

Gamification in primary school: “return to deir el-medina”

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Abstract: Several research studies show how the integration of video games in school environments can improve students’ motivation and engagement, thus enhancing their learning (Papadakis, 2018) (Rosas et al., 2002) (Lowry et al., 1951). Furthermore, the introduction of gamification elements within educational contexts can be an effective tool for motivating students and actively involving them in the learning process (Castrillón & Moreno, 2019) (Rosas et al., 2002). This paper will illustrate the use of video games, gamification in the classroom and the close relationship between immersive realities, video games and museums. Through some theoretical models that, as Gee points out, see video games as a tool capable of stimulating processes of problem solving, decision making and creativity, fostering the development of complex cognitive skills (Castrillón & Moreno, 2019)(Papadakis, 2018), a specific case and some gamification techniques used will then be presented. In particular, the video game ‘Return to Deir el-Medina’ developed within the virtual tour for children of the Egyptian Museum in Turin, in which Aida the young protagonist, an aspiring archaeologist, will find herself in the ancient village of Deir el-Medina and will guide the player in an adventure full of mysteries. Through quizzes, challenges and dialogue with real-life characters, the player will piece together the pieces of a mysterious amulet. From a purely methodological point of view, our reflection pursues principles of research linked to ‘inclusive educational contexts’ (Corona, De Giuseppe, 2015), to the dimension of the ‘educational video game’ (Di Tore, P.A., Di Tore, S., Mangione, GR, & Corona, F., 2014), to ‘Learning by Gaming’ (Di Tore, 2023) and to the principles of ‘educational interaction’ (Sibilio, 2020). In conclusion, the use of video games and gamification in primary school represents a promising strategy to improve student engagement and learning, although it requires careful design and appropriate teacher training in order to maximise the benefits and reduce the possible risks. the benefits and reduce the possible risks. (Lowry et al., 1951) (Castrillón & Moreno, 2019) (Rosas et al., 2002) (Papadakis, 2018).

Keywords: gamification, inclusion, education.



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1. Introduction: the video game, between entertainment and learning

1.1. Brief overview of the evolution of the video game and its growing popularity in society

Although video games have traditionally been viewed as mere entertainment (Gee, 2005) (Rickards Agreements, 2020) (Mosna, 2018), a growing body of research suggests that they possess significant educational potential, particularly in fostering more inclusive learning environments (Treglia et al., 2019) and developing additional skills that can transport students into immersive virtual worlds, allowing them to explore new roles and perspectives (Martino & Longo, 2019) (Díaz & Martín-Párraga, 2014).

Indeed, an increasing number of studies highlight the educational properties of video games, emphasising their ability to incorporate “many pedagogical practices known to be effective in other environments” (Mayo, 2009). These include encouraging curiosity, promoting active engagement and providing immediate feedback: all hallmarks of successful learning experiences (Díaz & Martín-Párraga, 2014).

Video games are important because they allow people to participate in new worlds. They allow players to think, speak, and act - let players inhabit - roles otherwise inaccessible to them” (Shaffer et al., 2005). This ability to immerse students in new scenarios can be valuable for marginalised or disadvantaged students, who may have difficulty connecting with standard curriculum content. To realise the full inclusive potential of video games in education, it is essential to adopt design principles that prioritise accessibility and student-centred learning. This could involve the integration of features such as customisable controls, multimodal feedback and content reflecting different cultural backgrounds and lived experiences (De Giuseppe & Ianniello, 2020).

Gamification, serious games and game-based learning are just some of the declinations of this innovative approach, which aims to make the learning experience more engaging and stimulating (Caicedo et al., 2020).

One of the main reasons behind this growing popularity lies in the intrinsically motivating power of play. As pointed out by Bai et al. (2020), play possesses a number of characteristics that make it particularly effective in triggering and sustaining student motivation. These include immersion in the activity, the opportunity to experiment and learn through; try and try again, and the sense of progress and advancement in the game.

1.2. Theoretical reference models

The scientific literature presents several theoretical models that support the idea that learning through play is not only feasible, but also particularly effective (Di Tore, 2014).

