

Strategies of collaborative work in the classroom through the design of video games

Juan Manuel Muñoz González

juan.manuel@uco.es

University of Córdoba, Spain

Sebastián Rubio García

sjrubio@uco.es

University of Córdoba, Spain

Ivanovna M. Cruz Pichardo

ivanovnnacruz@pucmm.edu.do

Pontifical University Católica Madre y Maestra,
Santo Domingo

Abstract

At the present time, the use of video games goes beyond mere amusement or entertainment due to its potential for developing capacities, dexterity and skills. Thus, video games have extended to environments like that of education, serving as didactic resources within dynamics that respond to the interests and necessities of the 21st century student. In this study, we approach the design of video games in initial teacher training. In this respect, we aim to collect the student's views regarding the learning process of the different tools used for designing video games within a framework of collaborative learning. The investigation is approached through a quantitative methodology applying a 28-item questionnaire on the learning experience of designing video games. We used a sample of 200 second-year students majoring in Childhood Education during the 2013/2014 academic course. The results obtained show that the students value in a positive way the collaborative learning methodology for mastering the video games designing tools.

Keywords

Video games, collaborative learning, higher education, ICT

Estrategias de trabajo colaborativo en el aula a través del diseño de videojuegos

Juan Manuel Muñoz González

juan.manuel@uco.es

University of Córdoba, Spain

Sebastián Rubio García

sjrubio@uco.es

University of Córdoba, Spain

Ivanovna M. Cruz Pichardo

ivanovnnacruz@pucmm.edu.do

Pontifical University Católica Madre y Maestra,
Santo Domingo

Resumen

En la actualidad, el uso de los videojuegos va más allá de la mera diversión o entreteniéndolo, debido a su potencial para el desarrollo de capacidades, destrezas y habilidades. Por tanto, los videojuegos se han extendido a ámbitos como el de la educación, empleándose como recursos didácticos dentro de dinámicas que responden a los intereses y necesidades del alumnado del siglo XXI. En este estudio, abordamos el diseño de videojuegos en la formación inicial docente. Al respecto, pretendemos recoger las opiniones del alumnado en relación al aprendizaje de las distintas herramientas empleadas para el diseño de videojuegos en el marco del aprendizaje colaborativo. La investigación la abordamos desde una metodología cuantitativa, a través del uso de un cuestionario de 28 ítems, sobre la experiencia de aprendizaje vivida en el diseño de videojuegos. Se ha trabajado con una muestra de 200 estudiantes pertenecientes al segundo curso de la titulación de Grado de Maestro especialidad en Educación Infantil, durante el curso académico 2013/2014. Los resultados obtenidos muestran que el alumnado valora positivamente la metodología del aprendizaje colaborativo para la adquisición del dominio de las herramientas utilizadas en el diseño de videojuegos.

Palabras clave

Videojuegos, Aprendizaje colaborativo, Educación Superior, TIC

I. Introduction

In our current society, Information and Communication Technologies (hereinafter ICTs) have become an everyday tool being that, among other things, provide us instant access to information from any location and contribute in a significant way to the communication processes. In the field of education, the importance of ICTs is even greater, as they enable stimulation and language development, increased self-esteem, motivation and social interaction (Díaz, Reche & Lucena, 2005). In this respect, Martin & Tyner (2012) state the importance of the school in its role to permeate the students with a series of essential values and skills in order not to confuse the schooling and usage of ICTs as a technological acquisition intended to create consumers and users of new technologies and that prevents seeing the purposes sought by education through the use of these means. In this sense, ICTs appear as a resource of great value to promote participation in all sectors of society, particularly in education, where a series of advantages can be noted, such as (Cabero & Córdoba 2009):

- Helping to overcome the limitations derived out of cognitive, sensory and motor disabilities.
- Promoting independence and autonomy.
- Fostering communication.
- Timesaving for the acquisition of skills and abilities.
- Facilitating diagnosis.
- Encouraging an individualized education where everyone can advance at their own pace, which is of great importance for people with disabilities. (p.73)

In this concern, the educational centers have progressively adapted to the new social demands, introducing technological improvements that are not only limited to a classroom with computer equipment, but that are targeted, for example, to design work dynamics that include the use of learning platforms, tablets, digital whiteboards or even didactic video games, which is the main focus of this study.

