Thesis Collection

for

Péter-Szabó Richárd

„Why so serious?"

Serious Games in the Field of Education

Ph.D. thesis

Thesis leader:

Dr. Bokor Tamás
Associate Professor

Budapest, 2023

Department of Communication and Media Science

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1. Research Background and Rationale for the Topic

1.1. Introduction

Jane McGonigal, American game designer and author of Reality Is Broken, is one of the biggest and most acknowledged advocate of using videogames beyond entertainment. In her book (McGonigal, 2012), she argues that video games can be used to address and solve real-world problems. According to her, the positive emotions experienced in video games, the motivation of players, the social skills they develop in the world of games or the high level of collaborative activities, can be translated into solving real problems such as climate change, poverty, hunger, etc. (Zetter, 2010). All this is based on the enormous popularity of video games. According to McGonigal, an average young person spend tens of thousands of hours playing videogames by the time they reach the age of 21. According to Malcolm Gladwell, author of The Exceptionalists, that's enough time to become proficient at something (Gladwell, 2020), leaving around 3 billion gamers (Clement, 2021) who are the best at what they do.

Considering the above, the question is: how can the potential of videogames be used to benefit the real world? Many researchers have been trying to answer this question, and over the years two major lines of research have emerged: the using of serious games, which means using video games as tools, and gamification, which uses only specific elements of video games. What these two fields have in common is the games themselves and the recognition that they are not just substitutes or opportunities to escape from the real world and to spend useless but entertaining time, but value-creating activities that can have a positive impact on the real world.

Video games have huge potential. There are three billion players worldwide and the number continues to grow. Moreover, a number of studies have already shown that the average age of gamers is not the commonly believed under 20, but well over 30 (Cabeza-Ramírez et al., 2020; ESA, 2021; Yanev, 2022).

The aim of the current study is to highlight the opportunities of videogames and to change the perception of said games in a positive direction and once and for all breaking out of years of harmful habits and the cloister of useless pastimes. I've been playing offline and online games for as long as I can remember, and that enthusiasm hasn't waned to this day. In

my opinion, a playful worldview is a way of being that, by mastering and using it, we can lead our world towards a better vision of the future, where everyone can stay young forever.

The aim of my research is to prove that, as in so many areas, the potential of video games can be effectively harnessed in the field of education, which is close to my work. To this end, I created the video game "*1848*", based on existing research and guidelines, to support the training of young people in history education in Hungary. The main focus of the current thesis is on young people and teachers currently involved in secondary education. The former age group is of particular importance, as I believe they are the ones most affected by technological innovations, and as a teacher I am also driven by a personal interest in understanding their educational needs and opportunities. As for teachers, there is no doubt that without them, as the driving force behind public and secondary education, change cannot be achieved. I believe that our future lies in games, especially video games, and that they have the potential to achieve significant results in many areas, so it would be a shame to use them purely for entertainment.

1.2. The Challenges of History Education in the 21st Century

Like many participants in the educational environment, the field of history-teaching has not escaped the digital paradigm shift brought to the fore by the 2020 coronavirus pandemic, and nowadays history didactics is facing a number of challenges. According to the National Core Curriculum, the aim of teaching and learning history is "to familiarise pupils with the historical facts, characters, events, histories and processes that are recognised as the most important in history and tradition, and to make them aware of their national identity [...]" (Education Office, 2020). For example, in "learning history, the ethical and responsible use of digital tools develops the student's information management and processing skills, which also helps to develop and deepen his/her analytical and reflective thinking, which includes checking the information acquired and examining its credibility."

