VIRTUAL GAMES IN SOCIAL SCIENCE EDUCATION

Abstract

The new technologies make the appearance of highly motivating and dynamic games with different levels of interaction possible, in which large amounts of data, information, procedures and values are included which are intimately bound with the social sciences.

We set out from the hypothesis that videogames may become interesting resources for their inclusion in the education processes in formal contexts. Videogames become laboratories for social experimentation where the scenarios, conditions and situations affecting a given human phenomenon are reproduced.

In this article, 35 videogames are analysed to find out which contents can be approached through them for the teaching of Social Sciences using problem-solving strategies. To this end, instruments for information gathering (data collection grid) and analysis (category system) were designed. The different contents of a social nature are analysed according to the study categories and in turn from the areas of social issues detected in them.

We present a working proposal for the use of videogames in the classroom on the basis of resolution of relevant problems, determining which are the issues that we consider relevant, what questions the pupils can be asked to approach through videogames and what the characteristics, benefits and obstacles are in the use of these resources in the teaching of Social Sciences.

Keywords: applications in subject areas; improving classroom teaching; interactive learning environments; pedagogical issues; teaching/learning strategies

1. Introduction

The understanding of social facts through videogames provides a recreational component that makes the difficult process of learning contents of a socio-historical nature more attractive and motivating. Concepts and procedures such as historical

evolution, change/permanence, diversity, multi-causality, social progress, … require a high level of abstraction and complexity, due to the countless variables involved and the great number of interrelations among them.

The communication possibilities enabled by new technologies make it possible to develop games with different levels of interaction between the participants. So, through new virtual worlds and the use of Internet, we can work with Social Science educational content focused on the formal education area in an informal and enjoyable way.

The current impact of videogames in society is evident and increasingly relevant. The studies carried out by the Interactive Software Federation of Europe (ISFE) demonstrate the impact that videogames have on society. Some 37% of Europeans between 16 and 49 years of age describe themselves as active players; 55% consider video games a means to stimulate creativity, 27 % a socialisation instrument, while 37 % consider that it is the medium with most influence on education after television (51%). Spain is the country with the largest number of videogame website users (22.5%), followed by France (21.2%) and the United Kingdom (19.3%). Both adults and children consider television and cinema to be the media where more negative contents are transmitted, much more than in videogames. However, it is reported that 55% of minors use videogames where people are tortured or killed, 33% have adult-classified videogames and 15% access games with violence towards women and/or drug taking (ISFE 2007; ISFE 2008; Serrano, Ortiz & Laseca, 2006). The sample used for these studies consisted of 4,000 individuals from Czech Republic, France, Germany, Italy, Latvia, Norway, Poland, Spain, Sweden and United Kingdom.

We currently find ourselves immersed in an intense debate on the use of videogames by children and teenagers. Several publications have demonised this type of games, affirming that many of them reproduce a great part of the negative values reigning in our society and attributing them an anti-socialising component of extreme violence and sexism (Moral, 1996). We agree that it is necessary to take care with the type of games to which young people have access, as with television programmes or certain publications, whether through the web or in traditional formats, and of course by avoiding the abusive use of these.

However, several works have also appeared indicating that videogames are not as negative as first supposed, emphasising some aspects that may be quite positive. Huizinga (1998), in his game theory, considered it a fundamental element in the

intellectual development and socialisation of the individual, an aspect which on the other hand can be taken advantage of in education processes in order to understand societies both past and present (Hernàndez, 1999). Johnson (2005) considers that videogames train cognitive skills such as deduction, recognition of visual models, hierarchical structuring of priorities and swift decision making. Likewise, according to studies carried out by the International Optometry Centre, the use of these games develops mental agility and visual coordination, to the extent that they are even used to treat visual problems like strabismus and amblyopia (Nieto, 2008) or to overcome phobias, by facing up to fears in a virtual reality environment.

The works along similar lines by Green & Bavelier (2003), Griffiths (2004) or Standen, Rees & Brown (2009), clearly showing how videogames, suitably utilised and followed up by specialists in different fields, are very useful in the resolution of health issues, both in the visual and mental fields. We defend the same perspective in this work, but in our case focused on the field of education. We set out from the idea that videogames may become an important educational resource for the teaching of relevant contents in the social formation of individuals.

As early as 1985, Leeper published a work analysing the role of computers and some games developed at that time which might be useful when working in formal educative contexts. Videogames and their impact in society, and especially on students, have advanced in leaps and bounds since then. The most recent studies indicate that it is possible to use videogames as educational resources. Among them, we can highlight the work by Rosas, Nussbaum, Cumsille, Marianov, Correa, Flores et al. (2003), where the effects of introducing videogames into the classroom are evaluated in terms of learning, motivation and classroom dynamics, using a sample of 1270 first and second grade students. Gee (2003) also analysed several highly popular videogames in the market to assess the impact they might have in the educational scope. In general, the videogames used as a sample in this type of studies are very generic, selected for their success in the gaming market rather than the content that could be developed as educational resources.

Nevertheless, despite the studies already carried out, it is important to continue the research into the didactic use of videogames to examine their application in the classroom, analysing the problems and benefits (Owston, 2009).