In this regard, it should be highlighted that the intervention design shown in this study is focused in designing video games through a collaborative learning methodology to develop a series of essential skills for the initial teacher training, such as:

- Knowing and mastering the user's level in the ICTs field.
- Knowing the learning implications of ICTs, particularly, of television during early childhood.
- Approaching field analysis through an observational methodology using ICTs, documentation and audiovisuals.
- Encouraging initiation experiences to ICTs.
- Analyzing audiovisual languages and their learning implications.
- Controlling and following-up on the educational process, particularly, teaching and learning through the mastering of necessary techniques and strategies.

It is therefore not a Game-Based Learning (GBL) strategy since this would be the second stage of the investigation, which takes place as the video games designed in the Early Education classroom are implemented.

II. Initial Teacher Training as a Response to 21st Century Schooling

The introduction of learning dynamics in classrooms of any educational stage requires several aspects- teacher training being the most decisive element. In this regard, prospective teachers should acquire a qualified education in order to be able to respond to the new student profile featured in today's classrooms. In this respect, Martin & Tyner (2012) consider that these "new literacies" are neither more nor less than another addition to rudimentary, yet still necessary, literacy, since the large majority of information used in the 21st century comes from digital resources. On the other hand, Martin (2007) points out that learning when to use the new technology equipment is essential provided that is supplemented with didactic training. Additionally, due to a fast-evolving digital era, teachers should be constantly acquiring new technology skills, thus making lifelong training essential to adapt to the changing needs of our society. On the other hand, Díaz, Reche & Lucena (2005), show that in order to be able to achieve satisfactory teaching and learning dynamics, it is necessary to address aspects, such as:

- The educational contents: these should adapt to the culture and the context that we live.
- Improving the infrastructures: to be able to include all these IT resources, which provide access to information and didactic online contents.
- A better organization of the educational system: to be able to provide customized training for all, motivating those institutions that promote and offer courses that respond to the demands of various groups such as adult literacy and usage of new IT resources.

Finally, De la Peña (2011) emphasizes that we won't be able to predict the future, but what we should be certain about is that there will be more technology within our reach and that education will continue being a basic necessity for all of society.

III. Video Games as a New Learning Tool

Video games have been considered for years as resources exclusively designed to target leisure, amusement or entertainment needs. However, if we analyze closely the elements that comprise a video game (script, time, goals, environment, main characters...), we can observe that many of them contain pedagogic components of great value in regards to their design. Nevertheless, in order to implement Video Games-Based Learning methodologies, it is crucial to analyze the proper title selection in terms of the intended goals. In this sense, "the teacher must have clear criteria for planning its usage and integration in the classroom; know the different game types and their time requirements, the existence of various strategies, etc." (Gros, 2009, p. 256). In this respect, we can mention, for example, a mythical strategy game that had great repercussion worldwide, as was *Age of Empires* (1997). This game showed the features of different ages (Stone Age, tools, Bronze...), as well as civilizations (Greek, Persian, Phoenician...). The goal was to defeat the other civilizations through the management of resources (wood, stone, gold....), which allowed the construction of buildings with different essential functions for the achievement of the goal. To all this we must add the selection of numerous campaigns that transported the user to the eras of Alexander the Great, Archimedes or Joanna the Mad, while turning the player into the main character of this history chapter. Other video games applied in learning methodologies are, for instance, the classic *Carmen Sandiego en el Mundo*, where students have to catch a felon travelling from one country to the other and learning things such as the country's currency, its flag colors,

etc. (Gros, 2000); as well as some titles such as *Deus Ex*, *Half-Life*, *The Sims*, *Rise of Nations*, *SWAT IV*, *Civilization*, *The Elder Scrolls III: Morrowind* whose structure is far more complex due to the diversity of settings in which the main character is immersed and the elements that he can interact with in order to reach the goals proposed and that, because of the number of possibilities and alternatives to solve the enigmas posed, require the development of skills (Gee, 2005). In this sense, as Marín, Ramírez and Cabero (2010) stated, the video games are shown as resources that encourage learning and motivation in students by having an interactive, accessible and dynamic nature.

