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Educational Games as a Motivational Tool: Considerations on Their Potential and Limitations

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Abstract: There is considerable interest in leveraging video games to support students' motivation. This involves employment of educational (serious) and entertainment games. However, while evidence indicates that games can enhance learning outcomes, doubts persist about whether they retain their enjoyable character in formal learning contexts. This study was carried out within the H2020 Gaming Horizons project, which involved a review of academic literature on the role of games in society, as well as 73 semi-structured interviews with relevant stakeholders, including players and educators, investigating their positions on game-related issues. The interviews suggested that players tend to view game-based learning – and specifically serious games at school – with scepticism. This is partly attributable to the perception that serious games have lower production values than entertainment games, and that gaming, as a voluntary, self-driven activity, clashes with the structured nature of school. Some educators reported individual and gender differences in the motivating power of games. However, the use of entertainment games to foster learning outcomes was seen favourably. Two focus groups devoted to the issue highlighted the need for carefully tailoring the gaming experience to both context and student, and the importance of developing a sustainable business model for enhancing serious games quality.

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1   INTRODUCTION

At the beginning of the '80s, Thomas W. Malone published his seminal Ph.D. dissertation addressing the following questions: "What are the features that make computer games so captivating?; and "How can these features be used to make learning, especially learning with computers, interesting?". Malone mostly focused on intrinsic motivation, i.e. "what makes an activity fun or rewarding for its own sake rather than for the sake of some external reward" (Malone, 1981, p.1), and produced a set of guidelines for designers of what he called "instructional computer games". Following Malone's pioneering work, much research has been carried out into computer games, the reasons why they are fun and engaging, and how we can leverage these characteristics to motivate people to engage in learning activities the same way they do with play. In this endeavour, especially in the last decade, a rich research strand concerning game-based learning, with dedicated conferences and journals, has developed, in part thanks to support and funding from the European Commission (Perrotta, Bailey and Rider, 2017).

The expression "serious games" came into use in the scientific literature around 2004 to identify games designed for a purpose other than entertainment (Ratan and Ritterfeld, 2009). Since its first appearance, the term's use has steadily increased. By the same token, the term gamification, which denotes the use of game design elements in non-game context(s) in order to influence user behaviour (Deterding et al, 2011), started to appear in the scientific literature around 2009. Very soon it attracted considerable interest within education and educational research (Caponetto, Earp and Ott, 2014).

The assumption behind all of this interest is rather simple: the more an interactive learning environment is gratifying, interesting and engaging, the more it motivates the user to stay there, focus on the proposed tasks, commit to them and work hard to carry them out successfully. As a consequence, it would also be more likely to generate learning outcomes than other, less captivating environments.

While empirical evidence of the effectiveness of digital games and gamification on learning has emerged (Clark, Tanner-Smith and Killingsworth, 2016), at least for students in formal education, and a number of moderating variables have been identified, the effects on motivation are still debated. Studies of individual serious games claiming positive results in terms of motivation are countless

(e.g., Papastergiou, 2009). However, Wouters et al's (2013) meta-analysis of serious games found that the games they examined were more effective in terms of learning and retention than traditional methods, but they were not more motivating. In addition, there is evidence that students' acceptance of video games cannot be taken for granted (Bourgonjon et al, 2010; Martí-Parreño, Galbis-Córdova and Miquel-Romero, 2018).

This study is an attempt to explore motivation in game based learning by engaging with the main stakeholders involved: players and teachers. The starting point of our work was the examination of themes such as the distinction between intrinsic and extrinsic motivation, the object of motivation (motivation to learn and/or to play), and the unintended effects a teacher may encounter when introducing game based learning.

Subscribing to Ryan and Deci's claim that being motivated means "being moved to do something" (Ryan and Deci, 2000), we contend that when talking about motivation in gaming it is essential not to lose sight of what that "something" actually is, namely what gaming triggers players to pursue. It may prove difficult for serious game designers to strike a balance between motivation to learn, which is their primary goal, and motivation to play, which is where the engagement potential comes in. In both serious and entertainment games, the relationship between (a) motivation to learn and motivation to play and (b) the relationship between intrinsic and extrinsic motivation seem to play a key role in understanding the conditions needed to harness the motivating power of games to improve the learning process.

This study challenges the generic assumption that games support learning because they are motivating and engaging. The aim is to enrich the body of knowledge concerning learning with games with a better understanding of the conditions for games to be motivating both to play and to learn from.

