

Identification of Educational Elements in Entertainment Historical-Based Videogames

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Summary

Videogames allow complex designs full of content. Additionally, they are engaging and popular among a wide audience (Anderson, et al., 2010, p. 255). Due those qualities, designers, academics, and researchers envisioned new applications for videogames. In this context, “the use of videogames as educational tools is slowly becoming an accepted practice in learning environments” (Van Eck, 2006, cited Echeverría, et al., 2011, p. 1127). Moreover, many researchers are exploring ways do design and develop games for educational purposes. Meanwhile, other scholar are investigating how to use existing games as learning tools.

This thesis aims to support the work done in this field. In the first chapter of this dissertation, we proposed a framework, based on Alevén et al. (2010) work, to identify and analyse educational features contained in historical commercial videogames. The framework uses Schell’s (2015) game analysis framework to analyse the game three of the four basic components (aesthetics, story, and mechanics); Bloom’s taxonomy of educational objectives and Gee’s learning principles to identify the educational. In the following next two chapters, we analysed two historical videogames based on World War One. The first game is *Verdun 1914-1918*; the second one is *Valiant Hearts: The Great War*. Finally, we discussed the relevant discoveries, their possible usages, the limitations, and future work.

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Introduction

Videogames are one of the most interesting human creation. They are elegant and complex crafts that combines artistic and functional features in order to produce engaging experiences to the player (Adams, 2014, p. 33). Since their creation, the level of complexity of videogames have increased drastically. New technologies allow the inclusion of newer mechanics and gameplays, more elaborated narratives, more realistic graphics, and the creation of massive virtual worlds. The evolution of videogame will not stop soon, and stories, mechanics and aesthetics will become even more complex.

Videogames allow complex designs full of content. Additionally, they are engaging and popular among a wide audience (Anderson, et al., 2010, p. 255). Due to their content and popularity, recently, designers, academics and researchers envisioned new applications for videogames. For instance, the term Serious Games (videogames with one or more purposes besides entertain) became popular in 2002 (Dörner, et al., 2016, pp. 3-26). As a result, the number of investigations in this topic is increasing, and, even though, there are many areas that have not been explored.

In this context, “the use of videogames as educational tools is slowly becoming an accepted practice in learning environments” (Van Eck, 2006, cited Echeverría, et al., 2011, p. 1127). Moreover, many researchers are exploring ways do design and develop games for educational purposes. Meanwhile, other scholar are investigating how to use existing videogames as learning tools. Despite the aforementioned approaches, researchers believe that the key feature of videogames as learning tools resides in their capability of teaching (very complex content) and at the same time they entertain and engage. As Gee (2003, p. 7) stated, “learning is or should be both frustrating and life enhancing. The key is finding way to make hard things life enhancing so that people keep going and don’t fall back on learning and thinking only what is simple and easy”.

Concerning to learning and entertainment (commercial) videogames, academics and educators are analysing videogames in order to find educational value. Furthermore, they are testing ways to use videogames in learning environments. For example, Gee (2003), created a list of learning principles that good videogames have. Sar (2012) investigated students' perception about historical commercial videogames during history classes. Maguth et al. (2015) highlighted the benefits of using *Age of Empires II: The Age of Kings* in social studies courses. Hergenrader (2016) designed a methodology to introduce other professors to videogames and how to use them during college classes.

Even though many researches in the topic have been explored, more investigation is needed. Many professors tried to use video games in their classes. Some of them had good experience, but many others failed in their attempt. The reason of those failures could be attributed to the lack of experiences of professor and the videogames, and the lack of knowledge of how to relate videogames in their classes (Hergenrader, 2016, p. 35). "Simply adding a game to an existing course will not automatically enhance the learning experience for students" (Hergenrader, 2016, p. 34).

This thesis aims to support the work done in this field. In the first chapter of this dissertation, we proposed a framework, based on Alevan et al. (2010) work, to identify and analyse educational features contained in historical commercial videogames. The framework uses Schell's (2015) game analysis framework to analyse the game basic component (aesthetics, story, and mechanics); Bloom's taxonomy of educational objectives and Gee's learning principles to identify the educational. In the following two chapter, we analysed two historical videogames based on World War One. The first game analysed is *Verdun 1914-1918*, and the second one is *Valiant Hearts: The Great War*. Finally, we discussed the relevant discoveries, their possible usages, the limitations, and future work.

Analysis Frameworks and Methodology

Videogame analysis requires a framework to identify and analyse the important design choices made by the designers during the creation of a videogame (Alven, et al., 2010, p. 69). In this work, we focused our analysis in two areas: the videogame components and the learning elements. To identify the videogame components, we used Jesse Schell's framework that states that the main components of a videogame are the aesthetics, story, mechanics, and technological.

For the educational section, we included tools that allow the identification of educational objectives and learning principles. We used Bloom's taxonomy to identify educational objectives. The identification of learning objectives "ensure that the game meets an intended and coherent set of educational goals" (Alven, et al., 2010, p. 70). Additionally, the taxonomy allows to map the current learning of students through quantitative and qualitative research (Sandham, 2015, p. 753). In addition to Bloom's taxonomy, we utilized Gee's learning principles. "The principles provide a way to think and talk about how a game supports learning, whether it does so in ways consistent with learning science findings and recommendations." (Alven, et al., 2010, p. 73)

The first three sections of this chapter describe each component of the framework. The fourth section explain how the methodology used for the analysis.

Schell's Basic Videogames Components

Every videogame has of a set of elements that brings them to life. For Schell (2015, pp. 51-52), the basic components of a video game are mechanics, story, aesthetics, and technology. Those elements are the core of the game, and it is not possible to create a video game without those components. All these elements have the same importance, none of them are more important the other (Schell, 2015, pp. 51-52). Below is a description of each component.

Mechanics

“Game mechanics are the core of what a game truly is” (Schell, 2015, p. 158). They define what a player can and cannot do to achieve the goal of the game. In other words, mechanics are rules that define all the interaction that the player has with the video game, and the consequences of those interactions (Schell, 2015, pp. 51-52).

Story

The story tells the events that happens during the game. According to Schell (Schell, 2015, pp. 51-52), there are two types of stories. The first one is linear and pre-scripted. In this type of story the player cannot change the results of the story. The second is branching and emergent. This kind of stories are highly interactive, and the decisions that the player take during the game, will be reflected at the next stages of the story.

Aesthetics

Aesthetics are all the perceptible assets of the game (graphics, colours, music, sound). Aesthetics are “an incredibly important aspect of game design since they have the most direct relationship to a player’s experience” (Schell, 2015, pp. 51-52). The combination of the aesthetic elements creates the tone, look, and feel of the game. This means that the aesthetics create the atmosphere where the player is going to be immersed. It has a direct influence over the feelings and emotions of the player.

Technology

The technological aspect refers to the medium that the game will use to deliver the mechanic, story, and aesthetics (Schell, 2015, pp. 51-52). Additionally, the technology used to create the game dictates what can and cannot be developed. For instance, designers could choose among different platforms

(such as consoles, computers, or mobiles) as the medium for their games. Each platform has its own characteristic. For example, computer games use the mouse as input. On the other hand, phones and tablet games use the screens of the devices as input. Computer mice permit the design of games that requires precision (like strategy games), but mobile devices inputs do not permit this type precision. As a result, videogame designer should be careful and pay attention to interactions that the selected medium allows.

