

Innovative Educational Technology: The Impact of an Interactive Video Game on History Teaching for Basic Education Students and its Link to Cultural Identity in Migration Contexts

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Abstract

This article presents a study on how the creation of a video game to teach history in basic education students strengthens learning and serves as an interactive educational resource for teachers, transforming the traditional approach to teaching. This generates a greater interest of students in learning, considering the importance of maintaining links with their culture of origin in the formation of their identity when facing migration. The study was divided into three phases: an exploratory investigation in the Pablo Arturo Suarez educational unit, the development of the video game using an agile methodology with an adaptive algorithm that modifies the content according to the player's progress, and finally, the evaluation of a specific group of students. The results demonstrated a 27.78% increase in students' knowledge compared to the conventional method of learning.

Keywords: *Learning, history, migration, interactive program, video games.*

1. Introduction

In Ecuador education is very important and it is for this reason that there are articles that give priority to this issue in the Constitution:

Article 26.- Education is a right of people throughout their lives and an inescapable and inexcusable duty of the State. It is a priority area of public policy and state investment, guaranteeing equality and social inclusion and an indispensable condition for good living. Individuals, families and society have the right and responsibility to participate in the educational process. [1]

Education is the training that plays in individuals an evolution of intelligence, knowledge, thought and consciousness that give significant advances for their survival, that is, education in the human being is the process by which he acquires knowledge and these allow him to integrate into society in a given professional field. [2]

Over the last four decades, there has been an evolution in the cultural and social landscape of the country, with changes in the perception of the civic, the moral, the fundamental values, as well as in the deep-rooted traditions that our ancestors be-

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queathed to us as a treasure of knowledge and discernment, giving uniqueness to the identity of a community, city and nation.

At present, new teaching methods for education have been increasing that human beings did not have before, since technology had not advanced so much, but today technology with learning go hand in hand, since we live in a network society, in which education is essential to have knowledge and for the future development of individuals both in the economic and social spheres and The systems that most attribute to this knowledge is the information that is surfing the net such as: interactive applications that allow the student to learn in a broader and less monotonous way. In addition, it examines how this approach might maintain students' connection to their cultural roots, even in contexts of migration. [3]

Interactive applications are multimedia systems that can be accessed through a computer, in these systems texts, graphics, audios and videos are presented and combined allowing direct contact with the user, since they can navigate, interact, create and communicate through these platforms that are currently very necessary to capture the attention of students. [4]

Applications such as video games, which are programs that are designed with the aim of amusing and entertaining, can be found in various media such as computers, cell phones and consoles that provide playful experiences to users through the audiovisual languages they transmit. Video games offer potentially educational experiences, as they allow you to acquire new knowledge, develop psychomotor skills, as well as hand coordination. In addition, they help develop critical thinking, strategy and decision-making skills and enhance fantasy, imagination and creativity. [5]

The creator must offer the user applications that are easy to manipulate, by the target group to which this proposal is being dedicated and must have two key concepts in his venture: usability and accessibility, which will result in the student being interested in educational content and contextualizing his chairs on his own, facilitating their own learning. [6]

These can play an important role in children's learning, since today the perception of a video game is no longer the same. Now they can be a hobby with pedagogical values that serve to motivate and stimulate learning resulting in student concentration. [7]

Learning for cultural dissemination of basic education in the Canton Baños de Agua Santa through video games, allows the development of content where the child acquires substantial information when having fun, which facilitates the way in which he captures and retains information. These are characterized by awakening the interest in students to learn, facilitating the work of the teacher. [8]

Students acquire in these games learning of trial and error, the error does not cause any frustration in them, better motivates them to reach the goal with the rules that the game has, but without having pressure to win or lose. The use of new technologies in the educational field has demonstrated its great role in the training process, multi-media resources to be integrated into the classrooms have provided the possibility of improving the educational procedure, and is a more than effective means for communication that exceeds the unilateral communicative model. [9]

