Games based learning environments: A review of potential steps forward for virtual learning

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RESUMO

A Covid-19 forçou os educadores a repensar o ensino à distância online. Não é mais uma mistura abstrata de tecnologias em situações de suporte, mas sim uma necessidade para evitar o encerramento total da educação formal. E essa inevitabilidade expôs várias questões, desde dificuldades técnicas até à configuração e aplicação de ferramentas, e efeitos negativos de curto e longo prazo na aprendizagem derivados da falta de motivação, incapacidade de estudo autónomo, interações sociais inexistentes ou limitadas e extraordinariamente pouco envolvimento e imersão nos conteúdos ministrados. Durante décadas, discutiu-se a possibilidade e o potencial da introdução de videogames como ferramentas de aprendizagem, mas sua implementação deve ser focada, pois géneros diferentes fornecem resultados diferentes. Portanto, consideramos a mecânica e os resultados específicos desejados e o uso de jogos de RPG como um ambiente de aprendizagem baseado em videogame potencial para apoiar o ensino à distância, bem como os possíveis problemas com essa abordagem.

Palavras-chave: Aprendizagem baseada em jogos; Jogos de RPG; Educação a distância; Tecnologia educacional; Jogos educacionais.

ABSTRACT

Covid-19 has forced educators to re-think online distance teaching. It is no longer an abstract mixture of technologies in support situations but rather, a necessity to prevent the complete shutdown of formal education. And that inevitability exposed several issues, from technical difficulties to configuration and application of tools, and short-term and potential long-term negative effects on learning derived from lack of motivation, incapacity for autonomous study, inexistent or limited social interactions and extraordinarily little engagement and immersion in the contents being taught. For decades, the possibility and potential of introducing videogames as learning tools has been discussed, but their implementation should be focused as different genres provide different outcomes. We therefore considered the specific mechanics and outcomes desired and the use of role-playing games as a potential videogame-based learning environment to support distance learning as well as the potential issues with that approach.

Keywords: Game-based learning; Role-playing games; Distance education; Educational technology; Educational games.

1. Introduction

On the 11th of March 2020, the World Health Organization officially declared the Covid-19 a pandemic. To mitigate the effects, countries began closing borders, restrict all forms of travel, and businesses and schools started shutting down to reduce the risk of potential infections.

Closing schools throughout the world meant over 1.700 million students were suddenly forced to study from home which in turn signaled an abrupt interruption of the traditional learning systems. In most countries, the

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school shutdown went on for at least two months and, in most scenarios, there has not been a return to "normal", with temporary shutdowns and reduced hours still affecting students.

Previously, for decades and most notably in developed countries, there have been discussions about the need to create alternatives to traditional models of teaching such as e-learning and virtual learning solutions. Governments and other institutions spent billions of Euros in multiple attempts to virtualize and digitalize schools, contents, tools, and teaching methods. However, when schools were closed, most teachers and school administrators found themselves struggling and were forced into a pragmatic use of classes in public tv channels, traditional learning management systems (LMS), emails and video-conferencing tools (Nicolas Dietrich, 2020)**,** (UN, 2020).

Although it is still soon to identify the full extent of how this is impacting the students, studies have already found concerns with student's physical health (Rundle, Park, Herbstman, Kinsey, & Wang, 2020), with motivation, anxiety and uncertainty, as well as a sudden and unprepared shift to autonomous learning and lack of social interactions leading up to depression, among other mental health problems, especially for those not in higher education (Asanov, Flores, McKenzie, Mensmann, & Schulte, 2020; Golberstein, Wen, & Miller, 2020; Lassoued, Alhendawi, & Bashitialshaaer, 2020; Unger & Meiran, 2020).

A recent study conducted in K12 schools in the US seems to confirm that. Estimations predict that students learning gains were, and will be, lower during the school year, due to the Covid-19 pandemic when compared with typical school years, averaging between 37% to 32% lower in reading and 63% to 50% lower in mathematics (Kuhfeld et al., 2020).

Although the educational technologies have become increasingly important tools to easily share and obtain information, feedback regarding effectiveness as a support system for students in their autonomous study has been less favourable when used with students who still lack the ability to self-organize and deal with isolation (Liaw, 2008; (Markova, Glazkova, & Zaborova, 2017).

To address these issues, some of the tools described above incorporated elements of gamification such as achievements, learning goals, application data such as time spent, exercises completed, and so on.

However, as these applications were built to support and not sustain, those mechanisms could still be insufficient and inadequate in helping young students in their long-term learning processes, overbearing teachers, and parents alike, in their attempts to convey knowledge and explain subjects.