On the other hand, only very few works focus on the didactic use of videogames for the teaching of specific social science related contents. The doctoral thesis by Squire

(2004) is noteworthy, analysing the educational relevance of one of these games, which is also approached here (Civilization III). The author studies the pros and cons of using this game in the formal educational area, the interactions that are developed when putting it into practice, how the knowledge emerges and what part the game plays in the students' understanding of socio-historical phenomena. Other studies have been conducted on another game of very similar features, Age of Empires, in this case assessing the notion of evolution provided by the game in the understanding of historical processes (Cuenca, 1999; Gómez, 2006).

Our study is presented along similar lines, although from a broader perspective in terms of transience and the sample of games subjected to analysis. In the present work, we put forward our theoretical positioning regarding the use of videogames in educational and learning processes, focusing on strategies for the resolution of relevant social issues, with primary and secondary pupils from 8 to 16 years of age.

On this basis, we determined the methodology, analysis phases and research instruments to be used to carry out our study. Next, we describe the first results obtained. The contents that can be worked through videogames in the different categories set out are presented. Then, some initial considerations are proposed concerning the selection and use in the classroom of these videogames to work on social contents by means of problem-solving strategies. Finally, conclusions are reached that allow us to approach the educational use of these resources and assess the obstacles and benefits in their didactic application.

The study has been underway since 1999. This decade has enabled us to assess the evolution of videogames over a long period of time, reviewing the purely formal aspects as well as the didactic and social. Analytical categories were established in line with the thematic aspects and contents that could be the focus of game-based education. After this, the videogames were analysed in two ways. Using an information recording template, the contents included implicitly or explicitly in each game were extracted in multiple laboratory analysis sessions. Subsequently, experiments were carried out with students in primary and secondary education, to verify if games can actually help understand certain Social Science related contents.

2. Material and Methods

Problem-solving is one of the most interesting methodological strategies for the development of education and learning processes, based on research proposals,

interaction, functionality and relation with real life. The aim of this proposal is to position the pupils among several alternatives through different strategies finally leading to decision making. The educators must channel the issues raised by the pupils and transform them into viable formulations for the ages with which we are working (Koppenjan & Klijn, 2004; Sweller, 2009).

In Social Sciences education, due to the innate subjectivity characterising these disciplines, problem solving presents specific aspects that distinguish them from other areas, where, in particular, control of the variables is much greater.

We must bear in mind that in Social Sciences the problems are not well defined from a theoretical viewpoint, as the answers necessarily entail value options and are influenced to a great extent by the information sources (Domínguez, 1994). In order to work in the teaching of Social Sciences with problem-solving strategies, we must set out a series of phases. In the first place, the problem must be presented and defined. The second phase would consist of the educator expounding and providing information on the basic theory for the understanding of the issue. In third place, the problem is broached and resolved, and care must be taken in formulating the questions to ensure that the pupils are provided sufficient information and encourage their interaction. Finally, the fourth phase consists of reflection and assessment of the results, especially evaluating the process and establishing comparisons with the preconceptions from which the pupils set out.

If the aspects mentioned up to this point can be considered the basic strategy to deal with problem solving on a methodological level, a fundamental aspect must be taken into account: which issues do we think it is appropriate to approach in the classroom? Regardless of the age or educational level, we consider that work should be done on the basis of relevant social issues, as centres of socio-educational interest.

From this angle, the current relevant social issues set forth by Estepa (2003) are democracy (crisis of representation and lack of credibility); social inequality and polarisation; multicultural immigration and societies; and hegemonic thinking or *pensée unique* (values in crisis and crisis of values), considering them key points of interest for the development of learning in Social Sciences.

In this sense, new technologies in general (Correa & de Pablos, 2009) and videogames in particular, as we shall see in the following pages, allow us to adopt a problem-solving approach to the educational process, through the design by the players of strategies that provide a solution to certain problems on the basis of resources and

variables determined by the game itself (Forcier & Descy, 2007). So, we may emphasise aspects such as warlike conflicts, territorial management, economic and commercial issues, social relations or democracy and citizenship, among others (Cuenca & Martín, 2010).

It is necessary to bear in mind that videogames respond to the demands and expectations of society and, as such, are a sample of current and relevant social issues and concerns, on many occasions approaching the ludic development of attractive historical representations for the present and with future projection through simulations.

Taking this perspective into account in terms of education and learning processes, as a working hypothesis we considered that videogames allow us to approach contents of great complexity for the interpretation of social phenomena, which can be applied in formal educational contexts on the basis of problem-solving strategies. Setting out from this consideration, we proposed the following objectives:

- Determining which social sciences teaching and learning-related contents are to be included, implicitly or explicitly, in the videogames.
- Evaluating its use for the development of problem-solving strategies for relevant social issues in the classroom.
- Detecting the obstacles and benefits of its use in formal educative contexts.

Studies focusing on videogame analysis usually make general classifications in terms of their technical or thematic features (Squire, 2003): role, strategy, simulators, action, combat, agility, ... Since our object of study is centred on Social Sciences education and learning processes, we must propose a classification in line with the subjects that make up this discipline. In this way, the Social Science contents to be approached in the classroom can be determined more effectively from the point of view of the educational curriculum. We reclassified the game typology in terms of our interests within the study that was carried out, assigning the whole sample to five different groups: games of an economic, social, geographical, artistic and historic nature.