2   CONTEXT AND METHOD

Gaming Horizons (https://gaminghorizons.eu/) is an EU-funded project in the Horizon 2020 program that concluded in January 2018. One of the objectives of the project was to investigate the influence of video games and gamification on the individual and society, considering a variety of perspectives (psychological, educational, ethical, sociocultural/artistic). The ultimate aim was to

promote alternative framings for research, practice and policy about video games and gamification.

In this paper, we will focus specifically on the outputs of the project concerning the potential of games and gamification for motivating learning. To this end, we will concentrate on three phases of the project. The first is a literature review that allowed us to get a broad picture of the most influential voices in social sciences research regarding games. The second phase entailed one-on-one interviews with various stakeholders involved in games, including players and educators, who were the most relevant voices for the topic of motivation. The third phase consisted of two three-hour workshops specifically focused on the topic of games and gamification for learning, where, through focus groups, we aimed at eliciting participants' recommendations for policy makers, educators, developers, researchers and/or players.

Each phase built on the results of the previous one, and together they trace a path that helped us identify 'areas of tension', open questions, critical aspects and possible solutions in the use of games as motivating tools.

2.1 Literature Review

The first phase of the project was a systematic literature review (Persico et al., 2017a). This review had three main aims: (i) identifying the main social sciences research trends for video games and gamification; (ii) highlighting the most influential contributions and results so as to obtain a broad overview of the 'state of the art'; (iii) identifying the recommendations - both explicit and implicit - issued in those investigations. Taken together, these three goals can help us in identifying critical aspects of the use of video games for learning, either because they are highlighted in the studies themselves, or because they yield contradictory results, or because they have been understudied and we lack empirical knowledge about them. Motivation turned out to be one of these critical aspects, because several authors have discussed the surmised motivating power of games, but conclusive evidence for or against it is not yet available. The first step of the review consisted in collecting all the journal papers concerning games and gamification published since 2010 and indexed on Scopus and/or Web of Science. The contributions were retrieved using sets of keywords specifically targeting three social sciences perspectives, ('psychological', 'educational', and 'ethical'; for more details, see Persico et al., 2017a).

This strategy led to the retrieval of 9,157 papers (after elimination of duplicates), whose keywords were analysed in terms of frequency and co-occurrence in order to inform goal (i). Since the large number of contributions made complete examination unfeasible, only a subset of papers was used to inform goals (ii) and (iii). The goal pursued in selecting this subset was to identify the most 'influential' papers by using year-adjusted citation rates as a proxy for impact. Only papers one standard deviation or more above the mean citation rate of their publication year (for the full set of papers) were retained in the restricted subset (n=674). A subsequent manual selection of papers through abstract reading led to a final set of 47 literature reviews and meta-analyses, which were then read and coded according to a codebook.

2.2 Interviews with Stakeholders

The second phase consisted in 73 one-on-one interviews with stakeholders involved with video games (Persico et al., 2017b). The stakeholders included 30 game developers, 4 policy makers involved with games, 14 researchers, 13 players, and 12 educators with experience in using games / gamification in class, all recruited through purposeful sampling. In this paper we will focus on the last two groups, who contributed the most to our understanding of games as motivational tools.

The interviews were semi-structured and the participants were asked to talk about a wide range of topics connected to games according to the 'expert interview' method (Bogner, Littig and Menz, 2009). The interviews were carried out online and were assisted by the use of visual stimuli in which selected keywords were presented to the interviewees. These were derived from the literature review and represented areas of interest in the study of video games and gamification. Participants were free to draw on these visual stimuli to guide their thoughts about games. The interviews had no set duration, but most lasted from 60 to 90 minutes. They were recorded, transcribed, and coded top-down according to a Codebook. Interviews were analysed qualitatively using the 'Framework Method' (Ritchie and Spencer, 1994).

2.3 Focus Groups

The third phase consisted in fifteen workshops involving different groups of informants and experts. In most of these events, we used focus groups to elicit critical considerations on the knowledge

collected during the previous phases of the project, and to produce recommendations for policy makers, educators, developers, researchers and/or players. Each focus group considered a specific Area of Tension (AoT), that is, a topic on which contrasting positions were collected through the literature review and/or the interviews.

The workshops were held in the UK and Italy, involving 206 stakeholders. The motivating power of games was specifically discussed during two of the workshops. The first took place in Naples and involved a group of six researchers in Technology Enhanced Learning and policy makers, while the second took place in Milan and was attended by a group of ten secondary school teachers. Focus groups were analysed with an inductive approach, specifically searching for explicit and/or latent recommendations.

