Game Design Model for Educational History Videogames

Ricardo Navarro Fernandez, Sergio Martinez Palomino,
Vanessa Vega Velarde, Claudia Zapata Del Rio[(✉)],
and Victor Chiroque Landayeta

Pontificia Universidad Católica del Perú, Lima, Peru
{ricardo.navarro,smartinezp,vanessa.vega}@pucp.pe,
zapata.cmp@pup.edu.pe, echiroq@pucp.edu.pe

Abstract. The objective of this study is to apply and validate a game design model for educational video games. For this purpose, a theoretical review has been carried out on the relevant factors that must be considered when designing an interactive educational experience such as video games. Then a model, previously used in the educational context, was applied to design and develop an educational video game about the independence of Perú. To validate this model, a population of 7 university students between 17 and 19 years played for 45 min the designed video game. Immediately, in-depth interviews were conducted with the validation participants to finally analyze the results and contrast them with the process that was used in the design of the game and the didactics of the story. Additionally, a user evaluation was applied to verify the usability level of the game in order to know if the game is pleasant for people.

Keywords: Game design · Education · Video games

1 Introduction

Since its invention until today, video games have played an important role in our society, as they have promoted the emergence of various social and cultural phenomena that do not go unnoticed by public opinion. In this sense, opposing positions on its impact can be found. On the one hand, a large sector of society considers that this means of entertainment is negative or harmful [12, 19]. While on the other, there are competitive spaces, followed by millions of spectators, where players face each other, considering this activity as a sport that currently involves large sums of money [9, 18].

In the midst of these opposing positions, the results of academic research suggest that video games provide benefits for the cognitive, affective and social development of people [16, 27, 10]. The impact of videogames on cognitive development shows that they can serve as interactive technological tools for education, so that they influence students' motivation and academic performance as shown by several examples found in: [11, 28, 14, 20, 15, 34, 3, 33, 13, 8]. However, these results generate new questions such as what aspects of video games are those that influence the interest of the players and their learning? The answer to this question lies in the design of video games (the "game design").

2   Game Design for the Educational Context

Different authors have approached Game Design from different perspectives as stated
in [1, 29]. For example, some authors consider the design of video games as an artistic
process that becomes a source of creativity and, consequently, considers artists as
designers [1]. However, other authors, possibly more associated with the development
of technologies, consider Game Design as an engineering process that comes from a
systematic methodology and a balance in the game's rules [1]. Each of these per-
spectives shows essential aspects of the design of a video game. However, none of
these perspectives alone can address a comprehensive picture of what Game Design is
[1], since it requires creativity and orderly and methodical planning.

Several models have been proposed for the development of Game Design, but most
of them in the entertainment industry and not in the educational context. There are
relatively useful guides for the educational videogame design process, but they tend to
focus on specific aspects of the process with little or no connection to the overall design
landscape. For example, it has been pointed out that the mechanics of games can
influence the cognitive functions of the user, that narrative resources have a more
significant impact on knowledge and that visual effects favor player immersion [7, 22,
4]. These contributions enrich the data accumulation; however, they are limited if you
intend to address the complete design of an educational video game. Therefore, it is
necessary to develop general models of game design for the educational field that
consider the educational aspects, the aesthetic and the entertainment. One of these
models for the design of educational video games is the one proposed by Navarro [24]
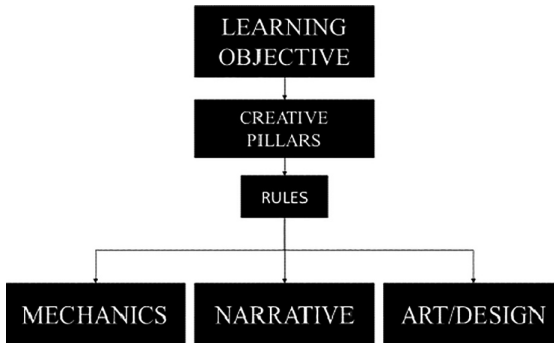(see Fig. 1).

Fig. 1. Game design model revisited base on the structure of Navarro [24]

2.1   Game Design Model

In this regard, an important point to note is that the main purpose of a video game is to
entertain [1, 6]. The model proposed by Navarro [24] starts from this premise and
considers that entertainment should be oriented or feed a learning objective. The model
defines "learning objective" as a set of knowledge, aptitudes, abilities, behaviors or

competencies that the user has to learn through the educational video game [35]. Likewise, the model used in this study is based on classic Game Design components in its model: mechanics, narrative and art, to which it adds two components that should guide the design: the learning objective and the creative pillars. In this way, it establishes that the learning objective is the main axis that will guide the development and design of the video game.