The population under study is the set of videogames in which Social Science-related aspects are developed. Given the countless number of videogames that can meet these characteristics, the ranking of the best-selling videogames was used, according to the information obtained in webs specialising in the market for this type of games (Gameprotv; Gamerankings; Meristation; Vandal on line; Modojuegos; 3d juegos; top.weboscope…). For selection of the sample, rankings of the highest selling

videogames in history were taken, as well as those most sold in 2005-2009, both in the European international market and in the specific Spanish scope. Due to the fluctuation and imprecision of this type of lists, we selected the games which on most occasions figured in the highest-ranking positions within each one.

Thus, we looked in the different rankings for the most popular and best-selling games for each of the types determined, from which we established a random sample within each of each of these groups, always according to the greater or lesser impact of sales of each group and the amount of games of each type present in the rankings reviewed.

In total, 35 games available in the European market were analysed. The first selection criterion was that they should correspond with PC frameworks, because education centres are equipped with this type of IT resources. Another basic criterion for selection was the thematic content of the videogames, which had to be directly related with the Social Sciences area. In this sense, in the games designed for PC we found a greater diversity of software in which socio-historical themes are among the best sellers. In contrast, in games designed for consoles this thematic area figures very little among the most distributed.

In line with our classification, we took a random selection, on the basis of the previous criteria, of the videogames of most commercial impact within the different types established, according to their presence in the aforementioned rankings: 2 of economic nature, 4 social, 3 geographic, 4 artistic and 22 historical (table 1), although it is possible that the same game may be located in more than one of these groups. The sample of videogames the object of analysis was determined by each group in terms of their impact in the market and the preferences expressed by the players in different studies (Raessens & Goldstein, 2005; Serrano, Ortiz & Laseca, 2006). As may be observed, the number of historical games is much higher, since there is a great diversity of these types of videogames in the market, with different features, as shown in the corresponding epigraph.

The study is in three phases. Although only the results of the first two appear in the present work, on a methodological level the three phases were developed to achieve an overall vision of the whole research process. In the first, the research categories are established and the information gathering and analysis instruments (data recording template) are designed (on the basis of the thematic and content categories established). The second phase consists of laboratory work, where each videogame is analysed using the instruments cited. Finally, the third phase involves practical

experimentation with groups of students in primary and secondary education to assess the potential of videogames to facilitate the understanding of Social Science contents.

In the initial phase, the first instrument designed is the category system, established in line with the classification of five types of videogame, determined by their thematic content within the Social Sciences and teaching area. This structure responds to the objectives that we set ourselves, referring to the determination of the contents for the education of this subject, in relation to problem solving. Each category is divided into three variables, equal for each one, depending on the features of the different types of contents that can be approached: conceptual (data, information, dates…), procedural (techniques, processes…) and attitudinal (values, attitudes, feelings…). Finally, the instrument has indicators in which the content features that can be approached with a problem-solving strategy are described (Table 2).

To obtain the information from the videogames in the laboratory analysis, another instrument was also designed, consisting of a data collection grid. This instrument includes the items referring to the designation of the game, the producer company, year of issue and technical description of the game process (graphic quality, speed, requirements, interaction, searchability…) and, of course, to the pertinent data for the analysis categories: game type, content developed and general remarks for its application in a problem-solving strategy. Similarly, the researchers responsible for analysis of the game are identified, as well as the date the table was drawn up (3).

In the second phase, the instruments designed in the first are used for the laboratory analysis of the different videogames selected in the study sample. The researchers carrying out this analytical task were university lecturers in the didactics of Social Sciences from the University of Huelva. The working sessions are carried out by the researchers, analysing each game on the basis of the data collection grid (Table 3), by means of experimentation in countless sessions, to check all the possible developmental variants of the game. Later, the data obtained in the study through the system of categories are analysed and codified (Table 2). The different contents present in each game are assessed, according to the category into which it is classified. Those contents of interest for the teaching of Social Sciences are taken into account following strategies for solving problems that may be relevant for the pupils. Likewise, the differences between the diverse videogames and game types are established in terms of their technical and design features and production and release dates.

Finally, in the third phase, which, as mentioned, is not the object of presentation in this work, the experiment in the didactic use of videogames in primary and secondary education takes place, setting out from the information obtained and categorised in the previous phase.

To this end, another data-gathering instrument was designed relating to the classroom observation during the videogame experimentation process, for use as a resource in problem solving. This instrument takes into account the social contents deemed pertinent for the development of a problem-solving strategy in the four phases, as indicated previously, also structured on the basis of the categories system. The same grid includes aspects concerning general observations and points of interest in the experimental process, as well as the benefits and obstacles detected during its application.

3. Results and discussion

3.1. Contents developed by the videogames according to the analysis categories.

As stated in the methodology, the study was arranged into five analysis categories. Next, we present the contents approached by the different videogames within each of these categories in relation to Social Sciences teaching (Table 2).