Bloom's Taxonomy

Bloom's taxonomy is a hierarchical classification system of educational objectives. It categorizes the skills expected by students after completing an educational process. Due the practicality of the taxonomy, it is still used during the process of curriculum development and educational hypotheses.

Bloom's taxonomy aims to facilitate the communication and understanding between educators and evaluators (Bloom, et al., 1956, p. 1). Additionally, the taxonomy looks to help educators to specify objectives in an easier way when they plan curriculums, evaluations, courses, classes, or any other learning experience (Boslaugh, 2013). For Bloom, the taxonomy should be “used to formulate hypotheses about learning process and changes in students”, or to “provide a basis for suggestions as to methods for developing curricula, instructional techniques, and testing techniques” (Bloom, et al., 1956, p. 21)

The taxonomy does not classify the different approaches to learning or methodologies. There are many ways of teaching and learning, and it would be an enormous task to classify them. Instead of doing that, the taxonomy tries to classify the type of cognitive skill that students should have at the end of an educational experience. In Bloom's word, “what we are classifying is the intended

behaviour of students – the ways in which individuals are to act, think, or feel as the result of participation in some unit of instruction” (Bloom, et al., 1956, p. 12).

Bloom’s taxonomy is arranged in a hierarchical order where the higher levels requires the skills acquired from lower levels. The taxonomy contains the following six classes (starting from the lower levels to the higher levels): knowledge, comprehension, application, analysis, synthesis, and evaluations.

Knowledge

The first level of the taxonomy is Knowledge. This objective is associated with the student’s ability of remembering ideas, material, or phenomena. According to Bloom, “the student is expected to store in his mind certain information, and the behaviour expected later is the remembering of this information” (Bloom, et al., 1956, p. 62). This category is subdivided in three categories: Knowledge of Specifics, Knowledge of Ways and Means of Dealing with Specifics, and Knowledge of the Universals and Abstractions.

Knowledge of Specifics. This category deals with the learning of all those concepts that are concrete and can be isolated. Usually, these concepts are used for basic communication in a specific field (Bloom, et al., 1956, pp. 63-65). The knowledge learned in this category could be classified in:

1. *Knowledge of terminology:* it is basic language of a specific topic. Most of times, terminology are conventions and agreements created by professional and researchers in field. It can be verbal or nonverbal symbols (Ibid.).
2. *Knowledge of specific facts:* includes dates, names of persons, places, events, etc. This type knowledge differs from terminology in that all data here is obtained from facts and are verifiable (Ibid).

Knowledge of Ways and Means of Dealing with Specifics. This type of knowledge deals with the way of organization, studying, judging, and criticizing ideas and phenomena. This category is about how the processes and operations are defined, but not about the results that a student or researcher will obtain if they apply them (Bloom, et al., 1956, p. 68). It deals theoretically with these processes. Bloom divided this category in 5 smaller units depending of the type of information the student would learn (Bloom, et al., 1956, pp. 69-73).

1. *Knowledge of Conventions:* ways of dealing and showing ideas, and phenomena (Ibid.).
2. *Knowledge of Trends and Sequences:* “directions, and movements of phenomena with respect to time” (Ibid).
3. *Knowledge of Classifications and Categories:* knowledge of the fundamental classifications and categories existing in a specific field of knowledge (Ibid.).
4. *Knowledge of Criteria:* knowledge of the way that an idea, category, fact, etc., can be tested, measured, or judged (Ibid.).
5. *Knowledge of Methodology:* methods and techniques used in a specific field to gather information or to investigate problems (Ibid.).

Knowledge of the Universals and Abstractions. “Knowledge of the major ideas, schemes, and patterns by which phenomena and ideas are organized. These are the large structures, theories, and generalizations which dominate a subject field or which are quite generally used in studying phenomena or solving problems” (Bloom, et al., 1956, p. 75). This category is divided in:

1. *Knowledge of Principles and Generalizations:* deals with abstractions “which summarize observations of phenomena” (Ibid.).
2. *Knowledge of Theories and Structures:* it comprehends generalizations of ideas to create an explanation of the nature of a phenomenon in a field. This type of knowledge tries to give a whole explanation of the phenomenon (Ibid.).

Comprehension

According to Bloom, Comprehension are “objectives, behaviours, or responses which represent an understanding of the literal message contained in a communication” (Bloom, et al., 1956, p. 89).

Bloom recognized three different types of comprehension: Translation, Interpretation, and Extrapolation.

Translation. It occurs when the student can communicate in their own terms concepts that he or she learned before (Bloom, et al., 1956, p. 89).

Interpretation. This type of comprehension requires that the student understand, rearrange, and reconfigure the information provided in his or her learning experience (Bloom, et al., 1956, p. 90). It is possible to know if a student could interpret a concept paying attention to his or her inferences, summarizations, or generalizations (Ibid.).

Extrapolation. It includes the making of inferences, estimates, or predictions based on understanding of the trends, tendencies, corollaries, or conditions described in the communication (Bloom, et al., 1956, p. 90).

Application

Applications is the next level of the hierarchy. It requires the student knows the concepts and comprehend them. The application skill is gained by the student in the moment that he or she can apply the correct concept, methodology, or abstraction in a situation that requires it. Application requires that nobody have specified which type concept, methodology, or abstraction should be applied in that moment. The student must select by him or herself the correct option (Bloom, et al., 1956, p. 120).

Analysis

“Analysis emphasizes the breakdown of the materials into its constituent parts and detection of the relationships of the parts and of the ways they are organized” (Bloom, et al., 1956, pp. 144-148). This category has in three levels:

Analysis of Elements. At the first level, the student is expected to distinguish and breakdown the elements that compound a material, concept, or theory (Ibid.).

Analysis of Relationships. At this level, the student should recognize the relationships among the elements. This means that the student should identify how the elements connect to each other and how are their interactions (Ibid.).

Analysis of Organizational Principles. The final level of analysis considerers all the organizational structure presented in the element of study (Ibid.).

Synthesis

Synthesis is the process by which the student or researcher creates new products or concepts using and combining elements from other sources (Bloom, et al., 1956, p. 162). This new product must have a pattern or a structure. According to Bloom (1956, pp. 163-164), there are three categories based on the products compound the synthesis process:

1. As a unique communication. For example, an essay, a story, a speech, etc.
2. As a plan or proposed set of operations. For example, a methodology to proof a hypothesis.
3. As a set of abstract relationships. For example, a new learning theory.

Evaluation

The last and highest category of the taxonomy is Evaluation. This category is “defined as the making of judgements about the value, for some purpose, of ideas, works, solutions, methods, material, etc.” (Bloom, et al., 1956, p. 185), and it could be quantitative or qualitative (Ibid).

Gee’s Learning Principles

Concerning to learning principles and video games, James Gee proposed a list of 36 principles that describes how good video games support good learning. His theory is based in three works. The first one is the *situated cognition* concept. Situated cognition “argues that human learning is not just a matter of what goes on inside people’s heads but is fully embedded in (situated within) a material, social, and cultural world” (Gee, 2003, p. 8).