3 RESULTS

3.1 Literature Review

The Gaming Horizons literature review (Persico et al., 2017a) looked at how the implications – both positive and negative – of gaming where seen in different research fields. In the case of the relationships between gaming, player motivation and learning, our focus spanned across education and psychology research output (18 and 26 papers, respectively). Much of the education-oriented research in this set centred on gaming in formal contexts.

As the literature review conducted by Connolly et al. (2012) confirmed, research studies into player responses to entertainment games have predominantly focused on learning impact, as well as affective and motivational outcomes. However, motivation, engagement and enjoyment are closely intertwined in much games-related research, and in many cases they are neither well defined nor clearly differentiated in the literature. Sometimes, they are conflated and treated almost interchangeably (Boyle et al., 2016). This inhibits efforts to gain a clearer understanding of the effective connections and interrelations between gameplay, motivation and learning outcomes. Indeed, efforts to clarify the motivation-learning relationship in gaming need to come to terms with different types and facets of motivation, which, at a personal level, can be varied and multiple (Yee, 2006).

One distinction of particular significance here is that between intrinsic and extrinsic motivation,

which are widely held to fuel learning in significantly different ways and to different extents (Ryan and Deci, 2000). In formal education contexts, participation in gameful activities is – more often than not – compulsory. This condition potentially shifts player motivation towards the extrinsic end of the spectrum and is in contrast with what many believe to be a fundamental condition for true gamefulness, namely voluntary participation (McGonigal, 2011). The question of intrinsic vs. extrinsic motivation also arises with regard to challenge and competition as ingredients of game based learning (see below). Here, gamification frequently comes into criticism for applying crude strategies ("pointsification") to motivate participants extrinsically, rather than by making challenge an integral part of engaging gameplay experiences (Seaborn and Fels, 2015).

Lastly, the meta-analysis that Wouters et al. (2013) conducted into the cognitive and motivational results of serious gaming found that while serious gameplay leads to better learning and retention than traditional teaching methods, it is not actually more motivating. This finding appears to clash with the foundational assumptions of game based learning but at the same time it's worth noting that it resonates with positions expressed elsewhere in Gaming Horizons (e.g. Haggis et al., 2018). These question whether serious games of the kind that have been most commonly adopted in formal education actually offer the type of high-quality, engaging digital gameplay that many of today's learners now associate with – and expect of – video gaming per se.

The picture is also variegated regarding gamification, (Deterding et al., 2011). In their review of empirical evidence of gamification outcomes, Hamari, Koivisto and Sarsa (2014) note that education and learning is the area of application most commonly investigated in gamification research. And while they find generally positive outcomes for participant-perceived motivation, the also find the risk for undue distraction from learning objectives and, significantly, participant stress related to the competitiveness inherent in many gamified learning implementations.

Competition is generally considered an important ingredient for fostering player motivation in gaming generally (e.g. Boyle et al., 2016). At the same time, however, Abdul Jabbar and Felicia (2015) note that in Role Play Games (RPGs) competition often coexists with collaboration. They posit that the combination of the two fosters motivation, although they find that sometimes this is more motivation to

play than motivation to learn. In their study of collaboration in games, Kong, Kwok and Fang (2012) report a somewhat similar outcome, namely that while collaboration seems to increase motivation, it does not necessarily translate into improved learning outcomes.

3.2 Interviews with Stakeholders

In general, the players we interviewed recognized the learning potential of both games and gamification. The players believe that this potential is not limited to disciplinary knowledge: they think games can help develop transversal skills such as problem solving and decision making.

However, when talking about games' potential for motivating students, player interviewees were somewhat skeptical. This skepticism was directed especially towards serious games, which were characterized as being far less engaging than commercial video games, to the point of not being fun at all ("Playing educational games that try and gamify learning, I think they really missed the mark, because they're not fun."). This lack of engagement is the result of both a general lack of polish ("young people nowadays are so used to a certain kind of gaming experience, that if you put in front of them a different kind, one that is seen as old, as simplified, as ugly [...] you don't engage them"), and the paradoxical result of unmet expectations ("labelling a game as something which is designed to be educational and wholesome [...] turns people off"). In fact, for some players, the very act of designing games for an explicitly educational purpose limits their potential for fun and engagement ("stop making educational games immediately. Make games which happen to teach you, not educational games"). Additionally, since players have different tastes in terms of genres and themes, it may be impossible to design a game that appeals to an entire cohort of learners ("people have different tastes and like movies, sometimes you don't want to sit down and watch action movies"). The players, however viewed somewhat more favourably the use of commercial off-the-shelf video games for a learning purpose (e.g. "[Portal 2] is a perfect example of what, in my opinion, should be done [...] it's a game in which you have to think").

