

Section 1

Chapter 3 - How Players Learn To Learn While Playing?

Theoretical Framework

3.1: Towards The Definition Of “Learning To Learn”

Providing definitions for human qualities such as intelligence, reasoning, and learning is usually a difficult and controversial task. The fundamental reason is that defining these concepts requires a certain circular process. That is to say, in order to define those qualities, humans must make use of them. This forces us to use recursive strategies that often lead to paradoxical situations, and also to use a level of abstraction that is not always easy to achieve.

Regarding the definition of "learning to learn", the level of complexity is greater because it is a second order concept. In any case, this section will try to provide the steps for defining this metaconcept.

The standard learning scenario usually involves two parties: teacher and student. A "learning to learn" scenario aims to dissociate this scenario and lead to total student autonomy in the learning process. The standard scenario generates a dependency relationship between the teacher and the student. In this case, even when the learning process is successful, the student may not become aware that they are learning. When the "learning to learn" process successfully achieves its objective, the student will be able to:

- Learn on their own (learning autonomy).
- Be aware of their own learning (learning self-awareness).

Learning autonomy means that the student will be able to acquire and internalize the necessary methodology to learn. Which means organizing and managing time, information and resources.



However, in order to learn to learn, it is necessary to previously acquire a series of basic skills such as reading, writing, and arithmetic. Nowadays, it is also necessary to competently use Information and Communication Technologies. Using these skills, the student who learns to learn must be able to seek, obtain, select, process, assimilate and internalize new skills and new knowledge. The usual methodological strategy for carrying out this task is the application of previous learning experiences to new contexts.

As a result of all this, the student will be able to manage their own learning by acquiring and configuring the methodology that best suits their case. This methodology will allow the student's learning to last. In addition, an adequate application of this methodology will improve student learning processes over time.

The other aspect of "learning to learn" is that the students must be aware of their own learning. This means that students must:

- Know their learning needs.
- Be able to identify learning opportunities.
- Know the processes that lead to acquisition, processing and assimilation of new skills and knowledge.

These three capacities together with the methodology mentioned above permit students to overcome any obstacle related to learning. Multiple learning strategies exist, and it is therefore necessary for students to have a clear idea of which strategies are most efficient in their particular case. In addition, it is very important for students to be aware of their own strengths and weaknesses in terms of abilities and qualities.

In short, "learning to learn" could be defined as the competence leading to the dissociation of the teacher-student dichotomy, such that students are able to learn autonomously and self-consciously.

A number of fundamental skills are associated to this way of learning, such as self-discipline, the conscious search for learning opportunities, the capacity for self-evaluation, the autonomous search for information, problem solving, overcoming obstacles, change management, the ability to



apply prior learning to new scenarios, and the search for learning aids when required such as advice, guidance, or support.

Likewise, there are a number of attitudes and values associated with "learning to learn" such as motivation, self-confidence or curiosity. In this chapter we will defend the idea that, when selected and used properly, video games can foster the acquisition of such attitudes and values in the classroom.

3.2: Video Games As Educational Tools: Literature Review

Research on video games and their applicability to the educational field began with Ball (1978), who argued that video games favour the development of spatial abilities, the assimilation of numerical concepts and reading comprehension.

From that date onward, and with the growth of the video game industry in the 1980s, research on their impact increased and diversified. Studies were published highlighting the benefits of using video games in terms of psychomotor skills, motivation for learning and the development of cognitive strategies.

During the 90s, there was a boost in research as a result of researchers' concern over the effects of newly released video game consoles. Research in this decade was also spurred by the curiosity about a medium that began to stand out from the rest. The lines of study carried out in this period were fairly uniform over the years, and revolved mainly around the relationship between video games and violence, the study of consumption time and gender differences in use.

With the dawn of the 21st century, there was an increase in research focusing on the effects of video games on learning, as well as a surge in studies focusing on the use of serious games for educational and training processes.

Among the recent lines of research in the field of video games and education, we would like to point out the one focusing on procedures and frameworks for developing educational video games. This line includes models for guiding the development of video games. For example, the



study by Yusoff (2010) defines twelve attributes that serious games should possess to be effective educational tools:

1. Incremental learning. Learning activities are presented incrementally, and the learning outcomes are addressed one by one and not all at once.
2. Linearity. This is the degree to which learning activities are sequenced by the game and/or the degree to which students can build their own sequences.
3. Attention capacity. It refers to the cognitive processing and short-term memory demands imposed on students by the game. These demands must be carefully adjusted to suit target users.
4. Scaffolding. This refers to the support and aids provided by the game during the learning activities.
5. Transfer of learned skills. This is the support provided by the game for improving the application of knowledge previously learned at other levels.
6. Interaction. The degree to which the game's activities require responses and commitment by students.
7. Student control. The degree to which students can manage their learning activities within the game to scrutinize themselves and adapt to their own pace and experience.
8. Practice and repetition. This consists of the repetition of learning activities with increasingly difficult tasks for better achievement of the expected learning outcomes.
9. Intermittent feedback. The degree to which each game responds according to the interaction received.
10. Rewards. Provisions for maintaining student motivation in the game.
11. Situated and authentic learning. This implies a game environment where students can relate learning to their needs and interests of the outside world.
12. Accommodate learning styles. The ability to adapt to different learning styles, offering variations in the game.

