

LEARNING FROM GAMING: TEACHERS' AND STUDENTS' PERCEPTIONS

MARGARIDA LUCAS

University of Aveiro, Portugal

mlucas@ua.pt

Research into the use of games in education is relatively new, but growing rapidly. Several authors suggest that these will gain widespread use in two to three years, but practical implementation is still rare and integration into the curriculum still seems unlikely. Games in education are described as inherently valuable, leading to a development of a range of skills and competences, such as collaboration, critical thinking, problem-solving, and communication that may transfer to other social and work-related spheres. This article presents an experiment that used online video games to foster interaction among students and teachers from different educational levels and different national schools. Results suggest that both students and teachers perceived gaming as a means to harness curriculum interdisciplinarity, develop skills and acquire new knowledge.

Key words: video games, gaming, learning, postgraduation

1 Introduction

The open, mobile and ubiquitous learning paradigm has been increasingly recognized as a requisite for all educational systems that wish to assure the acquisition and development of lifelong skills by their students – not only due to the recommendations made by recent reports and guidelines [1][2] that suggest the adoption and integration of mobile technologies as a means to support the new learning paradigm, but also due to the emergence of the so-called “New Millenium Learners” [3] or “Net-Generation” [4], a generation that has grown up with technology and face the new demands of a highly technological society. Some empirical findings about these new learners’ learning styles refer that they are immersed in a rich, technology-enhanced learning environment and that they select and master technologies for their own personal needs [5]. Furthermore, they seem to capitalise on mobile networking to foster learning communities, exchange ideas, provide support and check progress; they master learning resources to their individual needs and employ renewed learning strategies to build their own learning paths [6].

Emerging technologies and applications, namely online video games, are being used to widen and extend traditional learning approaches, not only to better meet the new learners’ expectations anywhere anytime, but also to endow them with a range of skills. Video games with educational potential are designed to enable the player to learn and feel accomplishment without giving up, i.e., they are made of experiences that have learning at their core with built-in mentoring. When playing video games, students learn that failing is not a problem and that often failing a few times is necessary

to achieve success. Feedback on failing and/or winning works as a built-in assessment mechanism which let players know where they are and what areas they need to improve in. Such aspects allow players to look objectively at things they are good at and work at improving areas where they are weaker.

When integrated with innovative pedagogical practices, games can become a “land of learning (and teaching) opportunities” for it fosters and supports different paces and types of learning, due to the interaction and connections it enables, the non-linearity it bases on, the multiple paths it affords as well as the learner empowerment it provides. The use of games in educational settings, namely real time strategy games (RTSGs) or massively multiplayer online games (MMOGs) are just an example, in which learning can happen unexpectedly as a result of the connections and interactions of participants playing the game [7][8][9]. Thus, learning can become a product of gaming through distributed, yet context situated and highly connected learning sustained by a collective practice [10][11].

Unfortunately, the assumptions and benefits underlying gaming that should be harnessed in (more formal) learning contexts lack recognition and effective implementation on the part of educational institutions; it is usually individual teachers and/or lecturers who exploit the educational potential of games and begin experimenting with them. They are the ones who move course environments from the closed and “inside-driven” institutional virtual learning environments and open them to all by harnessing the benefits of the social and mobile web.

The present article refers such an example. Having embraced the idea that learning is all about social participation and knowledge building and not just about delivery and acquisition, some of the teachers from the Masters Course on Multimedia in Education (MMEdu) of the University of Aveiro (UA) adopted a pedagogy that merged creativity and technology to explore gaming in their school subjects. In the next section, we refer some of the main ideas driving gaming in education. We then present the course context and its organisation as well as of the subject in which we will focus our attention for the purpose of this work. Then, we will describe one of the projects developed, which used gaming to foster interaction and learning, followed by a discussion section and a final conclusion.

2 Gaming and learning

The expansion of communication technologies into every facet of society has caused significant changes in how, when and where individuals learn. Educational systems have been embracing such technologies to prepare students effectively for a highly demanding society, not exclusively, but mostly in what knowledge and skills are concerned.