From this, the creative pillars are established and, then, all the other components for the design of the game. Below, some general ideas about these five components are developed.

Learning Objective

The first component of the model is the learning objective, which guides the entire design, therefore the process for define it should be serious and diligent. In order to establish the learning objective, it is necessary to carry out a theoretical review on the subject to be addressed, so that specific elements of the topic to be worked on are chosen. Also, the proposed objectives should be clear and specific, avoiding using generalities such as "talk about history," "learn from mathematics," "solve exercises," etc.

Creative Pillars

The Creative Pillars can be understood as guidelines for each decision made in the design of the video game and are established based on the Learning Objective. Thus, these pillars will filter the elements and contents that are addressed in the game. This component is essential for the design of an educational video game for two reasons: (1) it allows to disaggregate the learning objective in specific points that will be retaken throughout the design and (2) it allows to approach the learning objective creatively and attractively. It must be considered that the video game must be entertaining and, at the same time, teach something. Entertainment should not be sacrificed for learning or vice versa; a balance should be found. Likewise, to develop the creative pillars, it is necessary to master the specific theme established in the learning objective and filter those contents that are not relevant [24].

Mechanics

Mechanics can be defined as the basic and main rules of a video game [1]. This element is one of the most important aspects of Game Design in general, so its role in the development of an educational video game is crucial. For its development, it is necessary to consider that the design of a video game, educational or not, is an interdisciplinary work [24]. The mechanics of the video game must contribute to the learning objective [24], although not necessarily directly, but seeking to achieve what is proposed in the creative pillars. When working with mechanics for an educational video game, it is important to point out that there are pedagogical and didactic aspects related to the subject that is to be taught, and they must be taken into account when designing.

Narrative

The narrative is defined, in simple words, as the story in which the video game will be immersed [1]. In no way should the narrative be understood as solely textual; On the contrary, the narrative can be developed from the art of the video game, the mechanics and, of course, the sections in which a story can be explicitly presented in a visual, oral or both.

Art

This component, like the others, must respond to the learning objective. If the thematic of the game is based on symbolism, or allegories to an object or history, the art must respond with more abstract and not so direct designs. If the game is direct and focuses on real contents, art should be as real as possible [24].

Rules

In the present study, the rules can be understood as objectives within the game that determines the scenario where this takes place; and these can assimilate the symbolism expressed in the art and the characters [24].

However, the hierarchy that may exist between this aspect and the mechanics, narrative, and art, is not clear. Therefore, the present study suggests hierarchizing the Rules, placing it below the Creative Pillars, but above the mechanics, narrative, and art (see Fig. 1). This will allow a relationship that can feed the Creative Pillars and the other elements of the game.

2.2 History Learning

The importance of how a subject is taught is essential in the design of an educational video game. It is not the same to teach mathematical content as history content or physics. In this sense, this study is based on pedagogical and didactic bases of history teaching, so a review of the research on history learning is carried out below.

Learning and analyzing historical facts entails various benefits at a cognitive and social level [25, 26]. However, several obstacles hinder the teaching of history. One of the most common is the tendency to memorize historical facts [8, 21]. This type of teaching does not achieve the objectives of this subject and can even be harmful to students [8]. On the contrary, the teaching of this thematic area should focus on developing students' historical thinking [21], that is, helping students understand the processes of change in historical time and the influence they exert.

Historical thinking is a construct composed of six thematic axes [21, 30, 31, 17, 23, 32]:

1. Historical relevance, which refers to the reasons why they are considered as critical specific events;
2. Evidence, which refers to the methodology used to select and interpret the sources of a historical argument;
3. Continuity and change, which refer to temporal processes intertwined and not as opposites;
4. Cause and consequence, which refers to understanding that there are various reasons why specific actions and conditions happened, and in which the social conditions of the moment and the actors themselves are considered;
5. Historical empathy, which refers to identifying the influence of the social, cultural, intellectual context in the actions of the characters; and
6. Historical awareness, which refers to moral obligations on actions considered illegal or criminal carried out in the past and that have had repercussions up to the present.