As for the educational possibilities of videogames, it's worth noting, among others (García Marín 2005 of and; Pindado, 2005; Pérez - Latorre, 2011; Morales2013):

- Increased motivation for learning
- Development of creativity and imagination.
- Enhancing the learning ability to learn.
- Strengthens self-esteem and self-concept.
- Development of critical and reflexive thinking.
- Promotes collaborative and cooperative learning.

Ultimately, video games comprise an important didactic resource whose development and design should be part of the initial teacher training of any stage. This study shows the learning process followed for designing and developing video games used in Early Childhood Education College programs. Several IT tools were used for its making with specific roles that allow preparing different video games elements, such as those detailed in the next section.

IV. Video Games Designed Through a Collaborative Learning Methodology

Nowadays there are many tools intended for designing educational video games - one of them being *e-ADVENTURES*, a software developed by the Complutense University of Madrid, that facilitates creating interactive games under two visual modalities: 3rd person (the main characters appear on the screen) and 1st person (omission of the main character). An example of the video game type that can be created with this tool is found on the worldwide hit known as *The Secret of Monkey Island* (1990). This game was a graphic adventure in which the lead character had to interact with different characters and/or scene elements to attain his goals. In addition to this tool, there are others such as *Alice* that allows creating 3D animations through a relatively easy-to-use interface which enables creating stories, interactive games or videos; and *MissionMaker* which allows creating 3D landscapes where the main character exists in the first person. However, no specific tool for designing video games was used in this study; instead, we used software whose main goal is creating an e-learning course, as is the case of *CourseLab*. The substantiation of using this resource in learning dynamics is found in a series of aspects, such as:

1º. It is a free tool in its 2.4 version

2º. It has a similar setting to MS Office, which is a very familiar program to the overall student population.

3°. The insertion process of the different video game elements in this software is very intuitive and open and is not "corseted" in sections that are also comprised of subsections, making the procedure a much more complex one while hindering the learning process.

4°. *Courselab* integrates the so-called *Actions*, that allow students "to program" different types of interactions based on the user's intention without needing IT knowledge. This process is set up in 3 stages: Events, Actions and Objects.

5°. The final result is produced in *HTML* format which allows for a smooth integration in websites, educational blogs, learning platforms. Etc.

6°. It allows inserting any type of multimedia element such as audio, video, JAVA applications, Shockwave, Flash...

7°. Ultimately, it is a tool constantly updated that adapts to the continuous changes produced in browsers, add-ons, plugins, etc.

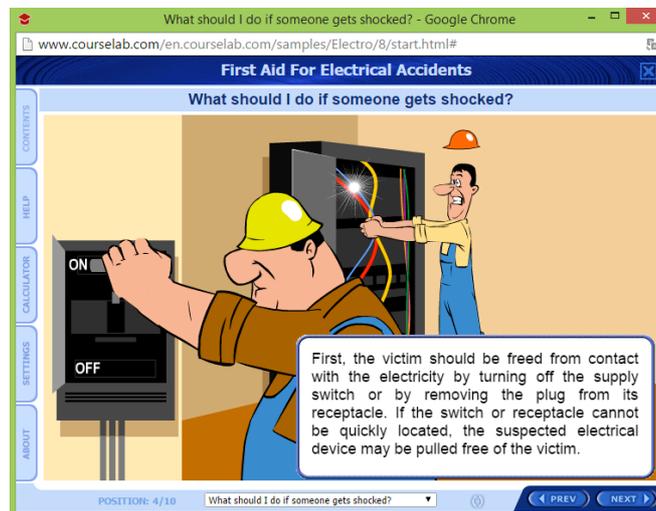


Figure 1 shows an example of the type of materials that can be made using *Courselab*.
Fuente: <http://www.courselab.com/en.courselab.com/samples/Electro/8/start.html#>

The learning dynamic carried out in this study is a product of the joint work of two subjects taught in the second year of the Early Childhood Education College program: Planning and Innovation in Early Childhood Education and Media Education and Educational Dimension of the ICTs.