School-aged children worldwide are becoming mobile learners as they are growing up immersed in a media-rich, ubiquitous, “always connected” world. They use laptops, tablets, cell phones and handheld game consoles and they expect to use them in their daily interactions. It is now known that these students are far more experienced and able at processing information rapidly than were their predecessors and are bored if they have to ‘power down’ at school [12][13]. The convergence of high-speed Internet connections, sophisticated graphics cards, and powerful microprocessors has paved the way for video games and the gaming industry, which, in the last decade, has been looking at Education

as an area of interest. Nowadays, most videogames present a set of mechanisms or processes [14] that help us understand how they can, in theory, assist the pursuit of educational goals:

- Rules – every game has a set of rules; these can be simple and binary (if/then), or multifaceted and accommodating a broad range of decision making processes;
- Clear, but challenging goals – by (re)solving activities students become aware of their efforts;
- A fictional setting or “fantasy” – by entering into a fictional setting or role players are allowed to experiment with skills and identities without suffering the consequences of failure in real life;
- Progressive difficulty levels – essential to progress from one level to another;
- Interaction and high degree of student control – transmitting the notion that effort and dedication will be acknowledged and rewarded;
- A degree of uncertainty and unpredictability;
- Immediate and constructive feedback – video games provide feedback in real time, not only as evaluation, but more often as guidance to facilitate and correct performance;
- A social element that allows people to share experiences and build bonds – the entire ecosystem surrounding the game is relevant from an education point of view, because it gives players the opportunity to share, interact and pursue interests and passions.

Given these characteristics, the use of games as learning tools is being used, not only to meet students' expectations, but also to enhance their learning experience and to enable them the acquisition and development of a range of skills and competences, such as collaboration, critical thinking, problem-solving, and communication that may transfer to other social and work-related spheres [7][15]. The reason why games are frequently cited as important tools for skill development is because they can accommodate a wide variety of learning styles within a complex decision-making context [16]. This is the case of massively multiplayer online games (MMOGs), described as “a whole constellation of literacy practices” [11].

MMOGs are highly graphical video games played online, allowing gamers to create personalized digital personae called avatars and interact, not only with the game setting itself, but also with other avatars [11]. These games are usually structured by open-ended (fantasy) narratives, where players are in control of a variety of actions. According to different authors, narrative is a critical component of the learning environment for it “situate[s] the activity, defining goals, constraining actions, provoking thought, and sparking emotional responses as students struggle to resolve complex, authentic problems” [17]. Authors add that “from a situated learning perspective, these narrative constraints and possibilities shape action, and become part of students' understanding of a domain in fundamental ways.” This is, in fact, a form of situated cognition. The game situates knowledge “in a multimodal space through embodied experiences to solve problems and reflect on the intricacies of the design of imagined worlds and the design of both real and imagined social relationships in the modern world” [10].

Arguments made by these authors stress Lave and Wenger's notion that learning is a social practice. Lave and Wenger [18] argue that learning, thinking and knowing emerge from a world that is socially constructed. Meaning is contextual, and learning is what happens when individuals become increasingly involved as participants in social communities of practice. This is particularly relevant to various online video games, such as RTSs and MMOGs, for they serve as communities characterized by a "full range of social and material practices" [19]. Usually learners enter into such spaces as newcomers, unfamiliar with domain-specific meanings. Through active participation, information sharing and collaboration, they learn to experience the world in new ways and they connect with others to discuss strategies or recommend improvements. The key concept of learning in this type of games is the intrinsic interest for participation in the community, which requires newcomers to move towards full participation in the community. Thus, the newcomers are inevitably involved in the community and the acquisition of knowledge and skills is a result of their full participation in the sociocultural practices of the community [18].

3 Course context and organization

The MMEdu of the University of Aveiro, 2007/08 edition, which is at present a doctoral programme, comprised different subjects related to the use, experimentation, assessment and integration of CT tools and software in education. The course was offered on a b-Learning regime, comprising two face-to-face (f2f) sessions – one at the beginning of each subject and another one at the end – and distance work for the span of four weeks. The MMEdu is a joint degree offered by the Departments of Educational Technology and of Communication and Arts and aims at endowing students with competences that empower them to integrate technologies into their professional tasks, develop activities or projects in educational fields that reflect and (re)create practices, along with the development of communication, collaboration, evaluation, assessment and research competences (knowledge, skills and attitudes). The work we present in this paper focuses on only one of the course subjects in detail – Multimedia and Cognitive Architectures (MAC).

