Adolescents as Game Designers

Developing New Literacies

Pilar Lacasa, Sara Cortés, & María Ruth García-Pernía

Transactions of the Digital Games Research Association
2017, Vol. 3, No. 1, pp. 89-125
ISSN 2328-9414
http://todigra.org

ABSTRACT

The main goal of this paper is to analyse adolescent activities when designing video games in an innovative school environment based on affinity spaces. We analyse the development of digital literacies, understood as a critical understanding of the game in terms of its dimensions and the relationships between them, which contribute to turning it into a system. Methodologically speaking, the study relies on ethnography and action research. The project was carried out at a secondary school in Madrid, during the 2012-2013 academic year as an extracurricular programme. The participants were a group of twenty adolescents (14 girls and 6 boys) aged 14 to16, and their teacher. The members of the research team acted as participant observers. The analysis carried out was two-fold, considering firstly the tasks that took

place over the course of time in relation to the adolescents' representations of the game, and secondly the products of these activities, which were present in the creation of the game. The results show that the students developed critical skills in relation to the game which are related to digital literacy.

Keywords

adolescents, design, video games, literacy, affinity spaces, critical thinking

INTRODUCTION

Relevance

The main goal of this paper is to analyse how designing video games in a school environment contributes to developing digital literacies, which is understood as the process of becoming aware of the specific dimensions of the game as much as the multimodal discourses supporting the process. We start from the idea that playing games in entertainment situations is associated with the satisfaction of overcoming certain challenges involving difficulties which, in one way or another, are related to the process of constructing meaning from digital objects.

In general terms, studying video game design allows us to approach two elements: play and games (Stenros 2016). In this paper, we consider play to have a double meaning; firstly, it is a context in which players are present, and secondly, it is a player's experience. It is a prerequisite for a game designer to have played previously. All the students, the teacher, and the researchers were regular players. We also understand that the relationship between the context and the players is mediated by the game, which is considered as an object, and is defined by a set of rules which allow for the achievement of goals. It is the situation and the

previous playing experience that contributes to making the game design process meaningful.

Salen and Zimmerman (2004, 32) explore Huizinga's (1938/2000) ideas and relate the concept of play with the construction of meaning, and with the player themselves. Sicart (2014,1) refers to play in very broad terms, also associated with the concept of meaning: "To play is to be in the world … Play is a mode of being human." At the same time, meaning is built on something that surpasses the player and the game (Pierce-Grove 2014, Tulloch 2014). From this perspective, we assume Juul's definition (2005,1), "To play a new video game is therefore to interact with real rules while imagining a fictional world, and a video game is a set of rules as well as a fictional world." The rules and fictional worlds are present in the game. Both are relevant in this study, which analyses how designing games at school contributes to the students becoming aware of the elements present in the game, which are organised as a system. All the students who participated in the study had played video games before, and in the first two sessions of the workshop we explored their experiences in previous play situations by discussing specific games. When designing games it is important to bear in mind players' previous experiences.

Also relevant is the work of Kafai and collaborators (Kafai 2006, 2012), who analysed game design in learning contexts. According to these authors, the process involves the coordination of multiple activities and the construction of meaning. They analysed particular skills in entertainment situations, "gaming fluencies", when adolescents design video games on Scratch. They referred to the use of technology, the creative process and critical thinking. In any case, developing critical approaches was shown to be particularly difficult in after-school settings. In this paper, we consider the ability to use and re-write other media in a reflective way as a critical skill. This involves re-reading these media as texts. Using this idea as a starting point, we want to explore whether the students can develop these skills, which are less frequent in leisure situations, starting from the design process in a school context.

Goals

The specific goals of this paper are the following:

- To explore the game design process in the classroom as a way of supporting the acquisition of new literacies. Students become producers, not just receivers.
- To analyse how the process of designing video games helps raise awareness of their multiple dimensions, considering the relationships between the virtual and real worlds.
- To examine the situations of support between designers and the tools they use during video game creation by focusing on meaningful, shared spaces.

Structure

First, we will outline the theoretical model supporting our research, based on three closely intertwined concepts. We understand literacy as the ability to gain awareness of the game's dimensions and the relationships between them. These skills are present in the design process, which involves the software that supports it, the artistic view, the narrative and the sound effects, among others. In addition, we focus on the role of context as a framework of shared meanings from which the game's representation is constructed. Second, we will introduce ethnography and action research as our methodological approach. Third, we focus on the data and its interpretation, considering the changes that took place throughout the process. The fact that the analysis took place over time allows us to delimit different phases during the study. We will focus on the game creation process by one of the groups to show how sound, narrative and mechanics come to coexist as a system. The awareness of all of the game's dimensions contributes to the development of new literacies and critical thinking, understood as the

ability to apply what is acquired in new situations to other situations when creating new games.

THEORETICAL MODEL

Our proposal is based on three fundamental concepts: design process, game literacies, and shared spaces. Figure 1 includes the main theoretical concepts to understand the process of game design taking place during the workshops. This theoretical framework was outlined prior to carrying out the study. First, we considered several game design models, including the contexts of play as well as the games' elements. Second, to carry out the game design process, the students needed to manage and master multimodal and computational discourses. As well as the use of a formal language, it is important to bear in mind the mastery of multimodal symbols such as images and sounds. Third, the design process is an interdisciplinary practice, in which interaction between the participants allows for the combination of multiple dimensions which give rise to the game as a system.

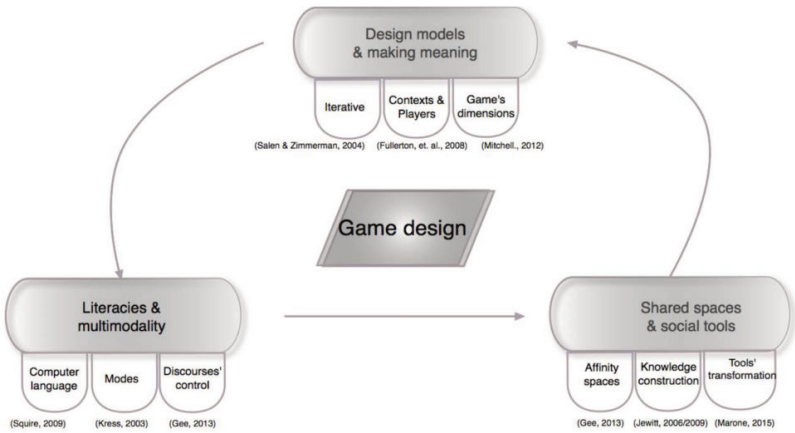

Figure 1. Theoretical model

Game design and making meaning

In order to promote literacy related to video games, we rely on design processes involving awareness of the elements that shape them. Several investigations have focused on games from a design perspective. Three models stand out, considering the time when they were published.