Based on the literature reviewed, the present study aims to design and validate an educational video game based on the model proposed by Navarro et al. [24], with university students. For this, a qualitative study was carried out, analyzing the users' perception of the video game. The results of this application will be presented and discussed considering the proposed theoretical framework.

3 Developing the Video Game

Video game "1821: la Lucha por la independencia" [1821: The fight for Independence]: is an educational video game that deals with the process of declaration and consolidation of the independence of Peru between 1821 and 1824 (see Fig. 2). The main elements of the game design are described, using the proposal by Navarro [24] as frame of reference.

Fig. 2. Title screen of the video game

3.1 Application of the Model

In this study, the component of Rules is being used as a hinge between the game design elements, the Creative Pillars and the Learning Objective:

Learning objective
In the first instance, the learning objective of the game was established, so that all subsequent design elements would aim at achieving it. In this way, and the function of the revision of material on teaching and pedagogy of history teaching, the following learning objective was proposed:

- "Promote historical thinking in students."

In addition, three specific areas of historical thinking that the video game sought to promote were selected:

– Cause and consequence,
– Historical empathy and
– Historical relevance.

Creative Pillars

Once identified the areas of the learning objective, the next step is to establish creative pillars that address them creatively and entertainingly. The participation of the game designer, in coordination with the educational experts, is especially meaningful in this aspect, since it is important to develop a video game that is entertaining and that also teaches. In this case, three creative pillars were established:

• Choose your destiny: it deals with the area of cause and consequence of historical thought;
• Listen to time: approach the area of historical empathy;
• Do not judge without knowing: it deals with the area of historical relevance.

Mechanics

For the development of mechanics, the educational expert must explain to the game designer what the learning objective is and what the creative pillars of the video game consist of (in case this has not been involved in the development of the same). For this video game, many mechanics were developed; nevertheless, we will mention only some of them below, in order to exemplify the connection between these and the creative pillars.

For the creative pillar "Choose your destiny", the mechanics of "decision-making" was developed (see Fig. 3). This consists of allowing the player to realized various decisions throughout the game.

Fig. 3. Decision making scenes (The translation of the text is: Main text: how would you respond? Text to the left: Friendly greetings, Text in the center: Hostile greetings, Text to the right: Greetings)

Fig. 4. Information Cards (The main title can be translated to: Know more about the intentions of every character)

For creative pillars "Listen to time" and "Do not judge without knowing", the mechanics of Information Cards was developed, which consisted in that before a battle the user had access to cards with data about the context in which it was developed (see Fig. 4).

Narrative

Being a video game based of real history events, the narrative becomes essential. However, the present study has focused on presenting history in a way that encourages historical thinking and not rote learning.

For this, three types of cinematics have been developed that address the Creative Pillars: "Listen to Time" and "Do not judge without knowing", because socio-cultural and personal characteristics of the actors of the Independence of Peru are exposed:

– Initial cinematics: It presents through images and voice-over the social and political context that unleashes the independence of Spanish America. The cinematics cannot be skipped and is subtitled.
– Cinematic by event: As the game progresses, this cinematics expose chronologically the most important events of the independence of Peru, as a preamble to the new section that the user will play.
– Explanatory cinematics: Cinematics that are exposed after the player has made a decision that may affect the development of the game. In this way, these scenes describe the new political, social and/or economic context resulting from the chosen decision.

Art

Finally, for the art of video game, we worked together with an artist, who designed cinematics that presented static images that depicted what was narrated by the voice-over. This is expected to allow concentration on the information presented rather than on other factors that could distract the user. Likewise, the colors used, the shapes and the textures of the elements were designed in such a way as to allow the user to understand how Peru looked in those years. The art was developed in close relation to the narrative, and it was emphasized in crucial aspects such as scrolls for the decisions that must be made, a map of Peru as a driving interface between the events, etc.

3.2   Development Process

Like any other software, a video game can be developed using known methodologies. If the application of the described model is taken as the development needs, then it is necessary to translate these needs into requirements in order to apply the known software development methodologies.

Given the size and interdisciplinarity of the team and the product to be developed, the adaptation of Scrum was considered as a development methodology integrated to usability techniques that allow building a more attractive game for people (see Fig. 5).