Perhaps the solution lies in videogame-based learning environments (VGLE) instead of traditional or gamified educational technological tools as those have been reported to, in the right conditions, promote motivation, immersion and engagement in learning and other benefits which are much needed at this time.

To understand this issue better, we propose in this paper the identification of major issues affecting distance and online learning, the most significant gaps in dealing with these issues with available educational technologies and what potential and problems exists in VGLE replacing or complementing these systems. We then take a closer look at the genre of Role-Playing Games as a system and a structure that could provide the necessary mechanisms and results to an ideal VGLE that can support distance and autonomous learning.

2. The reality of distance learning usage in schools

Although much advertised as the future of learning, distance or virtual schools still lack the tools and mechanisms to provide the same type of educational results as traditional schools. Several studies have shown mixed or negative results of using fully virtual schools, with even worse results showing when long-term assessments of learning are undertaken (Kuhfeld et al., 2020).

This has become a concern due to the Covid-19 pandemic and for the future of e-learning, as a study conducted in the US identified that 83% of children at school age were using online learning programs provided by their schools during the school's shutdown (Brenan, 2020), while, at the same time reports suggest that only one in five schools follows a rigorous remote learning program (Malkus, 2020) and estimate that students are spending 50% less time studying than before (Gewertz, 2020).

Spending less time studying while being at home could mean students are engaging in other activities. Recent studies show this is highly likely, with videogame and mobile games sales exploding in April and continued to

increase up until now (Epstein, 2020) while videoconferencing software is expected to grow 110% this year (ReportLinker, 2020) and media consumption also soared 215% in the US (Nielsen, 2020).

This context raises the question of 'how can educators provide, to a generation raised on media, educational content with the same interactivity?' which was already placed before in the context of videogames (Squire, Giovanetto, Devane, & Durga, 2005).

Battling against powerful engaging mechanisms, traditional educational technology and other forms of distance learning systems might not be enough to maintain the same levels of motivation, engagement, and information retention rates as traditional school. Although consumption of these technologies has been higher than ever, that might not originate better learning moments for students.

One of the reasons why these issues emerge could be communication difficulties, even when using videoconference complementary software. The departure of the student-teacher face-to-face individual learning moments means the disappearance of an opportunity to when a student is struggling with understanding a question or the subject being studied (Muilenburg & Berge, 2005; Price, Richardson, & Jelfs, 2007).

At the same time, if the teaching materials are presented through asynchronous digital technologies, such as video classes, delayed feedback leads to low interaction, interest, and engagement levels (Karal, Çebİ, & Turgut, 2011).

Additionally, a lack of collaborative and competitive activities involving social interaction has been proven to reduce student motivation and lead to high student dropout rates in online courses (Muilenburg & Berge, 2005). In fact, motivation in online courses has been proven to rise significantly the more complex the level of interplay between individuals and the environment is (Hartnett, St. George, & Dron, 2011), which does not always happen with traditional distance learning tools.

These issues students face when using distance learning tools could lead to lower grades and reduced learning outcomes, which in turn can be aggravated by asking students to spend more time studying from home as it is the case with school shutdowns. That additional time might not be used properly and, without active learning and lack of motivation, could degenerate to procrastination (Chen & Jang, 2010; Sherry, 1995).

3. Recent changes in distance learning tools

These well-known issues with distance and autonomous learning have led technicians and companies worldwide to gradually adopt changes to traditional educational digital tools for distance learning to incorporate gamified and social elements.

LMS have evolved from mere depositories of information with limited visualization capacity to highly advanced websites and apps that allow the student to access information quickly and easily. Most of these platforms not only offer some sort of social interaction, through chat and sometimes audio or video, but also have progressed into gamified LMS. Those can be defined as platforms which, in addition to the traditional LMS functionalities related to education such as manuals, videos, exercises, summaries, support activities and evaluations, have tools that aim at providing learners with feedback, rewards and motivations elements (Hursen & Bas, 2019).

In turn, gamifications – which are typical game mechanics such as badges, leader boards, progress bars, meters, point systems, rewards, and other items, among others – aim at increasing extrinsic motivation, interaction, and fun to the learning experience, therefore mitigating the issues seen above (Al-Azawi, Al-Faliti, & Al-Blushi, 2016).

These attempts seem to produce the desired results as several studies show both in young children and in secondary levels of education (Hursen & Bas, 2019; Lister, 2015).