The second work is the *New Literacy Studies*. Like *situated cognition*, this theory argues that reading and writing is achieved thanks to “social and cultural practices with economics, historical, and political implications” (Gee, 2003, p. 8). This means that reading and writing is not only completed by a mental process. It needs a social and environmental construction.

Finally, the third concept is *connectionism*. This view believes that humans have troubles when they try to learn and think using logic and abstract concepts. Furthermore, the theory emphasize that people learn and think better using patterns. Patterns are picked via their (humans) experiences, and they allow generalization and abstraction (Gee, 2003, p. 8).

Below is the list of the 36 Gee’s learning principles:

- | | | |
|---|---------------------------------------|---|
| 1. Active, Critical Learning Principle | 13. Ongoing Learning Principle | 25. Concentrated Sample Principle |
| 2. Design Principle | 14. “Regimen of Competence” Principle | 26. Bottom-up Basic Skills Principle |
| 3. Semiotic Principle | 15. Probing Principle | 27. Explicit Information On-Demand and Just-in-Time Principle |
| 4. Semiotic Domains Principle | 16. Multiple Routes Principle | 28. Discovery Principle |
| 5. Metalevel Thinking about Semiotic Domain Principle | 17. Situated Meaning Principle | 29. Transfer Principle |
| 6. “Psychosocial Moratorium” Principle | 18. Text Principle | 30. Cultural Models about the World Principle |
| 7. Committed Learning Principle | 19. Intertextual Principle | 31. Cultural Models about Learning Principle |
| 8. Identity Principle | 20. Multimodal Principle | 32. Cultural Models about Semiotic Domains Principle |
| 9. Self-Knowledge Principle | 21. “Material Intelligence” Principle | 33. Distributed Principle |
| 10. Amplification of Input Principle | 22. Intuitive Knowledge Principle | 34. Dispersed Principle |
| 11. Achievement Principle | 23. Subset Principle | 35. Affinity Group Principle |
| 12. Practice Principle | 24. Incremental Principle | 36. Insider Principle |

Analysis Process

To analyse the videogames and extract the component that could be used as leaning tools, we used a similar approach to the proposed by Alevén et al. (2010, pp. 69-76). We made two modifications to their approach. Alevén et al.’s methodology utilized MDA framework (Mechanics, Dynamics, and Aesthetics) to analyse the main components of the game, but we preferred Schell’s framework due to

its practical approach. The second modification is that we only utilized Gee's learning principles instead of the four categories utilized by Alevén et al.

The steps followed for the analysis are:

1. Analysis and identification of the main components of the game using Schell's framework. Due to the goal of this work, the technological is not necessary, and we excluded it.
2. Next, we identified learning principles applied in the game components. Learning principles could allow the usage of the game in learning environments, and ensured that videogames are using modern educational theories. For this purpose, we used Gee's principles.
3. Finally, we identified learning objectives and their classification in taxonomy. To accomplish this step, I will also look for the prior knowledge that the student most have, and the knowledge that the student could obtain playing the analysed videogames (Alven, et al., 2010, p. 70).

Verdun 1914-1918 – Game Analysis

Game Overview

Verdun 1914-1918 is a multiplayer first-person shooter based in the World War One (WW1). The game was developed by M2H and Blackmill Games. The first version (beta) of the game was released via Steam in 2013 (Makuch, 2015). After some improvements on graphics and mechanics, two years later, in April 28th, 2015, the producers published the official version. Later, in August 30th, 2016, the game was released for Play Station 4, and in March 8th, 2017, for Xbox One. According to the Pan-European Game Information (PEGI) (PEGI, 2017), *Verdun 1914-1918* is classified as an adult game. For this work, we analyse the PC version of *Verdun 1914-1918*.

The game took its inspiration and name from the battles occurred in the Western Frontline from 1914-1918. Those battles were remembered because their long trenches, massive loss of human lives, and the long duration of most of those battles. Chemical weapons, rifles, pistols, and heavy machineguns were the main arms used by both sides soldier.

Verdun 1914-1918 recreates those battles, weapons, and locations as realistic as possible. For instance, soldiers die with one shot; playing individually and impulsively increase the player possibilities of dying faster; team work is the ideal strategy (VerdunGame, 2017), and it is always rewarded.

Verdun 1914-1918 has four game modes: Frontlines, Rifle Death Match, Attrition, Squad Defences. The main game mode is Frontlines. Its gameplay tries to recreate the trench warfare. Due the purpose of these work, the only game mode that we analysed is Frontlines. In addition to the game modes, *Verdun* has 12 squads: “7 Entente Power and 5 Central Power squads” (VerdunGame, 2017). Each

squad has four members, and each member has its own role and special ability that complements the abilities of the other members.

Regarding the locations and maps, Verdun recreates nine well-known battle locations of the WW1. Those settings are Argonne, Artois, Aisne, Champagne, Douaumont, Flanders, Picardie, Vauquois, and Vosges (VerdunGame, 2016). All the representations are lugubrious and desolate. Everything seem grim and destroyed by war.

In the following sections, we analyse the story, aesthetics, and mechanics. Using this analysis, using we identified the educational elements that could be used as learning tools.

Story

Verdun 1914-1918 does not have a strong narrative, and it does not have any main character. Although, the game has some elements that helps the player to understand what is his/her main goal and the reasons why he/she needs to achieve that goal. The first element shown that tells the player what is happening is the first 'guide-tutorial' presented at the begging of the game. This tutorial only appears the first time you open the game. During the tutorial, a popup window shown a small narration that with the following sentences:

“Welcome to the front Soldier!

It might not be as comfortable as what you are accustomed to but fear not, we will be home by Christmas.

Listen up while I talk your through some basics.

You will be fighting on the Frontlines of the Western Front. On these trenches filled battlefields you will fight inch for inch to gain control of the enemy trenches.

Should the attack fail the enemy surely will launch a counterattack which will be repelled by any means necessary. Don't let them get any momentum by killing defenders or gain foothold since time spent defending is time wasted not attacking!" (VerdunGame, 2017)

After this message, the narration continued with an explaining of the general goal of the game and its mechanics.

From this small narration, the player does not know anything about the nationality or the side to which the player belongs. But at the end, it does not matter. The player is just a soldier in the middle of a battle, his main purpose is to survive the war, a war of trenches in the Frontlines of the Western Front.

Besides the first guide-tutorial, there are some small animations and illustrations of the settings displayed during the time that the player is interacting with the main menu (first screens displayed before starting the game). The animations show sections of the trenches where character is located. With this information, the player get an idea of where he/she is playing and how this setting looks.

Sound also plays an important part in informing the story to the player. When the player open the game, and enters to the main menu, the background music lyrics and style is related to World War One. This element enhances the player experience.

Finally, during the time that the game is loading, some screen with information and photos about the setting are displayed. This information gives an idea to the player of what occurred during the real battle, and the reason he/she is in that location.

Aesthetics

Verdun 1914-1918 is 3D first person shooter where its primary aesthetic feature is the realism that it depicts. The game designers chose soldiers personality, settings, uniforms, weapons, sounds, and

music in a way that match with how they look during that time. They (the designers) did not enhanced the characters or the settings to make them more appealing or modern. Moreover, the aesthetics seems desolate, austere, and sober. These features allow the player to experience a simulation of the same reality lived by the soldier in the trenches.