We used an adaptation based on a case study by Aguilar and Zapata [2], in which the XP design process is improved through the use of UCD tools. The difference in the present work is explained in Daly et al. [5] where Scrum is used instead of XP as shown in Fig. 5. In this sense, "Interviews" will not be used because the requirements
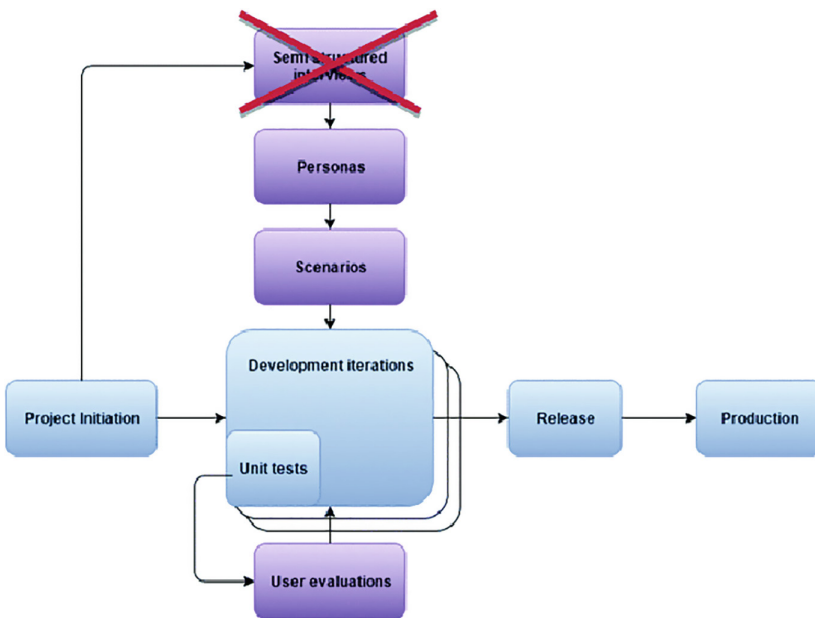

Fig. 5. Adaptation of integration proposed [5]

were obtained from the game design but "Personas" and "Scenarios" were used because they helped to represent the development needs.

For the application of the Game design model, a high-level design was developed that included the components of the model. As part of the iterations of development, the mechanisms of interaction, dialogues, facts to narrate, pieces of art and music were derived, thus allowing an incremental development.

4   Validating the Model

Once the video game was developed, the application of the model was evaluated through a validation that had the purpose of knowing if the players reached the proposed learning objectives.

4.1   Participants

The participants were 7 freshman students at a Peruvian university, whose ages ranged from 17 to 19 years old.

4.2   Instruments

Interview guide: A qualitative interview was developed that explores the mechanics, the narrative and the art of the game and how these influenced or not the achievement of the learning objective. The interview guide was made up of the following areas:

- General impressions: This area explored the general impressions of the users regarding the video game.
- Narrative: This area explored different aspects of the video game narrative. Thus, information was collected on the opinion of the cinematics, the information cards, etc.
- Mechanics: This area explored the way in which users respond to the mechanics in the game, and the rules identified while playing the game.
- Final impressions: This area explored the users' perceptions about the possibility of obtaining multiple endings and if they had understood how to unblock them.

4.3   Procedure

To evaluate if the design of the educational video game was effective, 7 people were asked to play it for 45 min. Then, they answered the usability questionnaire. After that, a total of seven interviews were conducted that explored the various aspects of the game design of "1821: The Fight for Independence", so that it could be evidenced if this had achieved the proposed design objectives. The application was made in a laboratory with four computers, and three sessions were developed in total. First, the participants played the game, without any interference from the researchers. Then, after the time ended, the researchers proceed to perform the interview to the participants.

4.4   Results

The objective of this research was to analyze the design of a video game for the teaching of history based on the game design model proposed by Navarro [24]. To do this, it was explored to what extent the Mechanics, the Narrative and the Art, in harmony with the Creative Pillars and Rules, achieved or not the proposed learning objective. Next, the information gathered in the interviews conducted will be analyzed.

Choose Your Destiny

Concerning the creative pillar "Choose your destiny" it was proposed that users can make different decisions throughout the game, decisions that could change the end of the game, becoming able to unlock six different endings. It was expected that the user would be able to understand that a historical event depends on different causes and that it will have repercussions on a series of future events. Indeed, it has been found that mechanics, narrative, and art have achieved what is proposed by this pillar.

Thus, various users have referred to the importance that the game gives to decision making and that these are what determine the events that will happen later. For example, the results suggest that the mechanics of dialogues and crucial decisions have favored the idea of cause and consequence mentioned above.

