

Gamification in Education: Implementation of a Digital Escape Room to "Eat Smart Save Your Land" Erasmus+ Project

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Abstract: Covid 19 pandemic forced us to transform our teaching and learning activities so as to fit the online learning. It also has accelerated digital transformation in education and the need to design an effective blended curriculum (synchronous and asynchronous) that takes advantage of the technology and opportunities it offers. Gamification is an innovative learning technique that addresses the need of increasing students' motivation and engagement in an interactive and collaborative way by applying game design elements in an educational environment. Many studies have shown that students learn best when they are also having fun while achieving the learning activity's objectives. With the growing popularity of gamification and the mixed success of its application in educational contexts, the current paper is a case study from our experience through our implementation of the "Eat Smart Save Your Land" Erasmus+ project, aiming to present how escape rooms could be implemented in a learning scenario, helping students assimilate new information and test their knowledge.

Key words: gamification, escape rooms, blended learning

1. Introduction: Gamification in the Educational Process

The technological innovations and development in the 21st century have crucial effects in social, economical and cultural lives of people all over the world. Teaching and learning activities can't be apart from these changes as all individuals from early ages are exposed to technological and digital devices. In this context, it is possible to mention a digital change in the educational area addressing the students who have different learning styles and requirements so as to be active participants of their learning process.

Gamification, which is defined as "using game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning, and solve problems" (Kapp, 2012) is one of the modern trends in education. In addition to presenting learning activities and tasks in a game design, it also improves motivation by giving the students the feeling of being selfdetective of their own learning process. In this respect, gamification can be used as an effective way of pulling the students into new topics with high motivation. According to Mazur-Stommen and Farley (2016), elements of *game mechanics* make players spend so many hours, and even alter daily behaviors "in the home, office, at the store, or on the streets". They state, however, that according to the Institute for the Future, games release our creativity, increase our efforts to express collaboration and enhance our

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ability to learn. To solve the world's most urgent sustainability problems, they state that even 3 billion hours of gameplay a week is not enough to enact all the urgently necessary changes. In the light of this information, it is possible to say that gamification leads to a kind of motivation to understand daily problems and rethink about our current behaviors.

Both the dominance of digital technologies and need for distance education gained more importance together with covid 19 pandemic have some challenges including the lack of motivation, involvement and active learning. According to Ouariachi T. et al. (2020), "Well-designed video games offer new opportunities to engage young people with the issue of climate change and encourage them to think, feel and act in ways that help address the problem". In their research, they proposed a framework with a set of codes about climate change via games. They realized that the students had been involved in three dimensions: "cognitively, emotionally and behaviorally". From their point of view, it is possible to deduce that the issue of climate change can be analyzed via video games and this process has effects on cognitive, emotional and behavioral engagements of the learners.

2. Description of the Teaching Process and Implementation Methodology

In this paper, through an escape room activity designed making use of a genial.ly, the students were exposed to engage in some tasks about the greenhouse effect and global warming in a funny way by completing steps and earning badges. In other words, they increased the ability to question and solve problems. It's an example of gamification in the educational process and consists part of the activities of the second out of nine modules that "Eat Smart Save Your Land" Erasmus+/eTwinning project implements.

After an introduction students were called to take part in two missions in order to achieve a badge. There was a description on how a greenhouse works and students were called to click so as to take part in a spin the wheel quiz. After that they were called to experiment with a greenhouse in a jar and make conclusions. Then they had to watch a video and click so as to be driven to an animation — both related to the greenhouse effect — look closely at this so as to reproduce each step in the next slide, respond correctly to a quiz on wordwall app, and develop their first number of the secret code. Then there's a simulation on the greenhouse effect and students were led to the second mission. They're called to drag elements so as to find a projector, watch a video, read some resources so as to respond correctly in the next tasks. Then there's a new quiz in the form of a video game, so as to achieve a second number. Though one more quiz designed on wordwall, and one more simulation they could achieve the last number of the secret code. Finally, students are called to drag elements so as to find a key, fill the secret code, open the door, and be awarded their badge.

In the beginning the educational process was to be implemented in asynchronous mode so as students to work as teacher independent as possible, and on their pace. Being aware that the majority of students had only a basic knowledge of greenhouse effect, and greenhouse gases, we decided this approach so as students to explore and familiarize themselves with the above concepts in a way that is as unnoticeable as possible. We thought that through their desire to unlock the room, and earn the badge students will be engaged to achieve it. On the other hand the fact that quizzes used in each mission were presented in various forms, simulations, experiments and videos used were interesting, would make them feel more engaged to go on. Finally, the visual-artistic part could also have fascinated the students.