The methodology was developed through exploratory research that evidences the contribution of an interactive video game in education, the development of the video game was through a planning process and finally a certain group of students was evaluated to know whether or not the game contributed in education. The results They show that with the use of the video game the levels of knowledge in the history chair increased in relation to the levels of achievement with the conventional method, especially in migration contexts that entail unique challenges. [10]

2. Related works

Video games manage, instantly, to pose an environment close to reality, in addition to all these components, they are presented within a narrative confabulation thus proceeding to less abstract and more linked to a significant socio/anthropological context. The components are encompassed within a general organization of knowledge that reveals its specific aspects of our society. [11]

In the field of education, we find strategy video games in which it is mainly characterized in the thinking of planning and ordering in a correct and intelligent way actions and resources to find the final goal [12]

Video games occupy a fundamental place in the leisure time of children and in these they learn without realizing historical and cultural concepts that give them only in school environments. Pokemon Go, Angry Birds and Tetris. [13]

These investigations have contributed in some way to cognitive development in the cultural area, in regular education children in different places. However, in Ecuador there are few studies carried out in this area. And those that have been analyzed by the research team are limited; boring and unchallenging. Many have game possibilities, others do not show different degrees of complexity or difficulty levels. There are few tools that show a dynamic adaptation in games and an adaptive flow of work, this makes these tools unsustainable tools. This fact has provided the opportunity to create a video game, evaluating its usefulness in a quasi-experimental study in a real context.

Where interactive multimedia mechanisms, give rise to the change in the communication model which is used in schools and accept the importance of self-education in educational institutions. [14]

3. Method

The method used was based on the following phases: first, an exploratory research was carried out to know how an interactive video game would contribute to education, which was applied to students, teachers who are the ones who teach the classes and parents who are the ones who have direct contact with the target group, Second, the video game was developed through a planning process and finally a certain group of students was evaluated to know whether or not the game contributed to education. The phases are detailed below.

3.1 Exploratory research

The methodology selected for this research included interviews as a research method, applied to teachers as key figures in the teaching-learning process. In addition, surveys were conducted aimed at students of the institution, allowing to identify their preferences in receiving information and their level of knowledge about local history. The study was conducted with a population of 29 participants, including parents of boys and girls ages 9 to 10, as well as sixth grade students parallel "B". Given the small sample size, all individuals were included in the analysis. The research focus also involved interviews with 8 teachers of the school, as they are responsible for education at middle and basic levels. These methods provided a comprehensive understanding of the impact of interactive video games on the teaching of history and its relationship to cultural identity, specifically in migration situations. [15]

First, an observation card of a class given to sixth grade students was executed in order to visualize the strengths and weaknesses that exist in that classroom and it was noted that the teacher shows mastery in the topics taught in the class, but does not use any technology to make the class more dynamic and interactive. On the other hand, in the interviews that were carried out with the teachers, it was obtained as a result that the

classes they teach remain the same as years ago, due to the limited technological resources to teach their classes. However, when they were mentioned the possibility of creating a technological solution that would support their work in the classroom, they were very interested and agreed on the implementation of interactive teaching, as it would help them reinforce the topics developed in classes. The results of surveys targeting parents revealed that children have access to electronic devices in their homes for entertainment. However, many parents were unaware of the possibility of using these devices as teaching tools. The idea of using them for educational purposes was perceived as interesting and beneficial for the education of their children. These findings underscore the opportunity and relevance of developing an educational video game as part of teaching. This innovative approach seeks to leverage technological access at home to enrich the educational process. The positive perception of parents suggests that the implementation of an interactive video game could be an effective strategy to connect with students in a more attractive and effective way, especially in the context of teaching history and its relationship with cultural identity in migration situations. [16]

3.2 Video game development

Next, Fig.1 presents the methodology applied in the development of the video game.