Interviewer (I): What do you think is the goal of the game?
Participant(P) 1: (…) give us information to reach a decision, can reach a specific end, with a decision making either in the same game or in the same dialogs that appeared

In the previous quote, it can be seen that the participant realized the importance of decision making and its impact for the future from the mechanism proposed in the video game, specifically from the dialogues and crucial decisions. This provides relevant information because it suggests that mechanics work as expected.

Also, the mechanics allowed users to analyze the situation that would result from the choices they made. Thus, they were able to use the information given, analyze it and ramble about the possible consequences that they entail.

I: (…) The moment you made a decision, what were you doing? What things did you take into account when you made decisions?
P1: Especially the effect that could later have (…) you had to choose if you could talk kindly, neutrally or as an enemy, let's say. Also, depending on that it could be that it is triggered… like, for example, that La Serna retires to the mountains and that La Serna leaves.

In the previous quote, it is observed that the mechanics of dialogue encourages the participant to be aware that the decision he/she will make will influence the possible future situations. Also, it is observed that the mechanics do not work independently of the other components of the video game since the user indicates that he uses the information provided in the proposed Narrative. This suggests that the video game design is an integral product and that it allows an adequate interaction between its elements.

In the same way, the crucial decision mechanics favored, in the users, the conception that the decisions that they make could have repercussions not only in the immediate future of a character but also in the future of other actors that relate directly or indirectly with them.

I: Did you like to make decisions?

P3: It is one of the parts that, like, I did a lot… Because sometimes I am afraid of making decisions, but I had to take one (…) And [the game] put me in a situation of the soldiers and their commander, and it makes me feel like I have a big responsibility. That is, it gave me an enormous responsibility to be leading a whole group, but I had to choose one.

In this way, it can be seen that this mechanism allowed the user to understand the responsibility of deciding for one or another possibility and that this decision would affect various people in different areas. Furthermore, it is pertinent to point out that, in this case, the user comments that he does not feel comfortable making decisions, which could suggest that this mechanism allows observing an action that the user would not be willing to perform in any other learning situation.

The proposed mechanics favor the understanding that a situation can be modified and influenced by the interaction of different facts, as opposed to a linear view of history:

I: Did you like to make decisions?

P2: I mean yes, that is always a plus I think (…) practically all that has repercussions, it is not always going to follow the same line and I think I like it a lot, I always like that.

I: What things did you take into account when making the decisions?

P2: I was thinking about both possibilities: which was the best possible situation and which was the worst possible situation (…) sometimes I chose the worst (…) because I thought I would be able to overcome those adversities in the battle.

In the first quote, it can be observed that the decision mechanics favor the understanding that a story will not always be linear but will depend on the different decisions that are made. However, in the second citation it can also be observed that the mechanics do not promote the idea that a decision will inevitably turn into a specific situation; on the contrary, the user suggests an understanding that following situations also depend on other crucial aspects and therefore, they are modifiable. Thus, he understood that the future of the Independence of Peru depended, at least, on two crucial aspects: (1) the political aspect (addressed by the decision-making mechanics) and (2) the military aspect (addressed by the mechanics of battles to which it refers).

Listen to Time and Do Not Judge Without Knowing

On the other hand, it was hoped that the creative pillars "Listen to time" and "Do not judge without knowing" allow us to understand that the social, political and economic context influences the development of subsequent events, together with the individual actions of the great historical actors. For this, both cinematic and information cards were used.

The results suggest that the cinematics provided information about the social, political and economic context of that time that was useful for the user when making decisions.

I: Did the cinematics help you to understand the history of the game?

P1: Yes, yes. (…), because they give you a context, they give you a context for what you are going to… for the different battles that you are going to have, the different decisions that you are going to have to make.

I: Did the cinematics help you to understand the history of the game?

P2: They give you the social context that is being lived and the functions that each one had.

I: What did you take into account to make the decisions?

P3: I took into account the social context and what could come later (…) That is, what consequences that decision would bring me.

From this, it is possible to assume that (1) the cinematics contained useful information about the context in which the events took place and (2) that this information was considered when making decisions. In this way, we observed that cinematics could allow the user to understand that future events not only depend on the decisions they make but also on the context in which they are immersed.

In contrast, the results suggest that, although the information cards also presented useful information about the context of the events, in some cases they were not considered at the time of making decisions. Also, some of the users did not read all the information cards.

I: Did you read all the information cards?

