A GAME-BASED LEARNING DESIGN FOR VIRTUAL FLIPPED CLASSROOMS

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Abstract

Game-based learning and the flipped classroom method are relatively new approaches of engaging university students and enhancing their learning experience. A review of the literature shows that there are important areas that need to be further examined including how students' self-reflection process can be supported in game-based learning and/or flipped classroom environments and the circumstances, under which these approaches are effective. This developmental paper presents a learning design that uses game-based learning and learning analytics to support a flipped classroom that runs fully online. The learning design will be used for the delivery of a Degree Apprenticeship module, offered by a UK Business School. The paper concludes with a brief discussion of the proposed methodology that will be followed to evaluate the learning design.

Keywords: Serious games, flipped classroom, learning analytics, game-based learning

1.0. Introduction

While online tools have long been used to support teaching, their use has now become imperative due to the pandemic restrictions. In order to successfully integrate them in the learning process and offer students an experience that closely resembles to face-to-face teaching, universities have to adopt more flexible teaching models. Among them, flipped classroom could be easily adapted to run fully online, as it requires students to access the learning material (usually video lectures) before the class, so that the class time can be used for learning activities, which consolidate students' learning (Reidsema et al., 2017). Indeed, evidence so far has shown that virtual flipped classrooms are as effective as conventional flipped classrooms (Hew et al., 2020; Lin et al., 2019).

Flipped classroom has been found to facilitate students' engagement, performance and understanding in a university context, but it does not promote further exploration of theories or skills development on its own (Al-Samarraie et al., 2020). This calls for

using additional teaching methods and/or tools to ensure that students are supported throughout their learning process. For example, scholars suggest the use of learning analytics or databases with learning tasks, which are accessible to students to guide the feedback process and the development of their reflective thinking skills in a flipped classroom setting (Shyr & Chen, 2018; Yılmaz, 2020). Gamification also appears to be promising in motivating students and enhancing their performance in flipped classrooms (Huang & Hew, 2018; Sailer & Sailer, 2020); however, little is known about whether serious games can be equally effective in this context.

The current study aims to present a learning design that combines flipped classroom with learning analytics enabled through game-based learning. By doing so, we expect to not only help towards developing a more effective flipped classroom model, but also address some of the research gaps in the game-based learning literature, as discussed below.

2.0. Game-based learning

Game-based learning relies on the use of serious games (i.e. games whose main purpose is not entertainment as such) and can facilitate learning and/or skills development (Erhel & Jamet, 2013). Depending on their use and design, serious games could be effective in motivating students to engage with the learning material and self-assessing their learning, which eventually can result in deeper understanding of the taught concepts and their long-term retention (Aldemir et al., 2018; Erhel & Jamet, 2013). This means that they could potentially work well together with other active learning approaches, which have similar goals, such as Problem Based Learning (PBL), however, further research is needed to understand this interplay.

In the broader area of game-based learning, research is mainly conducted by both educational psychologists and pedagogical researchers, with each group focusing on different aspects of the subject. The research questions that educational psychologists try to answer fall into one of the following categories (Mayer, 2019): a) value-added research, which studies the impact that different gaming elements can have on learning outcomes, b) cognitive consequences research, which focuses on the cognitive skills that learners can improve by playing a game, and c) media comparison research, which examines whether serious games have different effects on

learning compared to traditional learning tools/platforms. Most studies in this field follow an experimental research design, which is the norm in psychology.

Pedagogical researchers on the other hand, are interested in how game-based learning can be effectively used as a teaching tool and integrated in the learning environment. A common research question here is whether game-based learning can be applied into a specific context. For example, scholars have studied game-based learning as a tool for teaching business ethics (Jagger et al., 2016) and business analytics (Elise et al., 2017), primarily employing qualitative methods (e.g. focus groups, participatory workshops) and emphasising on the user experience/perceptions rather than the skills development.