In MAC, students, mainly in-service teachers, were expected to: i) deepen their knowledge about cognitive systems; ii) reflect upon learning theories related to the process of knowledge building; iii) explore the potential of social networking tools to augment interaction; iv) develop and implement an in-class activity with a strong focus on interaction; v) reflect upon the results derived from the activity implemented.

Along with the aforementioned objectives, the subject aimed at developing skills and competences related to students' professional perspectives: i) the integration of CT into teaching practices; ii) promoting and exploring interaction practices when planning pedagogical activities – whether curricular or non-curricular; iii) harness (in)formal learning outcomes that derive from the use of CT, namely social web tools, or the participation in such activities; iv) develop collaborative work; and v) develop research, management and information organization.

Besides the two teachers and one assistant, 56 students enrolled in MAC. From the questionnaire that a total of 42 students filled in at the end of the course subject, we can say that 26% were male and 74% female; 93% worked as teachers and 7% had other activities; from the 93% of students working as teachers only 10% were not teaching at the time data was gathered, which means a good percentage could engage in the effective implementation of the in-class activity with their pupils. Most students

(30%) referred the will to learn more as the main reason for having enrolled in the course, while 22% referred their personal interest and the prospects of new professional activities as the second and third more important reasons.

The tools used to distribute MAC were: 2 *Wordpress* blogs, *Slideshare*, *Wikispaces* and *Ma.gnolia*. The institutional e-learning platform – *Blackboard* – was used for administrative issues related to the course (for instance, before the start of the course, teachers prepared the guidelines and the tasks schedule in *Blackboard*. From this point onwards, *Blackboard* became the “router” to the course blog, which became the main learning platform). The majority of students, 52%, classified the choice of the aforementioned tools as being good and 43% as being very good. Only 5% referred this choice as reasonable.

In the following section we will refer to one of the activities developed and implemented by students during MAC. Data used pertains to data collected through document analysis and a questionnaire applied to students at the end of the course. From this point onwards, we will refer to MAC students as teachers and to their school students as students to avoid misunderstandings. Names and citations in Portuguese will also be translated into English.

4 Just one more level!

Just one more level! was the title of the activity developed by a group of five teachers: a primary school teacher, a History teacher, an English teacher, an ICT teacher and a Music/Civic Education teacher. When planning their activity, teachers sought to promote interaction among students in their classes, but also among all students participating in the activity they were developing. They also sought to explore contents from the subjects they taught under an interdisciplinary perspective and therefore, they opted to explore the topic online games. Teachers developed a plan that explored curricular contents from the subjects of English, History and Civic Education. In order to introduce students to the planned activities, teachers used Moodle (the learning platform used in their schools), because students were already accustomed to use it. After detailing the activity that was going to be implemented, teachers created a forum – Just one more level! – for all the students/teachers involved in the activity (Figure 1).



Figure 1. Game section from Just one more level! Forum.

Apart from a 'Welcome' section, 'Forum rules' and 'News' section, there was a 'Games' section in which participants could find 4 topics – 1 for each game explored: GCompris, Portugal1111 and Stronghold. Later on, and because demands from students were so frequent, teachers added another game from the Stronghold saga – Stronghold Crusader.

GCompris is a free educational software. It presents several educational activities (Figure 2) that can be used with children aged between 2 and 10. Currently GCompris offers more than 130 activities related to computer discovery, numeracy, science, geography, reading and games related to, for instances, learning to tell the time, cartoon making, puzzles, etc. The primary teacher that belonged to this group of teachers explored this software with her students aged 9-11. Data related to the use of this game will not be included in the present article, as it falls out of its scope.



Figure 2. Screenshots from GCompris.

The other two games fall into the category of real time strategy games (RTSGs) as well as massive multiplayer online games (MMOGs). Portugal1111 (Figure 3) was the first strategy game developed in Portugal. Its narrative is totally related to the country's history, more precisely with the wars between Christians and the Moors. In the game, each player has to conquer land to the Moors and build their nation. The player can take control of either the Christian Crusaders or the Moorish Invaders as both vie for permanence in the Iberian Peninsula. The game has only one resource - gold - which is acquired by selling wheat, or turning it into flour.



Figure 3. Screenshots from Portugal1111.