P1: Not so much. 70–80% of all

I: Did you read all the information cards?

P2: Superficially. I never read them in detail.

However, other users did consider that information cards provided useful information to contextualize and to understand the objectives of the various parties involved in historical events.

I: Did the information cards help you understand the context of the events you played?

P2: The truth, I think so. They told you the date; they told you where I was located and what… from Spain, what was your objective and from Peru what was your objective.

I: Did the information cards help you understand the context of the events you played?

P3: Yes, because they gave you as the context in which the historical context was, the objective of the Patriots, the objective of the realists

Because these results suggest that the information on the cards was useful to understand the context and, in addition, they allowed to understand more deeply the position of the actors when presenting the objectives of each of them, it is possible that the fact of not reading them lie more in the way in which they were presented than in the quality of the information they exhibit. In that sense, it is likely that modifications of art and style are required rather than content.

On the other hand, it was proposed that two main rules would characterize the game: unlock different alternative endings and face the Realist side. Thus, the results suggest that both rules were fully understood and that both mechanics, art, and narrative contributed to this achievement.

I: Why do you think that there are different endings within the game?

P3: [Its because of] how many points you won on the patriotic side, because not everyone can win. Not in every event. This is because of the strategies you can use, because you may have made a bad strategy and lost, then you subtract points and leads you to another end. Another would be the decisions you made or, well, in this case, that I took at the time of talk with a general or something.

Thus, we observed that the users not only understood the rules but that they were able to identify and describe them as expected. Also, the rules allowed an adequate interaction between the mechanics and the narrative. This favors the creative pillars because it allows understanding the video game as an integral and coherent product.

On the other hand, it was mentioned that an educational video game should not be limited to presenting educational content, but that it should be fun and entertaining. In this case, most users suggested that "1821: The Struggle for Independence" is an entertaining video game that is not tedious.

P1: Interesting, interactive (…) summarize, let's say, the history, in a way that is understandable and not so heavy to understand.

P2: Quite interesting. I had not previously played the games to make decisions, so, that influence your adventure, because it left me with the desire to continue seeing what would take my decisions.

P3: (…) Also, then I could go maybe so upset by the decision that took the game right? It is also entertaining to see what happens.

5 Usability Evaluation

As part of the development methodology, user evaluations were applied in each iteration. The final user evaluation is described below, which allows observing that using the described model and usability techniques, an educational video game can be obtained that not only meets the educational objectives but is also usable.

5.1 Participants

The participants were 9 university freshmen students, whose ages ranged from 17 to 19 years old.

5.2 Instruments

Questionnaire: Users resolved a questionnaire that included closed-ended and open-ended questions.

These questions were aimed at verifying if the information provided by the game is clear and if the mechanics of the game are easy to use. We also consulted which aspects of the game are nice and which are not. And finally, he asked the users if they consider the game useful and if they would play it again.

5.3   Procedure

During the 45 min of validation of the game, users of the game were observed to use it and before applying the in-depth interviews they completed the user test questionnaire. In this way, the same users were used in the same session, in addition two more people were added because the time they had only allowed to complete the usability evaluation but not to apply the interview.

5.4   Results

As can be seen in Table 1 corresponding to the results of the questionnaire, users answered positively to each aspect of the game. In this questionnaire, a liker scale from 1 to 5 was used from negative to positive.

- Cinematics: refers to the clarity that the cinematics of the game offer.
- Objectives and context: understandable and clear.
- Characters: identifiable characters and battle sides.
- Movement, attack, and dice: It is easy to interact with these options and use them.
- Decision events: are important.
- Decisions taken: have an impact on the game.

We can observe that the aspects of the battle as easy to attack and use of the dice obtained lower scores which are directly related to the difficulty of understanding these mechanisms at the first opportunity.

Despite the majority considered the stage of decisions important, many did not see clearly the consequences of their actions in the execution they did.