Firstly, we will look at the classic studies of Salen and Zimmerman (2004, 2006), which proposed an iterative design that involves playing as the game is built. This is ongoing learning. The starting point is a prototype that defines the rules and the mechanics. Juul (2005) extended this perspective when he defined the game by focusing on two fundamental elements: a) the rules, which must be clear for the gamers and define the challenges they face, and (b) the fictional world, which is projected in other elements of the game such as graphics, sound and texts.

The second model, which is closely related to the previous one, was proposed by Fullerton, Swain, and Hoffman (2008) and suggested three principles to support the design process: 1) understanding how games work, (2) generating the design prototypes that define the essential elements of a given set and considering the feedback generated to implement it, and (3) considering the social framework within which it is generated, often associated with business strategies and industries. From this perspective, (Nitsche 2008; Lacasa, Pernía, and Cortés 2015) outlined certain dimensions that need to be considered: the game, its context and the representations that players build.

More recently, Mitchell (2012) offered a third model. He organised the creation process by interspersing rules and narratives and emphasising the process. Based on a summary, goals are defined and a pitch is created. This takes into account the characters, their actions and the game environment, considering its visual components and the sound as well as the interface and navigation strategies. From this starting point, and understanding design as a collective process, the emerging activity

relates to a set of roles within an interdisciplinary framework. These roles involve specialisation as people generate and understand various complex products associated with the specific dimensions of the game.

Finally, we will look more closely at the contexts of the game, from which its meaning is generated. McKenzie (2012) points out that game design depends on a specific cultural context. This suggests shared interests inspired by the player's practices, which allow them to explore relevant games from interests at specific times. Johnson (2012) goes even further and establishes relationships between the theme of the game and its mechanics, which are essential dimensions to construct its meaning.

In short, we seek to blend the different design models to create a workshop to develop and transform game representations, connected to an awareness of game dimensions. New digital literacies will be facilitated by the creation and design of a new game.

Game design and literacies

Squire (2009) referred to the concept of literacy in relation to the introduction of video games into school contexts. In his opinion, strengthening literacy could be achieved by establishing educational programmes that included video games with a three-fold approach: play, reflection, and design. The relation to literacy stems from the fact that this ability involves meaning construction whilst interacting with technology in its many forms, which are present in game design. Furthermore, creating a game means producing multimodal texts. This author argues that what distinguishes these texts from other media is interactivity, which is directly related to immersive environments, community design, and digital storytelling. His ideas can be summarised through the following excerpt:

> *"I argue that games are an experiential, interactive medium where we participate (and cocreate) new worlds. Although these worlds are synthetic,*

> *simulated worlds, they are worlds constructed to provide particular kinds of experiences, which might be called* ***designed experiences****. Games literacy can be defined as developing expertise in designing rewarding experiences for oneself within a gameworld (particularly within the game's semiotic and rule systems)." (Squire 2009, loc. 639)*

Semiotically speaking, texts produced in a digital world go beyond the written word which has traditionally dominated in school environments. It is this new discourse associated with screens, which applies to video games, that demands new forms of literacy to master multimodal discourse. In this respect, Kress and collaborators (Jewitt and Kress 2003, Kress 2010) outline two dimensions to understand the world we live in today: 1) The image supersedes the domain of written language, and (2) screens take precedence over the pages of a traditional book. According to this author, writing and image are governed by different logics. Writing is closer to oral language; it is organised according to the logic of time and its elements are sequenced temporarily. However, the logic of image relates to spatial organisation and the simultaneity of visual elements. What is relevant for this paper is that we are faced with two forms of building meaning. Schools focus on the first one, and image literacies go unresolved. Other authors (such as Machin 2013, and Jewitt 2006/2009) provide a framework focused on the concept of multimodality, which helps us understand how to use discourse during the game design process. Designing video games requires new forms of expression and communication, which the students have to master.

In relation to video game design, Rowsell (2013) says that the process involves working with modes, which allows for higher levels of abstraction and universalisation across discipline-specific practices. She refers to Halliday (1978) to expand on the ideas of Kress (Kress and Van Leeuwen 2001):

> *"To be a mode that expresses, that represents, that signals a person or a context, it needs to have three functions: interpersonal functions that speak to an audience; more immaterial qualities that express ideas, values, beliefs, emotions, and senses as ideational functions; and, physical features*

> *that materialize these more ephemeral qualities of texts as textual functions." (Rowsell, 2013, loc. 192)*

From this perspective, modes are ways of expressing the human experience involved in game design and practice. Modes have a social and ideational function, because they express shared views of the world.

Finally, according to Gee and collaborators (Gee and Hayes 2011, Gee 2013), literacy in relation to game design is the ability to master discourses. It is understood as a tool to interpret the world. Literacy is linked to language, considered as a set of conventions. From this perspective, game literacy relates to the ability to know and consciously master the internal and external grammars of the game. Other authors also delve into the process of mastering the discourses involved in particular tasks (Barton and Lee 2013).

In short, in this article we define literacy as a skill associated with awareness and a critical reflection of the multimodal discourses and the elements that make up the game understood as a system. Its meaning is generated in certain social and cultural contexts. This reflection allows us to transform, control and rebuild its elements at an action and representation level. We assume that collective work creates frameworks for new meaning constructions that support the process of awareness of the game elements. The process is supported by the verbalisation of the elements using different discourses.

Shared spaces and social tools

Creating a video game is a collective task in which the creators distribute the tasks and generate situations of mutual support. Specific tools are present in these scenarios to facilitate the sharing of tasks and interaction. We also assume that collective work creates frameworks for sharing knowledge and for the construction of new meanings that support awareness of the game's elements. Collaborative scenarios involve the creators taking on particular roles as they interact among

themselves. At the same time, creative processes are supported by the verbalisation of the game's elements through the use of different discourses.