Regarding the side effects of using video games at school, players were very positive about the competitive aspects of games, reporting that competition in a video game is less frustrating than competition outside of the game ("where competition takes place in a space where everyone is able to opt in or opt out, as in a game, I think it's very healthy"). At the same time, they highlighted the potential of games for teaching collaboration ("I'm always impressed by how in League [of Legends] you're on five man teams and you have to immediately come up with some sort of teamwork and communication [...] in order to actually win.").

Similarly to players, educators expressed their confidence in the positive impact games can have on learning, but, at the same time, some obstacles were highlighted as to their application in a formal context, particularly regarding the constraints posed by school organization. The sample of interviewees included a certain number of teachers who had gained solid experience in Game Based Learning (GBL) while others were still exploring the potential of games. The position of the teachers belonging to this second group tended to be more enthusiastic, without a critical in-depth analysis of the multiple implications of using games.

The power of digital games is seen not only in their capability to engage and motivate but also as medium able to support situated and interactive learning experiences. In the interviews, some educators referred to the "intrinsically motivating nature" of games and playing, while others expressed the belief that their motivational power stems from the fact that games use a language that is part of the daily experience of students or from the innovativeness of the medium. Nevertheless, in more than one case, educators stressed that games should not be seen as a motivational panacea. In their view, games shouldn't be adopted as the last chance for motivating hard-to-reach students, and students' acceptance shouldn't be taken for granted, especially when gaming is presented as a compulsory activity ("as soon as you try to put students into the setting of having to play a game for learning [...] they then start to dislike this thought") or when the games have a playful/gameful dimension that is just a layer added to conventional instructional interactions ("When they realise that they are not playing a game, they are making the same exercises again and again and again, then they get disappointed").

Another important point raised by educators is the acknowledgment of existing individual differences at motivational level and their relation with game mechanics ("We are using a lot of different game mechanics, game dynamics, to make sure that we motivate everyone"). Some interviewees also cite gender differences in relation to the motivational aspects of gaming in general and

different games types and genres. In particular, boys seem more motivated by playing commercial games, while girls seem more open to applied games, and especially puzzle games, or coding experiences ("my boys always engage more with the commercial games. And they didn't always like the Maths games or Science games, because it just didn't feel like real game to them […]. But the girls, they did, and the puzzle problems on Nintendos and things, they liked them"). Games seem to have a double-edged effect also from the social viewpoint: while for one educator games reinforce relationships between boys and girls in class, for others the fact that girls succeed in playing can produce frustration in boys.

Motivation is also analysed in relation to game mechanics; some educators, similarly to the players, consider both collaboration and competition as motivational boosts ("there are two aspects that stimulate motivation: one is competition [...] and then there's the cooperative side that encourages and fosters learning"), while others are afraid of the impact of competition on their students ("competition is something we'd rather not go into. There's a lot of other ways to motivate").

The debate about intrinsic and extrinsic motivation was only touched on lightly in the interviews. While one teacher highlighted the potential of games ("once they realised that what we're trying to teach them actually was applicable in a setting that they were really engaged in [...], we could then go back to our regular school books - boring, unsexy school books - and then they would actually carry this enthusiasm and this willingness to learn") others were afraid that game mechanics could increase time on task when studying, but not a real motivation to learn.

It is worth pointing out that both educators and players believe that the former should increase their game literacy in order to better leverage games in support of learning. In this sense teachers call for more training opportunities and the introduction of policies at institutional and national levels.

3.3 Focus Groups

In two of the Gaming Horizons workshops, the area of tension concerning the motivating power of games was proposed as a theme for two focus groups using a challenging format "The surmised motivating power of games (are games REALLY motivating?)", and participants were provided with some excerpts from the literature review and the interviews to trigger the discussion.

As to the teachers, we collected different positions and attitudes, in some cases related to different level of experience in the field of GBL. One teacher agreed that students could feel 'cheated' by the use of games to deliver disciplinary content. Moreover, some teachers agreed that proposing game based activities as compulsory can be detrimental for motivation because it deprives the experience of spontaneity and cancels individual differences.

Others, on the contrary, had tried using games (and gamification) in their classes and reported quite positive experiences. Some teachers consider the application of game mechanics to the classroom setting more effective than the use of full-fledged video games. Kahoot proved to be very popular among the participants who, however, still tried to involve students in quiz preparation so that they need to study the topic before the lesson. Finally, game making using applications such as Scratch was considered more motivating than simple playing.