Table 1. Results of questionnarie

User	Cinematics	Objectives and context	Characters	Movement	Attack	Dice	Decision events	Decisions taken
1	5	5	5	5	4	3	5	5
2	5	5	4	5	3	4	2	3
3	4	4	3	3	2	2	3	3
4	5	5	5	5	4	3	4	4
5	5	4	5	3	3	4	4	4
6	5	5	5	5	5	5	5	4
7	5	4	3	3	4	5	4	3
8	5	5	5	5	3	5	5	5
9	5	5	4	4	4	4	5	4
	4.89	4.67	4.33	4.22	3.56	3.89	4.11	3.89

8 of the 9 users considered the game entertaining. All highlighted the usefulness and importance of having a videogame of this type and 7 of the 9 said they would play again especially for the interest of knowing the other possible endings. The aspects that were indicated as positive were:

- The cinematics allow to contextualize the story in an entertaining and clear way.
- The different endings make the game more interesting because the end is not always known in advance.
- Graphics and music are nice.
- The negative aspects found were:
- Difficulty in the interaction in the first opportunities.
- The battle could be made long depending on the results of the dice.
- In some cinematics the narrator's voice is softer than music.

6   Conclusions and Future Works

It is pertinent to point out that the mechanics have favored approaching history from an original perspective, which does not appeal to rote learning. Also, it is possible that the mechanics allow some independence to the user in front of a story that they have usually conceived as immovable (for example, "getting angry" from a decision that the game has taken). Besides, it seems that the historical content has been exposed in a non-boring or tedious way, which may be because the narrative is not overwhelming and that the elements of art, such as music, colors, interface, etc. could be beneficial to reduce this type of situations.

The objective of this research was to analyze the design of an educational video game based on the review of the game design model used by Navarro. The proposed model was characterized by establishing a learning objective and creative pillars that were the guides for the development of rules, mechanics, narrative, and art. From the above, it is possible to conclude that the rules, mechanics, narrative, and art allowed to achieve what is proposed in the creative pillars. This, in turn, made it possible to achieve the learning objective. Also, the results suggest that the video game was considered fun and entertaining by users, a fundamental aspect for the success of any video game and, especially for an educational video game.

The main contribution of this design is the revision and precision of the model proposed by Navarro, emphasizing the importance of establishing a theoretically supported learning objective and the articulation of this objective with the elements of the video game. Finally, the application of the proposed framework is suggested to verify its effectiveness and viability, as well as the limitations it presents.

References

1. Adams, E.: Fundamentals of Game Design. New Riders, Berkeley (2013)
2. Aguilar, M., Zapata, C.: Integrating UCD and an agile methodology in the development of a mobile catalog of plants. In: Soares, M., et al. (eds.) Advances in Ergonomics Modeling, Usability and Special Populations: Proceedings of the AHFE 2016 International Conference on Ergonomics Modeling, Usability and Special Populations, pp. 75–87. Springer International Publishing, Cham (2017). https://doi.org/10.1007/978-3-319-41685-4_8
3. Alarcia, D.T., Barco, D.I.: Videojuegos y aprendizaje de la Historia: la saga Assasin's Creed. Contextos Educ. Rev. Educ. **17**, 145–155 (2014)
4. Clark, D.B., et al.: Digital games, design, and learning: a systematic review and meta-analysis. Rev. Educ. Res. **86**(1), 79–122 (2016)
5. Daly, C., Zapata, C., Paz, F.: Improving the usability in a video game through continuous usability evaluations. In: Marcus, A., Wang, W. (eds.) DUXU 2017. LNCS, vol. 10289, pp. 387–397. Springer, Cham (2017). https://doi.org/10.1007/978-3-319-58637-3_31
6. Deterding, S., et al.: From game design elements to gamefulness: defining "Gamification". In: Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments, pp. 9–15. ACM, New York (2011)
7. Dickey, M.D.: Game design narrative for learning: appropriating adventure game design narrative devices and techniques for the design of interactive learning environments. Education Tech. Res. Dev. **54**(3), 245–263 (2006)
8. Evaristo Chiyong, I., et al.: Uso de un videojuego educativo como herramienta para aprender historia del Perú. RIED Rev. Iberoam. Educ. Distancia **19**, 2 (2016)
9. Gamepedia: 2018 Season World Championship. https://lol.gamepedia.com/2018_Season_World_Championship
10. Granic, I., et al.: The benefits of playing video games. Am. Psychol. **69**(1), 66–78 (2014)
11. Gros Salvat, B., Garrido Miranda, J.M.: "Con el Dedo en la Pantalla": El Uso de un Videojuego de Estrategia en la Mediación de Aprendizajes Curriculares. Teoría de la Educación. Educ. Cult. Soc. Inf. **9**, 3 (2008)
12. Henríquez, F.P., Zúñiga, T.A.: Hacia una conceptualización de los videojuegos como discursos multimodales electrónicos. Anagramas: Rumbos y Sentidos de la Comunicación **15**(30), 51–64 (2017)
13. Irigaray, M.V., del Rosario Luna, M.: La enseñanza de la Historia a través de videojuegos de estrategia: Dos experiencias áulicas en la escuela secundaria. Clío & Asociados **19**, 411–437 (2014)
14. Gee, J.P.: Lo que nos enseñan los videojuegos sobre el aprendizaje y el alfabetismo. https://www.uoc.edu/uocpapers/dt/eng/gee.html
15. Valverde, J.: Learning to think historically with information technology supports AU. Cult. Educ. **20**(2), 181–199 (2008)
16. Kato, P.M.: Video games in health care: closing the gap. Rev. General Psychol. **14**(2), 113–121 (2010)
17. Levesque, S.: Thinking Historically: Educating Students for the 21st Century. Scholarly Publishing Division, University of Toronto Press, Toronto (2009)
18. LoLSports: Las cifras del Mid-Season Invitational 2018 | LoL Esports LAS. https://las.lolesports.com/noticias/las-cifras-del-mid-season-invitational-2018-105989
19. Marín, A.A.L., et al.: Qué concepciones tienen los docentes en ejercicio y en formación inicial, sobre el uso didáctico de los videojuegos? (2016) http://files.bartolomevazquezbernal.webnode.es/200000096-4b7664d6a0/Lorca_version%20autor%2027edce.pdf