This group of studies also includes aids for teachers to design and adapt video games. An example is the study by Marchioria, Del Blanco, Torrente, Martínez & Fernández (2011), who present a DSL (Domain Specific Visual Language) that facilitates the flow history of adventure games, taking into account educational features such as student evaluation and content adaptation.

Within the research analysing the effects of video games, studies into the effects of video games on students with diversity are beginning to stand out. These studies pay special attention to the impact of commercial video games on cognitive functions (memory and executive functions), class participation and attention. For example, Armendarez (2015), Rodríguez-Jiménez (2015), Hillier (2013) and Sproull (2011) focus on research involving mainly children with Autism Spectrum Disorder (ASD), Down Syndrome, Specific Language Disorders, and Attention Deficit Hyperactivity Disorder (ADHD). These studies present positive results.

The field of study encompassing the effects of video games also includes research aimed at exploring the effects generated by the use of video games as resources for teaching and learning in the classroom. The most representative studies are those regarding the impact of video games on learning in general, their influence on the knowledge of curricular subjects and their effects on students' procedural and attitudinal skills.

For example, Del Moral, Fernández & Guzmán (2015), analysed the extent to which the planned and systematic use of educational video games can constitute propitious learning contexts to develop Multiple Intelligences (MI) in schoolchildren. Among the findings, the authors indicate that the prior selection of video games guarantees the acquisition and reinforcement of numerous types of learning linked to curricular contents and that designed recreational activities (related to eight intelligences) represented motivating challenges for schoolchildren and opportunities for enhancing various skills. After the ludic-educational video game experience, a generalized increase was observed in all intelligences, with significant increases in logical-mathematical, visual-spatial and the bodily-kinesthetic intelligences.

Zhao & Linaza (2015) describe a study carried out with children aged 7 - 12 years to determine how and what they could learn when confronting a recently released video game. The authors'



findings revealed learning ability by players of all ages without specific instruction from adults. They also found evidence of coordination and cooperation within each group to achieve learning and, thus, be able to use the video game. What stood out was the autonomy in the learning process, the ability to resolve different types of group conflict arising throughout the game, and the ability to give meaning to the game's virtual world. Very young children revealed complex and important skills such as: leadership, care for other players and control of the process.

Finally, another trend in studies on video games and education focuses on the analysis of educational strategies for using these resources in schools. This category includes studies on how student experience the introduction of video games into classrooms, and the role of teachers in game-based learning. In the latter case, teachers are offered guidance and tools for the application of video games in the classroom. However, studies such as the following are also included:

- Those which describe the methodology used by teachers to deal with certain content using video games.
- Those analysing educational practices with video games carried out in courses or training activities specifically for teachers and related to games-based learning.
- Those analysing teaching functions during the direct implementation of digital games in the classroom.

Together, these studies can help to design training programs for using digital games in the classroom, and to design video games which take the teacher's role into consideration.

3.3: Video Games For “Learning To Learn” Competence

As mentioned above, a series of skills, attitudes and values are associated with the "learning to learn" competence. We will now analyse how the use of video games in the classroom can, to a greater or lesser extent, contribute to the acquisition of these by students.

Self-discipline



The use by teachers of some video games contributes to the acquisition of student self-discipline, which leads to greater independence with respect to the instructor. In Zhao & Linaza (2015), cited above, the authors show how primary school students increase their learning capacity without specific instruction by adults through the use of a recently released video game.

Search for help, information and learning opportunities

Initially, it was not common among gamers to search for help to overcome the challenges of the video game or to use the help tools provided by some software in new generation video games. However, there has been a change in the learning model due to the fact that context, missions, collaborative playing, role changes, and so on have become more important. Nowadays, video games can be considered open areas of discussion and collaboration that combine a variety of tools for communication and searching for help and information. Social networks, search engines, and forums make it possible to create knowledge networks and collaborative connections among participants.

Consequently, video games could be considered educational tools that give students some autonomy in the search for information, and as a result lead to some degree of learning autonomy, leaving the instructor in the background to provide tutoring and generic orientation.

In addition, as indicated by Prensky (2001), good video games make the same game seem different for each player. That is, they can adapt to individual interests and abilities by providing supplementary aids when needed or generating new challenges to increase difficulty. Moreover, these games clearly define objectives, and facilitate their achievement with constant feedback and a variety of strategies. This adaptability is an essential aid in the conscious search for learning opportunities, one of the main skills associated with "learning to learn".