3.1.1. Games of economic nature.

Videogames of an economic nature are few and far between in the habitual IT market. They contain aspects related to the market, production processes and instruments of economic analysis. These games do not usually employ historical references for their development, being centred on the aspects, more or less complex, of current economic processes. The player may take the role of broker, investor or trading corporation executive, among others, and must handle production and productivity criteria, according to the economic resources they have to manage. With all of this, setting out from a positive attitude, which does not always accompany this type of games, it is possible to develop mutual respect and positive competitiveness, as well as the resolution of conflicts.

It is usually necessary to implement analysis procedures using several analytical instruments (data curves, micro and macroeconomic statistics, etc.), as well as a

highly specialised vocabulary, some of them of great complexity that makes us question their usefulness for application with pupils of Primary Education age.

Examples of these games could be *Wall Street Trader 2001* (Montecristo), set amidst stock market processes, or *Ruthless.com. This isn't business. This is war* (Red Storm), where a high degree of economic competitiveness is encouraged and any procedure is allowed in order to beat the other competitors.

3.1.2. Games of social nature.

This type of videogames is more recent in the market, since their reality simulation features have required greater technological development to achieve their aim. They are games based on day-to-day life, where the players can easily feel identified with the protagonists of the games or even have avatars to represent them, with a broad empathic process being developed. In this sense, they are clearly social reality simulation games, approaching issues related with culture, customs, identity, diversity, respect, resolution of conflicts and social empathy, by means of an open communication process between the players and their avatars through the use of Internet.

The most well-known, and almost unique, representative of these games is without a doubt *The Sims* (Electronic Arts), in any of the several versions already on the market. All of them are set in totally everyday social situations: life at university, going out at night…, although one of the key parameters in the game is fun. The avatars that appear are and act like common individuals and the players must take the role of one of them and interact with those represented by the computer itself or other players, via connections in cyberspace.

Through the game, it is possible to experience the consequences of the different decisions and actions taken throughout the game (of life). In this sense, these games really become laboratories of social experimentation. In them, different forms of social relations can be verified and developed, which is useful for working on content related with such current social issues as citizenship education, analysing the behaviours and actions of the different characters as well as their consequences, encouraging reflective decision making.

The latest generation has brought us *Spore* (Electronic Arts), which turns the player into a kind of God, in such a way that they can set out the basic criteria for the biological and social evolution of a being from its microscopic state through different

phases, becoming a thinking entity and eventually a socialised and even civilised being. As in the previous case, through Internet, cybergamers can engage in a competitive process, finalising with the victory of the avatar of one player over those of the others.

We cannot forget the virtual life platforms in this type of games, such as *Second Life* or the much more recent *Free Realms*, where the players' avatars simulate social relations and conflicts in a virtual world. All these aspects have an important educational potential as a laboratory for simulation of social relations, where creativity, observation, spatial orientation, conflict resolution, social empathy, competitiveness and respect are developed.

3.1.3. Games of geographic nature.

Geographic games are not very abundant in the computer science market, although we found some very interesting examples in which the spatial notions are developed, as well as the physical, political and human features of different territories. In them, the understanding and handling of different instruments of representation and spatial analysis are exercised through the use and observation of large amounts of images, maps, plans and statistics.

Geographic games of generic character could be *La Aventura de los Continentes* (IPS) or the already more than classic *Carmen Sandiego* (Electronics Arts Software), where the aim is to identify different territorial scopes by their physical, political or human characteristics, first through a game of questions and answers and the second by means of a search induced with detective-novelesque features.

The contents approached are of an eminently conceptual nature through the information and data provided, with little presence of procedures (the compass handling and the possibility of drafting virtual plans/diagrams are notable) and very little in attitudes. In this sense, activities are developed that provide information, the possibilities of searching for or processing the same being reduced (Cuenca & Ferreras, 2006).

As a type of geographic game, closer to the simulation game, we find *SimCity* (EA Games), where a city is developed from its construction, evolution and urban planning changes, at the cost of the surrounding natural environment, to control of the daily life of his inhabitants. The player becomes the mayor or governor of the city, being

responsible for its progress or decay, respect for the environment or its destruction, or equipping the city with the necessary infrastructures for its development.

We must bear in mind that this group could include many other games which, although their fundamental theme is not geographic, use spatial references for the contextualisation and location of the scenario or development of the game itself, as occurs in some of the examples that we will see later (*The Settlers, Age of Empires, Empire Earth…*).

3.1.4. Games of an artistic nature.

These are, very probably, the least common of all Social Science-related IT simulation games, although the artistic or monumental references, patrimonial in general, appear more or less habitually in most of the videogames, basically as illustrations that set the scene and decorate the scenarios or justify the references to specific times around which the adventures of the characters and the simulations are centred.

On the other hand, an increasing number of games coming onto the market have art itself as the focus of interest. In these games - among which we can mention *Misión Van Gogh* (Friendware), *Van Gogh & Kids* (Oberon Medialab), *Louvre* (Friendware) or *Versailles* (Reunion des Musées Nationaux/Cryo/Le Chateau de Versailles) - the player usually takes on the role of a figure of the time and becomes the protagonist of an interesting detectivesque adventure set in the historical periods of reference, with the aim of solving different mysteries in surroundings of continuous artistic and patrimonial references.

In general, identification proposals of artistic periods, specific works and the more relevant artists are approached through analysis of their stylistic and historical features, so that artistic procedures are highly developed in these games, along with dates, details, concepts and values basically related with the respect for cultural heritage.