The former is taught in the first semester of the academic year and allows students, among other things, to acquire the basic knowledge for preparing and developing a didactic programming as well as a didactic unit that will serve as basis for designing the video game. The students will also learn how to pinpoint learning objectives from the general information contained in the regulation in force as well as to establish the contents, methodology and corresponding evaluation approaches to outline a series of activities to be carried out with certain resources that allow students to achieve these objectives. All these elements will form the context of a videogame that meets the educational needs of students depending on the course of the stage where they are. On the other hand, the second subject is taught in the second semester of the academic year and it

will allow the future teacher to acquire the necessary skills for creating a videogame. In this regard, it should be noted that said degree is comprised by 3 class-groups, and thus, a total of 4 teachers intervene in said dynamic who will coordinate amongst themselves at least 4 times per year (twice per semester). This process is divided in several phases specified below:

1. Introduction Phase: It exposes students to the methodology used for teaching the subject while focusing on the group creation of a videogame as a point of interest. At this time, we note the importance of considering the entire body of work completed in this first-year subject, since it will comprise the core issue of the resource, as well as the reference for the goals, contents and evaluation approaches. In this sense, we emphasize the importance of carrying out an authentic collaborative learning, since it is fundamental that each member of the group masters the technique of each of the tools used in order to pass the individual final exam (Domingo, 2008; Moraña, 2011; Torrego and Black 2012).
2. Technique Mastery Acquisition Phase: Upon this time, it will be explained to the students all and each one of the computer applications that are necessary for creating the video game, which are as follows:
 - *Audacity*: Application for producing and editing audio. This program is essential so that each group can prepare its own narratives and endow the main characters of the videogame with a voice.
 - *Microsoft Windows MovieMaker*: Tool for producing and editing video files. It allows the group to create small audiovisual projects regarding the pursued goals. In the Early Childhood Education phase, the instructional videos are of particular interest due to the psycho-evolutional features of students.
 - *Gimp*: Application for editing and creating images. This tool enables creating environments, characters, and also altering images previously created by hand.
 - *Courselab*: This is the most important tool for creating the videogame, since it allows integrating all the resources produced by the applications above. In this regard, it enables creating interactive elements, integrating web pages with multimedia activities, developing learning paths based on user responses, videogame connection with learning platforms, etc.
3. Scripting Phase: Once the students know the methodology plan as well as the IT tools to be used, they will be asked to write a script for their video games, clearly specifying the following elements: story or plotline, context, main characters, goals, evaluation system and awards, without losing reference of the goals, contents and criteria from the previous (didactic unit) work. "The designer shall apply his conceptualization capacity and knowledge of various multimedia expression areas that may intervene in the realization of the video game as well as his ability to project several aspects and tasks of the audiovisual and multimedia realms". (Morales, 2013, p.107).

4. Video Game Creation Phase: This is the last stage of the dynamic where students will implement all the knowledge covered in the previous phases to create the video game. In the words of Morales (2013), "the designer must maintain at all times an overview of the project covering its fictional world, structure and interaction rules, and its pedagogical approach ... which should also meet his learning expectations." (p. 108).

Regarding the type of video games created by students, most of them are based in stories whose characters must overcome a series of tests in order to reach certain Objects that will allow them to reach to the end. These tests are activities that respond to the previously established goals, contents and criteria. We might say that is a game style similar to that of *Dora the Explorer*. The duration of the complete instruction-teaching process comprises the academic course semester with a total of 70 classroom hours. In the sessions theory and practice are not separated since all classes are both theoretical and practical by following the method known as *EAR*, that is, Explanation, Application and Resolution of doubts. Therefore, in each of the session that are part of the established dynamic, some video game design aspect is explained, followed by immediate group application of said explanation and possible resolution of doubts or difficulties that may come about during the process. This procedure largely ensures that everyone can learn in a satisfactory manner.