Self-evaluation

Common video game characteristics, such as immediate feedback and the use of incentives, have a relevant impact on students' self-evaluation capacity when they are used as educational tools. Felicia (2009) indicates that the learning cycle in video games can be compared to the learning cycle described in Kolb & Fry (1975); after experiencing a failure in the game, players formulate hypotheses about the cause or causes of the failure, establish action plans to help solve the



problem, and then test and evaluate the hypotheses. This analysis of the causes represents something more complete than a mere self-evaluation since it adds relevant components that complete a recursive process of self-learning that consists of the following phases: evidence of failure, self-evaluative analysis, plan for palliative measures, execution of the plan.

Problem solving and overcoming obstacles

Players confronting a video game are training their ability to overcome obstacles. In most video games, if they are reasonably well-designed, there is a main challenge that must be overcome, but in order to reach that goal it is necessary to overcome a series of sub-challenges before the main one. This strategy of breaking down a general objective into a series of sub-objectives is common and is often effective when trying to solve a problem. Therefore, the academically directed use of video games represents not only training for student in overcoming obstacles, but also contributes to improving their strategies insofar as problem solving.

The scientific research on video games includes studies regarding the influence of video games on procedural and attitudinal skills. These studies point out the positive and negative impact of video games on players' social interactions within the context of the game and outside. This line of research includes studies on the impact of collaborative problem solving as part of the game, and studies that demonstrate the effectiveness of video games as a valid resource for working on problem solving processes in the classroom.

Change management

Felicia (2009) mentions Vygotsky's Zone of Proximal Development, indicating that this principle is also found in video games that offer a simple learning curve, i.e. those game that have initial levels for players to become familiar with its mechanisms and which require new skills to move on to new levels, thus, making players responsible for their own learning. This together with the incentive and reward systems characteristic of video games are essential elements when dealing with autonomous change. Consequently, the didactic use of video games can contribute to adequate change management.

Application of prior learning to new scenarios



Different video games often share common strategies, movements, key combinations, and so on. Therefore, players with prior video game experience tend to move on to higher levels more easily because they are already acquainted with basic functions and success strategies. This fact demonstrates that video games can contribute to improving student's ability to apply prior learning to new scenarios.

What Gee (2007) calls the "mastery cycle" is even incorporated inside the same video game. This leads players to acquire routines that improve their score when doing a specific task. After the player masters this task, increasingly difficult tasks are presented and the cycle starts over again. This feature makes video games highly effective in some types of practical training. For example, in the field of surgical training, gamer surgeons commit 37% fewer errors and are 27% faster than those who do not play (Rosser et al., (2007).

Motivation

Undoubtedly, one of the attitudes most often associated with the didactic use of video games is motivation. The motivating nature of video games inside and outside of the classroom has been widely studied. As a result there is an extensive amount of research that analyses how the motivation provided by video games makes them especially suitable as educational tools. So as not to extend ourselves too much, we will only mention a few of these studies. For example, Malone (1981) was one of the first authors to defend the educational value of video games by pointing out a series of typical video game design features that have a significant impact on learning. Challenge, curiosity and fantasy are three essential features of most video games and are a guarantee for their success.

McGonigal (2011) states that playing video games is one of the human activities where one most often fails, yet the motivation towards achievement remains intact. To answer the question of how a voluntary activity, such as playing video games, can motivate students to be academically productive, Cipollone (2015) used the popular video game Minecraft to measure the intrinsic motivation of a group of students. Among other things, the results showed that intrinsic motivation remained high provided that students were competent at the game and that social presence playing an important motivating role by contributing to immersion in the context of the



game. Prensky (2001) stated that the motivation spurred by digital games stems from the fun they produce.

Self-confidence

Studies exist that try to show that video games can be adequate tools for the promotion of self-confidence.

According to Forés & Ligoiz (2009), one of the characteristics of learning through games is that it stimulates self-confidence, self-esteem and the desire to excel. One of the fundamental reasons behind this is that processes such as social recognition by other classmates tend to be activated when games are used in the classroom.

Alves (2014) confirms that video gamers are calmer, more relaxed, less moody, have greater self assurance and ability to cope with tense situations than non-gamers. That is, they reflect greater emotional stability. During the game, most of them feel joy, confidence, optimism and a sense of power. At the end they feel more cheerful and relaxed, as well as optimistic and with less stress, boredom and anxiety. In general, Alves (2014) concludes that gamers perceive video games as an activity that promotes well-being, joy, self-confidence, relaxation and optimism.