Several studies refer to shared spaces when playing or designing games, and we will focus on the main ones for the purposes of this research. Gee and collaborators (Gee 2013, Hayes and Duncan 2012) refer to the concept of affinity spaces as a facilitator of learning. These are digital environments linked to the internet, or real spaces where people share resources and values, supported by certain technologies (Pellicone and Ahn 2015). This is a synchronised intelligence, with multiple skills combined in a network so that capacities are strengthened. In this context, the whole is more than the sum of its parts. When designing games, people interact around a common goal – designing the game – but at the same time, this overall goal is compatible with the range of diverse interests relating to the multiple tasks performed in the process. In addition, the affinity spaces involve not only knowledge, but also action. For example, when designing the game, creators need to reflect on what would be the best sound to go with a particular challenge. They also need to act on and improve the game so that it can be played. Therefore, not all creators need to be experts in the same tasks; they need to interact with each other to give rise to a new product. In addition, people who specialise in a particular task need to master specific multimodal discourses, for example discourses involving sound and images, just as much as they need formal language (Marone 2015).

In the same line of research, Jenkins, Squire, and Tan (2003) refer to workshops at the MIT Comparative Media Study, focusing on the design of video games and working with industry, specifically with Sony. There, the students are given a task to generate ideas to plan the creation of a game. Collaborative work takes place for a set period of time, for example between 20 minutes and an hour. The groups are interdisciplinary. The core of the project is that students have to create a pitch to sell their game in front of an expert committee, just as they would do in the real world, rather than in an academic context. Mitchell

(2012) provides a broader perspective on situations that facilitate effective video game design in a school context, albeit inspired by professional scenarios. For this author, games have become increasingly complex, supported by increasingly sophisticated technologies which require specific skills. This study, which offers guidance on the design process, provides strategies to create characters, props, interfaces and environments. For example, the author discusses, in detail, the various moments involved in the process of designing a game from an interdisciplinary approach. This begins with the creation of a script and a pitch, which includes the key features of the game, highlighting the visual design, the sound, the manner of navigation, the levels and structure of the game, and the environments. In short, the process of designing a game requires collaboration by people who play different roles, depending on their particular skills and knowledge.

Until now, we have focused on the collective space shared by the creators. Squire (2012) focuses on the tools used in those collective environments, which he calls DARs (During Action Reports). These reports include an overview of the goals, motivations and thoughts arising during the design process. These reports are cognitive tools that contribute to the production of new ideas when shared. They are built from experience in action, and they contribute to new knowledge construction. Producing these reports means delving deeper into the structures of the game.

METHODOLOGY

Methodological approach

We start with a qualitative approach that allows us to understand the creative environments. We are inspired by the paradigms identified by Lincoln, Lynham, and Guba (2011), and Brennen (2013). First, the critical theories that consider reality and truth to be shaped by specific historical and cultural conditions. Second, a constructivist approach,

rejecting any permanent standards by which truth can be universally known. Finally, a participatory and cooperative inquiry understood from a transformative perspective that emphasises the subjectivity of practical knowledge and the collaborative nature of research.

Considering the techniques of approximation to data and the methods of analysis, we also rely on the practices of visual ethnography (Pink 2013, Delgado 2015), which consider both images generated by the researchers, and sources of data such as those created by the participants. Therefore, we go beyond ethnography supported by observations that underlie the written texts. In addition, we took some principles of action research (Kemmis, McTaggart, and Nixon 2014), including the following: shared ownership of research projects, community-based analysis of social problems and an orientation towards community action.

Contexts and participants

The project was carried out at a secondary school in Madrid, during the 2012-2013 academic year. This is a private school located next to a university, where the research team worked for three consecutive years introducing commercial video games as educational tools in the classroom to promote digital literacy by using machinima strategies. To afford continuity to this work process, we decided to develop an innovative experience related to the creation of video games.

A group of 20 students (14 girls and 6 boys) aged 14 to 16 participated in the project. These students had previously participated in workshops with the research team, so they were familiar with the world of video games. They worked in one large group and five small groups over the course of fourteen 90-minute sessions, as part of an extracurricular programme. We sought to promote collaborative work, and relevant games were discussed in large group situations with a view to the participants becoming gradually able to analyse them and consider them

during the creation of the game itself. In addition, groups of five students were formed, each of which created a video game. The students played different roles: team director, designer, programmer, art director and sound director. We used Game Maker software to support this process.

The teacher and the interdisciplinary research team (consisting of two educational psychologists and two specialists in communication and computing) took part in the programme. They were all involved in planning and monitoring the workshop. Both the researchers and the teacher sought to identify any preconceived ideas the students had brought to the classroom about video games. As well as being a motivational factor, this is the first step towards promoting awareness of the elements that define games. An analysis of these conversations also reveals the models that are present in the daily lives of adolescents in relation to video games. Table 1 includes a summary of the sessions.

Session	Date	Group of students	Objectives of the session
1	2012 11 29	Large group	Collective session planning. Introduction. Brainstorming. Reflect on video games.
2	2012 12 13	Large group	Select games. Analysis. Learn to analyse video games.
3	2012 12 20	Large group	Reflect on video games. Introduction to Game Maker Software. Organise working groups.
4	2013 01 10	Large group and small group (5 groups*)	Introduction and discussion: what is a pitch? Define the video game to be created in each of the small groups.
5	2013 01 17	5 small groups	Pitch presentation, discussion and evaluation.
6	2013 01 24	Groups organised by roles**	Discuss roles in the small groups. Distribute tasks among the group members.
7	2013 02 07	5 small groups	Video game prototypes on paper. Art and scenarios. Game Maker approach.
8	2013 02 14	5 small groups	Work on the creative process. Each expert takes his/her own role.
9	2013 02 21	Groups organised according to roles	Programmers combine art, design and song through Game Maker.
10	2013 03 07	5 small groups	Work on the game, supported by the research team.
11	2013 03 14	5 small groups	Work on the game, students work together. Final product becomes clear.

12	2013 03 21	5 small groups	Students focus on the levels of the game, the characters and their movements through the screen.
13	2013 04 04	5 small groups	Work on the final presentation. Review the final report on the working process.
14	2013 03 11	5 small groups	Final presentation. Each group introduces the video game focusing on 3 main points: introduction, demo and post-mortem.

Table 1. Sessions, details and objectives of the workshops

* Students who all have the same role work together in small groups (directors, art designers, programmers, game designers & script writers, sound directors)

** Students with different roles collaborate to create the video game

Data and analysis

Based on the perspectives outlined above, we can assume that human activities, in this case the creation of a video game mediated by technology in a formal learning context, acquire meaning in the social and cultural context in which they arise. Data collection and analysis was carried out from two complementary perspectives that are interlinked both conceptually and through time.