It also indicates that some video games can be particularly effective for students with special educational needs. For instance, in the case of students with specific learning disorders, video games can foster the improvement of attentional, memory and executive functions or for students with Autism Spectrum Disorder they can offer a structured and predictable, reassuring environment and also contribute to the development of social and communication skills. However, the mere integration of a video game does not necessarily ensure inclusive learning. Rather, the design of the game, its implementation in the educational context and the active role of the teacher are crucial elements in creating a positive and inclusive learning experience for all learners.

The main theoretical models recall the concept of 'flow' elaborated by Mihály Csíkszentmihályi (2014), i.e. a state of total immersion and concentration in an activity perceived as intrinsically rewarding, which can be found in video games. Such games, if properly designed, are able to induce a state of flow in students, thus fostering deeper and longer-lasting learning. Moreover, a well-structured flow experience adapts to individual abilities, allowing learners with different skill levels, backgrounds and learning styles to feel equally engaged and challenged.

Another key reference is David Kolb's (2005) experiential model, according to which learning occurs through concrete experience, reflection, conceptualisation and active experimentation. Video games offer an ideal environment to put this learning cycle into practice, allowing students to live simulated but realistic experiences, reflect on their actions and consequences, develop mental models and abstract concepts, and experiment with what they have learned in new situations within the game. Whereas, the concept of situated learning, elaborated by Jean Lave and Etienne Wenger (2006), supports learning as a social process that takes place within specific communities of practice, such as in multiplayer video games, where learning communities allow learners to collaborate,

share knowledge and learn from each other. Finally, Edward Deci and Richard Ryan's (2008) theory of self-determination, according to which video games, due to their playful component, are able to stimulate the intrinsic motivation of students, fostering more meaningful and lasting learning.

2. Terminological issues: GBL and Gamification

After this brief theoretical overview, we intend to elaborate on an aspect that is not only terminological, but substantive, the differentiation between Game Based Learning and Gamification (Karagiorgas & Niemann, 2017):

1) Game Based Learning is an educational approach that uses specially designed games to promote learning. The entire learning process is structured as a real game, characterised by rules, objectives, challenges and rewards. The main objective of this methodology is the acquisition of specific content and skills through playful experience.

Through the use of games and simulations, students can acquire knowledge and skills in a more engaging and motivating way, developing problem-solving, critical thinking and collaboration skills. Some examples of GBL include simulation games, role-playing games and educational adventures. The main advantages of GBL are its high level of engagement and motivation, the promotion of active learning and experimentation, the possibility to apply knowledge in simulated contexts and the provision of immediate and personalised feedback (El-Sattar, 2017). Examples of webtools for Digital Game Based Learning are Kahoot, Quizizz, Quizalize, Jeopardy, which, in addition to giving teachers the possibility to build games and quizzes for pupils to play, individually or in groups, thanks to various types of devices, also allow them to use games created by others and shared on their respective communities.

2) Coined in 2002 by Nick Pelling, the term 'Gamification' (Marczewski, 2012), only appeared in the literature on educational techniques and strategies in 2008 (Deterding et al., 2011) and has been gaining increasing importance since the 2010s. Gamification is a methodology that refers to the use of typical game elements in

different and non-game contexts, such as the educational and didactic one, offering the opportunity to design engaging and effective activities, capable of satisfying individuals' needs for relationships, competence and autonomy (Di Tore et al., 2014). Such needs are considered by Self-Determination Theory as fundamental to the development of intrinsic motivation (Deci & Ryan, 2008). In contrast to actual games, gamification is characterised by its serious purpose, and represents a more complex and structured teaching strategy, particularly suitable for older students and capable of using sophisticated approaches. In the school context, gamification involves dividing the class into cooperative groups, whose members have differentiated roles and responsibilities. The students, organised into teams, go on a playful adventure, a mission that employs game mechanics to perform academic tasks and achieve a complex goal. By cooperating and teaming up, pupils carry out educational activities that have a challenging structure and fantasy setting, progressively overcoming levels of increasing difficulty until the mission is completed (De Giuseppe & Ianniello, 2020).

Although GBL and Gamification have significantly different characteristics and implementation processes, they both share a common principle: to make the learning experience more engaging, fun and competitive. These are highly effective learning strategies, so much so that they are also applied in work contexts to increase employee productivity and engagement. In addition, the integration of gamified elements into the school environment allows teachers to closely monitor student progress.