V. Investigation Design

a. Objectives

The overall purpose of this study is focused on analyzing the views of students on the collaborative learning experienced in the process of creating a video game. This general objective is achieved by the following goals:

1. Describe the views of university students on the contributions of video games within the process of collaborate learning.
2. Analyze the differences among the views of university students according to gender and age.

b. Participants

The study received an incidental sample of 200 students enrolled in the Early Childhood Education Undergraduate Program at the University of Córdoba, for the subjects above. The group of participants is divided by gender as follows: 152 women (76%) and 48 men (24%). Age can be divided into three statistically distinct ranges: 18-22 years old (72.6%), 23-26 years old (22.3%) and 4.1% between 27 and 43 years old.

c. Instrument

To achieve the research objectives established, we applied upon completion of the experience, a Likert scale questionnaire designed to assess the experience of game development in groups with the help of *CourseLab* using 28 items. This quantitative approach was chosen because we thought it would be best suited for this type of students. They do not want to waste time to describe their

experience in class or perform personal interviews and a survey with Likert scale seems a clear and direct method to collect information.

In such items, shown in Table 1, students will assess the level of agreement or disagreement with each statement on a scale of 5 levels (Strongly Disagree, Disagree, Neither Agree nor Disagree, Agree, and Strongly Agree). The questionnaire was designed along the observation in previous years. The pilot test to validate the questionnaire was conducted with 40 people the previous year, with similar characteristics to the final sample. In the questionnaire questions related to ease of use and other applications with the utility of video games to achieve the objectives of the curriculum they are included. These questions were introduced to eliminate biases in data collection, because the students are validating their work.

After collecting and computing the data gathered in this survey, we proceeded with a quantitative analysis using SPSS (version 20.0). Thereupon, we performed Cronbach's reliability test for the instrument using the full sample and obtaining a 0.886, which seemed sufficient. In addition, the instrument has the age, gender and Internet and smartphone or tablet availability as socio-demographic variables.

Additionally and with the intent of gathering information during the development process experience and to help us better understand and appreciate the experience, we have taken into account the contributions collected through participant observation, field notes, student interviews and document analysis. Two teachers participated in the process of collecting information, comparing notes and impressions at the end of each session.

Indicate the level of agreement with the following statements regarding the creation of a video game as a group using *CourseLab* and other programs, according to the following rating scale: Strongly Disagree (1) Disagree (2) Neither Agree nor Disagree (3) Agree (4) Strongly Agree (5).

- 1) *Do you have a computer at home?*
- 2) *From where do you usually access the Internet?*
- 3) *Do you have a tablet?*
- 4) *Do you have a smartphone? (Mobile Phone with Internet)*
- 5) *Do you have internet service?*
- 6) *Empowers collaboration with other colleagues*
- 7) *Facilitates communication between students*
- 8) *Promotes personal relationships with colleagues*
- 9) *Promotes interactions and collaboration among students*
- 10) *Encourages the students to feel part of the group*
- 11) *Stimulates new relationships*

<p>12) Enables connecting with others outside of our class group</p> <p>13) Encourages students to participate</p> <p>14) The application settings are intuitive</p> <p>15) The application settings are easy to use</p> <p>16) The tool does not require prior knowledge of computers</p> <p>17) It facilitates sharing content</p> <p>18) It took great effort learning how to use the tool</p> <p>19) I had difficulties learning how to use the tool</p> <p>20) It took me a long time learning how to use the tool</p> <p>21) There was time during class for the teacher to answer questions which enabled mastering the tool as a fundamental aspect of the process</p> <p>22) Would use CourseLab for curricular development in various areas of the course or level</p> <p>23) Video games help develop the different proposed targets on the core curriculum for Primary Education established in Royal Decree 1513</p> <p>24) Video games are useful for students to delve into the Internet</p> <p>25) Video games are an adaptable activity for current IT support</p> <p>26) Video games are an activity that increases student motivation through the inclusion of multimedia resources and not just text and image</p> <p>27) Digital gaming is an activity that encourages autonomy in students</p> <p>28) Developing video games can foster relationships through the establishment of groups for its implementation</p>
--

Table 1: Test of views on the process of collaborative learning with CourseLab, after the group designed a video game.