Finally, we realized that some students missed some quizzes as they maybe didn't use the speaker so as to listen to instructions, but they achieved the secret codes and managed to unlock the room and earn the badges. But

that means that we didn't achieve our educational objectives. Thus we decided to design a constructive learning scenario so as to be implemented as blended learning, as research indicates that blended learning increases students' chances of meeting course outcomes compared with fully online and even fully face-to-face courses, by decreasing dropout rates, increasing test scores and increasing motivation on the part of students. In this way we could effectively combine the benefits of traditional instruction and ICT supported learning including both offline learning and online learning (Hancock S. & Wong T., 2012).

There, firstly, students without a teacher present are called to work online, following the link of the escape room in order to take part in the game. We suggested they click on the speaker so as to don't lose instructions and miss tasks, read the resources given, and watch the videos so as to respond correctly to the quizzes. They also were encouraged to take a look at all extra activities presented there so as to have an idea of our next lesson. Then students, during a face to face lesson, are divided into teams of five and take part in the attached "Greenhouse in a jar" experiment. Before starting they make an hypothesis on what will happen and write this at the end of the worksheet. At the end they make a description of observations in a padlet. Then there's a discussion on their observations based on questions and answers. After that students work again online as teacher independent. They are encouraged to investigate how different greenhouse gases affect the temperature on Earth. In order to do that, they make a search on scientific articles. They also are encouraged to simulate on their own by changing all the parameters in the given simulations. Next activity will take place face to face. There students are divided again into teams of five, and are called to experience the same simulations, with different parameters, and make conclusions on how the given changes in the parameters on the simulations, and those they have already practiced on their own, would affect the Earth temperature. They make a discussion in a new padlet based on questions. In the last step students are called to address the greenhouse effect in their school. Firstly they will work alone online, without a teacher present, so as to write an essay on the need to tackle climate change providing some tips so as to reduce our CO_2 footprint. They will post their essay to a board, by using the lino.it application. Then they make use of the postermy wall or canva app so as to design posters or infographics on greenhouse effect. These will be used for our campaign. These will also be peer evaluated in a face to face lesson. There students are called to give constructive feedback to their classmates based on a rubric we had designed together in the beginning of the topic implementation. In this rubric is described in detail how their work will be evaluated (both individual work, and teamwork). Besides these, evaluation will be conducted via the quizzes included in the escape room, observation data that will be collected during the collaborative work, and the rubric (self-evaluation). Students are also called to evaluate the learning scenario. In addition, they give feedback after the gameplay.

3. Conclusions

Gamification is a productive modern approach which has positive improvement on students' cognitive, emotional and behavioral skills. Digital escape rooms can easily and playfully introduce and promote young students to the world of science, utilizing their critical thinking and creativity, and contributing to autonomy in their learning, and skills improvement; as in order to solve the puzzles, students require skills such as searching, observation, correlation, memorization, reasoning, math, reading, and pattern recognition.

The proposed escape room is based on a presentation of the greenhouse effect and worksheets that are based on students' cognitive difficulties and the level of their previous knowledge and experience. Students are given a series of individual and group activities that cover the investigation of the topic we are negotiating, and are asked to explore, to make assumptions, to check their correctness and finally to come to assessments and conclusions. Through the utilization of the material that will be at their disposal, the questions-explanations and the conclusions of each phase will result in the assimilation of the new knowledge which will be evaluated throughout the unit. Overall, this attempt had unexpectedly positive results and it became clear that if game mechanics are aligned to pedagogical approaches there is a discrepancy in perceived and actual learning of content knowledge in recreational escape rooms, helping students to foster knowledge and skills more effectively as while they reach the game goals, they also achieve the educational goals.

Furthermore, implementing these in a blended learning, elements like collaborative learning, unambiguous feedback, and team challenges scaffold the learning process in a better way, while developing teamwork, communication and other general skills. Actually in this way, students also had the chance to practice technology skills by creating digital content (posters) for assignments and there was an increase in student-teacher and student-student interaction through the use of digital communication tools like padlet, and lino.it boards, and face to face discussion. It also gave students another possibility to increase their motivation of learning by providing them a fair, competitive platform during the pandemic which showed the importance of digital learning and teaching techniques. It is also important to note that students gained a positive change about their past behaviors and attitude towards environmental issues which are blended with digital learning techniques. Even though this demonstrative study of escape rooms is not intended to generalize data, we hope to offer new insights for further research.

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Annexes

Learning scenario

https://www.ucl.ac.uk/learning-designer/viewer.php?uri=/personal/aspas1a/designs/fid/728ae303d640b4efd01b0fb155adb0e5e3df1c0 7f1639f8b0096022e88c836b6

Escape room

https://view.genial.ly/602971ec91cb540d5f56b6a6/game-breakout-greenhouse-effect