2.1. VR, AR, MR and Video Games

The topic of educational and inclusive video games today is inextricably linked to concepts such as augmented, virtual and/or mixed reality. In recent years, augmented reality (AR) has become established as an effective tool for interacting with visitors in cultural institutions, and sometimes as a lever for meaningful learning in schools. By superimposing virtual elements on the real world, it provides additional information to the user. Edutainment and gamification become fundamental in the economy of the user experience, allowing for both educational and playful service delivery (Luis et al., 2017) (Martino & Longo, 2019) (Corona et al., 2013).

Edutainment promotes learning through playful experience. This new conception of learning is based on strategies that generate involvement and interest similar to those generated by games (Gee, 2005). The game thus becomes a medium for conveying educational content. This explains the increased popularity of Augmented Reality and Virtual Reality applications in pre-school and primary schools.

It is possible to trace a nodal moment of this innovative line during Covid 19. In fact, after the pandemic, several actors (schools, museums, foundations...) invested and bet heavily on digitisation to create virtual connections between people, places and objects (Bolognesi & Aiello, 2020). The use of digital technologies applied to cultural heritage since the 1990s is increasingly massive. Educational institutions, museums, but more generally any context can become a place of knowledge production and processing. Digitisation is no longer just a way to facilitate and broaden the experience, but is now a possible alternative to the traditional experience (Aiello et al., 2019).

With the advent of new technologies, the gap between the 'physical world' and the 'information world' has progressively narrowed, allowing elements from both to be combined. In 1994, Milgram and Kishino, in their work *A Taxonomy of Mixed*

Reality Visual Displays, introduced the concept of the Reality-Virtuality Continuum. In this spectrum, the completely real world is placed on one side and the totally virtual world on the other; the environments in between are called mixed reality, i.e. a combination of real and virtual objects. In particular, when the real world is enriched with digital content, we speak of augmented reality.

With the advancement of technology and the increasing popularity of smartphones and wearable devices, the number of augmented reality applications in different sectors - such as industry, education and entertainment - is constantly growing. In the educational context, students can connect elements of the physical world to information from the virtual world, deepening and making the learning process more engaging. Similarly, video games based on augmented reality have achieved considerable success in reaching a wide audience, contributing to the spread of this technology.

2.2. Impact of VR use

Professionals perceive multiple advantages in the use of virtual reality in the museum context. The adoption of this technology improves user engagement through the use of persuasive narratives and otherwise inaccessible experiences. VR allows access to people with disabilities, those who wish to experience the museum remotely, and those who had not previously had the opportunity to experience this technology first-hand. In addition, VR becomes an effective educational tool to explore different topics in depth, thanks to the immersivity that fosters involvement and learning. The experience also becomes personalised, especially if VR, now an established technology, is integrated with other types of technologies; however, some practitioners believe that the high degree of immersiveness may also present certain drawbacks in the museum context. There is no shortage of challenges and limitations, first and foremost the lack of social interaction, as in most cases VR is designed to be used by a single user at a time; immersion, in this respect, goes from being an advantage to becoming a limitation. Virtual reality presents several challenges and limitations in the museum environment. Besides the high costs and the need for staff training to support even less experienced visitors, the use of VR can be an obstacle for certain categories of visitors, such as people with sensory disabilities or children of certain age groups. Furthermore, there are practical and technical issues related to hygiene and physical side effects, such as dizziness. Factors such as graphic quality, realism, exhibition flow and the possible distraction from the content of the exhibition due to the use of technology, still not fully accepted by some sceptical visitors, require special attention

2.3. Towards a heritage pedagogy

In recent years, an increasingly significant role in education has been attributed to cultural heritage, understood in its broadest sense as the set of tangible and intangible assets that are the expression of a culture in its various manifestations (Poli, 2018). Cultural heritage exists to effectively communicate knowledge acquired and elaborated over time, so as to contribute to the cultural development of society; communication therefore serves as a tool to generate and disseminate knowledge. The task of a museum is to help all visitors, even those without specific knowledge, to understand the information it intends to convey in a very short space of time; ideally, the museum should also deepen its visitors' interest in the topics displayed in the exhibition.