The second game (Figure 4), Stronghold (in which we include the Stronghold Crusader), also focus on conquest and expansion through military pursuits, but also provides space for economic strategy and development. The game offers two types of campaigns: a military one and an economical one. In the first campaign, the player plays the role of a lord and has to defeat other lords in order to get the support of the king. In the second campaign, the player is responsible for reconstructing parts of the kingdom and provide for their men. The game takes place in Medieval England and Wales.

Participants in both games – Portugal111 and Stronghold – included students from different grades and schools:

- 2 classes from 8th grade (students aged 11-14, from a school in central northern Portugal)
- 5 classes from 9th grade (students aged 14-17, from a school in northern Portugal)
- 1 class from 10th grade (students aged 16-18, from a school in central Portugal)



Figure 4. Screenshots from Stronghold.

From these two games, students' preferences fell into Stronghold – The Ultimate Medieval Online Strategy Game. Students did not have prior knowledge about this game and so they started exploring it from scratch and sharing their findings about the game. Participation and interest from some of the students were so intense, that teachers promoted them to moderators of the forum allowing them to take a more active role, rather than being a “mere” player. The role played by teachers was almost imperceptible, giving students the freedom and control to learn by discovery. In fact, teachers were new gamers as well, asking for the students' support to move forward in the game.

5 Discussion

Just one more level! registered a total of 572 messages, 38 topics and 119 registered users, which, given the short period of time during which the activity took place, illustrate the level of participation and interest that the activity raised. During the activity, teachers' and students' enthusiasm was shared in a blog teachers' created to present the course project^a.

^a Available in <http://deadline5.wordpress.com/>.

Students' comments during the activity suggest the type of strategy adopted by most of their teachers during classes. One of them says that "usually classes are boring, because all the teacher does is saying 'open your books on page X and start reading'"; building on this comment, another student adds that "I also believe that school and classes in general do not appeal to us, because they don't innovate". It comes to no surprise then, that different students commented on the activity being implemented as "challenging", "addictive" and "fun". Teachers working in-class with students also shared their enthusiasm:

I share a small observation that has been filling me with satisfaction over these two weeks: the fact that my students from two classes, one from a professional course, showing immense difficulties in all subjects, particularly in English, have not complained one single time about the game being in English. Just the fact that it is a "game" motivated them and the language barrier was never a problem. I have also verified that they show interest in engaging with the activity most of their time outside the classroom; they want to learn strategies to overcome difficulties/obstacles and advance levels. They combine strategies during recess and at home and they help each other.

In my classes enthusiasm has also been great (...) there are students who show little motivation to learn, but at this point, motivation has greatly increased, not only in my classroom, but also in relation to the history subject. They have already spoken with the teacher and invited her to participate in the game ...

We finished this challenge by sharing a picture (Figure 5) showing students' involvement in the project. I am pleased to find that a project of this kind has managed to captivate students of various educational levels, from various schools dispersed geographically. It will certainly be an experience to repeat in the future. As to this particular picture, it needs to be said that it was taken during lunch time, during students' free time, when they showed up voluntarily to further develop the work already begun previously.



Figure 5. Students playing Stronghold (photo by F. Miguel).

Although it has not been possible to draw accurate conclusions about the impact that the activity had at the level of formal learning, namely in the subjects of History, English and Civic Education given the short time in which it was developed, it is possible to find evidence of learning gains by the students involved through a number of situations:

- i) by overcoming obstacles

I can manage myself...I read the subtitles and the words in English and use the online dictionary to translate them into Portuguese ;)

In the beginning I couldn't understand the game. My people starved and I couldn't earn money. Then I started playing in the Castle Builder mode – no enemies – and now I think I'm ready to enter a campaign.

I have no difficulties. There is usually someone online that helps me whenever I find a problem!

- ii) by sharing what one has already discovered

If you don't want to be attacked, you need to build defence towers. They will automatically defend your territory.

You have to build a Pitch Rig. Then you can use it to earn money or to defend your castle.

You need a woodsman to gather wood, so that you can build arrows and train archers!

The green areas are very important, because they allow you to feed your community!

- iii) by negotiating

Are you sure? Note that many troops are just the basics in an attack...a few troops and a good striker can do miracles...now imagine a good striker with many troops!