3.1.5. Games of historical nature.

These are the most common games in terms of the typology proposed here, and one of the best sellers within the difficult videogame market in general. These games focus on one given historical period or several, designing a virtual historical world where the avatars are immersed. In this way, a simulation of historical evolutionary

processes can take place, a component that makes them much more complex and attractive, both in the ludic and educational scope.

The patrimonial elements, eminently monumental, provide the historical framework and underpin the keys to identify and distinguish the different historical periods in which the players may be located. These usually take the role of governors, steering a civilisation through time, or of time detectives, with the aim of solving mysteries or questions in a given historical frame. To this end, during the development of the game it is necessary to use, read and interpret different socio-historical type instruments and resources, such as maps, graphs, images, time lines, etc., fundamental for the resolution of the game (Cuenca, 2008).

In these games of historical slant we can find diverse groups in terms of their characteristics and the role, more or less relevant, that the historical contents may have in them, which can range from partial and barely significant chronological references for the development of the game to cases in which the historical facts and contents are crucial to the designs.

In the first place, there are games that use history anecdotally, merely as the setting where the adventure in question takes place. These games usually take historical features of the medieval era or classic period as mere illustrations, which seem to be more attractive for the public, developing elements of mystery, including mythical, fantastic or magical contents. Examples of these characteristics are *Odyssey: The Search for Ulysses* (Cryo), *TZAR,* (Haemimont Games), *Gothic* (JoWood Productions) or *Prince of Persia* (Ubisoft).

Other historical games basically intend to reproduce in the present day outstanding historical and highly relevant events, wars or battles, which through simulations can give alternatives to reality as a result. These games are similar to those we have characterised in the previous group, since the adventurous component takes precedence over the temporal in the development of the game, although on the other hand they do have a real historical base which the previous ones lack. Some examples are *Rome. Caesar's will* (Montparnasse Multimedia)*, Imperium* (Haemimont Games) or *Patrician* (Ascaron Entertainment) set in classic antiquity*, Port Royale* (Ascaron Entertainment) developed in the period of American colonisation, or, especially, those set in the World War II such as *Combat Flight Simulator* (Microsoft), *12 O'clock High* (Talon Soft) and *Panzer General* (Strategic Simulation), or even in the cold war, as in *The Day After* (Planeta DeAgostini). In these cases, the context of the game, its

generic characteristics or *mise en scène* have a certain historical rigour, but the development and, of course, the outcome are distanced from the actual historical events according to the strategic capacities of each player or their skills in piloting an airplane or handling a tank, for example.

On the other hand, there are other games in the market in which history constitutes the central axis, although of course with a certain degree of licence, positing a series of incognitos or enigmas characteristic of the historical period of reference, which the player has to clarify and solve throughout the game. Of this type we can find *Egypt. The Heliopolis Prophecy* (Cryo), *Ankh* (Bhv), *Paris 1313. Le disparu de Notre-Dame (*Réunion des Musées Nationaux) or *Aztec. The sacred amulet* (Cryo), in which the cultural heritage maintains an important role as historical contextualiser of the game.

In general, this type of games approaches contents related with temporal aspects, change and cultural diversity. As we see, the most characteristic consist of the resolution of some type of historical enigma or the search for characters and elements, more or less relevant, throughout history. Through the development of these searches, the socio-cultural features of past societies are exposed, while other contents of procedural nature are approached by the development of different types of activities, although the presence of attitudinal content is very anecdotal and in no case is considered explicitly.

Another category within games of a historical nature consists of those jointly taking in a wide range of social aspects, including geographical, historical, economic, political and urban references, providing an integral vision of societies, constituting what is probably one of the most successfully achieved historical simulators, thanks to the technological and virtual possibilities provided by the IT resources. Of these we may cite *The Settlers* (Blue Byte), *Caesar* (Sierra) or the different versions of *Total War* (Sega), which develop different proposals centred on the Roman civilisation, the European medieval period and the Far East.

A step further within these games, which makes them still more interesting from our perspective, was found in those cases where a process of historical evolution of the different cultures or civilisations is established, usually coming about through the attainment of a series of conditioners and variables.

Within this type we can cite *Age of empires* (Microsoft), *Civilization* (Infogrames) or *Empire Earth* (Sierra), as the most notable examples, perhaps for the great diversity of variables that interact in them and whose didactic interest has already been the object

of several studies (Cuenca, 2008; Gómez, 2006; Squire, 2004). The historical evolution depicted in these games (in terms of the relation between changes, permanence and multi-causality) sets out from the man/man and man/environment relationship, with respect to intercultural forms of contact and the use of natural resources, as a departure point for the development of any society and basic element of conflict between the different civilisations represented in the game. In this way, the evolutionary process may set out from the Stone Age before moving on to more advanced historical periods, the present time or even the future, each of them with its own identifying features, depending on the specific culture and historical period in question, where cybernauts compete in multiplayer games for a determined space, the control of resources and economic or military supremacy in a territory where diverse civilisations coexist.

In these games, we can emphasise the involvement of basic socio-cultural contents such as social and technological evolution, diversity of civilisations in terms of the different cultural features (through the representation of a multiplicity of patrimonial elements), changes and permanence or commercial and political relations. However, we found some basic problems in their design, fundamentally referring to different anachronistic aspects, some factors of a magical or fictitious nature that can determine the result of the game, a tendency towards the outcome of the game through warlike conflict or the secondary or practically nonexistent role of women.