Participant observation allowed us to be part of the group class during the course of the sessions. It was important to make us feel like a member of the group, experiencing from within that "reality". Through field notes, we collected the events taking place in the classroom; difficulties encountered by students were: learning the technique of making mind maps, questions or issues learning to use the software required for game designing, issues regarding selection, prioritization, etc. These notes contain detailed information on the context of the classroom, as well as the different and continuous social interactions that occurred between groups. The works created as a result of developing the subject favored this analysis, in terms of collecting more information. The documents analyzed, as mentioned above, are mainly working scripts. The quality of these has been part of the learning evaluation process. Finally, unstructured interviews allowed us to steer

questions in a more flexible and open manner, allowing the students to express their ideas, concerns, feelings, etc.

d. Data Analysis

The information collected was analyzed using univariate descriptive statistics such as frequencies, percentages, mean, median and standard deviation for describing students views, estimating averages and analyzing the distribution and dispersion of responses (Pérez, Garcia Gil y Galán, 2009).

To compare student perceptions under different grouping variables, we used a bivariate type of analysis which specifically contrasts mean differences. Also, in the case of variance analysis, multiple comparisons "post hoc" were performed to analyze specific groups among which occur the differences found. To this end, we administered the Tukey test when variances were equal and the Games-Howell test if otherwise (Catena, Ramos and Trujillo, 2003). Finally we estimated the effect size of mean differences using Cohen's *d*, whereas a value of .20 indicates a small effect, a value of .50 a moderate effect and a value of .80 or above a large effect (Cohen, 1977). The data set analysis was performed mainly using the statistical program SPSS v. 20.0. In all tests administered statistical significance was established at a level of $p \leq .05$ (confidence level 95%).

VI. Results and discussion

The description of the opinions of university students on the contributions of video games in the collaborative learning process is performed on the stage of interviews with students and at the stage of validation tools for collecting information.

Table 2 shows the main results of the analysis in order to analyze the opinions of pupils on the usefulness of the activity. Particularly, frequencies and percentages were analyzed according to the block-related activity regarding work items 6 to 28. The question block 1-5 is essentially to rule out individuals who are not part of the group object study.

ITEMS	1		2		3		4		5	
	f	%	f	%	f	%	f	%	f	%
6) Empowered collaboration with other colleagues	3	1,5	12	6	39	19,5	82	41	64	32
7) Facilitates communication between students	7	3,5	10	5	48	24	76	38	59	29,5
8) Promotes personal relationships with colleagues	19	9,5	24	12	84	42	51	25,5	22	11
9) Promotes interactions and collaboration among students	1	0,5	13	6,5	51	25,5	78	39	57	28,5

10) Encourages the students to feel part of the group	8	4	11	5,5	41	20,5	79	39,5	61	30,5
11) Stimulates new relationships	14	7	19	9,5	85	42,5	47	23,5	35	17,5
12) Enables connecting with others outside of our class group	8	4	15	7,5	74	37	62	31	41	20,5
13) Encourages students to participate	3	1,5	6	3	52	26	77	38,5	62	31
14) The application settings are intuitive	1	0,5	11	5,5	96	48	51	25,5	41	20,5
15) The application settings are easy to use	0	0	12	6	87	43,5	59	29,5	42	21
16) The tool does not require prior knowledge of computers	8	4	43	21,5	64	32	47	23,5	38	19
17) It facilitates sharing content	4	2	53	26,5	46	23	52	26	45	22,5
18) It took great effort learning how to use the tool	34	17	48	24	75	37,5	24	12	19	9,5
19) I had difficulties learning how to use the tool	33	16,5	52	26	71	35,5	28	14	16	8
20) It took me a long time learning how to use the tool	34	17	49	24,5	62	31	30	15	25	12,5
21) There was time during class for the teacher to answer questions which enabled mastering the tool as a fundamental aspect of the process	8	4	32	16	20	10	54	27	86	43
22) Would use CourseLab for curricular development in various areas of the course or level	5	2,5	54	27	29	14,5	61	30,5	51	25,5
23) Video games help develop the different proposed targets on the core curriculum for Primary Education established in Royal Decree 1513	2	1	12	6	45	22,5	63	31,5	78	39
24) Video games are useful for students to delve into the Internet	15	7,5	24	12	43	21,5	51	25,5	67	33,5
25) Video games are an adaptable activity for current IT support	4	2	15	7,5	32	16	65	32,5	84	42
26) Video games are an activity that increases student motivation through the	5	2,5	12	6	33	16,5	66	33	84	42