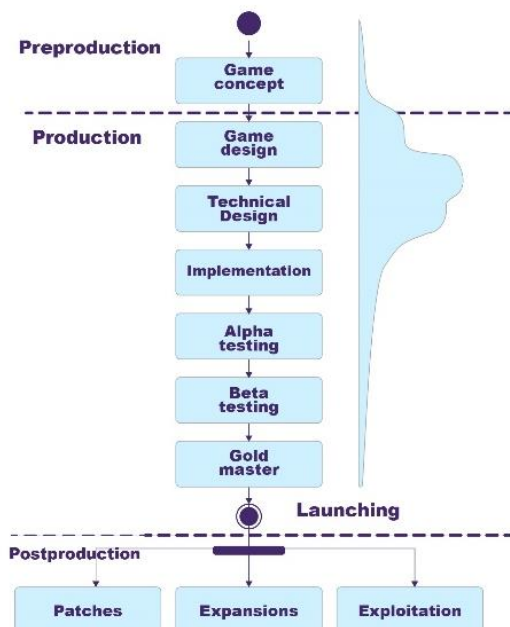


Fig.1. Production process of an adapted video game: The production process of the video game: production phases.

3.2.1 Pre-production phase

In the pre-production phase it consisted of the planning process that served to define the game and the aspects that would have to be carried out for its materialization.

The genre of the video game is educational action with a realistic 2d aesthetic for the teaching of culture in basic education students, the plot that will be talked about is that children as they grow up are learning with the guidance of a teacher who will help them in their evolution.

In its architecture it will be characterized by being a realistic game with a linear story, that is, as the student evolves in his knowledge the character with which he will play will also do so so there will be levels with certain degrees of difficulty. This is why it is a game with an adaptive mechanism and will always be entertaining, provocative and sustainable for the student. [17]. Foster environmental awareness through the implementation of innovative ideas in the creation of sustainable products, such as video games, that

promote the preservation of cultural identity and knowledge in children facing migration situations. [18].

The game consists of 1 character (Thomas) which has to go through 1 level with different difficulties, with obstacles and observe historical data while playing. The central idea is that the character ventures through terrain which will go through different difficulties and obstacles along the way in order to reach a goal. And finally the premise of the video game will be used as multimedia material to add new knowledge to students about the history of the canton.

Costumes and scenarios will be used, which will make the video game fun and carry out its objectives and for the continuity of the story within the game, it must go hand in hand with the script and complement the plot that are a group of experiences that a video game must continue, at the end of the last level you will see why the city is called Holy Water Baths. [19]

The sketches were made by hand in order to visualize the features, clothing and characteristics that the characters of the game have before making them digitally.



Fig. 2. Sketches

The game will develop in a spectacular way when the character which is the one who has to have interaction with the environment and objects, through actions that is executing or performing, then the game consists of following the player who goes for that goal and all the stumbles he has along the way

The scenarios undergo changes, the obstacles change and increase when jumping level, this system has the purpose of increasing the difficulty at the time of studying this scenario, in order to demand challenge and interest from the player. [20]

The Game Design Document is the part that allows you to synthesize in depth every-thing related to the game, which includes the following parts: the genre, as already said above is purely educational action with a multiplatform, players will have an individual game mode, the story is based on Thomas, our protagonist, that while going through the game

they learn about the history of their city, the look and feel refers to the characters formed in 2D with chibi-realistic style, in which the characters will be followed with the front camera, in the user interface the game was made so that the student plays occupying the keys up, Below, right and left, the space key to jump and the mouse for interaction with the objects of the game, in the objectives each level is discussed.

In level 1 the character will have to dodge the enemies that move on the platforms to collect the objects to move to the next level. At this level we will find ourselves in the construction of the church which needs more objects for it to be finished.