- First, the reconstruction of the workshop allowed us to observe evolution and learning in relation to the process of generating awareness of the game. We used qualitative techniques focused on the participant observation by the research team (Boellstorff, Marcus and Taylor, 2012). This reconstruction came from summaries collected during the sessions, along with photographs and video recordings.
- Second, the analysis of the video games created by the groups

(Fernández-Vara 2015), paying attention to both the context and the formal elements of the game. We were especially interested in the activities involved in the game's creation (Mitchell 2012) related to the design, sound, narrative and programming.

The corpus of data comprises all video and audio-recorded sessions, the photographs taken at key moments of the workshop, and the video games created by the students. The researchers also created an interpretative summary of the sessions. The data collected appears in table 2.

Data collection tool (1)	Total	Data collection tool (2)	Total
1. Video recording (14 sessions)	39:39:52	7. Blog	54
2. Audio recording	33:17:45	8. PowerPoint	7
3. Group interviews	05:26:33	9. Drawings	125
4. Photographs	1290	10. Sound files	50
5. Radio interview	1 group	11. Video games (3 trailers)	00:03:35
6. Researchers' summaries	11	12. Written material (texts)	10

Table 2. Data collected throughout the workshop sessions

RESULTS

In accordance with the objectives proposed, we will show how adolescents built successive representations of the created game, becoming aware not only of the game's mechanics but also of other dimensions such as sound, narrative and elements present in the game context. We will explore how the fact that the process took place in a formal learning environment provided critical skills related to digital literacy.

First, we will examine how the participants understand what a video game is through the analysis of different games selected by them. Subsequently, we will look at the process of creating a new video game by one of the groups, paying special attention to how its elements were

generated. Finally, we will show the representation that young people built around the video game after creating their own. Figure 2 provides a summary of the structure of the workshops.

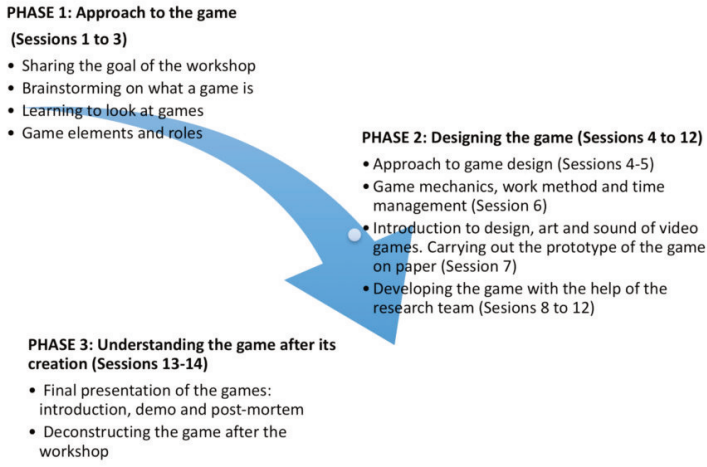

Figure 2. Phases and workshop sessions

Approaching the Game

The first three sessions of the workshop can be considered an example of what happens in an innovative school context. They have features of formal education in that dialogue and conversation occupy most of the time. Learning takes place by exploring abstract concepts that go beyond the concrete, supported by oral and written discourse. There is a certain degree of innovation, in that the topics discussed during the conversations are not topics which are commonly talked about in classrooms.

Sharing the goal of the workshop

Converting the video game design process into an educational task required that we reflect on the purpose of the workshop with the students,

thereby creating a platform for the construction of shared meanings, as the goal of the successive sessions was to create a video game. In addition, as indicated, the starting point was to analyse previous experiences from a double perspective, both as players *and* as creators, contributing to digital literacy through a process of awareness of previous experience (authors). Fragment 1 is a good example of these conversations:

> Researcher: Does anyone know how to make a video game? Has anyone ever tried?
> Student: I have. Researcher: Great, how did you do it? Student: I made a video game using a Nintendo DS simulator. Researcher: Did you make a new game or did you modify an existing one? Student: I modified one I had. **Fragment 1.** The goal of the workshop: creating a video game (2012 11 29 – Session 1)

Designing a new game is rather different from transforming an existing one. The researcher tried to facilitate reflection on the concept of game, starting with what the students considered to be a good game:

> Researcher: We are going to discuss some ideas about how the workshop will work. First, what you expect of it, and then, how we are going to work. And another very important idea: (…) To make a game we must first think about what a good video game is. Being able to tell that a video game is good does not mean we will be able to create one, but at least we need to know what's there. (…) I mean, models help us think better, so let's see which games you like and why.
> **Fragment 2.** What is a good video game? (2012 11 29 – Session 1)

Creation does not emerge from nothing; in many cases it is necessary to rely on what others have created as a starting point. There are many elements for reflection behind the screens of existing games, such as the game environment, the challenges the player faces and the strategies that will be put into practice (Fernández-Vara 2015). To facilitate awareness of these elements, we carried out a very simple first analysis of some of the students' favourite games, such as *Guitar Hero, Portal, Prince of Persia* and *Final Fantasy.*

Game elements and creator roles

So far, we have seen how games were approached in a school context through dialogue, supported by students' own experiences as players, which forms part of the process of generating literacy (Squire 2009). Again, formal education strategies are different from the strategies used in leisure situations. While abstract thought is promoted in school contexts through conversation, practice plays a more significant role in leisure situations. Based on the ideas put forward by Mitchell (2012), we organised the video game creation process so that programming, narratives, sound and art were interlinked. It was important to emphasise that each student would play his or her own role as part of a specialised creation process. We sought to create a similar scenario in the classroom to the structure of work teams that design games in the professional world. In the excerpt below, the researcher introduces the task and explains that each participant has their own role:

> Researcher:
> We are going to design the game as a team, because this way it will be easier to work and learn other things. (…) In a team, everyone plays a specific role. Remember the credits at the end of movies. To design a video game, the following are the five main roles: – A person who is the director of the game – Another person who is responsible for programming – Someone who is responsible for the sound (…) – The script. – The artist. Then, you have to design the screens, define the story, decide what the platform will be like, and the problems in the game. But we will combine those roles, so the director or the programmer won't be on their own. We are a team with a shared goal which is to design a game, and this will be hard if you do not talk among yourselves to coordinate the team. This means that some roles are intertwined with others. **Fragment 3.** The roles involved in the design of the game (2012 11 29 – Session 1)

In this first session, the teacher and researchers had two goals. Firstly, to introduce the activity, as shown in the fragment above. Secondly, to discover the expectations of the participants and to generate expectations among them in relation to the working method to be followed, with a particular focus on the roles to be carried out by each student. To

summarise, the distribution of the five roles (directors, art designers, programmers, game designers and script writers, and sound directors) among the students serves a dual purpose: it contributes to their awareness of the game's dimensions, and reinforces the social organisation of the working environment. From this perspective, organising the design process through working teams, in the style of non-formal education and based on a professional, real-world model, could be considered a motivator for learning.