Concerning to the soldiers, the game depicts them as regular people from that time. They do not have any outstanding feature that make them different from another soldier. They are just average men. The only features that change among each soldier are some small details. For instances, some of them were glasses. Others have the moustaches, beards, or shaved face. But all the fashion, look and feel of the characters are depicted as soldiers from 1910s.

Verdun 1914-918's designers depicted in a very realistic way a lot of assets of the game. The first one that we analysed are the uniforms. Each squad has their own suit depicted with detail. Colours, measures, and textures imitated in an accurate way the original versions. Uniforms change each time that the squad level up.

The second elements analysed in this section are the weapons. *Verdun* has 54 weapons, including guns, rifles, heavy machineguns, melee weapons, and tools. Their sizes, colours, and textures are realistic.

About the setting, *Verdun* has nine locations based on real battle places. For instance, one of the settings is based on the well-known fortress of Douaumont, located in Verdun, France. Visually, the map recreates the fortress and a set of trenches like the real ones. The place is devastated, trees are burn, corpses are everywhere, and everything is covered with mud. The game tries to show the horrors of the war not only through their mechanics. The settings also enhance the feeling of trench warfare and desolation.

As mentioned above, Verdun settings increases the feeling of a real trench warfare through realism. Most of the maps, as the real location, are open fields filled with trenches (only Douaumont map has a fortress). All the maps (except the map of Picardie) are muddy places. And all the maps are devastated (buildings were destroyed and vegetation burned), except for the “heavily wooded farmlands of the Aisne sector” (VerdunGame, 2016).

Regarding to music, compared to other games of the same genre, *Verdun 1914-1918* is minimalist. The only sections of the game where music is played are at the main menu (first screen) and its sub-sections. The music has an old style and it is related to war. During the game, the designers chose to avoid any type of background music to enhance the player experience. The only moments during the game where small ‘music-themes’ are played are at the beginning of each battle, and when the game switch from attacking mode to defence mode or vice versa. Music-themes during the gameplay are just warning for the player.

Concerning to the sound effects, the game has a big library of them. Most of the sounds effects tries to enhance the battle experience, and all of them are related to battle or to the settings. For instances the most common sounds that the player can hear during the game are screens of battle mottos, high level officer orders, screens of dying soldiers, weapons shots, explosions, and airplanes. Maps that simulated the trenches located in the forest have environmental sounds such as birds and animals.

Mechanics

As mentioned earlier, *Verdun 1914-1918* is a first-person online multiplayer shooter that recreates the dynamics of World War One. The game mechanics try to simulate how a soldier act and feel during a trench battle. In this section, we analysed the actions that a soldier can do, the rules of the main game mode (Frontline), and the emergent dynamics.

Verdun 1914-1918 allow the player to move his/her character around the maps freely. Movements can be done in three different body postures: standing, crouching, and crawling. While the player is standing, the soldier can move around the setting. The player can move the soldier forward, backward, right, and left directions. To move the soldier, the player must use the keyboard. As other shooters, while the player is moving, the front side direction of the soldier's body does not change. This feature allows the player to move freely, and his point of view and his gun will aim to the same direction. The standing position allows the player to cross short and medium distances without any problem. The regular speed of the soldier while moving in the standing posture is like a fast walk. During the period in which the player is moving, the player can shoot his/her gun, but the accuracy of the shoot decreases significantly.

While moving in the standing posture, the game allows the player to run. The player can activate this variant holding a key while the soldier is moving in the standing position. Running allows the player to cross long distances in the battlefield much faster. This feature has two benefits. First, it is easier to get to the attacking or defending area. Second, it is more difficult for enemies to aim the soldier while he is moving. On the other hand, running has one counterproductive feature. While running, the aiming accuracy of the soldier decrease so much that it is almost impossible to hit an enemy.

Another action that the player can perform while his/her soldier is standing is jumping. Jumping allows the player to avoid obstacles such as rocks, trunks, pieces of walls, or lethal obstacles like barbed wired that can kill the soldier if he gets trapped. Additionally, jumping allows the soldiers to climb through the wall of the trenches. While jumping, the accuracy decreases considerably.

Besides the standing position, the game allows two postures more: crouching and crawling position. In the crouching position, the soldier can move in all directions. There are some differences between the standing and crouching. First, while the soldier is crouching, he moves slower than while he is

standing. The second difference is that the soldier becomes a more difficult target to aim. Crouching decrease the targetable area of a soldier. Also, it is a good way to cover behind trenches and obstacles (such as barrels, stones, walls, etc.) that the player can find in the map. Finally, while the player is crouching, the aiming precision increases considerably.

The second position is crawling. While the player is crawling, it is possible to move in the four directions, but it is very easy to get stuck with obstacles in the ground. The movements are even slower than when he is crouched. For this reason, it is not a good way to travel long distances. The player obtains two benefits while crawling. First, it is even more difficult to target a soldier who is crawling. Crawling helps the soldier to camouflage into the terrain. Finally, while crawling, the soldier increments his aiming accuracy.

Another important mechanic is attacking. There are many types of weapons. Most of them are guns, rifles, and heavy machineguns, and those weapons allow the shooting mechanic. But there are other weapons that their activation has different results. For example, the flamethrower, grenades, knives, and bludgeon do not allow shooting. The type of weapon used by the player defines the strategy that he/she should take. For example, if the player is using a rifle, he/she can attack from a very far distance. On the other hand, if he is using a flamethrower, he must be near to enemy to kill him.

During the analysis of the mechanics, we found the aiming mechanic. Probably, aiming is the most important mechanics of the game, and it has several functions. First, aiming is the way that the player perceives the game settings and all the elements that are contained inside it. Second, aiming allows the player to guide the soldier while he is moving forward. Forward movements follow the aiming direction. Third, aiming is the only way that the player can use to find enemies. Fourth, aiming serves to position the weapon in the right direction. It is important to mention that some weapons have some aiming constraints. For example, heavy machineguns cannot aim to the higher positions. Finally,

there is a secondary way to aim that allows more accuracy in the shoot, but slow down all the movements of the soldier.

Another mechanic related to attacking is the recharging mechanic. Weapons have a very close relation with this mechanic. Some guns, rifles, or machineguns allow a bigger number of bullets than others, and charging some of them is faster than others. For example, heavy machineguns allow 100 bullets per charge while some pistols only allow 10 shoots per charge. If the player uses all the bullets and tries to shoot, the soldier automatically will charge the weapon. Although, charging a weapon in the middle of a crossfire is a disadvantageous action that could lead to dead. The player must be careful about the number of bullets he/she has in the gun, and which places are good locations for charging.

Each soldier has a main weapon and a secondary weapon. To player can change of weapon every time he/she wants. For example, when the player spent all the bullets from one weapon, he/she can switch the weapon. Additionally, some types of soldiers can use grenades. Finally, all soldiers have one gas mask. Gas masks are necessary during chemical attacks.