One critical issue raised was the impact of competition at individual level. As with the results of previous phases, competition is seen as a double-edged sword: it can be motivating for competitive students as well frustrating for students who struggle to reach the results of their classmates. In this sense, teachers suggest preferring group competition to the individual variety.

The issue of extrinsic and intrinsic motivation was raised by researchers in relation to gamification and Massive Open Online Courses (MOOCS). According to them, gamification in MOOCs can affect motivation at different levels in relation to the mechanics applied. For example, extrinsic motivation can be pushed through elements like points or leaderboards, but other aspects can work on intrinsic motivation (e.g., supporting self-regulating learning by providing learners with the opportunity to choose their own learning path or supporting reflection).

4 DISCUSSION

The Gaming Horizons project evidenced a number of critical aspects and open questions regarding the motivational power of games.

The chief issue addressed emerged at several points in our investigation: the concern that employing games for educational purposes can actually limit their intrinsic motivating potential, as it contrasts with the spontaneous and recreational character of play. This problem was clearly stated by

some of the players we interviewed and concerned serious games especially, since in serious games the educational intent is more overt and the technical quality generally lower. Responses were more positive when considering entertainment games used for educational purposes. Teachers too showed awareness of these problems, reporting that students resent the use of games whose playful component actually masks typical learning activities, so much so that they also prefer the use of entertainment games. Relatedly, players and educators agreed that gaming should not become a mandatory activity in schools, and should be presented as an alternative to other learning activities. The reason for this is that playing is characterized by a certain degree of spontaneity and self-determination: forcing people to play a game risks antagonizing students and depriving the activity of its potential for fun. Additionally, making gaming a mandatory activity ignores individual differences: our investigations revealed how players differ widely in terms of preferences, and there is the possibility that gender plays a role in that. Previous research on players' attitudes towards video games for learning (Martí-Parreño et al., 2017; Bourgonjon, et al., 2010) suggests that media affinity is a factor in favour of acceptance of game based learning. Our results do not align with these findings, but we suggest that there may be a 'sweet spot' of familiarity with the medium that makes the potential for engagement higher: individuals who play video games casually may have just enough familiarity with games not to be intimidated by them. Experienced video game players such as those we interviewed, on the other hand, are probably used to high production values and highly engaging games, and may be more difficult to entice with relatively simple game mechanics and modest graphics.

An additional risk arises when the games used for teaching incorporate an element of competition: while this increases engagement and motivation, it can prove stressful for some individuals. The players we interviewed viewed competition somewhat favourably, but we recruited individuals that spend a significant amount of their free time playing. Therefore, we probably selected for people who are comfortable in competitive settings. The teachers, instead, tended to be very cautious in introducing competition in their classrooms, where they would rather see collaboration prevail. Careful consideration of the game mechanics employed, and how they may affect students, should be a necessary step in designing a teaching activity centred on gaming or gamification.

Lastly, both stakeholder groups agreed that any educator considering using games for learning should have extensive knowledge of the medium, and that teacher training for the use of games should be provided at the institutional level.

5 CONCLUSIONS

The present work has several limitations, mainly due to the timing constraints imposed by the project. By its nature, the literature review cannot be considered comprehensive, focusing as it does on 'mainstream' contributions. Nevertheless, it probably accurately represents the broader trends in educational research, i.e. those that are most visible and impactful on professionals that are not experts in the field. Regarding the interviews, their main limit resides in the wide variety of the themes explored: some interviewees talked about games as motivational tools for a relatively short time, while focusing more on other topics. At the same time, they provided useful first-hand experiences, and evidence for aspects of games and motivation that are often referenced in literature, but rarely backed with data. The focus groups, comparatively, were narrower in scope and longer in duration, leading to focused and extensive conversations resulting in recommendations.

Lastly, our work presents the same limitation we mentioned regarding previous studies in the literature review: it is sometimes unclear what our participants meant by the term 'motivation'. In the case of players, we could not expect them, on their own, to make the fine distinction between motivation, engagement and enjoyment. In the case of educators, they sometimes explicitly distinguished between intrinsic and extrinsic motivation, but the target of motivation (to learn or to play) was not always as explicit.

Future work should focus on further exploring how individual differences impact on the motivational power of games. Additionally, there is a clear need for a learning design framework for game-based learning, one that takes context into careful consideration, that clearly maps game mechanics and contents to learning objectives, and that considers video games and gamified systems as resources supporting activities that, while remaining non-compulsory, can enrich the learning experience for the individuals they resonate with.

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