The changes of the modern era are well illustrated by new approaches to history teaching that focus on experiential and activity-based, discovery and inquiry-based teaching. This kind of approach is very useful because, in contrast to the traditional 'rote' approach, it focuses on the students' experience of the task as a success, accompanied by a sense of flow (Kaposi, 2020). The differences between traditional and modern history teaching are illustrated in the table below:

Table 1: Comparison of traditional and 21st century teaching-learning

Topics	Traditional	21st Century
Objectives	Strengthening national identity and building civic awareness	Processing the common cultural code system, preparing for active citizenship
Content	The presentation of the overall events of universal and Hungarian history	History of civilisation, stories, themes and phenomena relevant to global issues and citizenship education
Structure	A chronological structure, a comprehensive approach and a process-oriented - "processological" approach	Problem-focused, "in-depth", research- and experience-based, differentiated processing based on documents
Focus	Teaching facts, figures, concepts, textbook texts	Developing knowledge acquisition, processing and communication skills
Viewpoint	Providing centrally agreed explanations and conclusions from one point of view	Multi-perspective, developing critical thinking by processing different explanations
Focus of development	Developing reproductive skills	Developing productive and creative skills
Focus of activities	Teacher presentation, visual demonstration, presentation	Varied and creative learning activities, interactivity, differentiation
Methods of classwork	Individual processing and typically competitive teaching	Collaborative methods (projects, problem solving, group work, etc.)
Evaluation I.	Intermittent and typically summative	Ongoing and typically formative
Evaluation II.	Oral exams, written tests, essays	Presentations, projects, problem-solving- and competence-oriented tasks

1. Source: (Kaposi, 2020)

Without going deeper into the didactical issues of history (which would lead far from the aim of the present dissertation), it is worth observing how the issues of serious games, the new trends in history didactics and the requirements and guidelines of the NAT correlate with each other in the teaching and learning of history. A history-centred educational game, such as the 1848 game presented below, both develops and develops students' ICT skills, their ability to process resources independently, and their competences related to empathy, interpretation and critical analysis. In addition, by taking advantage of the flow experience

provided by the game, students are more likely to see independent problem solving as a success rather than a constraint.

2. Method

My hypothesis is that a serious game, with a focus on education and knowledge transfer, can have a positive impact on students' learning processes. For the research, I created a self-developed video game entitled 1848 and conducted two questionnaire surveys to assess the selected students' prior knowledge and to measure the change in their knowledge after their encounter with the game.

1848 is a self-developed video game inspired by the popular Adventure, Game, Risk books of the 80s and 90s. The program is a text-based adventure game where players play the role of Sándor Petőfi and relive the events of 15 March 1848. During the game, users are put in different decision situations where they have the opportunity to choose between historically true and false decisions. However, if the wrong answer is given, the game does not end, but the story continues according to the decision.

Of course, as the game is designed for educational purposes, there is no possibility to wander too far in the flow of events and change history. The program will always steer students back in the right direction, and occasionally, if they make the wrong choice at a critical juncture (for example, taking up arms instead of peaceful solutions), the game will pause, clearly indicate the severity of the error, and then put the player back in front of the decision to try again.

In 1848, in addition to the text-based history, there are also logic exercises where players are assisted by authentic sources in history books. Such tasks include marking the 12 points, putting the verses of the National Song in order or identifying the parts of the printing press. Well-made, historically accurate decisions and solved logic tasks will earn the player new medals, which also serve as the game's point system.

During the game, users' results are saved to an external database for analysis. At the end of the game, players will also receive feedback on their own results, with a more detailed explanation of the historical reasons behind their decisions. The game is accompanied by a website for teachers and students, where students' activity and results can be tracked by educational institution by registering. The website also provides useful help on how to install and run the game.

The two questionnaires (pre-game and post-game) were structured around the three layers of the game (text, character, setting). The first part asked about the events of 15 March, while the second part asked to recognise the historical figures from the pictures provided, and the third part asked about the locations. The first questionnaire also included questions about students' attitudes towards video games, while the second questionnaire was specifically about 1848.

The game was first tested in a pilot study. Only data where the student completed the pre- and post-game questionnaire in full and played the game at least once were included in the analysis of results. Based on the results and feedback from the pilot research, several aspects of the game were modified (instant feedback, help, time limit skip button, etc.).