Evaluating serious games is another topic often addressed by pedagogical researchers. For instance, scholars have identified characteristics evaluative research in the area needs to have, such as having a broad scope (i.e. considering the different educational contexts, learning objectives etc.), being triangulated (i.e. using mixed methods), and applying flexible data collection methods (as gameplay can be unpredictable) (Mayer et al., 2014). In terms of quality criteria, factors such as game design, learning outcomes, user's experience, enjoyment, and usefulness can be also used to evaluate a serious game (Calderón & Ruiz, 2015).

Despite the large number of studies in the broader area of game-based learning, there are still important research questions that need to be addressed. First of all, it is essential to understand the boundary conditions of the game-based learning effects, or in other words, to study the learning contexts and the kind of learners, game-based learning is successful (Mayer, 2020). For example, previous research has highlighted the need to include more heterogeneous samples, as there is an indication that age, gaming experience, and attitudes towards gaming may affect the learners' experience with serious games (Carenys & Moya, 2016; Hernández & Moreno, 2019). Secondly, the role of scaffolding (e.g. briefing activities organised by the instructor) in supporting learners' knowledge acquisition and acceptance of serious games (Barzilai & Blau, 2014; Carenys & Moya, 2016) is still unclear. Thirdly, further research is needed to understand students' reflection strategies during game-based learning, as it is unclear when/how it takes place and whether it interrupts the students' gaming/learning experience (Taub et al., 2020).

3.0. The Learning Design

The proposed learning design attempts to combine game-based learning with flipped classroom and Problem Based Learning approaches (Figure 1). The theory of each workshop is available to students on the Learning Management System used for the module (out-of-class activity), in the form of Panopto recordings (i.e. videos). Each workshop starts with students playing the online game (as an in-class activity), which follows the format of a multiple- choice quiz (Figure 2). The goal of this game is for the player (cat avatar) to win the fight against the robot, by answering its questions correctly. The game currently provides both students and the instructor access to the learning analytics collected by the game (i.e. score evolution, engagement with game over the semester, list with wrong answers by student, list with top scorers). This allows students to self-reflect on their progress and the instructor to identify the students that need further guidance/feedback.