As mentioned above, *Verdun* has four game modes: *Frontlines*, *Rifle Death Match*, *Attrition*, *Squad Defence*. *Frontline* is the main game mode, and it “recreates the tug of war trench warfare of WW1 with a shifting frontline” (VerdunGame, 2017). *Rifle Death Match* is a chaotic battle game where all the players must kill each other, there is no team or group strategy. *Attrition* is like *Rifle Death Match*, but players are divided in two teams. Finally, *Squad Defence* is a cooperative game where team of 1-4 players defend a trench against “waves of bots” (Ibid). Because the game is about the World War I, and its main characteristic is the trench warfare, *Frontline* is the only game mode analysed.

In *Frontlines* mode, each side will attack by turns, and the main goal is to capture the enemy trench. The game defines an area for attacking and defending, and assign an area a team. Also, inside the

attacking and defending area, the system defines a 'main' zone (the area that the player must capture or defend) and a neutral zone. The number of attacking soldiers inside the 'main' enemy area defines if the trench is captured or not. The more players of the attacking team are inside the enemy area the best. If the defending area is taken by the attacking team, the area shifts deeper.

Each attacking and defending turn last for a certain number of minutes. If the attacking team takes the area and kill a big number of enemy's soldiers, the game will reward the team increasing the attacking time. If the attack fail and the time is over, the other team will get its turn to attack (VerdunGame, 2016).

In *Frontline* and in the other game modes, most of the times, soldiers die with one shot, and it is usual to die several times during a match. After dying, some seconds later, the player reappears with a different soldier in a different position, but always inside the team's territory. Sometimes, the player reappears near to main battle zone, and in other occasions he/she appear far from the area of action. During the time that the player must wait to reappear, the player can see through 'the eyes' of other team members. This features helps the player to locate other enemies and places that should avoid. Also, the player can learn strategies from other players.

It is very difficult to find safety places in the maps and being an active player. If the player is trying to be an 'active' soldier, generally, he/she will die. Often, players die without even know which enemy soldier kill him/her. Moreover, *Frontlines* force the player to attack or at least stay inside the battle area. If a player get out this area, the system gives to the soldier a few seconds to return to the battle area. If the soldier does no return on time, the system will kill the soldier and subtract points to the player for been a deserter. On the other hand, the game mode rewards players who stay close to the main battle area.

Frontlines game mode allows the players to use seven of the twelve squads available in the game. Each squad is “different regarding, abilities, loadout, uniform, nationality and specialisation” (VerdunGame, 2016). Also, each squad is comprised by four members, and each member has their own special role and weapon. For example, there are soldiers specialized in the usage of rifles, machineguns, grenades, or flamethrower. *Frontlines* game mode reward troops that work together. For examples, the game gives extra points to those squads stay together during battle. Even if this objective sound easy, it is not simple task.

The strategy applied during the game depends of the troop and type on soldier that he/she chose. For example, there are some squads that have soldiers that handles grenades and light guns. Those soldiers should be close to the enemy to use their grenades. They must move fast leave the grenades, and then, they must get out as soon as possible. Other troops have rifle specialist. Those soldiers could attack from far distances. For that reason, they usually settle far from the enemy. Most of the time, they prefer to crawl and hide behind hills, trees, or rocks, or over trenches. In those places, they can use the secondary aiming system that allows them to shoot enemies very accurately.

Learning Elements

Unlike most of the World War One videogames, *Verdun 1914-1918* is a realistic recreation of trench warfare in the Wester Frontline. Moreover, the game mechanics allow a realistic representation of trench battle. They rewards team collaboration, strategic location of the soldier, and correct usage of weapons. Additionally, the player cannot run into the battle without suffering consequences. In *Verdun*, one shoot is enough to kill a soldier, and if the player tries to be a ‘hero’, sooner he/she will die. Of course, the game will not end with the death of that soldier. After some seconds, another soldier will be summoned; the player will take the place of that soldier; and he/she could have the opportunity to enter the battle again.

According to Gee (Gee, 2003, p. 207), this is an important learning principle called *Psychosocial Moratorium*. This principle states that good learning permits students to take risks with no consequences of their actions. *Verdun* allows the player a virtual understanding of being a soldier during WW1, without having to be involved in a war. The game mechanics are sufficiently realistic to learn properly the concepts of fighting in a trench.

Another learning principle (and maybe the most important) presented in *Verdun* is the *Identity Principle*. The Identity Principle says that “learning involves taking on and playing with identities in such a way that the learner has real choices (in developing the virtual identity) and ample opportunity to mediate on the relationship between new identities and old ones” (Gee, 2003, p. 208). In this sense, the player can relate and reflect on his/her real identities (for example, being a teenager or a student), what means to be a soldier in the middle of the trenches (virtual identity), and how he/she projects his/her real identity in his/her virtual identity (the soldier). The player must construct the identity of his/her soldier applying his/her values, knowledge, common sense, and the rules (mechanics) that the game imposes. This interaction will cast questions about what are the real desires of the player, and if he/she feels fine with the rules imposed by the game. The player can take for some minutes the identity of a soldier, and create a more accurate meaning about his/her experience.

Verdun 1914-1918 has simple (but well defined) mechanics and open maps that allow the player take thousands of different decisions. In addition, there are many weapons, obstacles, and other real players inside the virtual world. Due to these characteristics, players can create their own soldier profiles with their own strategies. The player can prove hypothesis of what he/she believes should be a good strategy for a soldier. Also, players can get feedback and approximated results of these hypotheses by different means. Allowing a player (student) to resolve problems in different ways is a learning principle. The name of this principle is *Multiple Routes* principles. According to Gee (2003, p. 209),

Multiple Route principle “allows learners to make choices, rely on their own strengths and styles of learning and problem solving, while also exploring alternative styles”.

As most of the modern videogames, Verdun has big amount of contents and aesthetical elements. During his/her gameplay, the player can appreciate depictions of weapons, uniforms, textures, materials, and environments. He/she can navigate around the maps discovering how trenches looks like. For instance, he/she can watch the differences between the trenches built in the forest (map of Aisne) or in open moody fields (map Champagne). The player can discover the different strategies that he/she could apply in each map. Additionally, each map has its own fact sheet with information and photos of the real setting. Also, you must interact with other soldiers (players) that can take their own decision based on their knowledge and value, just as a real soldier could do. Finally, the sound effects and small animations after dying enhance the whole experiences. In other words, all the elements described above complete the experience of being a WW1 soldier. This type of experience is what Gee called *Multimodal Principle*. This principle states that “meaning and knowledge are built up through various modalities (images, text, symbols, interactions, abstract design, sound, etc.), not just work” (Gee, 2003, p. 210).

So, what learning objectives could be achieved after playing *Verdun 1914-1918*? First, the detailed depiction of maps, uniforms, and settings, allows the player an understanding of the elements used by the soldiers and the places where the battles occurred. Additional information and photos could be obtained from the fact sheets presented in the middle of each game. Those sheets give extra information to the player of specific facts related to the setting. This type of knowledge could be classified in the *Knowledge of Specific Facts* of the taxonomy. Knowledge inside this category can be measured by professors and evaluators.

Second, after playing *Verdun*, the player could comprehend deeply how trench warfare was. With small assistance of professors and other academic material, learners will have the capabilities to give their own interpretations of dynamics occurred in trenches. This could be classified in the category named *Comprehension*.