If you let me build another farm near the lake, I won't attack you! OK!?

The participation in MAC and the development and implementation of the in-class activity was perceived as a learning opportunity by teachers themselves, who recognized that it had allowed them to develop skills and attitudes. The percentage of teachers acknowledging the development of social skills and attitudes corresponded to 85%; these included, for instances, the will to innovate, share and embrace new teaching practices or the ability to work collaboratively as part of a group; the development of technological skills and attitudes, which included, for instances, the ability to use CT to promote problem solving and innovation or the selection and management of resources and tools for specific purposes, was acknowledged by 81% and 90% stated that they had developed professional skills and attitudes; these included, for instances, a student centered learning approach or an interdisciplinary posture.

Data regarding the aforementioned aspects were gathered through a questionnaire given to teachers after they completed the course. The questionnaire also sought to collect the perceptions of teachers in relation to the in-class activity developed and implemented with their students. Results shown in Figure 6 refer to a set of statements presented to teachers, in which they were asked to position themselves according to an agreement scale, in which SA stood for strongly agree, A for agree, N for neutral, D for disagree and SD for strongly disagree. Statements selected for the present

work pertain to relevant aspects discussed so far and they include, for instance, the impacts of the activity on students and teachers’ practices. We felt it pertinent to understand the impact that the course had on students’ perception of new types of learning, teaching practices, in which gaming is included, and training approaches.

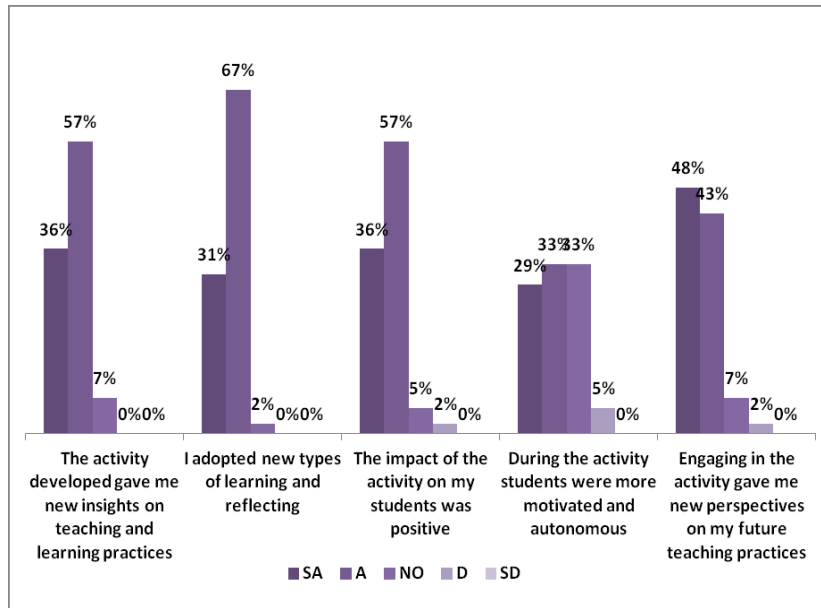


Figure 6. Teachers’ perceptions on the activity developed.

As illustrated positions “SA” and “A” are the most chosen ones. In fact, when read in conjunction, the percentage of answers in both positions exceeds 90% in 4 of the 5 statements. In the statement “The activity developed gave me new insights on teaching and learning”, the percentage of teachers to position themselves in the options “SA” and “A” corresponds to 93%. Only 7% expressed a neutral position towards the statement. This neutrality was manifested again by 7% in relation to the statement “Engaging in the activity gave me new perspectives on my future teaching practices”. The number of teachers to position themselves in this option regarding these two statements may be related to the fact that both refer specifically to the professional activity of teaching. As mentioned earlier, 3 of the 42 course participants who answered the questionnaire were not teaching professionals and this may help to explain this result. However, this does not rule out the possibility of teaching respondents actually aligning with this option.

Results referring to the statement “The impact of the activity on my students was positive” are relatively the same. 5% maintained a neutral answer and 2% disagreed with the statement. Again, this may be related with the fact that 7% of the respondents did not work as teaching professionals, thus did not have the opportunity to acknowledge such aspect.