Curiosity

The narrative character of many commercial video games exercises the power of intrigue on players and induces them to follow the plot. For this reason, it could be said that video games stimulate curiosity. The aforementioned research by Malone (1981) refers to this fact. The author indicates that the guaranteed success of video games is fundamentally due to three aspects: the challenge, which seeks for players to feel the inclination towards achieving goals; the fantasy, which originates from the evocation of mental images that do not immediately come to the senses; and curiosity, produced because the game offers multiple alternatives, screens and scenarios to reach, as well as new characters, and so on. The game generates curiosity in players so that they maintain the necessary motivation to continue advancing.

Returning once again to Forés & Ligoiz (2009), the authors also affirm that the use of games in the classroom stimulates curiosity by constantly allowing the discovery of new opportunities. This



means that students must continually ask themselves what decisions to make, which stimulates their creativity.

3.4. Educational Strategies For Using Video Games In The Classroom

It is increasingly common to use concepts from the realm of digital games and video games for the aim of achieving learning outcomes. The literature on the subject increasingly contains descriptions, evaluations and analysis of experiences on the use of educational strategies that involve digital game components for educational purposes.

With respect to the educational use of games in general, there are two strategies that are often mistakenly considered as similar and that should be distinguished:

- *Gamification*: It does not refer to the use of a specific game within an educational context or the elaboration of a game for didactic purposes, it consists of using game design elements such as incentives, narrative, and immediate feedback to support learning processes. However, although it does not strictly constitute using video games in the classroom, gamification is often an interesting and effective strategy that can be reinforced by using technological tools.
- *Game-Based Learning*: is an educational strategy that consists of using games, in their most generic sense, as educational media for supporting teaching-learning processes. It is a general strategy that can be broken down into more specific strategies such as:
 - *Video Game-Based Learning*: Consists of the didactic use of video games that originally focused on entertainment. Some studies show that this practice increases motivation, active involvement and attention, improves the learning of procedures and strategies, decision making, problem solving, and two aspects that we have already mentioned as preconditions for " learning to learn " - the acquisition of languages and the development of digital literacy skills.
 - *Serious Games*: These games are designed for a specific didactic aim based on the idea that the capacity for fun and entertainment is the starting point for learning.



They represent an evolution of educational software and recreational video games. The design of this type of games should take into account, on the one hand, the educational aim for which it is created, and on the other hand, being entertaining and fun for players like commercial video games. These feelings are a basic motivating element that is of vital importance in "learning to learn" contexts.

- *Creating Video Games in the Classroom:* In this case, students make their own video games. This is a very new strategy because until recently the use of programming languages was limited to specialists and computer enthusiasts. Currently, people without experience in the field can start programming easily by having access to simple development environments adapted to inexperienced users. Studies on this strategy highlight the positive effects for students while designing and programming their own video games, especially in contexts of learning mathematics, technology and scientific concepts. Moreover, the implementation of this strategy has positive consequences for creativity as well as lateral, computational and logical thinking. The design and development of video games by students is often described as a fundamentally fun, participatory and challenging experience that increases social skills and motivation. For this reason, it could be considered a good choice as a tool for the acquisition of the "learning to learn" competence.

To use video games in the classroom, you must first know how to select them, then play them and finally analyse them to identify contents and potential. Subsequently, activities can be designed to be carried out with students. It is important to perform a prior classification of video games according to their potential for use in the classroom. This will help determine if they are didactically adequate and effective. Video games must be suitable for the aims and content of the instruction, and must also be contextualized with respect to the type of students and their social conditions.



Although the ultimate goal of "learning to learn" is the dissociation of the teacher-student dichotomy so that students are capable of learning autonomously, the figure of the teacher is especially necessary in the early stages and for the pedagogical use of video games in the classroom. The teacher should serve as a guide to help students reflect on the educational experience as well as helping students see the connection between the video game and learning. Thus, the video game is provided with a didactic character and pedagogical meaning that it does not have when it is used exclusively for entertainment. The teacher should guide and make decisions during the educational process when using video games as tools.

Other requirements for putting these educational strategies into practice in formal contexts include teacher training in digital competence, the design of monitoring instruments, evaluation strategies, the capacity for teamwork, and a favorable attitude. There are also organizational and technical requirements such as suitable spaces, infrastructure and equipment, as well as access to online game repositories and a good internet connection. Finally, methodological considerations must be taken into account, such as the proper selection and evaluation of games. Without all of this, the effectiveness of the strategy could be at risk.

The use of digital game and video game-related concepts in educational contexts is a challenge for teachers that implies having to adjust a good number of variables so that the classroom does not become a mere playroom.

Specialists point out that incorporating games into the classroom makes it possible to work with the whole group of students through cooperative teams, since games provide a working style that is very similar to project development (autonomy and organization of each group based on an investigation, establishment of objectives, shared responsibility, etc...)

However, not all video games are valid as teaching resources. To help teachers select video games and manage sessions with these media in the classroom, there are interesting resources such as the European Schoolnet project [<http://games.eun.org/>].