<i>inclusion of multimedia resources and not just text and image</i>										
<i>27) Digital gaming is an activity that encourages autonomy in students</i>	3	1,5	26	13	44	22	56	28	71	35,5
<i>28) Developing video games can foster relationships through the establishment of groups for its implementation</i>	21	10,5	33	16,5	49	24,5	59	29,5	38	19

Table 2: Frequency (and percentage) in the different items of the questionnaire (6-28)

The study results show firstly, a set of views regarding the influence of the educational experience for improving learning at an individual level. The majority of university respondents that participated in this experience enabled the understanding of issues and may have favored solving the learning difficulties of the different thematic units.

On the other hand, other reviews are linked to directly influencing the experience for improving social interactions and collaborative learning. The vast majority of students valued very highly the process of developing a strategy game as set in the curriculum.

Processing data from a gender perspective showed no significant differences regarding the perception of usefulness of the tool between men and women. The dispersion of data broken down by gender was only 5%.

As per age, no special differences of opinion were detected between the youngest and the small percentage of older students. In this sense, it can be expected that older people feel less affinity for using video games in education, however, older students also often have greater motivation to learn new teaching techniques, so the dispersion found from the perspective of age was less than 3%.

It should be noted that for the students part of the sample, the implementation of this experience positively influenced teamwork for developing and producing digital games shared through a process of collaborative learning and implemented in *CourseLab*.

VII. Conclusions

This paper analyzed both the individual and group impact within the initial teacher training, for developing video games through the *CourseLab* application as a learning tool for planning a subject. The results showed that the interaction between groups and the improvement of positive classroom climate allowed the achievement of meaningful learning through new tools while expanding the use of video games beyond pure entertainment.

During the course of the sessions, the exchange of ideas and opinions among students, allowed them not only to interact but discuss what was important while generating the construction of

shared knowledge, fostering respect and an appropriate work climate within the group. In this regard, permanent classroom observations about their work along with testimonies from the respondents showed a significant change of attitude towards group work in the university classroom. We have also observed that students can quickly learn how to manage the *CourseLab* software to develop video games, prepare presentations that facilitate communication in the classroom and add many other types of educational resources in digital format (text, sound, images, video, web pages...).

The assessments made by prospective teachers about this tool and its educational applications are quite positive. Therefore, we believe that the use of this resource to develop classroom activities is a realistic and effective integration of ICTs in education, helping to enrich the learning process. Through additional registers used in the experiment, we have compiled a series of reviews that highlight a positive assessment regarding the process and understanding of the main functions of game design. In this case, the theoretical content of the course and solving problems of understanding as well as implementing processes for learning how to learn, resemble a model quite close to the constructivist view of teaching thinking processes for teaching evaluations.

Individual and group involvement contributes to creating a positive climate for guiding individual action as a condition for group action in the construction of parts of the game, which enhances the cooperation of the group activity.

In conclusion, the development of this study was possible due to objectives reasonably achievable. However, we are aware that the number of participants in this research is not large enough to consider that the results are generalizable, so we should collect more data in subsequent years and extend the experience to other degrees.

This preliminary work is important to encourage the development of games as a collaborative tool in teacher training.