3.2. Implications of videogames for educational practice in problem-solving.

With the information obtained through the laboratory analysis, we can consider the use of videogames as a resource to work on social contents on the basis of problem-solving approaches. This first part of the study provided us the contents that can be developed in each of the different types of game classified by categories and what the relevant issues are on which we can work.

From the contents worked on in the videogames, we detected five areas of pertinent social issues from which strategies can be developed for their resolution and decision making by the pupils: war and conflicts, urbanism and territorial management, democracy and citizenship, economy and trade and the environment. These areas are specified into different issues from which the search for information, reframing and resolution of the problems is established, selecting to this end those videogames that we considered most suitable for this purpose (Table 4).

3.2.1.   War and conflicts.

With respect to this kind of social issue, we found a large number of examples with different features. *Age of Empires* or *Empire Earth* propose an evolution from remote historical times (prehistory or ancient era) to others more recent, the present or the future, depending on the game version of each of these sagas. From the outset, the player faces problems that must be solved by means of constant decision making.

Many other games also have similar characteristics, although without the temporal evolutionary component which perhaps makes the former more interesting. As examples, we may cite *Imperivm* or *Total War*, focused on ancient times and the middle ages. It is evident that most of these games are not adapted to the learning of historical information (although some may provide a lot of contextualising information), but we must take into account, as stated previously, that one of the premises of problem solving is that the most important thing is not the result, but the process that was followed to deal with the issues and resolve them by means of suitable and systematic decision making. This way, these games provide new solutions to historical problems and conflicts, in line with the interpretation and the hypotheses that have been developed by the players and which may be considered in class sessions leading up to the educational use of the game. Thus, with variables and resources similar to the historical ones, problems from the past can be resolved with new solutions different from those taken. We are moving away from historical rigour, but giving a new, current sense to history teaching, encouraging interaction of the pupils with History and facilitating their understanding of historical facts (Hernàndez, 2010).

3.2.2.   Urbanism and territorial management.

Another of the great problems of the present time is the coexistence of human beings in their physical context. Many different games deal with this theme, raising the notion of the sense of the city and its evolution in a delimited territory, interrelating large amounts of variables that must be controlled by the player, who plays the role of governor. Also, as in the previous case, we find examples of this type of games in different historical periods, such as *Caesar*, centred on the construction of a classic Roman city. Perhaps one of the most interesting in this line is *Simcity*, which has become a series approaching different current issues related with running a city, from

transport and communications to tourism and vacations, as well as health, security, education, traffic, the environment, architecture, taxation, or the response to natural disasters.

3.2.3. Democracy and citizenship.

The problems most closely related with immigration, tolerance, sectarianism, coexistence, democracy,… are developed very little, in general, in the different videogames that we can find. In the aforementioned Simcity or The Sims, a large number of issues are approached. These are questions that appear as relevant contents in the educational curricula of primary and secondary education.

3.2.4. Economy and trade.

Examples of games in which this kind of problems can be worked on could be *Wall Street Trader* or *Ruthless.com*, set in the stock-exchange processes or macroeconomics. We can also find other examples in which, although trade is not the central axis, it does constitute an important part of the game. This is the case in *Patrician* or *Port Royal*, set in different spaces and historical periods, with the development of the games being governed by the buying and selling of products.

3.2.5. Environment.

On the other hand, the videogames in which environmental issues are approached are few and far between. It is more common that in some other types of game, related problems may come up as secondary concerns, as can happen in some mentioned above (Simcity, Age of Empires or The Settlers, for example), in which the evolution and improvement of the human ways of life cause, evidently, serious damage to the environment in which they take place, although this issue is not configured as the centre of interest of the game.

4. Discussion

Considering all the aspects analysed in terms of the educational use of videogames, we put forward a didactic proposal based on the problem-solving strategy arranged in the four phases initially presented. The first phase would consist of selection of the issue to be worked on and the videogame to be used as a resource to approach each subject area. In table 4, we indicate a proposal of basic areas of problems with the

videogames that we consider most suitable to work on each of them, according to the information obtained from the preceding analysis. Following the selection and presentation to the pupils of the subject in question, and establishment of the working hypothesis on the other hand, the second phase would begin, where it would be necessary to provide the data and information needed to contextualise the problem under study. This activity can be carried out directly by the teaching staff or through information-seeking tasks performed by the pupils under the guidance of the trainers.

The third phase is the most complex, consisting of the application of the videogame to gather and check the information put into play within the education process. In the light of the experiments that we carried out, it is recommendable to develop the game in groups of two or three students, in such a way that they use the game as a laboratory in which, during a session, they can experience the social concepts, procedures and attitudes determined by the problem and the game chosen.

The final phase of the process consists of the pupils questioning the different issues associated with the problems selected and which they have experienced in the course of the game (Table 4). The activities may take the shape of debates or reports that compare their original ideas with the perceptions acquired after taking part in the experiment.