3.2.2 Production phase

In this phase the game was developed digitally. Here you can find the artistic design of the game or also known as the game art bible, which has to do with the appearance and physics that this interactive platform will have, here are four elements such as: the story, the sound, the interface and the graphics, these artistic aspects made it different from the rest of the games that exist in the market. [21]

After having ready the initial planning of the video game is increased what the next steps to the template related to the production of the game. This is considered the most difficult phase due to the different activities that it applies, since in them there are a multitude of people in charge of specific tasks.

The Bible is created, a compilation of all the stories of the characters, the environment where the game takes place, their past and the pre-established secondary characters, thus developing a complete plot continuity, with all the components.

History:

In the city of Baños de Ambato in the midst of tragic events, our protagonist Thomas an adventurer has to look for several artifacts which will give us facts about the history of the city and its history

The character card tends to be an important part of character development, this is a direct tool for the screenwriter, and this document specifies the physical characteristics of the playable characters within the game such as: name, sex, height, age, date of birth, place of birth, way of dressing, skills, among others. [22]

Thomas is a 60-year-old Ecuadorian man who was born on July 9, 1843, with tan skin he has short white hair and his face is round. He is a cheerful and happy person, wearing a white short-sleeved shirt, blue pants, brown hat and black boots.

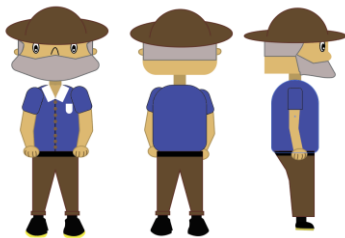


Fig. 3. Man-Thomas

Enemy Development: Panzaleos Statues

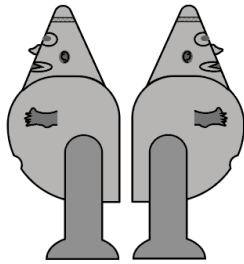


Fig. 4. Child-Pepe

The sound are the sound elements that the game will have. All the sound components of the game are created such as: voices of the characters, atmosphere, effects within the game, ambient music. The music that was used in the start menu, controls scene, scene to choose the characters and the scene of the description of each level is called Hip hop drum backing track 86bpm, the music of level 1 is Free Beat - LO FI 86BPM, the failed level scene music is Sad trumpet sounds effect.

The interface refers to how the GUI (Graphical User Interface) and HUD (Head-Up Display) elements, by which players interact with the game, will be displayed.

In this section she is in charge of carrying the information that is needed within the game.

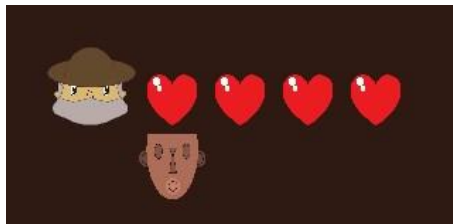


Fig. 6. Interface

The graphics of the game were designed as a 2 d element, which was made using sprites (bitmap) and tiles (backgrounds or scenarios) made with the Adobe Illustrator CS6 program.

Level 1

The user will have to move through various platforms, while dodging the statues that move within the stage of the level, since if these are touched the player will receive damage until losing the 5 lives and will have to repeat the level

The Character: Jump and Run

Statues: These enemies are in the different areas of the level moving in the scenarios.

Scenario: It is located in the old baths where there was nothing but nature and the Tungurahua volcano.

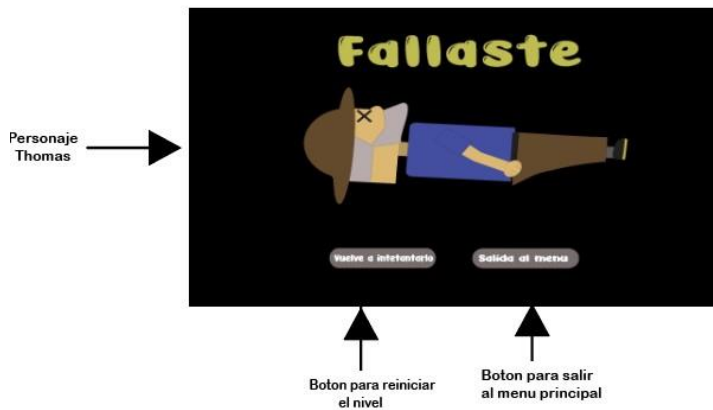
It is observed elements mainly 2 buttons in which you can call by clicking to the instruction page of the level, instead with the other button is to exit the game.