References

- Cabero, J. & Córdoba M. (2009). Inclusión educativa: inclusión digital. *Revista Educación Inclusiva*, vol. 2, Nº 1, 61-77.
- Catena, A., Ramos, M. M. y Trujillo, H. M. (2003). Análisis univariado de varianza. En Catena A., Ramos M. M. y Trujillo H. M. (Eds.), *Análisis multivariado. Un manual para investigadores* (pp. 47-92). Madrid: Biblioteca Nueva.
- Cohen, J. (1977). *Statistical Power Analysis for the Behavioral Sciences*. New York: Academic Press.
- De la Peña, J. (2011). Alertas sobre innovación tecnológica: tecnooptimismo y tecnorrealismo. *Telos: Cuadernos de comunicación e innovación*, 89, 6-7.

- Díaz, I. A., Reche, M. P. C. & Lucena, F. J. H. (2005). El impacto de las TICS en la sociedad del milenio: nuevas exigencias de los sistemas educativos ante la "alfabetización tecnológica". *Publicación en línea*, 2 (4), 177-190.
- García, M. D. y Marín, V. (2005). Los videojuegos y su capacidad didáctico-formativa. *Pixel&Bit*, 19 (2), 113-119.
- Gee, J. P. (2006). Why Are Video Games Good For Learning? *Curriculum Corporation 13th National Conference*. Recuperado de:
http://www.coulthard.com/library/Files/gee_2006_whyvideogamesaregoodforlearning.pdf
- Gros, B y Grup F9 (2000). Los videojuegos: mucho más que un entretenimiento. *Videojocs a l'Aula*, 1-12.
- Gros, B. (2009). Certezas e interrogantes acerca del uso de los videojuegos para el aprendizaje. *Comunicación*, 7, Vol.1, 251-264.
- Marín, V. (2006). Los videojuegos en el ámbito de la familia: Propuesta de trabajo colaborativo. *Aula Abierta*, 87, 71-84.
- Martín, A. G. (2007). Integración curricular de las TIC y educación para los medios en la sociedad del conocimiento. *Revista Iberoamericana de educación*, 45, 141-156.
- Martín, A. G., & Tyner, K. (2012). Educación para los medios, alfabetización mediática y competencia digital. *Comunicar*, 19 (38), 31-39.
- Morales, J. (2013). El diseño de Serious Games: una experiencia pedagógica en el ámbito de los estudios de Grado en Diseño. *Digital Education Review*, 23, 99-115.
- Moriña, A. (2011). Aprendizaje cooperativo para una educación inclusiva: desarrollo del programa PAC en un aula de Educación Primaria. *Estudios sobre educación*, 21, 199-216.
- Pérez, R., García, J. L., Gil, J. A. y Galán, A. (2009). *Estadística aplicada a la educación*. Madrid: Pearson.
- Pérez-Latorre, O. (2012). Del Ajedrez a StarCraft. Análisis comparativo de juegos tradicionales y videojuegos. *Comunicar*, 38, 121-129.
- Pindado, J. (2005). Las posibilidades educativas de los videojuegos. Una revisión de los estudios más significativos. *Pixel&Bit*, 26, 55-67.
- Domingo, J. (2008). El aprendizaje cooperativo. *Cuadernos de Trabajo Social*, 21 (21), 231-246.
- Torrego, J. C. y Negro, A. (2012). *Aprendizaje cooperativo en las aulas*. Madrid: Alianza Editorial.

Recommended citation

Muñoz, J.M; Rubio, S and Cruz, I. (2015) Strategies og collaborative work in the classroom through the design of video games In: *Digital Education Review*, 27, 69-84 [Accessed: dd/mm/yyyy] <http://greav.ub.edu/der>

Copyright

The texts published in Digital Education Review are under a license *Attribution-Noncommercial-No Derivative Works 2,5 Spain*, of *Creative Commons*. All the conditions of use in: http://creativecommons.org/licenses/by-nc-nd/2.5/es/deed.en_US

In order to mention the works, you must give credit to the authors and to this Journal. Also, Digital Education Review does not accept any responsibility for the points of view and statements made by the authors in their work.

Subscribe & Contact DER

In order to subscribe to DER, please fill the form at <http://greav.ub.edu/der>