It is interesting that social content has become one of the areas most demanded in computer games, especially those with settings of an historical nature. The acceptance of these games is worthy of attention, given the customary rejection that the contents related with this subject cause in students during their required educational curriculum. This contradiction may be mainly due to the increased motivation inspired by the simple use of a computer in students and to the concretion of aspects which, without the support of IT technology, are tremendously abstract, providing dynamism and capacity for interaction with socio-historical facts in the simulation processes that would be impossible to achieve any other way (Champion, 2006).

Through the study that we have presented, we consider that videogames can be interesting to specifically approach and work with knowledge of an historical-social nature in education and enable us to approach cultural and social references in a contextualised, attractive and dynamic way. In this way, students can approach knowledge of social and cultural aspects of civilisations that otherwise would be difficult [for them to grasp] if they were simply told about it (Santacana, 1999), this

learning taking place from non-formal educational areas, providing a much more motivating knowledge than can be acquired in the classroom.

We must take into account that, although there are increasing numbers of educational videogames where contents of a social nature are developed, they enjoy a very small market share in comparison with games designed with only entertainment and commercial aims. Educational games focus on the learning process of specific contents through motivating proposals more or less achieved. However, this software cannot compete in any way with the videogames that we have designated entertainment-commercial in the aspects concerning their design, attractiveness, graphic recreations, sound effects, marketing methods/media, capacity for communication with other players, and, mainly, their potential level of interaction with the story, basically because of the budget required for their development. This is compounded by the fact that some of these games include socio-historical and geographic information, seeking a certain rigour in the contextualisation during the development of the game so that a minimum scientific-cultural base is provided, more or less correct depending on cases.

We have already made reference to the large amount of contents that could be implemented, from concepts related with time, chronology, history, space, commerce…, as well as with procedures of temporal and spatial orientation, the interpretation of data and graphs, or the attitudes that connect with the values related with Social Sciences: empathy, respect, resolution of conflicts, as well as those related with heritage and identity, which are generally much closer to Western culture (table 2). In this sense, the work by Esnaola (2006), including the results of a study on the social and personal identity transmitted by videogames, is interesting. This study shows how videogames help to construct the personal and collective identity of individuals, through the characters with whom they interact and the actions that these take. Through videogames, types of attitudes and actions in the face of certain problems and challenges are projected and configured that define the characteristics of the players and the identity that they adopt for themselves and their attitudes towards others.

It is evident that great care must be taken in educational work with these resources in view of the large number of games whose contents are clearly unsuitable for school ages, both for the negative aspects that may be transmitted (violence, sectarianism, xenophobia, discrimination...) and the lack of rigour in the information provided in

some cases. For this reason, the selection process of the game to be applied is fundamental for its didactic use in formal education, as well as the reflection and analysis on which contents and problems are to be worked on in the classroom and how the different sessions are to be carried out, aspects upon which we have already reflected in a previous work (Cuenca, 2001).

The use of these games in the classroom is not devoid of obstacles. On the one hand, the difficulty of working in large or medium-sized groups with this resource can foment individualism in the learning process, undervaluing the importance of collective work as an approach to knowledge. To this must be added the assumption of rules imposed and immutable under any concept, which entails alienation with respect to unjustified norms in most cases. On the other hand, it involves having a series of IT resources that make its application possible, as well as having students interested in taking part in a didactic proposal that can easily motivate them to work with Social Science-related contents. In this sense, these games can be articulated as motivators in the first steps in the education-learning process, or as resources for the significant extraction of socio-cultural information during their development on the basis of the problems initially proposed.

Finally, they could be used as synthesisers of the learning that comes about through the practical application, virtually simulated, of socially relevant processes developed in a past or present culture.

This way, the work to be carried out by the teaching staff is much more complex, since protagonism in the education process is lost in favour of the students and resources, an aspect that may give rise to student behaviour issues. In this sense, the preparation of the sessions is less specific, since many more unexpected variables may appear, and it is necessary to know the games perfectly and relate them to the contents of the educational proposal that is being developed at that specific time and in subsequent periods. It is important to be aware that the pupils have a much closer experience of videogames than the teaching staff. Prensky (2009) designates this aspect with the terms "digital natives" and "digital immigrants". Likewise, it is important not to lose the didactic sense of the sessions, so that the fun component of the games serves as a motivator and dynamiser of learning, but not as the objective of the working sessions.

We cannot forget the possibility of interacting with other players, developing a process of virtual socialisation, through the use of Internet. This fact allows the

accomplishment of highly motivating activities for the students outside of the school schedule, whose educational sense can be retaken and synthesised later in the classroom, by means of debates and analysis of the contents worked on in the games by different groups of students in multiplayer sessions.