However, some concerns have not dissipated with the inclusion of gamified elements and, when using gamified LMS, for long term educational purposes. Design problems which can result in a "meaningless gamification" (Nicholson, 2012), mostly due to the time and amount limited effect of rewards and repetition of tasks (Sanmugam, Abdullah, & Zaid, 2014), and the still lower-than-desired engagement and immersive capacity when compared to other media (Kreijns, Kirschner, & Jochems, 2003) are some of those. Additionally, due to their architecture, these systems appear to respond more to the organizational and

instructional side than to the learner and provided limited informal learning opportunities and is being advocated that teaching needs to move past these systems into more self-governed, problem-based and collaborative activities (Dalsgaard, 2006).

4. Games as alternatives to traditional and gamified educational digital tools

Where traditional and gamified digital learning tools might fail, other solutions have emerged over the years to complement and add to the learning experience by offering a more engaging and motivating experience. Among those we can find videogame-based learning environments (VGLE). Having produced a significant amount of research regarding its structure, potential outcomes, and potential uses and applications (Connolly, Boyle, MacArthur, Hainey, & Boyle, 2012; Van Eck, 2006) VGLE appears to have or promote positive impacts in learning (Connolly, Boyle, MacArthur, Hainey, & Boyle, 2012) and long-term knowledge retention which at least matches the levels of traditional school learning environments (Jackson, Dempsey, & McNamara, 2011).

Game-based learning (GBL), a type of game play with defined learning outcomes (Shaffer, 2005), and particularly videogame-based learning environments (VGLE) works by using videogames to play in educational contexts for the purpose of learning and development (Plass, Homer, & Kinzer, 2015). While gamification turns processes, mechanisms, background, usability of a learning process into or partially into a game, VGLE uses the game as part of the learning process (Al-Azawi, Al-Faliti, & Al-Blushi, 2016). To develop a VGLE would therefore be to rely heavily on one or multiple videogames and use those into the teaching of a certain subject or multiple subjects in a classroom.

Those videogames can either be commercially released games like the popular game Civilization (Squire, 2006), modified commercial videogames such as conversion of the game The Sims (Becker, 2007), videogames specifically built using game engines which was the case of Virtual-U (Harasim, 1999), or videogames built from code.

Regarding genre, several different types of videogames have been used and tested in learning scenarios. Each game genre has its advantages and disadvantages, which also varies depending on the subject being presented and the age group which will be playing (Baek, 2008; Connolly, Boyle, MacArthur, Hainey, & Boyle, 2012).

Additionally, the game elements that can be incorporated are multiple, even within a specific game genre. Those elements range from achievements, quests, avatars, social features, multiplayer tools, fixed and/or random rewards, scheduled events, customization, monetization, among others and their effect could also change depending on the context (Plass, Homer, & Kinzer, 2015).

The variety of potential VGLE has thus presented an opportunity compared to other educational technologies, and a challenge at the same time.

On one hand, a videogame presents several advantages compared to gamifying a learning process such as a more immersive visualization experience, flow between actions and other game mechanisms – which are usually hard, if not impossible to apply in most learning software – such as variables, triggers, interaction with non-playable characters, automatic actions and paths, and so on (Pivec, Dziabenko, & Schinnerl, 2003). The fun factor alone appears to be enough to create a positive connection to learning and therefore enhance the study experience (Chang, Liang, Chou, & Lin, 2017).

The adaptation of videogames to focus more on learning mechanisms and passing information to students does not translate into lower desire to play, if it's still fun (Ibrahim, et al., 2018).

However, videogames are usually not made for learning purposes, but rather focus mostly on fun and stress release and their use in education becomes a paradox (Plass, Homer, & Kinzer, 2015). Also, their learning content varies, while some videogames go as far as having mechanisms to display encyclopedias full of game knowledge, others provide features such as books and bits of information in-game which the user pieces together, still others have little or no mechanics that cater to the gathering of information. This lack of a pre-determined structure leads developers and teachers that consider the creation and use of VGLE to struggle with their adoption in the classroom (Baek, 2008).

5. Inside game based learning environments: specificity

This wide range of existing videogame learning software, and potential mechanics that can be applied to each, has produced mixed results and caused issues with its implementation, and made the VGLE development path unclear (Gunter & Kenny, 2008; Shi & Ju-Ling, 2015).

It could be possible that the focus is simply too centred on the game genre desired to bring into the classroom (Rapeepisarn, Wong, Fung, & Khine, 2008) or the graphics functionalities and immersion capacity, when the attention should be on what mechanics we need and what features the game must have in order to be effective in the classroom (Moreno-Ger, Burgos, Iván, SIerra, & Fernández-Manjón, 2008).