Valiant Hearts: The Great War – Game Analysis

Game Overview

Valiant Hearts: The Great Battle is a puzzle adventure game developed by Ubisoft Montpellier and published by Ubisoft. The game was released in June 25th, 2014 for the following platforms: Microsoft Windows, PlayStation 3, PlayStation 4, Xbox 360, and Xbox One (Petit, 2014). In September 4th of the same year, the creators ported the game for iOS platform, and in November 25th, for Android devices. According to Pan-European Game Information (PEGI, 2017), *Valiant Hearts: The Great Battle* is suitable for teenager over 12 years.

In contrast to other games about World War One, *Valiant Heart* is not a war game. According to Julian Chevalier, the lead designer, they “wanted to do a game about the war but not a war game, so that's why you don't kill people.” (Petit, 2014). Instead of focusing in war strategies or shooting other soldiers, the game pay more attention on the stories of its character. Those stories were inspired by real letter written by regular persons from time (Lewis, 2013). As a result, characters are normal people trying to survive the horror and repercussion of war.

Valiant Hearts is composed of four chapters. Each chapter generally has five or six ‘scenes’. During each scene, the player resolves puzzles, finds special items, and overcomes a set of obstacles. While playing, the player discovers new sections of the story of each character. All stories intertwine with the other ones, showing several perspectives of the war. The game does not focus on one single character, and in each chapter, the player must use several characters.

Regarding to the visual style, *Valiant Hearts* took its ideas from comics. The game use a 2D cartoonish style full of colour. The characters are stylized and they are drawn disproportionally. When the speak to each other during the cut-scenes, the message is contained in a speech balloon in the

same way that is used in comics. The characters and the setting are accurate detailed. All the objects represent they real objects of the time.

In the next sections, we analysed the story, aesthetics, and mechanics. After that, using the identified elements, we identified all the possible the educational elements that could be used as learning tools.

Story

The main feature of *Valiant Heart* is its story. All the other game components (aesthetics and mechanics) work together to enhance the feelings and emotions depicted in the story. The narrative is divided in four chapter. The game shows the story through cut-scenes, and every time that the player completes a level, a cut-scene is shown.

The story about five characters during the World War One in the Western Front, France. For this analysis, we focused on the first and second chapter of the game. Regarding the next chapters, we commented them, but more briefly than the first ones.

The story begins the 1st of August 1914, with the murder of the archduke Franz Ferdinand. The Austro-Hungarian Empire declares war on Russia. Due to military alliances, France is forced to fight with the Russians. During the preparation for war, the French government asks to German citizens to leave the country. One of those Germans was Karl.

Karl is a young farmer who lives in the countryside of France with his wife Marie, his new-born child, and his father in law Emile. As many other Germans, the (German) army forced Karl to enrol and participate of war. Against his desires, he became a soldier.

Some days later, Emile received a letter from the French army. In the letter, the French army asked him to become a soldier of the army. As Karl, Emile was forced to leave the farm. He travelled to Saint Mehiel to receive his military training.

After some days of training, the army sent its soldiers to Paris. In the capital, Emile met Freddie. Freddie was an American who lived in France. Due to the German army attacks, he lost his wife. Seeking for vengeance, Freddie enrolled in the army to find the person who was responsible of killing his wife.

The 21st of August, Emile's regiment received orders to go Crusnes to (North-East side of France), and fight against the 71st Division of the German army. Baron Von Dorf led the squadron; the same one that enrolled Karl as a soldier. During the battle, French army failed in its attack, and most of the soldiers perish by the German machineguns. Emile, bullet wound, managed to survive, but he was taken as a prisoner by the Germans.

Weeks later, Freddie and his troop joined the battle in Marne. There, Freddie helped to defeat the Germans, and during the battle, he found that the man who was the responsible of the death of his wife was baron Von Dorf. The German army retreated to the North side of French. The trench warfare began.

For months, Emile worked as a cooker while he was a prisoner in the campsite of the German army in Neuve Chapell. The 10th of March 1915, Emile and Karl met in the kitchen of the camping. During their meeting, Karl asked Emile for information about his wife Marie. Emile shown the letter that his daughter sent to him. The letter said that during that moment things were tough in the farm. After their short meeting, the Britain army bombed the German campsite. The baron escaped in his zeppelin with Karl who in charge of ridding the flight machine.

After the bombing, Walt, a rescue dog, helped Emile to get out from some debris. Both Emile and Walt escaped from the destroyed German base to look for Karl. While their travel, Emile and Freddie met again. After a small chat, Freddie and Emile decided to go together to find baron Von Dorf and Karl. They moved East, to Ypres.

The 22nd of April of 1915, the German army used for first time the chlorine gas. The gas released during the bombing trapped Emile, Freddie, and Walt. When they thought that everything was lost, Anna, who was passing near and saw them, rescued them using her car. Like Freddie and Emile, Anna was looking for baron Von Dorf who had kidnapped her father, a famous engineer. All of them decided to travel together to find Von Dorf.

The 1st of June of 1915, the trail of Von Dorf took Emile, Freddie, and Anna to Reims. Emile and Freddie followed Von Dorf's zeppelin to a cathedral. There, Emile fought the baron in a one versus one battle. Emile defeated the baron, but he escaped to a higher level of the cathedral. Freddie was waiting Von Dorf. They engaged in battle. Again, the baron lost the battle, but he managed to escape.

Chapter two starts nine months before with the backstory of Anna. She was a Belgium student in France. When the war started, decided to go the frontlines and help wounded soldier. There she heard some soldier saying that the Germans were going to use a new weapon in Belgium; in the same city where her father lived. She took her car and travelled to find her father.

In Belgium, she found that the city was under attack. After helping some people in the city, Anna got to her father house. There, she discovered the blue prints of machines that were being used in the war. Also, she discovered that baron Von Dorf kidnapped her father to use his knowledge and his machines for the German army purposes. In that moment, she took the decision to go and find the baron. On her way, Anna met and rescued Emile and his crew.

The story return to the present days. After all the damage received during the battle, the baron's zeppelin could not flight anymore and crashed. The baron managed to escape, but Karl was not so lucky, and he got badly injured.

After many troubles, Anna could get near to Karl and healed him. Minutes later, the French troops capture Karl, Emile, Freddie, and Anna. Karl was put in a prison camp, and Emile was sent to court martial for desertion. But, because of his courage, the court released him, and sent him again to the frontline again.

The 8th of May 1916, the French army commanders sent Emile's troop to the Fort of Douaumont. The idea of the commanders was to take the fort and undermine the German defences. After lots of adventures, Freddie found Anna's father, but baron Von Dorf cornered them and tried to kill them. Emile managed to rescue them from the baron, but in revenge, the baron exploited the fort in order to kill them. Emile could escape but the others were not so lucky.

In chapter three, both armies French and German started to dig tunnels hopping to get through the defences of its enemies. At the same time and after a big effort, Karl escaped from the prison camp. After the explosion in Douaumont, Freddie and Anna's father did not die. Together, they fixed a damaged tank, escaped from the fort, and joint again the French army. Emile was sent to a mission inside some tunnels. There, Emile saved a German soldier who was in trouble. They worked together to get out of the tunnels that where full of traps. After leaving the tunnel, the French commander ordered Emile to take an important cargo under the German tunnels. The cargo was full of explosive, and they were used to explode the Germans tunnels. Karl was very upset.