Videogame type	Videogame designation
Economic	*Ruthless.com. This isn´t business. This is war* (Red Storm) *Wall Street Trader 2001* (Montecristo)
Social	*Free Realms* (http://www.freerealms.com/) *Second life* (http://secondlife.com/) *Spore* (Electronic Arts) *The Sims* (Electronic Arts)
Geographical	*Carmen Sandiego* (Electronics Arts Software) *La aventura de los continentes* (IPS) *Simcity* (EA Games)
Artistic	*Louvre* (Friendware) *Misión Van Gogh* (Friendware) *Van Gogh & Kids* (Oberon Medialab) *Versalles* (Reunion des Musées Nationaux/Cryo/Le Chateau de Versailles)
Historical	*12 O'clock High* (Talon Soft) *Age of empires* (Microsoft) *Ankh* (Bhv) *Caesar* (Sierra) *Civilization* (Infogrames) *Combat Flight Simulator* (Microsoft) *Egypt. The Heliopolis Prophecy* (Cryo) *Empire Earth* (Sierra) *Gothic* (JoWood Productions) *Imperivm* (Haemimont Games) *Odyssey: The Search for Ulysses* (Cryo) *Panzer General* (Strategic Simulation) *Paris 1313. Le disparu de Notre-Dame* (Réunion des Musées Nationaux) *Aztec. The sacred amulet* (Cryo) *Patrician* (Ascaron Entertainment) *Port Royale* (Ascaron Entertainment) Prince of Persia (Ubisoft) *Rome. Caesar's will* (Montparnasse Multimedia) *The Day After* (Planeta DeAdostini) *The Settlers* (Blue Byte) *Total War* (Electronic Arts) *TZAR* (Haemimont Games)

Table 1. Sample of videogames analysed according to their typology.

Category	Variable	Indicators	
Economic	Conceptual	Information and data on the economic and commercial processes	Commerce/market;
	Procedural	Development of techniques and strategies for the interpretation of economic and commercial processes	Manual skills, Men
	Attitudinal	Values and attitudes related with trade and the economy	Respect; Conflict re
Social	Conceptual	Information and data on social relations	Society; Culture; C
	Procedural	Development of social techniques and skills	Creativity; Manual Intercommunication
	Attitudinal	Values and attitudes related with social relations and phenomena	Respect; Conflict re
Geographical	Conceptual	Information and data on spatial, city-planning and geographical phenomena	Space; Economic re Infrastructures; Soc diversity; Political
	Procedural	Development of techniques and strategies related with the interpretation of spatial, city-planning and geographical phenomena	Observation; Manu Graphic interpretati
	Attitudinal	Values and attitudes related with spatial, city-planning, geographical and environmental phenomena	Conflict resolution;
Artistic	Conceptual	Information, data and dates related with art, heritage and associated socio-historical processes	Art; Patrimony; Ti
	Procedural	Development of techniques and strategies related with the interpretation of artistic and patrimonial phenomena	Creativity; Observa analysis
	Attitudinal	Values and attitudes related with respect for art and heritage	Historical empathy
Historical	Conceptual	Information, data and dates related with socio-historical processes	Time; Chronology, Space; Patrimony; Human/environmen diversity; Political
	Procedural	Development of techniques and strategies related with the interpretation of socio-historical processes and phenomena	Observation; Spati Communication
	Attitudinal	Values and attitudes related with socio-historical processes and phenomena	Resolution of confl environment/histori

Table 2. System of categories for analysis and contents worked on in each type of game.

ANALYSIS OF VIDEOGAMES FOR TEACHING OF SOCIAL SCIENCES				
Videogame designation:		**Manufacturing company:**		**Year of issue:**
Game Type		**Content**		
Economic	C			
	P			
	A			
Social	C			
	P			
	A			
Geographical	C			
	P			
	A			
Artistic	C			
	P			
	A			
Historical	C			
	P			
	A			
Technical description				
General remarks for application to problem solving				
Date of analysis:		**Head Researcher:**		

Table 3. Data collection grid for laboratory analysis of videogames (C: conceptual content; P: procedural content; A: attitudinal content)

Social Issues (Problems)	Questions	Appropriate Video games
War and conflicts	Which part of the world to explore, how and what with? Which resources to exploit? To take a defensive or offensive position towards the rest of the civilisations with which they coexist? To evolve towards more developed societies? Which industry or war machinery to develop to face other civilisations or to evolve? Which strategy is the most appropriate? Where to position the basic infrastructures of civilisation in order to be more competitive? Which civilisations to seek an alliance with? Why did things happen? What is the origin of the conflict? What are the consequences? Could it have been avoided?	Age of Empires Empire Earth
Urbanism and territorial management	What are the characteristics of a city? What are its needs? Which infrastructures are required? How are the resources managed? What are the limits of growth? What role do the citizens play? How to act in the event of emergencies?	Caesar Simcity
Democracy and citizenship	Who are we? With whom and how do we coexist? What makes up a city and what needs and infrastructures are required? How can we preserve the environment? What are human rights and why do they exist? How do the organs of political representation work? How is the population structured?	Simcity The Sims
Economy and trade	What are the criteria whereby the market is regulated? What do profit and loss depend on? How can great economic benefits be achieved? What relations are established between supply/demand or investment/profit? How far is it licit/ethical to go to achieve wealth? In which markets can I buy a product cheaply and sell it at a profit? Which products can I trade to make most profit, where can I sell them? What resources do I need to set up a trading business? How does piracy or contraband affect the market?	Wall Street Trader Port Royal
Environment	Which waste products are produced by humans in each of the different historical periods? When how and why is the landscape most transformed? What kind of economy can be developed in a given landscape so that it is sustainable? What does quality of life depend upon? How can I achieve a harmonious and balanced environment?	Age of Empires Simcity The Settlers

Table 4. Questions for the teaching of Social Sciences using problem-solving strategies

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