Figure 1. Videogames sorted by genres, playing types, graphics and rewards systems
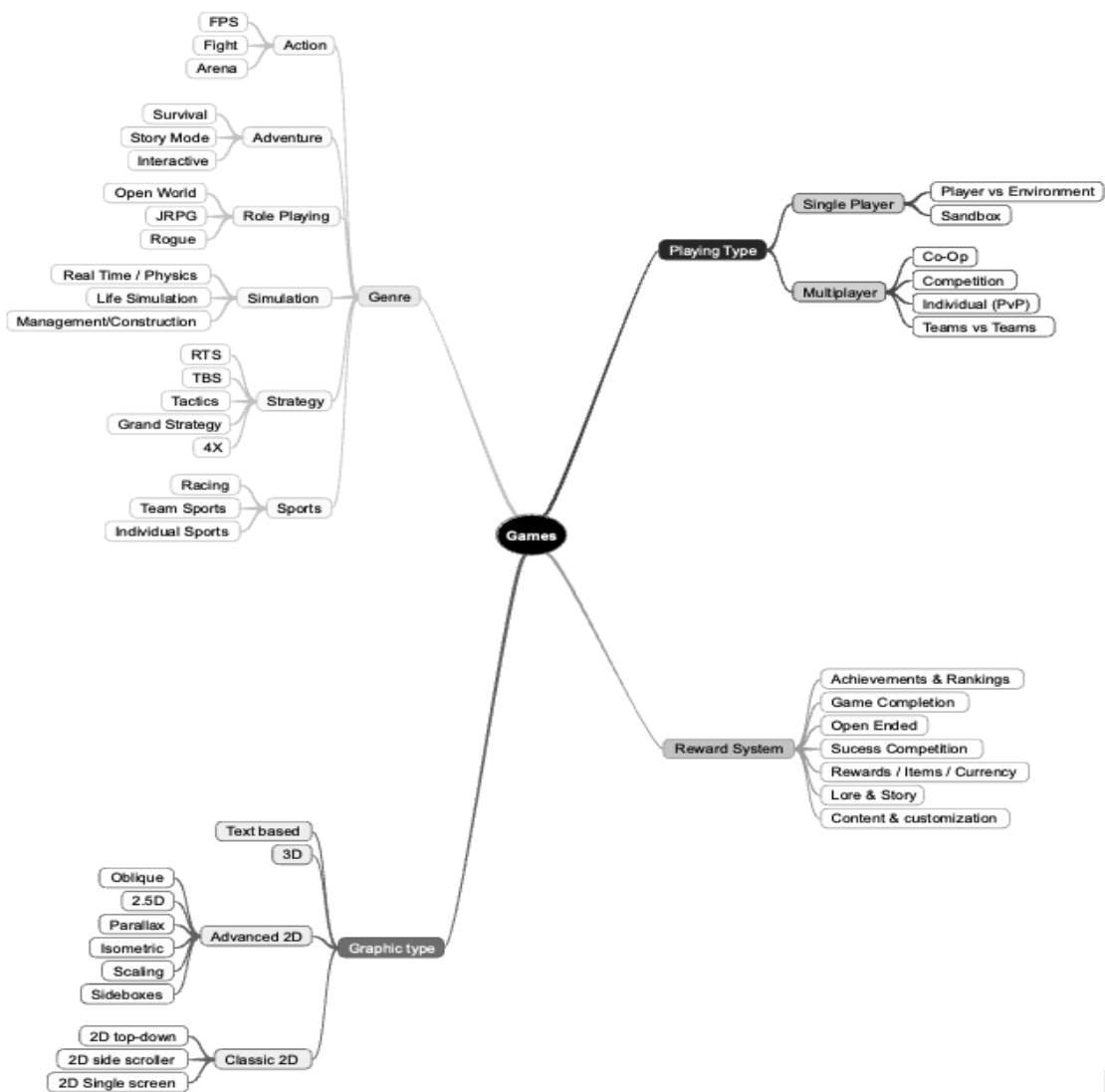
In that sense, some genres appear to produce better outcomes than others (Moreno-Ger, Burgos, Iván, SIerra, & Fernández-Manjón, 2008), and specific game mechanics have a bigger effect in the desired impacts on the students. For instance, Margaret E. Gredler, in a table transcribed (Table 1) has defined that, for educational purposes, games should have meaning, address important content and be dynamic enough to engage as well as provide the contents necessary.

Additionally, it appears that an active form of construction of knowledge, obtainable through centering the pupil as the main character or hero and progressing the story around their experience, could be particularly impactful (Baptista & Carvalho, 2008).

This idea that educational games should be fun but also bring the necessary mechanics to the learning context, as well as meaningfulness seems to point towards the specific development story-based and character driven games (Gunter & Kenny, 2008). Role-playing game (RPG) is, of all the game genres (Figure 1), the one that has both these aspects and therefore, has been studied as a type of game with the potential to provide the necessary context and motivation for students to learn.