Level Information Scene



Scene of the failed game



Settings menu



Boton para control de sonido

Boton para activar una pantalla de pausa

CHARACTER ANIMATION (SPRITES)

Thomas – Immobile



Thomas – Walking



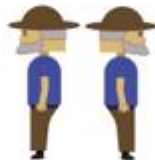
Ana – Jump



Thomas – Lose Life



Thomas – Return



Thomas – Takes Damage



Enemy (Statue) – Immobile

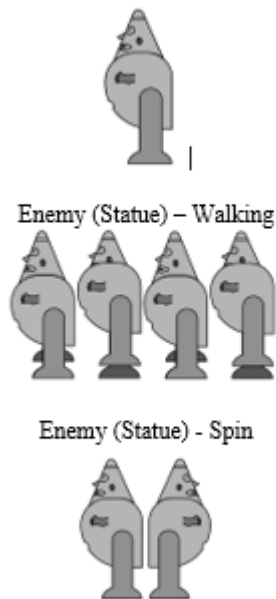


Fig. 7. Character animation (Sprites)

Likewise, in the mechanical design, the patterns of interaction in the game, the internal rules as well as the type of communication that must be provided in case the game is in an online development were contextualized. [25]

The player has to interact with this game through a computer, in which you can use the A and D keys to move from right to left, just as you can use the arrow keys to perform that action, they must also use the mouse to continue after each message that will be obtained when collecting each of the vessels since this triggers a pause to be able to read the message, you should not touch the enemies since they will lose a life until you reach 0 and fail the level, to cross the level the player has to collect the 5 vessels to finish the level.

The game was distributed for use through a cd that had the application to be installed on the computer.

Finally, the engine with which the game was made is called Unity, which is a tool that allows you to manufacture video games through an editor and a scripting that are easy to use, supported by Visual Basic that is responsible for the programming language.

Unity as mentioned above is an engine that is used for the creation of interactive games with architectural designs in real time, as the main feature has that its results are of maximum quality and are made with minimal effort, since it is a very easy to use system. [26]

Next, Fig. 8 shows the architecture of the video game.

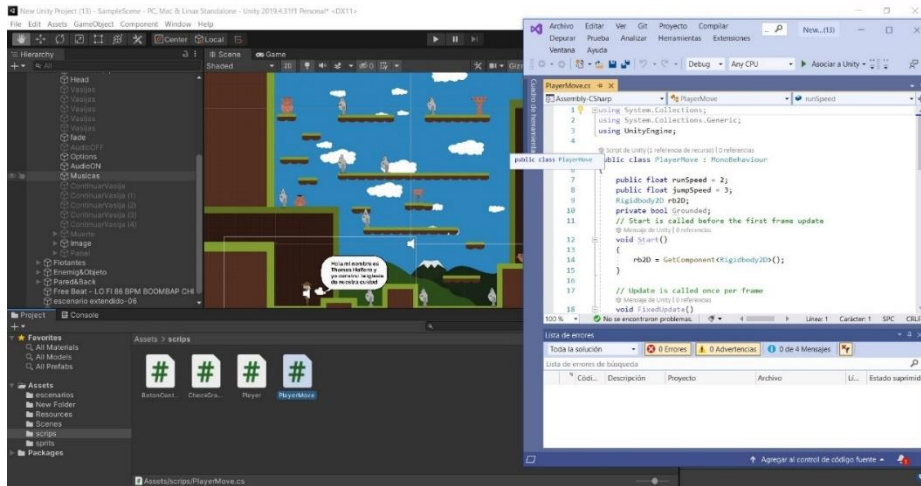


Fig. 8. Video game

Before being able to form a video game as a form of leisure you have to identify the support for which it was created, we set the computer application that reinforces the story that exists behind the video game. This application has a very strong relationship with the platform for which it was created, such as: mobiles, computers, etc. [27]