In the main research, which is the backbone of the dissertation, 1848 was tested in a similar way to the pilot research in the 11th and 12th grades of a secondary school specialising in information technology and in the 12th grade of a history department of an elite secondary school. A year earlier, the students had already learned about the events of 15 March 1848, but not in as much detail as the game depicts. In the first week, the students completed a pre-assessment questionnaire and were shown the game. They registered on the web interface, which also guaranteed access to the game. In the second week, they played the game for 45 minutes in a double lesson and in the third week they completed the post-game questionnaire.

3. Results

3.1. High School Faculty – 12th Grade

In total, 19 students participated in the first week. However, due to the epidemiological situation in 2021, by the end of the third week, a total of 10 valid results were obtained due to absenteeism. Valid results are those students who have fully completed both questionnaires and played the game at least once. According to the first questionnaire, 31.5% of the responding faculty students play video games several times a week and 26.3% never play. Among those who choose this type of recreation, the most frequently encountered game genres are action-adventure, racing, logic, and strategy games.

The first part of the questionnaire was designed to assess knowledge of the game and the events of 15 March. Looking at the ten valid answers, an average increase of 40.5% in knowledge was observed.

Examining the results, it can be observed that in all but one case the results improved. It is interesting to note that in this one case, it was the question of going to the censor that received an incorrect answer, especially considering that previously this question had received good answers in 10 out of 10 cases. This could be due to inattention when filling in the questionnaire. For the other answers, the largest increase was for questions that had previously received very few good answers. For example, the question of why the young people wanted to act on Wednesday or whether they let more experienced and more peaceful politicians take the lead in the afternoon shows a 90% change in the positive direction.

The second part of the questionnaire, the second layer of the game, focused on portraits of characters swimming in from the side. These images are virtual, hand-drawn versions of the original portraits found in real life. Respondents were asked to recognise the original portraits as they had only seen them redrawn in the game.

The last part of the questionnaire focused on the third layer of the game, the background. The average increase here was 21.8%. In contrast to the results of the 15 March player recognition, a number of negative changes were also observed here. Such changes were seen for the National Museum (-20%), the Ship Bridge (-10%) and Vörösmarty Square (-10%). However, there were also a number of buildings that students did not recognise at all and successfully identified after the game, such as the Medical University (90%), the City Hall (60%) and the Council of the Governor's Office (50%). The National Theatre was recognised by all regardless of the game.

In the second questionnaire, students' opinions of the game were measured using a five-point Likert scale. The results showed that the majority of students liked the game about 15 March 1848 (4.27) and would find it useful if it were part of the curriculum (4.00). However, they admitted that after a week they had a medium recall of the game (3.73), but felt that the game helped them to learn the material (4.27). The responses also show that students are unlikely to spend their free time playing the game at home (3.73). Conversely, if the game offered a more cinematic experience, more in line with today's needs, they would be more likely to play it at home (4.09).

3.2. Secondary School 11th Grade

Initially, 31 pupils from the 11th grade of the vocational high school signed up for the game, but due to the epidemic situation, only 20 participants were included in the research.

The number of valid responses was also 20, with all students present throughout, completing the two questionnaires and playing the game. The majority of the students in the survey play video games every day, or at least several times a week. The most popular genres were action-adventure, FPS and car/racing games.

Regarding the questions about the events, the percentage of good answers from students increased by 22% after the encounter with the game. Negative changes were observed in two cases. Overall, the biggest change was for questions that were not common facts, such as the anecdote about why the youth wanted to act on March 15th or the slap in the face of the teacher who was being a nuisance at the medical school.

The second section of the questionnaire, which tested the recognition of the real shape of the characters in the game, showed an average improvement of 1%, which is not considered a significant result. Before the game, there were no characters other than Petőf that the majority recognised and this did not change after the game. In none of the cases did the change exceed 20% and the proportion of good answers was negative in 4 out of 11 cases.

The average increase for locations is 4%, which is also not a significant change. Prior to the game, the vast majority of respondents confidently identified the Pilvax café, the Landerer printing house, the National Museum, the Ship Bridge and the National Theatre. After the game, the same venues received the most positive responses, but it is important to point out that the Landerer Printing House, the Ship's Bridge and the National Museum also showed a negative change.