Role-playing games can be defined as games that enable a player to pursue adventure, goals, story development, multiple narratives and in general success by both creating and enacting characters and interacting with a world (Bessière, Seay, & Kiesler, 2007). This game genre, regardless of the existing sub-genres, has a greater potential for creating complex environments by presenting a non-linear narrative, a multitude of characters, locations, items and events as well as the game mechanics necessary to make the play fun, immersive and engaging (Susaeta et al., 2010).

Additional specific research has been dedicated towards the Massive Multiplayer Online Role-Playing Game (MMORPG) genre, probably the most popular game genre played, which indicates that playing it supports collaborative learning approaches and other 21st century skills (Yu, 2009).

Table 1. Design criteria for educational games (Gredler, 2004)

Winning should be based on knowledge and skills, not random facts
The game should address important content, not trivia
The dynamics of the game should be easy to understand and interesting for the players but not obstruct or distort learning
Students should not lose points for wrong answers
Games should not be zero-sum exercises

6. Role playing games characteristics

As mentioned above, RPG have specific game mechanics and allow for a combination of game elements which are relevant to their use as a VGLE, wrapped around storylines and non-linear narratives. These are, among others, avatars, achievements, rewards, environmental and character dynamics, as well as adventures and quest systems.

6.1. Avatars

Avatars can be characterized as digital representations of the player, not necessarily like the person's physical appearance or even characteristically human on multimedia screens. Those can have a positive influence in both offline and online environments and players can use them in-game for communication and interaction as also to express what they perceive as their "better" selves to other players and to the environment (and therefore to themselves) (Baylor, 2011).

In RPG, avatars are crucial as the character is a major part of the narrative and story contents of the world, and other characters such as NPC will interact with them based on the avatar characteristics. This character development is embedded in all the game elements, as some activities, interactions and plotlines will only be possible if a character is using a specific item of clothing or an accessory or has reached a certain level or learned a specific skill (Williams, Kennedy, & Moore, 2010).

Some studies have pointed out that using avatars has a profound influence on motivational outcomes and a positive perception on activities such as learning, exercising, dieting, etc. (Baylor, 2011). Those therefore could be used in learning environments to motivate students to learn by increasing motivation, immersion, invested effort and enjoyment (Birk, Atkins, Bowey, & Mandryk, 2016), even in conventional learning (Mazlan, 2012).

Curiously, it has also been suggested avatars should be used by teachers, either as they present themselves as non-playable characters (NPC) in those games, or as players themselves (Inal & Cagiltay, 2006).

6.2. Achievements and rewards

Although not specific to the RPG genre, achievements and rewards systems are also a crucial part in this type of games as it enables and is intertwined with the story and character development.

An achievement system is the rewarding of the player achieving certain goals, objectives, and milestones, which can be used to foster desired learning objectives or behaviours. When a player reaches said milestone, either be it the completion of a quest, the number of clicks or enemies defeated, a reward is given. Rewards can range significantly, extending from badges which the player can have shown in his avatar, profile page, personal page or a specific achievements list, to medals, accessories, clothing and other items to place in the avatar, and can also observe potential other achievements if that is the intention of the game developer (Wang & Sun, 2011).

There are specific situations in which, mostly in open world games, achievements are hidden to give players motivation to explore the game engine as much as possible. The game can also reward achievements by providing the player with rare content or game currency so the player can choose the reward.

Achievements are crucial for students motivations to learn new information (Mcdaniel & Lindgren, 2012), even when not related to the use of grades or real-life score systems (Hakulinen, Auvinen, & Korhonen, 2013) as it provides a way of a player to compete, either with themselves or with others and how much more then have to do before reaching the objective (Gibson, Ostashewski, Flintoff, Grant, & Knight, 2015).

Achievement systems can also play the additional role of providing indications or even proof, if effectively used, of reaching learning objectives and can therefore be used for student evaluation. For that to happen, one must create a valid and clear link between the activities and learning objectives such as completing an exercise about a specific subject inside the curriculum several times (Gibson, 2007).

6.3. Environment and character dynamics

RPG environments are, by nature, quite different than those experienced in other game genres, except for adventure games. The player is placed inside maps and forced to interact with characters, which provide the setting for the storyline and action to develop (Baptista & Carvalho, 2008).

By nature, these environments are significant and similar to those found in, for example, fantasy literature, to prevent plot holes and lack of depth. For that reason, most RPG are placed inside a fully developed fantasy world with all aspects depicted, ranging from size and shape of continents, climate conditions, races and cultures down to every living creature (Mackay, 2001).