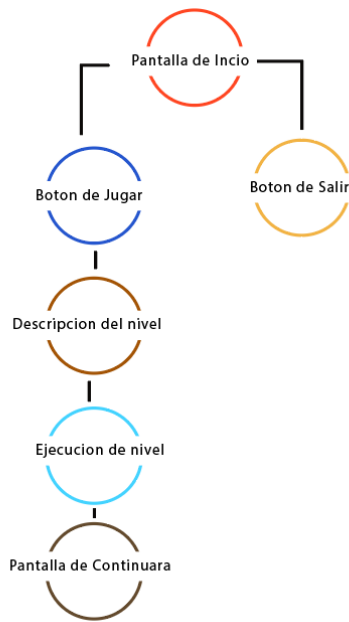


Fig. 9. Technical Design

The implementation aims to organize in a similar way all the elements that have been developed and planned so far, thus linking in a perfect way with the game engine to prevent everything from working. [28]

To maintain an order when advancing with the game has seen the need to create a schedule of activities to be fulfilled, in the first part of this process the information that will be relevant to be shown in the game is collected, then the design of characters and scenarios that may go within the video game is raised, the trading system within the game was not occupied since it was not useful to expose the information, for the game will be required the use of only 1 level to expose the most important topic which was previously selected by the teachers, it should be noted that the illustration of the character and scenarios were made mediate the Adobe Illustrator program, for the interaction through coding the unity program was used with the use of the C# language in

Visual Estudio, to culminate tests are carried out with a group of students to provide them with this new historical and cultural information through the video game in the area of Social Sciences. [29]

3.2.3 Post-production phase

This stage was aimed at the implementation of the product developed, although the focus of the project was oriented towards an experimental program in the educational field. Although the final objective of this phase contemplated the commercialization of the video game, its implementation was conceived mainly as an opportunity to test new methodologies within the educational field. The experimentation approach within the educational context underlines the interest in evaluating and understanding in depth how innovative educational technology, represented by the interactive video game, can transform and improve the learning experience in the teaching of history. This phase also reinforces the connection between technology and cultural identity in migration contexts, considering how the tool can serve as a bridge to maintain and strengthen this connection in an ever-changing environment. [30]

After the development phase of the game, we proceeded to test in its beta version. For this, a group of 15 students from the Pablo Arturo Suárez educational unit was involved. In parallel, a survey was implemented that sought to evaluate various attributes of the video game, such as scenarios, controls, gameplay and level of attention that the game generated in the players. During these tests, information about local history that students were unaware of was presented through the video game.

This evaluation is configured as a crucial step in the investigation. It allows us to understand more precisely how the interactive video game not only impacts the teaching of history, but also how its design and execution influence the receptivity and participation of students. It also opens the door to exploring how this novel tool can strengthen the link between education and cultural identity, especially in the challenging context of migration, the following assessment will be described below.

3.3 Experimentation in a real context

Participants

A total of 15 basic education students in sixth grade participated in this study.

Table 1. Demographics of participants

Type	Boys and girls	Chronological age	Level of education
Regular	15	9 and 10	Sixth grade
Total	15		

Experimentation instrument

As an experimentation instrument, a laptop and the computer room that the school had were used, installing the program on desktop computers through a flash memory.



Fig. 10. Children using the Video Game

Note. Adapted from Interactive applications for the learning of educational content at the middle basic level in the Ambato canton (p.90), Sancho Cinthya , 2019, Universidad Tecnológica Indoamérica.