20. Marín Díaz, V., García Fernández, M.D.: Los videojuegos su capacidad didáctico-formativa. Video Games Didact. Form. Capacity **26**, 113–119 (2005)
21. Carretero, M., Montanero, M.: Teaching and learning history: cognitive and cultural aspects AU. Cult. Educ. **20**(2), 133–142 (2008)
22. Young, M.F., et al.: Our princess is in another castle: a review of trends in serious gaming for education. Rev. Educ. Res. **82**(1), 61–89 (2012)
23. Mora Hernández, G.D., Ortiz Paz, R.: El Modelo de Educación Histórica. Experiencia de Innovación en la Educación Básica de México. Enseñanza de las Ciencias Sociales: Revista de Investigación **11**, 87–98 (2012)
24. Navarro, R., Zapata, C., Vega, V., Chiroque, E.: Videogames, motivation and history of Peru: designing an educational game about Mariano Melgar. In: Ahram, T.Z. (ed.) AHFE 2018. AISC, vol. 795, pp. 283–293. Springer, Cham (2019). https://doi.org/10.1007/978-3-319-94619-1_28
25. Perafán Cabrera, A.: Reflexiones en torno a la didáctica de la historia. Revista Guillermo de Ockham **11**(2), 149–160 (2013)
26. Prats, J., Santacana, J.: Principios para la enseñanza de la Historia. Enseñar Historia: Notas Para Una Didáctica Renovadora, pp. 13–55 (2001)
27. Primack, B.A., et al.: Role of video games in improving health-related outcomes: a systematic review. Am. J. Prev. Med. **42**(6), 630–638 (2012)
28. Requena, B.E.S., McMullin, K.J.: Videojuegos para la inclusión educativa. Digit. Educ. Rev. **27**, 122–137 (2015)
29. Schell, J.: The Art of Game Design: A Book of Lenses. CRC Press, Amsterdam (2008)
30. Seixas, P., et al.: A design process for assessing historical thinking: the case of a one-hour test. In: Ercikan, K., Seixas, P. (eds.) New Directions in Assessing Historical Thinking. Taylor & Francis Group, Abingdon (2015)
31. Seixas, P., Morton, T.: The Big Six Historical Thinking Concepts. Nelson Canada, Toronto (2012)
32. Serrano, J.S., López-Facal, R.: Competencias y narrativas históricas: el pensamiento histórico de estudiantes y futuros profesores españoles de educación secundaria. Rev. Estud. Soc. **52**, 87–101 (2015)
33. Vivancos, A.E., et al.: Videojuegos, historia y patrimonio: primeros resultados de una investigación educativa evaluativa en educación secundaria (2017)
34. Watson, W.R., et al.: A case study of the in-class use of a video game for teaching high school history. Comput. Educ. **56**(2), 466–474 (2011)
35. Preguntas frecuentes sobre Schoology – Centro de Ayuda. https://support.schoology.com/hc/es/sections/200216583-Preguntas-frecuentes-sobre-Schoology