Inside that world, there are non-playable characters, pre-set game actors that may interact with the player to provide story context, allow for decisions, give/sell/buy items, or initiate the player in quests/adventures and give rewards for successful completion of tasks and are therefore a crucial part of the scenarios. These scenarios can play a relevant part in the immersion sensation a student needs to have to engage in studying while playing, especially if those are dynamic and variable, resulting in moments of focused concentration (Hamari et al., 2016).

6.4. Narrative, adventures, and quests

RPGs revolve around narratives. Defined as "the core pattern for cognition, comprehension, and explanation and is the most important tool for construing identities and stories" (Nicholson, 2014), the game narrative is

crucial, with an undefined number of sub-stories or plots occurring along the story path and which might or might not affect its final outcome (Domínguez, Vance, & Roberts, 2016).

Players can engage the game to achieve scores, complete tasks and unlock achievements, but they also do it to explore a storyline and the quest they were given, particularly to assess how their decisions affect the story. In these videogames, narratives can be non-linear, which gives options to the player to decide what action to take inside the story line, choices between decisions and quests or the order in which those quests are completed (Moser & Fang, 2015).

Well applied, non-linear narrative games could create "an experience that is both self-determined and purposeful" (Lindgren & Mcdaniel, 2012). This might particularly relevant when talking about long term teaching as seen above. By offering students quests and adventures, it might be possible to provide the much-needed solid motivational goals to keep playing and therefore, keep studying, as the game, and therefore the learning system, keeps providing interactivity, structure, and immersion by enhancing curiosity, concentration, challenge, empathy, control and comprehension (Nicholson, 2014; Qin, Rau, & Salvendy, 2009).

Previous studies have shown a positive relation between the introduction of narrative and motivation to learn as well as knowledge developed during courses that included narrative with learning materials (Lindgren & Mcdaniel, 2012)

In comparison, one of the main problems with gamified LMS is the lack of storyline and narrative. In 19 case studies regarding gamified learning applications it was found that only one used storyline (Lister, 2015).

7. Massive multiplayer online role-playing games

One crucial element in traditional education is the existence of social interactions and a social environment between students and between the teacher and the students, which can occur on an individual or group basis.

If a student is failing, the teacher's responsibility is to contact further with the student, assess and support through the difficulties. Challenges and collaboration are much a part of the day-to-day of students and a big reason for their motivation levels. These social interactions mostly disappeared or are significantly lower than usual during the pandemic, with only 39% of teachers admitting to contacting students once a day (Kurtz, 2020).

These social interactions and contexts can be built in a VGLE through the development of an environment like those present in Massive multiplayer online Role-Playing Games (MMORPG). These are RPG that are set in a virtual world where it is possible to interact, through both collaboration and competition, with not only NPC but also other players (Susaeta et al., 2010).

Commercial MMORPGs currently have an active gaming population over 16 million players (an increase of 262% in just two years) and with platforms such as World of Warcraft with 4.9 million active users in 2020, 16 years after being launched (Advent, 2020), which is a demonstration of their capacity as social platforms. MMORPG specifically provide a social infrastructure that allows for players to interact online with other players, compete, collaborate, form teams or guilds, or simply chat. The social practices are emphasized in such a manner that makes them powerful tools for developing secondary language skills (Rankin, Gold, & Gooch, 2006).

Although there should be some considerations regarding safety when developing online environments such as those present in MMORGs (Smed, Kaukoranta, & Hakonen, 2002), this particular type of videogame presents not only the benefits of RPGs but adds necessary social elements (Moreno-Ger, Burgos, Iván, SIerra, & Fernández-Manjón, 2008; Steinkuehler, 2004).

8. Issues with implementing RPG as VGLE

As seen above, employing RPGs as VGLEs could, arguably, present, the benefits and impacts impact desired in the distance learning experiences. There are, however, some obstacles to their implementation, such as cost, integration with educational requirements and complexity, as well as stigma.

8.1. Cost

Role Playing games are built by using fully developed worlds, with dozens, if not hundreds of characters, locations, buildings, events and items, and their development might be, for educational purposes, prohibitive (Koster, 2018; Lewis & Jacobson, 2002).

In fact, some studies have pointed out that even if teachers try to provide only a small educational game, it could cost more than 100.000 USD (United States Dollars), while a higher quality and capacity game could result in spending millions of USD (Torrente, Moreno-Ger, Fernández-Manjón, & Sierra, 2008).

This cost might be reduced by using a game engine, which is modular simulation code-based software, and that may or may not have been built specifically for a game, but which can be used to develop other games, not necessarily of the same genre (Lewis & Jacobson, 2002). Their cost is significantly lower than recruiting a development team and it also reduces time of execution (Moreno-Ger, Burgos, Iván, SIerra, & Fernández-Manjón, 2008).

