

# Collaborative Learning by Means of Video Games. An Entertainment System in the Learning Processes

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## Abstract

*New Technologies have been incorporated to schools as learning tools some time ago. In this paper we remark some advantages of video games as educational systems and how we can use them as a tool of CSCL (Computer-Supported Collaborative Learning) into classrooms. Moreover, we consider that learning process is important enough to be measured in addition to the solution. So, we are interested in this scope and we present a first step towards our method of collaboration analysis in VGSCCL (Video Game - Supported Collaborative Learning): a messages categorization.*

## 1. Introduction

We could assume that playing is one of the most enjoyable activities for children. According to Vygotsky [1], games promote the general development of children because it allows them to try out social rules and attitudes, their capabilities and limitations.

Nowadays, due to the New Technologies advance, video games have become the new way of playing. Although there have been some detractors, there are several researches that claim for the advantages of video games into educational environments [2], [3]. These studies have shown that video games can be exceptional educational tools and they add several advantages to the learning process: improve scholar success and cognitive skills, enhance motivation because learning process is easier and also improve children's attention and motivation.

Once we accept that video games can be used as educational tools, we want to introduce them into CSCL processes. Humans can interact in several aspects of their daily life and in particular, in their learning process. This interactivity allows us to obtain new viewpoints and attitudes different from ours, fostering respect and tolerance attitudes. In the educational field, this interaction avoid that students

simplify complex concepts during their learning, thanks enrichment achieved due to the different views obtained about the concept being studied [3]. Then, we can obtain advantages from both activities (playing and collaborating). We have named it as VGSCCL (Video Game - Supported Collaborative Learning).

The rest of the paper is organized as follows: The next section shows the design of our educational video game with collaborative activities "Leoncio and friends". In section three we have a brief section talking about the importance of interaction analysis and our message categorization. Finally, we have some conclusions and future works.

## 2. Designing "Leoncio and friends"

Designing video games is a very difficult job and because of this it is important to use some design guidelines in order to reduce complexity. In previous works we have presented a design guideline [4] structured according to the five essential components for collaborative learning presented by Johnson and Johnson in [5]: positive interdependence, individual accountability, face-to-face promotive interaction, social skills and self-analysis of the group.

Next we list some of our guidelines [4] that have been used in the design of this video game:

- This video game has a common goal
- We have a set of "good characters" with which student identify.
- To overcome a challenge is rewarded with individual elements that must be shared with the rest of the group later.
- Activities in which each group member must solve a part of it.
- We have a group score and life.
- All group members must achieve a minimum level to pass to the next stage.

"Leoncio and friends" is an educational video game with collaborative activities. The educational goal of this video game is to teach the vowels and improve their interaction skills by means of group activities

included into video game; the recreational one is to rescue Leoncio's friends, who have been kidnapped by the evil "Perfecte". It is designed for children between 3 and 4 years old. Educational activities are hidden into a sequence of funny activities according to a small and easy story. In this way we want to improve students' attention due to the game objectives.

In our video game, Leoncio is the main character which pupils identify with. Leoncio has to travel from an island to other to rescue their friends. The name of each of them starts with a different vowel. So, the activities connected to each friend's rescue will be related to this vowel.

Our world is composed of 5 islands, which are the game stages. At the beginning of the game a vowel is assigned to each of 5 players. This assigned vowel will be learnt by the player in this match.

Firstly, we are going to see the game's organization related to the educational contents' organization as it is done in our game. We start with *world* concept, where challenges are developed. In our world we teach a didactic unit. So, each *stage* in the world corresponds to a conceptual content and it is composed by one or more *levels*. In each level we capture the procedural contents to teach the corresponding concept. Several *challenges* are proposed in each level, corresponding to activities in the traditional learning process. So, if the didactic unit was "Learning vowels", conceptual concepts would be each of the vowels; procedural concepts would be, for example, graphics, phonetics, and so on; and exercises would be done related to each concept and procedure.

In order to maintain group awareness the video game shows the situation and achievements of the group to each member. To do this, each tool is filled up with color gradually, according to the degree of achievement of each partner. Background color is according to T-shirt's color of each Leoncio (see figure 1, upper screen). It is possible to win extra rewards when we are carrying out the different challenges.

At the end of each stage of the game, commonly, the group must win a "Perfecte's" friend. To do it, each member of the group must prove what he/she has learnt along the levels. By doing this, we expect to evaluate the individual learning process: each player must write his/her vowel taking into account the randomly proposed sequence (see Figure 2, left). Moreover, the members of the group must "validate" their tools in order to contribute to the common work. The goal of common challenges is to introduce students to the development of group interactions. In this way they must agree on some method to achieve a goal. In our game, the members of the group must build together a means of transportation to travel to the next island. To do this they have to decide in which order the tools

must be used. Then they must use his/her own tool when corresponding. When this common challenge is overcome, the stage is overcome too. Then, the group travel to the next island (see Figure 2, right).

