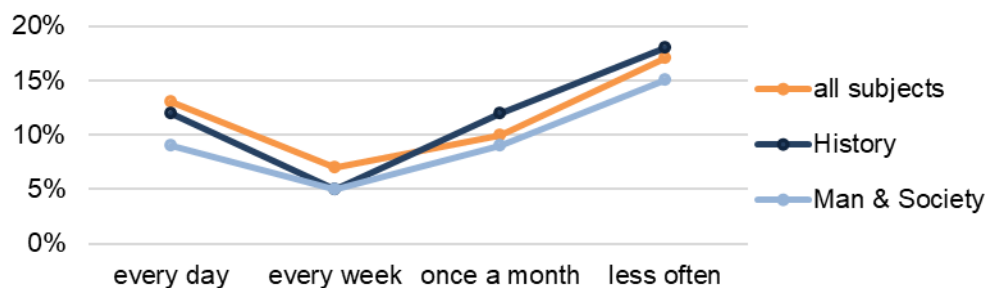


Figure 5. Students view: Frequency of playing educational games

One of the essential factors for applying GBL is the teachers' willingness to practice it. Thus, the question "Do you use or plan to use educational video games in the classroom?" reveals teachers' attitude. Only 27% of teachers have already some experience with educational video games. Still more than half of respondents (62%) have not tried such resources, but the hopeful prospect is that they are planning to do this. Thus, the majority of teachers are ready to practice GBL, if there are

necessary conditions. Only 11% of teachers that are surveyed neither use nor plan to use games in their lessons.

Table 1 compares the statistical parameters of the answers of target respondents concerning the suitability of educational video games for the teaching-learning process in different school subjects. A five-point Likert scale is used to measure students' and teachers' viewpoints (from 5 – “definitely yes” to 1 – “definitely not”). The mean values of the answers are between 2.88 and 3.54 for the students and between 3.78 and 3.92 for the teachers. The differences vary and are approximately half of a point for the social sciences (including history) and 0.85 for the mathematics. Thus, the differences between the mean values are statistically significant as T-tests return p-value less than 0.05 (except those concerning languages). Hence, teachers have higher expectations than students about the possible advantages of teaching through educational games.

Table 1. Appropriateness of educational video games for teaching-learning process in different school subjects.

Statistics Subjects	Students (N = 357)			Teachers (N=64)			Difference	
	M	SD	SE	M	SD	SE	ΔM	p
Mathematics	3.0476	1.4427	0.0787	3.9032	0.8629	0.1079	0.8556	0,0000
Sciences	3.1108	1.4467	0.0792	3.8491	0.8637	0.1080	0.7383	0,0000
Languages	3.5430	1.3905	0.0757	3.7857	0.8886	0.1111	0.2427	0,0878
Social sciences	3.4125	1.3991	0.0762	3.9107	0.8796	0.1100	0.4982	0,0006

Table 2 gives a comparison of statistic parameters of students' and teachers viewpoints to different aspects of the learning process that are influenced positively by educational video games. Again, the five-point Likert scale is used to measure respondents' opinions to the following statement “Video games offer the learning opportunities and are an effective means of supporting the considered processes”. Students' answers range between 3.00 and 3.42, while teachers' ones are between 3.45 and 4.07. The differences vary significantly – from 0.21 to 0.82 that is an indication of a different appreciation of target respondents on the value and expected impact of GBL. For both groups, the motivation effect on learners has the highest assessment, while the opportunity for controlling the learning process receives the lowest evaluation. T-tests return p-value less than 0.05 for the most of considered aspects except the “development of critical thinking”, so these differences between the mean values are statistically significant. As a whole, teachers seem to be more optimistic about the potential benefits of educational games than students.

Table 2. Learning aspects that are effectively influenced by video games.

Statistics Aspects	Students (N = 357)			Teachers (N=64)			Difference	
	M	SD	SE	M	SD	SE	ΔM	p
Experimenting with knowledge capturing	3.1826	1.3951	0.0738	3.6774	1.0980	0.1373	0.4948	0,0023
Controlling the learning process	3.0058	1.3508	0.0715	3.4500	1.1992	0.1499	0.4442	0,0111
Experiential learning	3.2536	1.3300	0.0704	4.0781	0.9969	0.1246	0.8245	0,0000
Interacting with other students	3.3808	1.3326	0.0705	3.8548	0.9892	0.1237	0.4740	0,0014
Developing critical thinking	3.3988	1.3501	0.0715	3.6129	1.1359	0.1420	0.2141	0,1888
Motivating learners	3.4232	1.4226	0.0753	4.0794	1.0519	0.1315	0.6562	0,0000

5 CONCLUSIONS

The presented findings concern the process of application of game-based learning and the identification of the issues related to the user needs for educational video games for teaching history. The research provides some valuable findings while at the same time it is a foundation for further exploration in the area of GBL for game practitioners and designers. Although teachers are already aware of the impact of games on the majority of students, still very few educators use games in classrooms often. It seems that there is a considerable reluctance to practice game-based teaching. In addition to the shortage of games with an educational purpose, one of the reasons is that usually most of the existing games are developed not with education in mind. Furthermore, there are also a number of obstacles pointed out in the surveys' comments by teachers who really want to practice GBL in classrooms. These include inadequate technology equipment, lack of appropriate games corresponding to the educational goals, lack of methodological resources and, last but not least, insufficient time in lessons. Thus, teachers prefer to use games in extra curriculum activities, in after-school lessons or just for having fun for students. Both teachers and students express quite a positive attitude to educational games in the survey, which indicates the need for more educational video games. Moreover, it is a little bit surprising that teachers appreciate the potential positive effect of video games on students at a higher level than the students themselves.

The demonstration of the prototype of a maze game on history topic before filling the questionnaire in the scope of project APOGEE brings deeper insight to the respondents. Thus, their answers are more focused and comprehensive and give a valuable understanding that will be taken into account further in the process of developing the next prototype of the game. Based on the impressions of the game "Asenevtsi", teachers comment that educational maze games are appropriate for presentation of boring historical facts and learning content in an engaging and entertaining way. Hence, such games have the potential to keep students interested and stimulate learning.

Generally, the teachers express more encouraging evaluations than the students concerning the benefits that can be gained by integration of educational video games in classroom teaching. However, a majority of teenagers are familiar with computer games, because playing is a typical part of their daily routine. Hence, this fact can be an indicator of students' predisposition for accepting educational games as an efficient means that make the process of learning easy and fun.

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