Games and video games

After the initial discussions, it was time to focus on the concept of the game itself. We tried to go beyond specific examples and used a strategy which probably hadn't been seen outside the classroom, as students tend to remain at the practice level in leisure situations. This time, they reflected and wrote a text individually about what they understood by games and video games. Here is an example:

> What is a game?
> "A game is an object or a set of conditions defined in a given situation in order to have fun and entertain yourself. Games can also be educational, that is, we can learn by playing". What is a video game for you? "To me, a game is an electronic game. It is projected on a screen and you have a series of commands or controls that can be used to modify what appears on the screen. Video games, in my opinion, are the type of games to which teenagers dedicate most of the time". **Fragment 4.** What is a game and a video game? (2012 12 20 – Session 3)

If we focus on the student's interpretation of the concept of a game, it is clear that for her, games are linked to leisure situations. The text shows that she refers to a game as a set of conditions, based on certain rules and mechanics, which is geared towards achieving certain challenges. Using tools designed for entertainment in the classroom defies students' expectations, because generally speaking, leisure does not tend to be associated with schools. Finally, when the student refers to video games, she relates them with the digital world.

In short, students establish links between the video games they usually play and the process of creating their own video games. When players become creators, they use certain skills related to new forms of literacy, such as analysing the game's dimensions and taking on the different roles they play in the creative process (Gee 2013). We observed that, in this first phase, before they become game designers, the students approached video games based on their experience with commercial video games. To this end, they held discussions in large and small groups, which helped to clarify their previous ideas on games and video games.

Design of the Video Game

We will now analyse the game designed by one of the groups and the design process. The perspective used is that of a participatory culture (Jenkins, Itō, and Boyd 2015), where adolescents are not only the recipients of content but also active producers. Halverson (2012) talks about participatory media spaces, where design becomes the focus of intentional learning. In this work, the learning space is designed as an interdisciplinary space around the game elements and the environment associated with the roles that each of the members of the group plays in the process.

Confronting the Design of the Game through "Pitching"

The design process took place in a small group situation over nine sessions, through several consecutive moments. The students produced a sketch that was later materialised in a pitch, and shared and discussed with the other groups. Mitchell (2012) and Squire (2012) point out the importance of the moment when a synopsis is outlined, goals are defined and the logline is closed. By imitating a real context, each group presented their game as if they were offering it to potential producers

who would provide the funding. We felt this situation added a motivating element to the task.

Considering these preliminary ideas helps students to develop an overview of the game environment, rather than concentrating on precise details or specific mechanics, which can be determined later during the design process. First, they need to consider the broader dimensions of the game, such as the goals, setting, characters, actions and the environment that provides the backdrop for the story (Mitchell 2012). To design the game, the students need to focus on the act of playing and this is possible when using a program such as Game Maker, which allows the user to practice and compare any steps made in the creation process at any time. Adult guidance was necessary to help ensure students' awareness throughout the process. The adults asked key questions that contributed to the development of literacy in relation to the students' awareness of the game's dimensions.

In the example below, the researcher tried to help the students towards the first step in creating the game by contrasting the "how" and the "what":

> Researcher: (…) We don't want to know how, we want to know what (what the game is about). We are going to focus on the challenge behind the game, that is, the goals. We are going to describe the main characters and their environment. And we are also going to focus a little on what the game will look like.
> **Fragment 5.** The content, the objectives and the characters (2013 01 10 – Session 4**)**

The idea is that the core of the game involves a problem and some characters. The story, although obviously present, is not as important as the challenge and goals that players face.

Through verbalisation – a strategy linked to a conscious justification of tasks that is common in the classroom (authors) – the students built a first approach to the game. Fragment 6 is a sample of this conversation. In

this case, we asked students to share what would be presented formally the next day as a test in the large group.

> Student: It's a blender which wants to take a girl's fruit away to make a smoothie with it. The girl wants to rescue her fruit, so the goal is to neutralise the blender by unplugging it. The girl is short, brown-haired, she looks like Dora (The Explorer). And the bad guys in this game are the cupcakes, which are like the mushrooms in Super Mario, and the blender itself.
> Researcher: What about the visual aspect? Student: It will be like a cartoon in bright colours. **Fragment 6.** Talking about the first ideas of the game (2013 01 10 – Session 4)

The student, who played the role of director in this small group, provided an initial approach to the game, its main goal and the characters. The goal of the game is "fighting the blender that stole the girl's fruit." As in other games, the story behind the screen is oriented by the goal; fighting to solve the main character's problem (Nitsche 2008). We were also able to observe how the students were inspired by other games. For example, they referred to Super Mario and its levels of play, and Dora the Explorer, a famous TV character who inspired the design of the protagonist. The students are aware that games need some references or models for their design (McKenzie 2012). Figure 3 shows the design of the characters created for the game.