There have been several experiments at using game engines for educational purposes, such as medical simulations using Half-Life ((Marks, Windsor, & Wunsche, 2007), teaching science concepts using the Unity engine ((Christel et al., 2012), among others (Moreno-Ger, Burgos, Iván, SIerra, & Fernández-Manjón, 2008), which means those can be used as a means to develop a RPG-based VGLE with lower costs.

8.2. Educational requirements and structure

It has also been argued that one of the main issues with developing videogames, as seen above, is the difficulty of implementing those as educational tools. Although those provide several advantages compared to LMS, even gamified ones, they are usually difficult to execute, behave in a closed fashion and are not fully integrated with the school's curriculum. It is difficult to get relevant instructional information, as well as student's performance in assessments and historical records (Sancho, Moreno-Ger, Fuentes-Fernández, & Fernández-Manjón, 2009)

Especially considering storylines and narratives necessary as well as the number of adventures and quests and other challenges necessary to translate into gameplay all the knowledge that otherwise is present in school manuals might just be too complex (Susaeta et al., 2010).

Size and complexity are another problem, as most educational games produced usually represent only a tiny portion of a subject's entire year-long school curriculum. Implementing one that represents the entirety of the curriculum might be too big to be usable in a virtual classroom-like context.

A possible solution to this problem lies with dividing the game into several games, one for each of the subjects (mathematics, history, geography, language, etc.), while maintaining the same game world to assure continuity and the connection with the story.

Concerning game structure problems, the problem might be corrected by adding the necessary functionalities through the engine and adapt the tool to the curricular needs like it has been done before (Vinyals et al., 2017).

8.3. Stigma and concerns

Despite some evolution in how videogames are perceived, there are still some misconceptions which linger (Baek, 2008). In particular towards RPGs and MMORPGs, using the argument that these promote violent, addictive or anti-social behaviours , although research dismisses such claims (Kirby, Jones, & Copello, 2014), even regarding all types of games (Calvert et al., 2017) or warnings that it's a multi-faceted phenomena that does not originate in videogames themselves (Halbrook, O'Donnell, & Msetfi, 2019).

In fact, promotion or reinforcement of existing behaviours and therefore additional positive transversal outcomes from playing RPG have been observed, such as positive social attitudes (Greitemeyer & Osswald, 2010), growth in empathy (even in antisocial games when playing a hero, as opposed to a villain) (Happ, Melzer, & Steffgen, 2015), and increased emotional regulation (Villani et al., 2018).

9. Conclusions

Videogames have an immense capacity to simulate different mechanisms, triggers, actions, behaviours, file executions, objects, animations and so on. To each a specific outcome or effect on the user could be attributed and used as a tool to support learning. Between those, the connection between a fantasy world, a non-linear narrative, characters, and the introduction of the player in that context appears to have the greatest capacity for engagement and motivation.

We have also observed that the development of educational RPGs and specifically MMORPGs could have, amongst all the game genres, the highest potential to lead students towards a meaningful, fun and engaging learning experience.

If we can connect the educational needs and game characteristics necessary for what is expected to be an adequate VGLE by using a RPG structure in a multiplayer context, we can arrive at a complex circular system in which the interactions between students and teachers and the learning contents are much different than usual. A possible model of such a VGLE is proposed in Figure 2.

By comparison, in traditional or gamified online educational technologies there is a very one-sided non-interactive experience. Teachers deposit or give access to study materials and give support via videoconference and receive information based on the student s actions such as completion of exercises, opening files, etc. Students in turn interact with the system by grabbing learning materials and filling answers to evaluations and exercises.