The majority of students' perceptions of the game showed that they liked the game about 15 March 1848 (4.2). Most of them would find it useful if it were part of the curriculum (4.55), but they admit that they do not remember much of what happened in the game (3.35) and are not sure that it helped them to learn the material (3.9). If the game offered a film-like experience, they would be likely to play it on their own (4.35), even at home (4.1).

3.3. Secondary School 12th Grade

From the 12th grade, originally 14 students signed up for the survey, but only 12 completed the questionnaire to assess their existing knowledge, played the game and completed the second questionnaire, bringing the total number of valid responses to 12.

The answers to the general questions in the first questionnaire show that the vast majority of the respondents play some form of video game every day. Only one student

indicated less than several times a week. Among the preferred categories, story-oriented and action games stand out.

For the questions on events, the percentage of good answers from students increased by 27% after the encounter with the game. A negative change in the number of correct answers was observed in 3 cases. It is interesting to note that one of the biggest changes was in the question "Where did the protesters go after the museum?" with -17%. This question had previously only received correct answers. The biggest positive change was observed in the order of the universities and the events in the morning.

The second section of the questionnaire, which tested the recognition of the real shape of the characters in the game, showed an average improvement of 18%. The most significant changes were observed in the portraits of Gyula Bulyovszky (42%), Lajos Landerer (42%) and Mihály Táncsics (33%). Negative changes were only observed for Pál Nyári (-8%).

The average increase in terms of locations is 21%. The most significant changes were observed at the Council of Governors building (42%), City Hall (33%) and Vörösmarty Square (33%). The Pilvax café was correctly identified by everyone in the second questionnaire. No negative change was observed.

Regarding the questions about the game, the vast majority of students liked the 1848 video game (4.67) and most of them would find it useful if it were part of the formal curriculum (4.42). In contrast, however, students said that they did not really remember what happened in the game (3.42) and that it did not really help them to learn the curriculum (3.58). It is also important to highlight the fact that they would not play the game in its current form on their own (2.83), but would (4.58) if it offered a more modern, film-like effect. In this modern form, they would be more likely to spend even their free time playing the game, regardless of school requirements (3.92).

4. Discussion

Excluding the pilot study, 1848 was tested under research conditions for three groups. However, before summarising the results, it is important to note that a meaningful comparison between the three groups can only be made for the 11th and 12th grades of the vocational secondary school. The main reasons for this are, among others, the different educational systems, the different abilities of the students and the number of hours of history taught. The elite group of upper secondary school pupils study in much more detail and with higher hours

than their upper secondary school counterparts. On the other hand, the faculty group implies a certain interest in the discipline, which is not necessarily the case for vocational students. However, students in a vocational upper secondary school receive the same education from the same teacher.

Looking at the responses to the events of 15 March, it can be seen that the biggest increase in knowledge was in the year 12 faculty group of the elite high school. It can be observed that this group already gave more correct answers than the students of the vocational high school in the first questionnaire, and after the game they gave almost perfect answers. The two groups from the vocational high schools, which study under similar conditions, produced almost identical results for both questionnaires.

In the recognition of portraits of well-known people, the faculty high school group also shows the largest increase in the proportion of good answers. In this area, there is also a noticeable gap between the results of the 11th and 12th year groups of the vocational high school. While the pre-matriculation group shows an increase of around 18%, there is a 1% difference for the year 11 group.

In terms of locations, the faculty group and the 12th grade of the vocational high school showed roughly the same improvement (21.8% - 21.2%), while the 11th grade showed a less significant change (3.7%). It is worth noting that, for the third part of the questionnaire, although the two classes of the vocational upper secondary school had the same proportion of recognition of the sites, there was nevertheless a significant difference in the rate of progress.

Examining the logging system behind the game, it is also clear that it takes students on average 30 minutes to complete the game. Further analysing the ratio between the number of good answers, the time spent in the game and the number of times the game was played, it is also clear that students who achieved the best score in the game (number of tickers) and who played the game more than once achieved better results in completing the follow-up questionnaire than their peers who played the game only once and spent significantly less time on it. The logging data also show that a total of 11 students from the three grades played the game more than once (High School Grade 12: 3, Technical High School Grade 12: 4, Grade 11: 4).