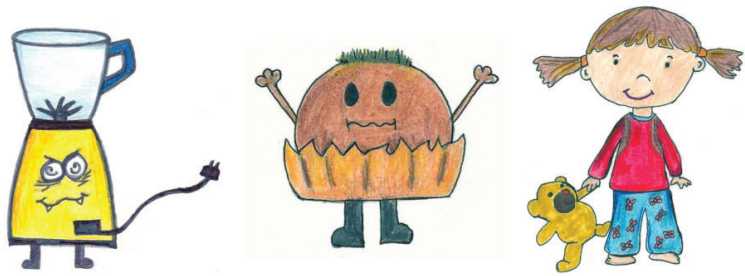

Figure 3. The characters of the game

Based on these first ideas, the students worked on the development of the pitch, which was presented before the large group at the next session. The characters, spaces and the weapons are no longer just an idea, now they have an image. By analysing the explanation offered by each of the creators, we can see how the design progressed:

> Student 1: Our game is called Carlota Fruit, who is the protagonist. It is a linear, visual and personal game. (…) The main character is called Carlota, who goes to school every day and one day forgets her rucksack and leaves her fruit in her room. When she returns, all her fruit is gone because an evil cupcake stole it. The action takes place between the school and Carlota's room. The kitchen is the final stage and there are several levels.
> Student 2: The main character is a short, brown-haired 8-year-old girl called Carlota. She goes to the kitchen and finds the evil blender (Marina) and her minions, light cupcakes and explosive cupcakes. Light cupcakes walk faster and explosive cupcakes, well, explode. These are the main characters. Student 3: The goal of the game is to pass all levels. At the end of each level you find this [points at cardboard] and have to pick up the fruit and get to the next level. When you get to five you have to defeat the blender. If you lose, you go back to the beginning. If not, you win. Student 4: The reason why the game is linear is because it is inspired by *Super Mario*, but with a touch of *Call of Duty*. Regarding weapons, we wanted to use real weapons along with a fantasy story, which is the reason why I have drawn on elements of the game such as cupcakes or fruits to make weapons.

(…) **Fragment 7.** Pitch (2013 01 17 – Session 5)

This fragment includes the essential elements of the game. Pitching the game furthers the students' understanding and development of it. The students have thought of a striking name (*Carlota Fruit*), and they have defined the setting and the type of game: "It is a linear, visual game." The story is the same, it has not changed. It was logical from the start. Now they have better defined characters − in this case, cupcakes − and actions. They have also thought of levels and the final goal: to collect fruit until the final fight with the blender. Again, we can see the influence of other games such as *Call of Duty* for creating weapons, according to the information provided in the post-workshop interview. All this shows how the game makes sense within an imaginary world built by the students from their experience with other games (Salen and Zimmerman 2006).

The Game as a System

Once the students have outlined their game, the next step is to make their ideas a reality using digital tools such as Game Maker. In any case, we want them to be aware that the tool is not everything, as clearly expressed by the researcher:

> Researcher: On the one hand there's the program, which you don't know how to use, but we'll teach you. But the program isn't everything, as we will see. Each of you has a role, one or two of you will use the program but the rest will have to do different things, because having five people use the machine would be a waste of time. (…) You have to organise the planning.
> **Fragment 8.** Beyond tools (2013 01 24 – Session 6)

This is the first time the students are faced with the software. They begin to investigate the possibilities offered. The researchers also want them to understand how a game is made up of different elements that have to be prebuilt so that they can be integrated at a later stage. These reflections lead to a new question which will mark this session: What is behind the game? The researchers help the students to think about the elements that

will contribute to the gameplay and which will be materialised by using Game Maker.

> Researcher 1: (…) It is not only about defining whether the dummy jumps here or there, you also have to see the connection between one jump and the next. And that's the game as a system. No element makes sense without the other. (…) You have to have an overall vision of the game. For example, what is the overall vision in Super Mario?
> Student 1: To not get killed. Student 2: Getting from one point to the next without dying, jumping… Student 1: Catching coins. Researcher 1: All the resources you have shape the game, just like the levels do. Here, we'll only build one level, but every level is a system. These are not isolated elements. **Fragment 9.** Game challenges (2013 01 24 – Session 6)

At first, the students define the goals of the game through simple actions that the character can perform and the resources to carry them out. This involves solving problems to continue playing, making decisions that have immediate consequences and considering that even mistakes play an important role when it comes to moving forward in the game (authors).

4.2.3 The Visual Style and Sound Atmosphere

After introducing the software, it is necessary to explore other components of the game. The students will have to consider in depth the design of the levels, the setting and the sound. The researchers provide insights and tools that will be required to work on multiple dimensions of the game.

> Researcher 2: We want you to think about the game using paper and pencil. Think of representing the entire level, of how the player would move, how the characters would move, think of the camera, of what the player would be like in the game….
> Researcher 1: Now we will also show you visual examples of different artistic styles, so that you know you don't have to make everything exactly the same. Researcher 2: The key today is defining the atmosphere, not seeking specific sounds, but looking for a main theme, maybe. **Fragment 10.** Design, art and sound, key parts of the work (2013 02 07 – Session 7)

At this point, we approached the game from a new perspective; the design of the levels, including the challenges and problems to be faced by the player. These levels must also be associated with different screens, with the design based on particular artistic models that provide unity to the game as a system. They need to feature sounds to guide the attention of the player. Each challenge is connected to the acquisition of multimodal and critical discourse (Machin 2013). Later on, the students work in small groups and individually on specific tasks related to the role they play in the team. Figure 4 is an example of the situation:

Figure 4. Designing the prototype (Sessions 7 & 8 – 7 to 14 February, 2013)

The groups continue this work for several sessions (Sessions 8 to 12). They have clearly defined roles within the group and they have developed a great capacity for teamwork. Everyone knows what to do and they move fast. They look like a video-game design company. Figure 5 features a screen showing the game design once the different elements have been integrated.

Figure 5. The game through their screens (an example)

Through practice, the students understood the benefits of teamwork and the importance of their individual responsibilities when the functions to be performed are distributed among different people. They learned that the process of creation is linked to the various roles played – the tasks assigned in relation to the various dimensions of the game – and that this creative process is a collective, interdisciplinary task.

Learning from the Design Process

The final workshop sessions allowed us to take stock of what had been learned through the analysis of the creations (Gee 2013). There were two key moments in terms of understanding the final phase of the workshop: 1) The formal presentation of the video games created, and 2) the final interviews with each group.

Presentation of the Video Game Created

In order to ensure a successful presentation, they are organised into three parts: an introduction that offers the context for the project, a demo of

the video game created and a section called ‘post-mortem’, where we analyse whether the elements worked or not. Fragment 11 refers to the main aspects of the game, the changes made to the initial approach and potential enhancements.

> Student 1: If we had had time to finish, we would have made many types of weapons, but so far we have only made the boomerang-shaped banana. We were also going to unplug the blender and set it loose around the kitchen. At first, we thought of unlimited lives, but then switched back to three. The scenarios would be the kitchen and the school, but then we had the kitchen, the park, the house and back to the kitchen. We were only going to build platforms for the cupcakes to move along, but now we’ve added the pipes.
> **Fragment 11.** Final presentation of the game: exhibition of post-mortem (2013 11 04 – Session 14)

There are various aspects worth highlighting in this passage about the changes that students had to implement as they advanced in the game design. For example, unlimited lives was changed to three. The order of the scenarios and the number of levels was modified. In addition to the originally planned platforms, pipelines were added to create new possibilities for action.