Results are more balanced regarding the statement “During the activity students were more motivated and autonomous”. This was the only statement that did not reach 90% of answers when combining results from options “SA” and “A”. Along with the option “A”, the “NO” option was the most chosen one. Also, the percentage of answers in the “D” option is higher than in any other statement. Apart from the already mentioned reason, we add another one that relates to the number of students who effectively implemented the activity with their students. Although there were working groups in which all of its elements were able to develop and implement the activity with their classes, there were groups in which only one or two of the elements could do it. In such case, taking a position on other students' motivation and autonomy could have been considered inadequate by respondents.

6 Conclusion

This paper makes reference to a course subject which gave students hands on experience in exploring and integrating gaming in their class activities as a means to develop interaction and thus promote different types of learning.

Findings seem to suggest that, when merged with new pedagogies and innovative methods – transfer of responsibility to students, autonomous learning, context situated problem based learning and collaborative work – online video games can support distributed learning contexts in which the development of different competences are fostered. From the teachers own perspective, games can support, facilitate and enhance learning opportunities and outcomes. Furthermore, their use is increasingly recognised to improve knowledge exchange and to foster the development of personal skills and personal achievement.

Although the case we present is by no means comprehensive due to its limited duration and scope, it provides data on how the use of games impacted teachers and students, and to some extent, teaching practices, and it adds to the discussion on how future in-class activities could be designed.

References

1. UNESCO. Policy guidelines for mobile learning, 2013. Retrieved October 10 2013, from <http://unesdoc.unesco.org/images/0021/002196/219641E.pdf>.
2. European Union. Delivering Lifelong Learning for Knowledge, Creativity and Innovation. Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Region, Brussels, 2007.
3. OECD. Education at a glance. OECD Indicators, 2008. Retrieved October 12 2013, from www.oecd.org/edu/eag
4. Oblinger, D. G., and Oblinger, J. L. Educating the Net Generation. An Educause e-book publication, 2005. Retrieved October 12 2013 from <http://www.educause.edu/research-and-publications/books/educating-net-generation>
5. Conole, G. et al. Disruptive technologies, pedagogical innovation: What's new? Findings from an in-depth study of students' use and perception of technology. *Computers & Education*, 50, 511-524, 2005.
6. Kennedy, G. et al. Questioning the net generation: A collaborative project in Australian higher education, *Australasian Journal of Educational Technology*. 24(1), 108-122, 2006.
7. Alvermann, E. et al. Adolescents' Web-Based Literacies, Identity Construction, and Skill Development. *Literacy Research and Instruction*, 51(3), 179-195, 2012.

8. BECTA, Computer Games in Education project. Retrieved 18 October 2013, from www.becta.org.uk/research/research.cfm?section=1&id=2826
9. McClarty, K. L. et al. A Literature Review of Gaming in Education: A research report. Pearson, 2012.
10. Gee, P. What video games have to teach us about learning and literacy, NY: Palgrave Macmillan, 2003.
11. Steinkuehler, C. Massively multiplayer online gaming as a constellation of literacy practices. *eLearning*, 4(3), 297-318, 2007.
12. Mumtaz, S. Children's enjoyment and perception of computer use in the home and the school. *Computers & Education*, vol. 36, no. 4, p. 347-362, 2001.
13. Prensky, M. Digital game-based learning, New York: McGraw-Hill, 2001.
14. Kirriemuir, J. and McFarlane, A. Literature review in games and learning, 2004. Retrieved October 18 2013 from <http://archive.futurelab.org.uk/resources/publications-reports-articles/literature-reviews/Literature-Review378>
15. Adachi, P. and Willoughby, T. "Do Video Games Promote Positive Youth Development?" *Journal of Adolescent Research*, 28(2), 155-165, 2012.
16. Squire, K. D. From content to context: Video games and designed experiences. *Educational Researcher*, 35(8), 19-29, 2006.
17. Squire, K. D. et al. Design principles of next-generation digital gaming for education. *Educational Technology*, September-October, 17-23, 2003.
18. Lave, J. and Wenger, E. *Situated Learning, Legitimate Peripheral Participation*. USA: Cambridge University Press, 2001.
19. Steinkuehler, C. Learning in massively multiplayer online games. in Kafai, Y. B. et al. eds., *Proceedings of the Sixth International Conference of the Learning Sciences*, Mahwah, NJ: Erlbaum, 2004, 521-528.