An interesting parallel is that students who achieved more modest results in the game, but repeatedly asked for help using the in-game cocktail stick (in which case points are deducted), also showed an outstanding increase in knowledge when completing the control

questionnaire. The reasons for this positive result may be related to interest (asking for help rather than guessing) and to the examination of resources.

The results also show that the emphasis of the three educational layers in the game (text, characters, background images/scenes) is directly proportional to the number of correct answers. Notably, students have the most knowledge about the events, while they recognise the famous people less and can barely identify the locations, with the exception of Pilvax. A look at the wrong answers from Year 12 in the vocational secondary school concerning events suggests that the wrong answer is likely to be ticked due to inattention or guessing. Indeed, one question, which offered the choice between arming or peaceful demonstration, was initially correct, but subsequently received two wrong answers, while the other two questions (Who conducted the theatre and What did Petőfi and Jókai do at the universities?) had only one answer different from the initial results.

Overall, taking the above results into account, it can be seen that 1848 can successfully broaden students' knowledge of the events of 15 March. Although there were several comments that the game would be more effective in a modern format, the results indicate that a video game based on outdated mechanics can make a difference, despite the lack of 3D surroundings and the fact that students admitted that they would not play the game at home.

It can be seen that 1848, based on Bartle's model, favours the achievers, a behaviour that is typical, with a slight shift, of the behaviour of students in secondary education (achieving the best mark). In the case of the game, in order to achieve the maximum score, one has to be both fast and accurate. Wrong answers or too much time spent on puzzles will result in a deduction of points. The various mechanics are also subject to the player's performance. The main motivational goal here is to complete the game, with minimal internal competition provided by the existence of a school leaderboard. And the Yee model of immerge is provided by the graphics, characters, wording and storytelling mode that allows the impersonation of Petőfi. From the perspective of the F-model, it can also be concluded that all available game mechanics favour explorer-type players, which can also be concluded within the framework of the BrainHex model. The eight driving forces of the Octalysis system are also present in the game, whereby the epic goal is to bring the revolution to success, in the skin of Sándor Petőfi. Challenges, creativity and feedback systems are represented by puzzles and making the right decisions. Possession is less emphasised here, and the social driver is only reinforced by the presence of the top list. There is also little emphasis on drives based on scarcity, impatience and curiosity, and on avoidance and loss mechanisms.

Using 1848 as an example, students could try out what it is like to make decisions in the skin of Sándor Petőfi, face the consequences of their decisions, compare their skills with each other, and experience the events of the day of the Revolution. Based on my research and the results of the test classes, I believe that even such a limited game can make a positive difference.

5. Limitations

The research has several limitations. One of the most important of these is that the current research only measures the short-term impact of 1848. Although the students did not get the right answers after completing the first questionnaire and presumably did not look it up on their own (which was an explicit request), only one week elapsed between completing the second questionnaire and interacting with the game.

The next limitation is the sampling. Only students who had already studied the 1848 curriculum were included in the study, and there is a clear difference between students in secondary schools and those in vocational schools. It is also important to underline the fact that the sampling was carried out exclusively in the context of secondary education, using one secondary school for IT and one secondary school.In the future, a more comprehensive and accurate picture could be obtained in a longer study by testing the game with several consecutive year groups from the same school, who learn the curriculum under similar conditions (same teacher, curriculum, etc.). Alternatively, the game and its effects could be tested in a professional-university context.

In addition to the above, the game and the research also have a limitation for financial reasons. As the game was not designed for business but specifically for research purposes, it had no budget. As a result, the quality and style of the game is not in line with today's video game trends and falls far short of products such as Assassin's Creed Discovery mode.

There is an additional limitation to the choice of topic. 1848 is a history-centred game, which expands on a well-defined, well-known topic, so the impact it has on the teaching of history can only be measured in terms of the transmission of the historical curriculum, and cannot be applied to other subjects.

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