Figure 2. Videogame learning environment framework
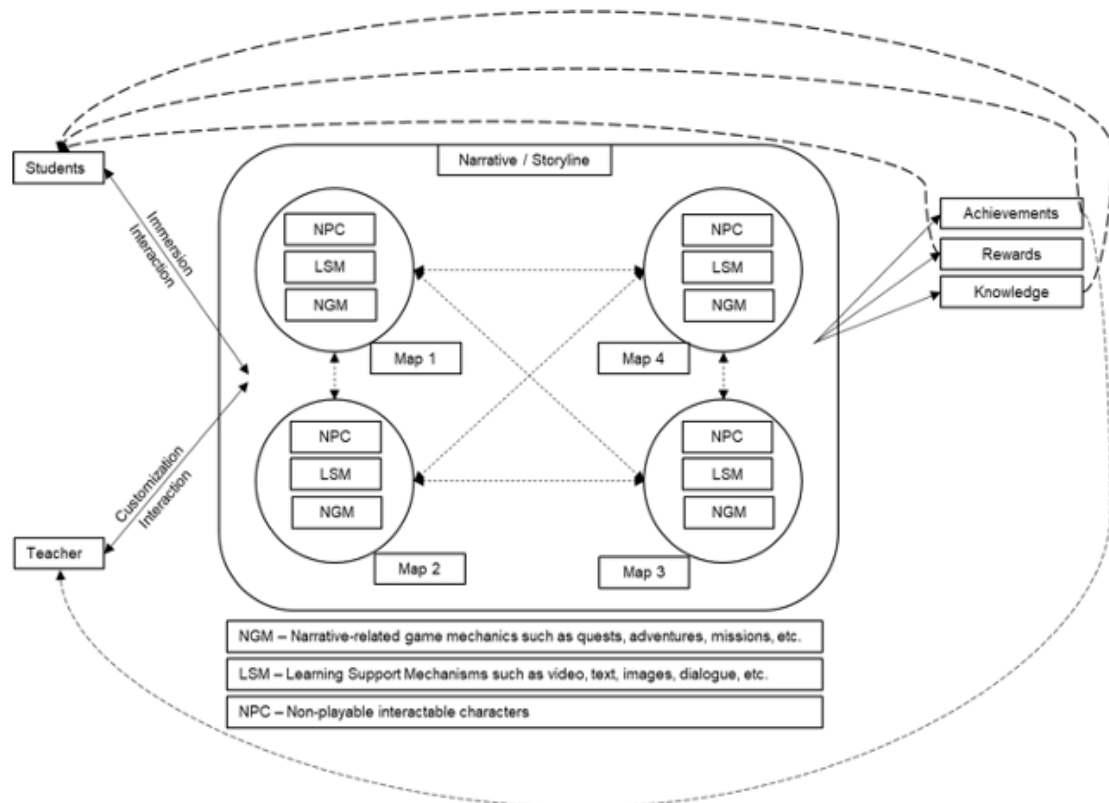
Through Figure 2 we can observe that the VGLE-model proposed allows students and teachers to engage in multiple alternative means with in a complex but fun, immersive and rewarding system.

We can therefore assume that an RPG-like environment such as the one proposed could allow for several benefits:

- It can create less friction between leisure and study moments when students are at home, resulting in longer study periods (Chang, Liang, Chou, & Lin, 2017).
- Less repetition in learning methods and more visual methods could allow for higher concentration levels and knowledge absorption rates (Ang, Zaphiris, & Mahmood, 2007; Kirby, Jones, & Copello, 2014).
- A potential positive association between a fun activity and a learning experience.
- If the environment created allows for multiplayer and online mechanisms, possible additional social interactions between the teacher and the students and between the students in the same classroom.
- Higher levels of intrinsic and extrinsic motivations related to the immersion experience in the videogame scenarios (Jackson, Dempsey, & McNamara, 2011).
- Higher levels of continuous engagement and feeling of fulfilment through visual and immediate achievements, rewards, and customization settings (Hakulinen, Auvinen, & Korhonen, 2013).
- Higher levels of long-term knowledge retention (Jackson, Dempsey, & McNamara, 2011; Steinkuehler, 2004).

We believe that, in conclusion of what was discussed in this paper, using RPG, and specifically MMORPGs could potentially be a powerful tool to support distance learning and a meaningful evolution from other educational technologies. Therefore, we believe the production of such tools should be explored further for videogame-based learning environments in the near future as a potentially positive experience with digital distance learning.

10. Discussion and further research

Through this research we proposed to investigate and explore the possibility of developing RPGs as a VGLE to support existing tools, which could not fulfil the needs of young students while learning almost exclusively from home for all school formal curricula.

We believe that this game genre could be further tested in several different groups and environments to assess if individually, and together, the effects of the proposed game mechanisms are as expected. Different outcomes might come from different age groups, gender, socioeconomic backgrounds, and different cultures and we anticipate that such a VGLE framework can result in not one but several different practical approaches with as many different results.

Also, no matter how appealing the VGLE solution might appear, there will still be a need to wrestle with the negative perspective a lot of educators and parents have concerning videogames and there might be some resistance to implementing these as solutions for study.

Concerning the costs and time needed to execute and test a VGLE, it is suggested that educators and developers could consider adapting a game or game engine to the framework, if possible, as it might help accelerate implementation. If that is the case, it is suggested that, to cater to all students and prevent ethical issues, all violence-related and other morally questionable references such as weapons, armour, animations, and expressions should be removed from the game engine.

On a last note, from all the characteristics presented, although adding to the VGLE online multiplayer capacities can be one of the most promising features, special concern must be given to potential safety issues with online registrations, undesired presences in game, hacking and other security risks.

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