All these changes, and the need to improve, denote that students are aware of the dimensions of the game. They have understood the levels and the stories that lie behind them. The students were aware of the different dimensions involved in the process of creating the game, which contributes to a specific digital literacy. They mastered specific skills closely related to the design process, the use of multimodal discourses, and the understanding of computational language (Squire 2009, Holland, Jenkins, and Squire 2003)

Learning after the Workshop

We will now look at the post-workshop interviews for the same group of students. At this point, the students have a different perspective;

they now focus on specific aspects behind the various screens. They observe the game critically, considering it as a whole and identifying the possibilities for its potential transformation.

> Director: Yes, now I look at games thinking of how things are made, from a completely different point of view. Before I only focused on the game, on playing, that was all. Now I see everything and I ask myself questions. It has changed my view of the game. I used to think it was very easy, but it isn't.
> Sound: I thought it was all computer-generated. Researcher: So it's not as simple as it seemed, there is so much more to it. (…) Director: Now we value the work of the people behind it much more, doing everything is a lot of work, especially now that video games are so amazing.(…) —— Researcher: Can you learn from what you are doing with the game? Designer: We learn from programs, about how to do things and stuff. Researcher: Do you think that what you are learning relates to the content of your classes? Sound: When I designed the levels, I remembered that in technology classes we learned about dimensions, technical drawings and stuff. Director: We also learned from presenting it, about the economy, marketing (…) Programmer: Exactly, this is basically like a company. Designer: And, for example, in language classes we learn to write stories, narratives. **Fragment 12.** A new perspective on the game (2013 03 21 – Group 4 Interview)

From their answers, we can infer that designing the game was a motivating activity for them, which is an added value when it comes to opening the door to learning. Although the experience goes beyond learning in an academic context, students were able to connect what they learned during the workshop with the content of their academic curriculum. This underscores the value of this experience, which is aimed at the development of new forms of literacy.

CONCLUSION

Video games are being used increasingly in classrooms to facilitate the acquisition of curricular knowledge, and in this context they are referred to as serious games. Commercial video games are used with different goals than usual, for example, to facilitate reflection on the game itself, to explore other contexts and to learn and teach ways to solve problems

((Lacasa 2013, Gee 2007). Using games as a starting point for reflection, and to generate discussion, is an initial step that shows how students develop critical literacy. The research presented in this paper goes one step further. The main goal is not just to reflect on the game, but to learn to design cultural objects by consciously mastering new forms of literacy associated with the activity of creating. Our guiding principle is not only play, but also the creation of these cultural instruments. Bearing in mind the objectives of the article, the following conclusions can be drawn.

The first objective involves new literacies and the idea of turning players into video game designers involved in creating and active learning in a digital universe, which allows them to acquire certain skills related to new forms of literacy (Gee 2013, Squire 2009). It is important to bear in mind that video games are well-known tools among the students, and form part of their everyday lives; in many cases, they rank very high on their list of interests. The main reason we chose to analyse and design video games is the fact that they can be used as learning tools. The process of learning is based on active participation through reflection on the game, considering firstly its various elements, which constitute a system, and secondly the multimodal discourses present in the creation process.

The second objective is to design the game. The students can create and reflect as they interact with objects from the real and virtual worlds. Thinking from the standpoint of their own particular roles helps them understand the key dimensions that define a game, including its mechanics, stories and visual and sound aspects. Games can be understood internally, as a set of content and rules (internal grammar), or externally, in terms of people that participate in a set of social practices (external grammar) (Tulloch 2014, Gee 2003). Both the internal and external grammars need to be taken into account when designing the game.

Finally, the third objective (the learning situations organised between the researchers and the students during the creation of the game) is

directly connected to the context in which the process takes place, the instruments used and interaction with others. The roles and the design process, which were inspired by the way professional teams work (Mitchell 2012), were also a key feature of the workshops, generating a context in which conversation and problem-solving processes promote literacy and critical multimodal discourse (Machin 2013). The students learn that creation is linked to the roles they play and the tasks assigned to them, and that it is the result of a collective task.

ACKNOWLEDGEMENTS

Thanks to the editorial members and the reviewers for all their comments and help in improving our text. Thanks to the Spanish Ministry of Science and Innovation (MICINN) for founding the project, EDU2012-34624. Special thanks to the school, the teacher, and the students who participated in the research, and their families.

REFERENCES

Barton, D. and L. Carman. *Language Online Investigating Digital Texts and Practices*. Milton Park, Abingdon, Oxon: Routledge, 2013.

Brennen, B. *Qualitative Research Methods For Media Studies*. New York; London: Routledge, 2013.

Delgado, M. *Urban Youth and Photovoice: Visual Ethnography In Action*. Oxford; New York: Oxford University Press, 2015.

Fernández-Vara, C. *Introduction To Game Analysis*. New York: Routledge, 2015.

Fullerton, T., S. Christopher, and S. Hoffman. 2008. *Game Design Workshop: A Playcentric Approach To Creating Innovative Games*. 2nd ed. Amsterdam; Boston: Elsevier Morgan Kaufmann.

Gee, J. P. *What Video Games Have To Teach Us About Learning And Literacy*. New York: Palgrave Macmillan, 2003.

Gee, J. P. *What Video Games Have to Teach Us About Learning and Literacy. Second Edition: Revised and Updated Edition [Paperback]*. New York: Palgrave Macmillan, 2007.

Gee, J. P. *The Anti-education Era: Creating Smarter Students Through Digital Learning*. New York, NY: Palgrave McMillan, 2013.

Gee, J. P. and E. Hayes. *Language And Learning In The Digital Age*. 1st ed. Milton Park, Abingdon New York, NY: Routledge, 2011.

Halliday, M. A. K. *Language As Social Semiotic: The Social Interpretation Of Language and Meaning*. London: Arnold, 1978.

Halverson, E. R. "Participatory Media Spaces: A Design Perspective on Learning with Media and Technology in the Twenty-First Century." In *Games, Learning, and Society: Learning and Meaning in the Digital Age*, edited by Constance Steinkuehler, Kurt Squire and Sasha A. Barab, 244-271. Cambridge: Cambridge University Press, 2012.