Therefore, it is necessary to be able to convey even the most complex themes in a simple and engaging way, in order to make access available to an ever wider public. Another fundamental aspect that museums are confronted with is the fact that artefacts are not fully accessible to visitors, since most of the exhibits cannot be touched as they are fragile, unique and precious objects; moreover, some cultural goods cannot be enjoyed for security reasons or due to destruction or damage caused by natural or man-made events such as wars. All this, together with the advent of new technologies, has led to the digitisation of museum content: a digital copy of an archaeological artefact is a replicable, navigable and decomposable image of an object, which can be used in different ways to study the artefact itself and to share the results with the public and the scientific community.

Digital and communication technologies allow cultural heritage institutions to broaden their user base, complementing traditional modes of use with new forms of active and participatory learning. Digital communication also makes it possible to convey more information, even in different formats and potentially not otherwise accessible, allowing users to personalise their experience and access collections at any time. At the same time, these technologies offer the possibility to 'trans-carry' museums or rather cultural heritage artefacts wherever we want. Digitising, by means of 3D scanning, works of art and historical museum artefacts from the Italian territory, in order to develop proto types of inclusive educational open source digital assets allows us to build inclusive virtual museums, usable in VR or AR. In this way, the digitisation of historical artefacts and their virtualised or physical reproducibility through 3D printing will allow an in-depth study of the most effective forms of inclusive interaction, which can be used in the educational sphere and enjoyed by groups of students in any location through visors. Experience carried out by the *Laboratory Teaching Learning Centre for Education and Inclusive Technologies - Elisa Frauenfelder* of the Department of Human, Philosophical and Education Sciences at the University of Salerno, which, through the Scanitaly: VR Museum, VR Art Gallery and AR Museum project, aims precisely at conducting the digitisation through 3D scanning of works of art and historical artefacts from southern Italy, in order to develop prototypes of open-source inclusive teaching resources.

The use of cultural heritage within the school system is a fundamental objective that necessarily implies continuous exchanges between school and territory, between tangible heritage and cultural landscape. The pedagogy of cultural heritage can become a means of interweaving knowledge and promoting a sense of belonging to the 'community of heritage' present in the contexts in which Italian schools are located, and finds new impetus in the Educational Community Pacts, which become the tool through which the school rethinks itself as an integrated educational system capable of connecting formal, non-formal and informal in the school of proximity. Within this pedagogical vision of a school of proximity, where the school extends to the territory and the territory makes its social and cultural capital available to build organisational forms that rethink the spaces and times of doing school, new didactic-ludic experiences are inserted.

Starting from a reconceptualisation of educational environments, with the aim of exploring ways of integrating the cultural and spatial heritage of museums into formal and non-formal educational experiences, we feel it is urgent to ask whether through the creation of a virtual museum it is possible to foster inclusion.

From such a viewpoint, the school takes on a social-experimental connotation with a shift from being a place of learning par excellence (delegated to the transmission of knowledge) to an environment of social interaction, in which to experience/experience experiences, the expression of relationships and educational/formative emotions (Rogers, Shoemaker, 1971). We are faced with a new sense of doing school, which, according to the socio-constructivist theoretical view, is a school of life. A positive ecological climate must be established, which aims at socialised learning and meaningful actions (Rogers, Shoemaker, 1971), to foster metacognitive progress, as self-awareness of cognitive functioning. Through the application of cooperative learning methodologies and/or co-construction of the virtual museum, the degree of inclusiveness will be assessed. Among the different cooperative methodologies, the project proposes to apply Flipped Inclusion (De Giuseppe et al., 2020).

2.4. Economics of experience and the current landscape

The concept of the 'experience economy' was introduced by Pine and Gilmore in 1998 to describe the evolution of economies, in particular the process of tertiarisation towards a service-centred approach. This model has found particular application in the tourism sector, where the visitor experience has become increasingly central. In this context, technology has proven to be an effective tool to offer tourists unique, personalised, educational and enjoyable experiences. Cultural and museum tourism represents one of the most important forms of tourism activity, as cultural sites are destinations that visitors choose to visit regardless of their geographical location.

A key factor for the visitor experience is the perceived experiential value, which is based on the interaction or co-creation of the experience between the service provider and the customer. When it comes to experience, understood as an event that engages individuals in a personal way, two key concepts are absorption and immersion. Absorption refers to experiences in which there is some distance from the individual, while immersion examines the direct involvement of the person.