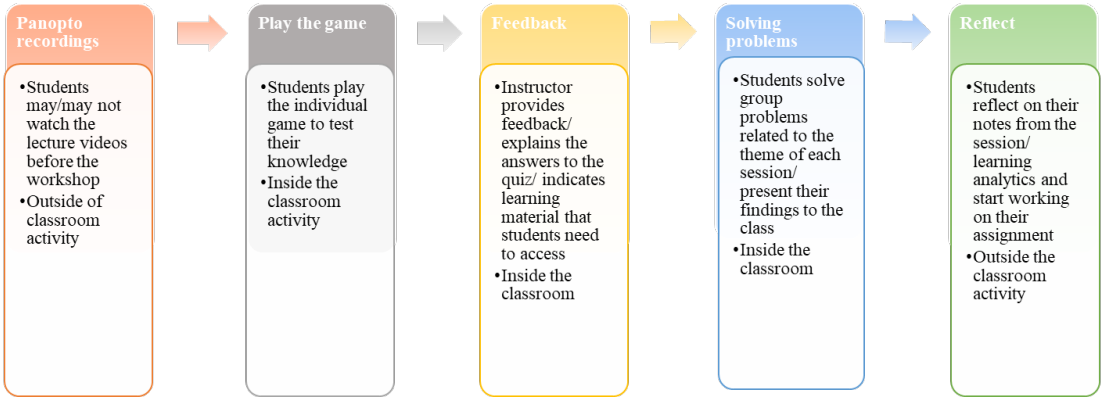

Figure 1. The proposed learning design

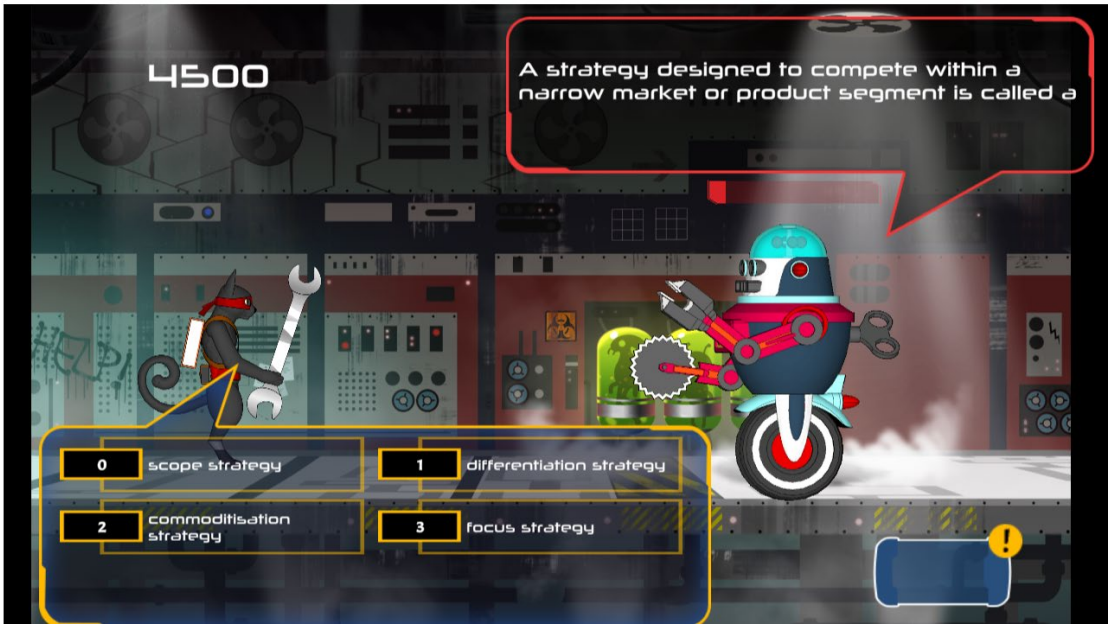

Figure 2. Screenshot from the FLIP2G game

As soon as the game is over, the instructor uses the learning analytics to identify the concepts/theories that students find difficult to understand and explain them further and/or provide guidance about the learning material students have to revise. This means that even students that have not accessed the theory before the workshop can benefit by playing the game as they will receive specific instructions on what they need to access.

Once the class discussion about the correct answers finishes, students are asked to work in teams to solve a problem related to the topic of the workshop (in-class activity). This could be about developing solutions for a case study regarding a real organisation. Students are expected to use the theory of the workshop (which now should have become clearer after playing the game) and search for evidence online (e.g. reports, white papers, statistics) to justify their suggested solution. The workshop finishes with teams' presentations over their suggested solutions and the class discussion/feedback is provided by the instructor.

After the workshop, the students are asked to complete an entry in their online reflective journal (on OneNote), which is accessible by the instructor. The journal includes prompts, which help students reflect on what they have learned, how they can use this knowledge in practice, and whether there are any areas they need to examine further. This opens an additional opportunity for the instructor to provide formative feedback and identify students who need further support.

4.0. Methods

The proposed learning design will be applied to an undergraduate module in the area of Digital Business, offered by a UK business school to Degree Apprenticeship (DA) students in their second year of their studies. Degree Apprenticeship cohorts are much smaller than the average cohort in Business Schools, which makes them ideal for a pilot study. Self-reflection is also essential in DA courses as students are asked to link the theory that they have been taught in the course to their workplace practice. In addition, as DA cohorts consist of students from different age groups, they tend to be more representative of the overall population, and therefore will help examine the boundary conditions of game-based learning, meaningfully contributing into an area, which asks for further study. The choice of the Digital Business module is also important; many of the students in the DA course are digital immigrants that have difficulties in applying the concepts of the module to their practice and using digital technologies for supporting their own learning. Thus, the study will help towards developing an understanding of how these challenges can be overcome.

In order to evaluate the effectiveness of the proposed learning design for DA students, a mixed method approach will be followed. This will consist of a) focus groups at the end of the pilot with students, who will have completed the module, b) analysis of students' reflective journals and c) instructor's reflection based on the learning analytics collected by the online game. The focus groups will be transcribed and analysed following the thematic analysis method. The same technique will be used to analyse students' reflective journals. By using three different sources of data (i.e. focus groups, reflective journals, and learning analytics), we expect that we will be able to triangulate the research findings of our case study.

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