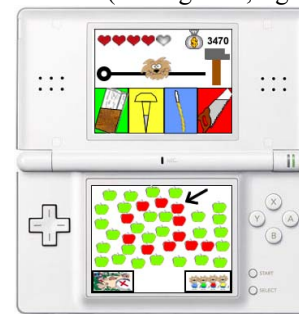


Figure 1: Writing 'a' vowel. Group feedback in upper screen

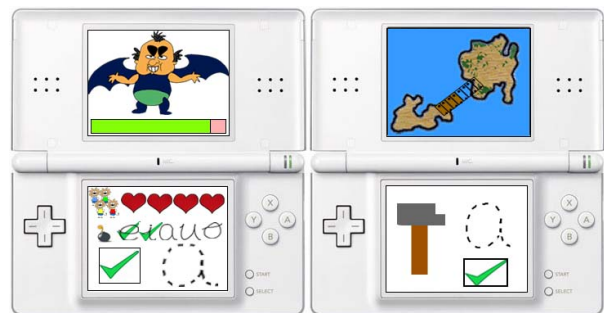


Figure 2: Ending phase challenges. Building the bridge

When a group wins a final challenge in a stage, players have passed educational objectives too, since they are hidden into the challenges: A challenge is overcome when the player proves he/she has learnt the concept linked to it. If a player has not taken part enough or he/she needs some kind of reinforcement, the stage is not passed. In this situation, we can add new difficulties in the phase's final challenge. For example, if we are using a hammer and his/her user has not achieved the minimum educational goals we can make hammer crashes. So, they must get a new hammer to overcome the final stage. This action can be applied as times as necessary in order to guarantee that the entire group has achieved the goals successfully.

Game finishes when the group completes the last stage and defeats evil "Perfecte". So, the collaboration will be carried out in the video game's activities, encouraging pupils' participation, motivation and attention in appealing and didactic activities.

#### 4. Analyzing collaboration

Analyzing collaboration is a wide field of investigation inside CSCL researches. This is because to sit down several people around a table to do a job do not guarantee that they work collaboratively [6].

So, we are interested in the collaboration analysis in order to act during the learning process to improve it.

Group Interaction Analysis has been studied with interest from twenty years ago [7]. Nowadays, we are working in a process of collaboration assessment into video games, in order to adapt the process according to the students' achievements. Although this method is in an early phase, we need a quantitative strategy to assess collaboration during the game.

To carry out this analysis, we are going to observe the messages sent by partners during the learning / collaboration process. We consider messages not only those written via e-mail or chat or any other media, but all intentions hidden into actions during the game. For example, check the individual life when a partner has used up hers.

Next we show our message categorization. The first level is well known into CSCW (Computer-Supported Collaborative Work) field:

- *Communication*: These messages are used by group members to interchange general information, related to the learning / playing process. With these messages we can evaluate active participation of group members.
  - Question / Answer
  - Sharing information: Error detection.
  - Checking
  - Social context
- *Collaboration*: They are messages occurred in a situation that requires collaboration. In these messages collaboration is proposed or supported.
  - Proposal: Posing the proposal, negotiation and counteroffer.
  - Help: Asking for, negotiation and solution.
  - Resources: Asking for, owner / user identification, negotiation and solution.
- *Coordination*: The group uses these kinds of messages to decide strategies and methods that will be used during the collaborative learning process.
  - Making decisions: Identification, negotiation, voting and agreement.
  - Group identification
  - Planning tasks: Identifying tasks, negotiation and distribution of tasks.

## 5. Conclusions and further works

In this paper we have shown several items encouraging the use of video games as educational tools in classrooms and we have presented our educational video game with collaborative activities "Leoncio and friends".

Our intention is to assess the interaction occurred during the learning / playing collaborative process. So, we have presented a message categorization as part of a method of collaborative process evaluation in VGSCCL. The first step to achieve our goal is to study how these messages can be found into video games and which actions we have to take into account during the learning / playing process.

## Acknowledgements

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## 10. References

- [1] Vygotsky, L. El desarrollo de los procesos psicológicos superiores, Crítica, Barcelona, 1979.
- [2] Nussbaum, M., Rosas, R., Rodríguez, P., Sun, Y. and Valdivia, V. "Diseño, desarrollo y evaluación de video juegos portátiles educativos y autorregulados". Ciencia al Día. 3, vol. 2, 1999, pp. 1-20.
- [3] McFarlane, A., Sparrowhawk, A. and Heald, Y. "Report on the educational use of games: An exploration by TEEM of the contribution which games can make to the education process", [http://www.teem.org.uk/publications/teem\\_games\\_in\\_education\\_full.pdf](http://www.teem.org.uk/publications/teem_games_in_education_full.pdf), 2002.
- [4] Padilla Zea, N., González Sánchez, J. L., Gutiérrez, F. L., Cabrera, M. J. and Paderewski, P. "Design of Educational Multiplayer Videogames. A Vision from Collaborative Learning". Special Issue of Advances in Engineering Software. DOI: 10.1016 (forthcoming).
- [5] Johnson, D. W. and Johnson, R. T. "Learning Together". Handbook of Cooperative Learning Methods Sharan S. (Ed.). Greenwood Press, Connecticut, 1994.
- [6] Collazos, C. A., Ochoa, S. F. and Mendoza, J. La evaluación colaborativa como mecanismo de mejora de los procesos de evaluación del aprendizaje en un aula de clase. Revista Ingeniería e Investigación N° 27 (2), 2007, pp. 72-76.
- [7] Harrer, A., Martínez Monés, A. and Dimitracopoulou, A. "Users' data: Collaborative and social analysis", Technology-enhanced learning. principles and products, N. Balacheff, S. Ludvigsen, T. de Jong, A. Lazonder, S. Barnes and L. Montandon (Eds.), Springer (forthcoming).