Anna and her father met after so long time. But Anna told Emile that the French troops killed him during the escape. After hearing the bad news, Emile got sick. Freddie were sent to another mission

against Von Dorf. This time, after a tank battle and a fist fight, Freddie defeated the baron. During this time, Emile did not know that Karl was still alive. Emile asked Anna to tell Marie, his daughter, about Karl. She accepted and went to Saint Mehiel. In her way, she found Karl and helped him to return home.

In the final chapter, the German army captured Anna and Karl just one mile before the farm. After an attack to the German camp, Karl escaped and could save his family from a chemical attack. Freddie joined the Canadian troops. After struggling in a bloody battle, the Canadian army defeated the Germans.

The 16th of April 1917, the French commanders ordered Emile and other soldiers to attack the German defences. The battle was bloody and thousands died. Emile tired of following suicide orders, punched his officer, but the punch was so strong that he killed him. Like Emile, many other soldiers mutinied against their officers. At the end of the battle, the French court martial found him guilty for murdering an officer and sentenced him to death.

Valiant Hearts story offers the player a detailed narrative of the facts occurred during the World War One. The writer of the story arranged all the events of the story to match the events occurred during the war. Additionally, most of the dates are accurate or near to real one. The game simplifies many aspects of WW1, but introduces many historical events and contextualizes them in a story. Finally, there are some sets of fact sheets presented meanwhile the player is solving the puzzles. The sheets explain historical facts and explanation about important objects depicted in the story.

Aesthetics

Valiant Hearts is a 2D game with a cartoonish visual style. The visual assets are very detailed, stylized and colourful. The music and sound effects are rich, and they are a key feature during the whole game. The designers use the aesthetic elements to enhance the emotional experience of the player.

Concerning the colour scheme, it is meaningful and expresses the general feeling narrated in the story. For instances, at the begging of the story when the first battles had not yet occurred, French soldiers did not expect a long and bloody war. They were excited about the war, and they were having fun during their training and in the train station. This general feeling was represented also through the colour scheme showing bright and full of colour setting. On the other hand, while the war becomes longer and cruelty, the general feeling was desperation, sadness, depression. Dark and sober colours make up the colour scheme during final chapters. Although, the player always can find a bright element or light that warms dark scenes. Maybe, this detail could suggest that there is always hope.

Regarding to the game characters, they are stylized illustrations. Furthermore, *Valiant Hearts* has its own visual style. For instance, most of the male characters have big thorax (or bellies), strong arms, tiny legs big beards or moustaches. On the other hand, female personages have more proportional bodies, but stylized. Furthermore, all characters do not show the whole face, and their eyes are always covered by hair or a hat.

Concerning to the clothes, they are detailed representations of the fashion worn in 1910's and the period of the war. For example, the uniforms of both armies French and German are accurate stylizations. As stated before, the representations of the clothing also depict the period of the war. For instances, at the beginning of the game, the uniforms were in good conditions, but as the game progresses and so the war, clothing starts to look damaged.

About the settings, all of them are based on real places of France and the Western Frontline. All the illustrations are full of detail, and as the colour scheme, they change while the game progresses. About the objects that could be used during the game, they are illustrated with detail, and most of them have explanations of their importance during war.

Regarding to the Valiant Heart soundtrack, most of the songs are melancholic or related to the battle. Combined the sound effects, together they increase the player emotional engagement.

Mechanics

The mechanics seek to complement the story of the game. For instance, story is about regular citizens who were asked to join the army. Mechanics are congruent with this fact. All the actions that the characters can perform could be done by a regular person.

Valiant Hearts has many mechanics. The first one is running. Like most platform games, the character only can move forward and backward by running. The characters' pace is slow. For that reason, traveling long distances could take long periods.

The second mechanic is climbing. Characters can climb small obstacles or ladders. Like jogging mechanic, the characters climb slowly, and Emile, for instance, has trouble climbing. In contrast to other games that allow the player to jump, the only way to go to higher by own means is through climbing.

The attacking mechanic allows to knock down enemies or to destroy some obstacles. All the attacks that the player can perform are not lethal. To attack, characters use their fists, ladles, stick, and only during the first training, a rifle.

The 'interaction' mechanics permit the player to interact with some elements presented during the game. Interaction mechanics are grabbing, talking, asking, or use tools. For example, the grabbing mechanic lets the player grasps objects such as handlebars, knobs, tools, bottles, grenades, or pull rope shown during the game. Some objects (like handlebars and knobs) can be operable after interacting with them. For instance, some handlebars operate elevators. If the player wants to use them, first he/she must grab it through the interaction mechanic. Another example of operable objects are the knobs.

The throwing mechanic allow the player to throw objects. The player can aim the target by controlling the direction and the elevation of the throw. This mechanic is used server times during the game pass objects to other characters, or to attack enemy soldiers with grenades.

Due tunnels and trenches are usual settings of the game (and in WW1). Digging was part of the regular labours of a soldier. For this reason, the game designer included the digging as a mechanic. The digging mechanic allow the user to open new paths and to discover new objects hide under the ground. Those paths and objects are always important to solve the puzzles. Although digging is an important mechanic, it is only possible to dig in the sections specified by the game designer. It is no possible to use it to solve the puzzles in different ways.

One of the most interesting and engaging mechanics is 'controlling Walt' (the dog). Walt is one of the most important characters of the game, without him it is impossible to solve most of the puzzles presented during the game. By receiving instructions of his human companions, Walt can find, dig, and pick objects, bring objects, pull handlebars, distract enemies, and place himself in desired locations. Walt's assistance is necessary to solve puzzles that requires to realize two actions at the same time, or to go through space were humans could not.

Another interesting mechanic is the healing. Anna is the only character that can perform this mechanic, and she must use her ability several occasions during the game. Like music games (such as Guitar Hero), healing mechanic rewards precision. Anna must do her ‘healing actions’ in specific moments and with precision. All those actions do not need to be perfect, but at least most of them.

There are three mechanics available during the game, but that they are not frequent. The first one is the driving mechanic. Driving permits the player to control the direction of car to avoid obstacles and attacks, and it is very limited. For example, the player cannot increase or decrease the speed of the car. The next two are aiming and shooting mechanic. They are only available a few times during the whole game.

Valiant Hearts has simple rules, and its gameplay is very linear. The player must discover the order and the actions that he/she must perform in order to solve the puzzles. In certain occasions, the player must resolve the puzzles with limited time, but time based puzzles are not common. Additionally, the game has some challenges that requires precision, like healing or driving. But basically, there is only one way to solve the puzzles and challenges. Even though, the discovery factor is very engaging.

Learning Elements

Valiant Hearts: The Great War has a strong narrative, and its main learning features are contained in the story and aesthetics. In this section, we identified and analysed the learning principles and objectives.

Valiant Hearts introduces to the player WW1 topic. As mentioned above, *Valiant Hearts*’ story is rich on events, dates, setting, and characters. All of them are based on historical research and real letters wrote during the war (Lewis, 2013). The story starts with the events that initiated WW1. Then, it continues explaining how the war evolved during the following years. In addition, during the game,

fact sheet appears as a reward after solving puzzles, and the player has the possibility of reading and watching photos about events and objects used during the war. Moreover, to enhance the (learning) experience of the player, the visual aesthetical elements depicts with detail elements such as soldiers, uniforms, settings, machines, and objects.