Procedure

After obtaining authorization from both the school authorities and the parents of the students, a link was established with the students to validate the effectiveness of the video game. Initially, tests were carried out to ensure that the equipment was in optimal condition for the evaluation of the tool. Once the devices were ready and the game installed on each, the children were given instructions on how to play and the purpose of this proposal was explained. In addition, they were subjected to a series of questions in order to measure their level of historical knowledge.

Subsequently, they were allowed to start participating in the activities of the video game. During this phase, a noticeable increase in student motivation and concentration could be observed. The interaction with the video game generated a stimulating and engaged learning environment, suggesting that innovative educational technology, in this case the interactive video game, has the potential to positively impact how students engage with historical content and how they relate to their cultural identity, especially in migration contexts.

Statistical analysis

For the quantitative statistical analysis, the data of level of achievement obtained by the students in this new learning strategy was calculated; a quantitative analysis of the data was applied, it was verified, in the first instance, that the data of the levels of achievement, with the two moments of the study (T1/T2), behaved normally; for this and by the size of the sample, the Shapiro Wilks test ($p > 0.05$) was applied. Subsequently, the parametric Student's T test ($p < 0.05$) was applied with a confidence level of 95%, to determine whether or not there were statistically significant differences between the levels of achievement, in these two moments.

3.4 Results

The validation carried out after the implementation of the video game revealed significant results. 92% of the population answered correctly to the multiple choice evaluation, while 8% presented certain confusions and incorrect answers. Of the total respondents, 93%

indicated that the video game provided them with new information about the history of the Baños canton, while 7% expressed difficulties in understanding the information presented. Notably, 100% expressed a desire to continue learning history through video games.

These findings show an increase of 27.78% in the levels of historical knowledge and cultural diffusion thanks to the use of video games, compared to the levels achieved through traditional methods. To evaluate the existence of statistical differences between the levels of achievement obtained through the video game and the conventional method, a statistical analysis was performed. First, the Shapiro-Wilk test confirmed the normality of the data for both the conventional method ($p = 0.500$) and the use of the video game ($p = 0.172$). Subsequently, the parametric Student's T test was applied to analyze the statistical differences, yielding a significant result ($t = -6.75$, $gl = 12$, $p = 0.000$).

These results support the conclusion that the implementation of the video game in the classroom generated a significant increase in the measured achievement levels, compared to the traditional method, supported by significant statistical differences with 95% confidence and a significance level of 0.

4. Conclusions

This research, conceived in collaboration with teachers, parents and students, played an essential role in the execution of this study. The first interactions and interviews provided valuable clues about the importance of developing interactive software to strengthen the teaching of history and cultural dissemination in basic education students. The creation of the video game was guided by agile methodological principles, ensuring an interface that fit the needs of the target group. The result was a video game that met expectations, generating interest in the subject, concentration, motivation and entertainment during the learning process.

When exposing the video game to sixth grade students at the Pablo Arturo Suárez educational unit, a statistical analysis revealed a positive impact on their levels of knowledge. There was a notable increase of 27.78%, compared to the conventional method of teaching. The statistical model applied confirmed statistically significant differences in learning between the use of video games and the traditional method, with a significance level of $p = 0.000$. These results strengthen the evidence that innovative educational technology, in this case the interactive video game, can revolutionize the teaching of history and its relationship with cultural identity, especially in contexts of migration.

Future work

This study addressed a significant intervention in the field of historical learning through the evaluation of a video game in sixth grade students of basic education. In perspective, a future line of research of great interest could consider the application of the tool to children with disabilities. Given the need in the province of Tungurahua for technological tools in special education centers, it would be relevant to evaluate how this interactive video game could be adapted to offer inclusive and enriching support.

In addition, it would be advisable to extend the exploration to other educational areas. One promising area is second language teaching, where technological tools such as this could be employed to enrich and diversify learning methods. Continued research in these directions could further expand the scope of innovative educational technology and its impact on the integral formation of students in diverse contexts.

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