Hayes, E. R., and S. C. Duncan. *Learning in Video Game Affinity Spaces, New Literacies and Digital Epistemologies*. New York: P. Lang, 212.

Holland W., H. Jenkins, and K. Squire. Theory by design." In *The Video Game Theory Reader*, edited by Mark J. P. Wolf and Bernard Perron, 25-46. New York & London: Routledge, 2003.

Huizinga, J. *Homo Ludens: A Study of the Play-element in Culture*. London: Routledge, 1938/2000.

Jenkins, H., K. Squire, and P. Tan. "You can't bring that game to school: Designing supercharged!" In *Design Research: Methods and Perspectives*, edited by Brenda Laurel, 244-252. Cambridge, Mass.: MIT Press, 2003.

Jenkins, H., I. Mizuko , and D. Boyd. *Participatory Culture in a Networked Era: A Conversation on Youth, Learning, Commerce, and Politics*. Cambridge, UK; Malden, MA: Polity Press, 2015.

Jewitt, C. *Technology, Literacy, learning. A Multimodal Approach*. London & New York: Routledge, 2006/2009.

Jewitt, C., and G. R. Kress. *Multimodal Literacy, New Literacies and Digital Epistemologies*. New York: P. Lang, 2003.

Johnson, S. Theme Is Not Meaning: Who Decides What a Game Is About?" In *Games, Learning, and Society: Learning and Meaning in the Digital age*, edited by Constance Steinkuehler, Kurt Squire and Sasha A. Barab, 32-40. Cambridge: Cambridge University Press, 2012.

Juul, J. *Half-real. Videogames Between Real Rules and Fictional Worlds*. Cambridge, MASS: The MIT Press, 2005.

Kafai, Y. B. Playing and Making Games for Learning: Instructionist and Constructionist Perspectives for Game Studies." *Games and Culture* 1 (1):36-40, 2006. doi: 10.1177/1555412005281767.

Kafai, Y.B., and K. A. Peppler. Developing gaming fluencies with Scratch: Realizing game design as an artistic process. In *Games, Learning, and Society: Learning and Meaning in the Digital Age*, edited by Constance Steinkuehler, Kurt Squire and Sasha A. Barab, 355-381. Cambridge: Cambridge University Press, 2012.

Kemmis, S., McTaggart, R. and R Nixon. Introducing Critical Participatory Action Research." In *The Action Research Planner Doing Critical Participatory Action Research*, edited by Stephen Kemmis, Robin McTaggart and Rhonda Nixon, 1-26. Singapore; London: Springer, 2014.

Kress, G. R. *Multimodality: a Social Semiotic Approach to Contemporary Communication*. London; New York: Routledge, 2010.

Kress, G. R., and T. Van Leeuwen. *Multimodal Discourse: The Modes and Media of Contemporary Communication*. London, New York: Arnold; Oxford University Press, 2001.

Lacasa, P. *Learning in Real and Virtual Worlds: Commercial Video Games as Educational Tools*. New York: Palgrave McMillan, 2013.

Lacasa, P, M.R. García Pernía, and S. Cortés. Creative collaboration in young digital communities." In *Creativity in the Digital Age*, edited by Nelson Zagalo and Pedro Branco, 135-158. London: Springer, 2015.

Lincoln, Y. S., S.A. Lynham, and E.G. Guba. Paradigmatic controversies, contradictions, and emerging confluences, revisited." In *The SAGE Handbook of Qualitative Research*, edited by Norman K. Denzin and Yvonna S. Lincoln, 97-128. Thousand Oaks, Calif.; London: Sage Publications, 2011.

Machin, D. What is multimodal critical discourse studies?" *Critical Discourse Studies* 10, no. 4:347-355, 2013. doi: 10.1080/17405904.2013.813770.

Marone, V. From Discussion Forum to Discursive Studio: Learning and Creativity in Design-Oriented Affinity Spaces. *Games and Culture* 10, no.1, pp:81-105, 2015. doi: 10.1177/1555412014557328.

McKenzie, N. Nurturing Lateral Leaps in Game Design." In *Games, Learning, and Society: Learning and Meaning in the Digital age*, edited by Constance Steinkuehler, Kurt Squire and Sasha A. Barab, 49-75. Cambridge: Cambridge University Press, 2012.

Mitchell, B. L. *Game Design Essentials*. Indianapolis, Ind.: John Wiley & Sons, 2012..

Nitsche, M. V*ideo Game Spaces: Image, Play, and Structure in 3D Game Worlds*. Cambridge, Mass.: MIT Press, 2008.

Pellicone, A., and J. Ahn. Building Worlds: A Connective Ethnography of Play in Minecraft.” *Games and Culture*, 2015. doi: 10.1177/1555412015622345.

Pierce-Grove, R. Pressing Play: Digital Game Techniques and Interactive Art.” *Games and Culture* 9, no. 6, pp:468-479, 2014. doi: 10.1177/1555412014549806.

Pink, S. *Doing Visual Ethnography*. 3rd ed. Thousand Oaks, CA: Sage Publications, 2013.

Rowsell, J. *Working with Multimodality: Rethinking Literacy in a Digital Age*. London; New York: Routledge, 2013.

Salen, K, and E. Zimmerman. *Rules of play. Game design Fundamentals*. Cambridge, Massachusetts: MIT Press, 2004.

Salen, K, and E. Zimmerman. *The Game Design Reader: a Rules of Play anthology*. Cambridge, Mass.: MIT Press, 2006.

Sicart, M. *Playful Thinking series: Play Matters*. Cambridge, MA, USA: The MIT Press.

Squire, K. Designed Cultures. In *Games, Learning, and Society: Learning and Meaning in the digital Age*, edited by Constance Steinkuehler, Kurt Squire and Sasha A. Barab, 10-31. Cambridge: Cambridge University Press, 2012.

Squire, K. D. Video-game Literacy. A Literacy of Expertise. In *Handbook of Research on New Literacies*, edited by Julie Coiro, Michele Knobel, Colin Lankshear and Donald J. Leu, 635-669. New York: Routledge/Taylor & Francis Group, 2009.

Stenros, J. The Game Definition Game: A Review.” *Games and Culture*, 2016. doi: 10.1177/1555412016655679.

Tulloch, R. The Construction of Play: Rules, Restrictions, and the Repressive Hypothesis." *Games and Culture* 9, no. 5, 2014