Virtual and augmented reality can be used in education, culture and museums to create immersive, authentic and interactive experiences. This approach, known as edutainment, combines the educational aspect with entertainment, exploiting modern technologies to emotionally engage and stimulate active participation. In addition, the use of augmented reality makes it possible to provide additional information on artefacts or present them from a different perspective. However, when it comes to reconstructions of environments, monuments or objects that no longer exist, special attention must be paid to the authenticity of the reproduction. The lack of complete information may lead to a certain degree of subjectivity, despite being accompanied by historical and scientific insights. It is important to consider this aspect in order not to compromise perceived authenticity. AR applications often adopt 'serious games' in various fields, ranging from cultural to education and medicine. These are video games with specific objectives, adapted to the application context, which aim to achieve certain results without sacrificing the playful element.

AR applications incorporating ludic elements are therefore an effective tool to increase visitor satisfaction, as well as to increase their level of interaction and involvement. In this context, storytelling becomes a means to foster greater user participation; when integrated with technological tools, it evolves by introducing new ways of communicating and narrating, thus creating a closer relationship between

user, narrative and context. In designing the experience, it is crucial to consider both the cognitive and emotional components of the user, providing not only more information, but also engaging narratives capable of touching the visitor's soul, for instance through historical audio recordings or animations. Finally, the design of user interfaces is essential so that the system can communicate clearly even with less technology-savvy visitors and children, who might find the combination of interactivity and AR a reason to be interested in cultural heritage.

An important issue to consider is the possibility that the augmented reality experience may distract visitors from the physical world, leading them to focus exclusively on the device being used rather than on the actual exhibition. Therefore, it is crucial to design the application in a way that associates virtual elements with what can only be observed and interacted with in the physical environment. In this way, one tries to reduce the time spent solely focused on augmented reality, fostering an effective connection between the two worlds to offer a more balanced and enriching experience.

2.5. The 'Return to Deir el-Medina' Case

What we have described so far led us, during the third edition of the conference 'The Videogame in Italy: Archaeology of the Present: the Videogame between Past and Future', to the videogame *Return to Deir el-Medina* developed as part of the virtual tour for children of the Egyptian Museum in Turin. Aida, the young protagonist of the video game, is an aspiring archaeologist with a passion for Egyptian civilisation. She will find herself in the ancient village of Deir el-Medina and guide the player through an adventure full of mysteries and insights. Through quizzes, challenges and through dialogue with real-life characters, the player puts together the pieces of a mysterious amulet. The video game in HTML5 and Javascript, playable from browser, mobile and desktop, succeeds in captivating and intriguing pupils, prompting them to discover Aida's adventures and delve deeper into the Egyptian civilisation. It also uses an OpenDyslexic font to increase readability for children. It is a narrative video game with great care in the relationship between graphic assets, artefacts and historical sources that makes use of existing museum technology to simplify access to the game and implementation in the museum context. *Return to Deir el-Medina* is characterised as a product with a strong visual and playful impact and coherent content from a historical and philological point of view. And here we define our narrow focus of investigation.

3. CONCLUDING REFLECTIONS

With this contribution we wanted to suggest that the integration of video games and extended reality in primary school (and beyond) represents an extraordinary opportunity to create learning paths that are stimulating, inclusive and above all in step with the digital society.

At the same time, let it be clear, this forward-looking and innovative outlook must in no way obscure the complex and, in some contexts persistent, fabric of criticalities and challenges that these new forms of learning and teaching bring into play. This criticality and challenge process concerns, on the one hand, the need for in-depth and timely training of teachers, who must have the necessary skills to integrate video games and extended reality into teaching, and on the other, the importance of the

upstream selection of quality games and applications, suitable for the ages and contexts to which they refer.

Therefore, far from delegating the transmission of knowledge to technology, the role of the teaching staff is now more crucial than ever - in the present and in the future (Limone, Parmigiani, 2017). A teacher who with intelligence, sensitivity and spirit of knowledge becomes selector, mediator and evaluator of the new 'technological uses'. And where, in a rediscovered dialectical and constructive enthusiasm, the founding (and in some respects strategic) value of a close and fruitful collaboration between school, family and experts to create a concrete educational and innovative ecosystem is always enshrined (De Giuseppe, 2016).

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