In other words, the game enables a learning experience where the player can learn about and come to appreciate “interrelations within and across multiple sign systems (images, words, actions, symbols, artefacts, etc.) as a complex system” (Gee, 2003, p. 207). According to Gee (2003), that process and experience corresponds to the *Semiotic Principle*.

Additionally, Valiant Hearts contextualize that information given, and allow the player to experience the war through the characters presented in the story. As mentioned before, the aesthetical elements reinforce those experiences. According to Gee (2003, p. 209), the *Text Principle* argues that:

“Texts are not understood purely verbally (i.e., only in terms of the definitions of the words in the text and their text-internal relationships to each other) but are understood in terms of embodied experiences. Learners move back and forth between texts and embodied experiences. More purely verbal understanding (reading texts apart from embodied action) comes only when learners have had enough embodied experience in the domain and ample experiences with similar texts.”

Even if the (learner) player does not live the real experience of the war, the player will ‘live’ the virtual experiences of the characters depicted in the game. This could enable in the player mind a deeper understanding of the war, its terminology, and how it affects the life of the people lived during that time.

As *Verdun 1914-1918*, *Valiant Hearts* uses the *Multimodal Principle*. In the game, knowledge is built through the story, its characters, and the aesthetical elements. The usage of words appears to give

information about facts of objects, settings, and dates. Most of the information is given in the narrative and images. This feature enables an easier understanding and contextualize the sequence of events of WW1.

Finally, *Valiant Hearts* allows the application of the *Subset Principle*. This principle states that “learning even at its start takes place in a (simplified) subset of the real domain” (Gee, 2003, p. 210). *Valiant Hearts* story do not cover all the aspects of WW1, it only gives a small view of the war. But with this small idea about WW1, the player could make inferences about the whole incident, and the experiences of other soldier and citizens involved in that war.

Concerning to the learning objectives, while playing *Valiant Hearts*, the learner can obtain knowledge of dates, locations, and historical facts related to World War One. This type of learning could be classified in the category of *Knowledge of Specific Facts*. Additionally, after playing the whole game and thanks to learning principles applied, learners could understand how was WW1, the experiences of the soldiers, and the implications that war had over the nations and their citizens. This kind of learning go beyond the Knowledge category. This type of learning is classified in the Bloom’s taxonomy category of *Comprehensive*.

Discussion

World War One (WW1) was an awful war. Thousands of unknown soldiers died in bloody battles. Armies tested new lethal weapons and strategies against their enemies. The usage of trenches extended the war for many years. The Western Frontline became the iconic image of this war. And the decisions taken by an incompetent political and military elite, caused the death of thousands of soldiers (Champman, 2016).

According to Chapman (2016), the above paragraph summarizes the popular memory (“a shared understanding and collections of information between members of a group” (Halbwachs, 1992, cited Champman, 2016)) of what most of the people who live in the nations that participated in WW1 believe. And most of the time, this idea is also the official version of the facts (Champman, 2016). For instance, the Canadian War Museum website, “the Canada’s national museum of military history” (Canadian War Museum, n.d.), thereby a national authority in historical topics, hosts a game named *Over the Top*. The game tries to recreate the experiences of a soldier during the war in the Western Frontline (Canadian War Museum, n.d.). It allows the player to take decisions in order to survive the war. One of the decisions that the player must take is “to dash out into No Man’s Land to help a returning band of wounded soldier” (Kempshall, 2015, p. 661). If the player decided to help them, the result will be that the soldier will perish. Even though, due to the complexity of the WW1 and moral implications, the representation of the (WW1) popular memory of WW1 is avoided in film and in most videogames. Moreover, more than two thirds of the games related to WW1, avoid the representations of soldiers, trenches, and the Western Frontline (Champman, 2016).

From the above statements, we can assume that the popular perception of WW1 is a valid interpretation. In this sense, *Verdun 1914-1918* and *Valiant Hearts: The Great War* could be used as an educational tool because both games address the topic of WW1 using the popular memory as

central axis of their story and mechanics. And, additionally, we identified four of Gee's learning principles in each game and two of Bloom's taxonomy educational objectives in both games. Learning principles ensure that the games are using modern educational theories that enables good learning. On the other hand, Bloom's taxonomy helps to identify measurable educational objectives that educators could to integrate the games in their classes. But, educator should be careful at moment of including games in their courses.

For instance, *Verdun* is a bloody and violent game, and it is rated as a game for adults (over 18). This feature constrains the places where the game could be used. For example, professors should not include *Verdun* in curriculums for primary school and high school. On the other hand, *Valiant Hearts* is an excellent game for teenager, and according to PEGI, it is rated for persons over 12 years old.

Additionally, "students are generally unaccustomed to considering games critically, and making connections between gameplay and course content does not happen naturally" (Hergenrader, 2016, p. 35). For this reason, professors are indispensable, and they should guide their students through games, pointing which elements are important and which ones no. In this sense, due to its narrative qualities and its introductory level, *Valiant Hearts* is easy to include in almost every high school curriculum. In contrast, *Verdun* requires more guidance of the professors, and it should be used in more specific college courses.

Finally, it is important that professors learn and understand the games that they should include in their classes. In many occasions, professor do not know anything about videogames, and for that reason, they do not include games in their courses, or they do it in wrong way (Hergenrader, 2016, p. 35).

In addition to the analysed games, educators have a broad range of games that could be used in primary school, high school, and college courses. For example, related to WW1, educators could use

games like *Battlefield 1* and *Battle of Empires: 1914-1918*. Games like *Never Alone* and *Papo y Yo* could be used to obtain cultural knowledge. *Total War* and *Assassin's Creed* series are well-known because of their settings and mechanics depicts historical places and activities. All those games differ in genre and purpose, but the complexity of the main elements, and their contents enables them to be used as educational tools.

Conclusion

In this work, we analysed two videogames related to World War One: *Verdun 1914-1918* and *Valiant Hearts: The Great War*. The purpose of these analysis was looking for their educational elements that enable them to be used as learning tools. For the analysis, we used Schell's game analysis framework, Gee's learning principles, and Bloom's Taxonomy.

After the analysis, we found that both games apply learning principles. Regarding *Verdun 1914-1918*, we identified the following learning principles: "Psychosocial Moratorium" Principle, Identity Principle, Multiple Routes Principle, and Multimodal Principle. Concerning *Valiant Hearts*, we found the Semiotic Principle, Text Principle, Multimodal Principle, and Subset Principle. Those principles guarantee that the videogames use modern educational theories.

Additionally, we identified that the content learned in *Verdun* and *Valiant Hearts* could be classified using Bloom's taxonomy. In both games, the identified learning contents are classified in the category *Knowledge of Specifics* and *Comprehension*. The usage of the taxonomy gives evaluation tools to the educators who want to measure the progress of their students.

Concerning to the limitation of this work, we found three mayor limitations. First, we only analysed historical-based games related to World War One. Second, we only utilized one learning principle framework. Third, to narrow the scope of this work, we did not analyse carefully the historical truthfulness of the games. In future work we should include analysis of other videogames, research about curriculums that includes videogames, and test about the effectiveness of the videogames during classes.

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