

Creating a Social Serious Game

An interdisciplinary experience among computer scientists and artists from UNLP Faculties

Javier F. Díaz, Laura A. Fava, Luciano J.
Nomdedeu

Research Laboratory on New Information Technology -
LINTI-

Informatics Faculty, La Plata National University,
Buenos Aires, Argentina

jdziaz@unlp.edu.ar, lfava@info.unlp.edu.ar,
luciano.nomdedeu@gmail.com

Carlos Pinto, Yanina Hualde, Leo Bolzicco,
Vicente Bastos Mendes Da Silva

Multimedia Department

Fine Arts Faculty, La Plata National University
La Plata, Buenos Aires, Argentina

cpintius@hotmail.com, yaninahualde@gmail.com,
leobolzicco@gmail.com, vicentebms@gmail.com

Abstract—This article describes the interdisciplinary work carried out by teachers and students of the Faculties of Fine Arts and Informatics in La Plata city, to develop a serious game for social networks related with Argentine native peoples. The game presented is a serious video game, innovative for social sciences, which promotes more effective learning processes than traditional methods, adding to social networks the ability to transmit knowledge, besides favoring socialization, cooperation and entertainment. The artists, computer scientists, anthropologists and primary school teachers who are part of the team believe that this game help understand and become aware of the historical and current issues of native peoples, seeking to strengthen the concept of Argentina as a multiethnic and multicultural country. The most important aspect of this serious game, called *Raices*, is to provide an innovative interactive interface to encourage the interests of school children in learning cultural history of Argentinean aboriginal communities. Also, the paper would be a guidance for other teams who would like to do similar work.

Keywords-*Serious Game; Social Game; Heritage Culture; Games for kids; Games with kids.*

I. INTRODUCTION

The use of multiple electronic media is an integral part of the lives of many children today. The TV, dominant media from the '90s to the present, is having significant competitors [1][2][3]. A child today can watch a TV program on his computer, use his cell phone to browse the Internet or connect to social networks from his Tablet. While this is not the reality for all children, a large percentage has access to one or another media and therefore spends many hours using them and playing through them. Our work with heterogeneous children communities reveals that children between 9 and 12 play an average of more than 3 hours a day. Also, the number of users who join social networks like *Facebook* and *Twitter* is growing daily [4][5]. Technological convergence, a hallmark of the use of the media today, allows children and adolescents in a greater extent to access the same places through different media, often to social networks. In this context, we intended to develop a game that benefits from social networks, creating a serious game where kids have fun, share experiences with the game, compete for scores in a collaborative and collaterally, learn without trying, without seeking it. Social networks have the potential to make this happen. They help promoting a pro-

social behavior, increased social skills, and provide an attractive place to play, a significant space to transmit and acquire knowledge.

In Argentina, there are nearly one thousand communities established in different parts of the country with a self-recognized native population which is 2.38% of the total national population, representing a total of 955,032 people, according to the official report of the 2010 census INDEC [6]. It is also important to stress, extending ourselves geographically, that even though in Latin America there are nearly thirty million natives, a high percentage of children are unaware of their existence or have a distorted understanding about them. It is the aim of this game to introduce the culture of these people, help so that they are perceived as people who exist today and not something of the past, helping to make their values remain, knowing that their identity is constructed and reconstructed in the context of their relationships and situations, both within the community and outside of it.

It is important to highlight that there are other games related to aboriginal communities as *Papakwaqa* [7] and *Expedition Conquistador* [8]; however, *Raices* focuses on a social approach, language, technical aspects, and is also oriented - though not exclusively- to Argentinean children and adolescents. The former is an educational game whose aim is to teach about the history and culture of Atayal tribe from Taiwan. This is an interesting game but it only relates to one community of that country and is only available in Chinese. The latter is a strategy non-educational Spanish game for children and adolescents which recreates the genocide perpetrated by conquerors in America during the conquest. *Raices* deals with local issues connected to the primary school curricula which is interesting for teachers since it could be used by students inside or outside the classroom as educational material favoring a learning process through the same multimedia they are used to.

This paper is organized as follows: after proposing a definition for serious games and discussing the current characteristics of social networks, the motivations for the development of social play are described. Then, the subgenres that make up the game and the artistic aspects are described, both visual and sound aspects. The article ends with a description of a prototype testing and conclusions.

II. SERIOUS GAMES DEFINITION

It is interesting to recover beginning the definition given by Salen and Zimmerman [9], who argue that: “A game is a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome”. This definition has important features, such as the virtual conflict, the rules that must be met to solve the conflict and it also states that the game should have a measurable outcome, that is, that an appraisal of the possible outcomes can be done. It is also interesting to work with Juul's [10] definition based on these aspects, but which discusses in more detail the relationship between the player and the game, the game outputs are classified as positive or negative, states that an effort is done by the player to achieve something and believes that a player will have different moods depending on whether he achieves a positive or negative result. Thus, the definition given by Juul is: “A game is a rule-based formal system with a variable and quantifiable outcome, where different outcomes are assigned different values, the player exerts effort in order to influence the outcome, the player feels attached to the outcome, and the consequences of the activity are optional and negotiable”.

Based on this latter definition, we propose incorporating the following premise for the game to be serious: *the game should allow the acquisition of benefits in the real world*. The benefits will depend on the goal of the game, for example, educational games should enable the acquisition of knowledge, health games should promote physical and / or mental improvement of a patient, business games may favor the incorporation of labor skills for employees, etc. In particular, the game we are presenting, will try to benefit non-aboriginal children and adolescents with the acquisition of knowledge through social networks. It will also seek to raise awareness on the values of native cultures and the rights of these peoples. On the other hand, it is expected for children of native communities to be satisfied with the game and can self-recognize as such, without fear of discrimination.

III. REASONS FOR CREATING A SERIOUS SOCIAL GAME

There are many motivations for undertaking the design and implementation of a new serious video game for *Facebook*. On one hand the high number of hours that children and teenagers spend online, sharing information with friends and playing video games is well known. This statement is based on a recent survey conducted for the National Ministry of Education which revealed that 70% of Argentine children are part of a social network and use the Internet to communicate with friends, have fun and spend time [11]. Also, to discover the habits, customs and preferences of Argentine school children between 9 and 12 years old regarding games, a quantitative methodology was applied using a survey in public and private urban educational institutions of our country. An illustrated questionnaire with 12 age-appropriate questions for scholars was designed and was provided to about 300 children in different schools by the teachers of each course. Below, the most significant data that influenced the decision to make a serious social game are shown in a graphic.

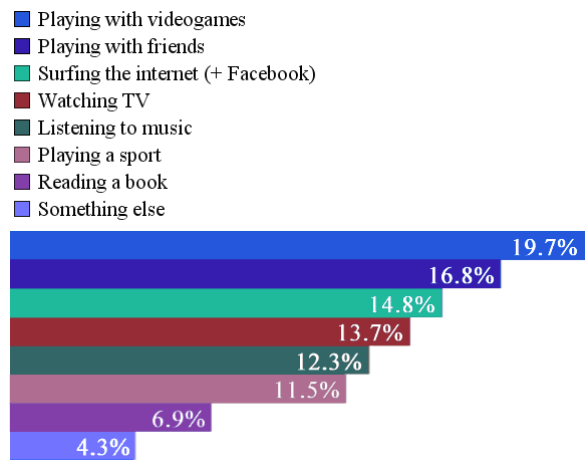


Fig. 1. Favourite activities

The graph in Fig. 1 shows the favorite activities of children outside school hours, where we can see a strong tendency to play video games, play with friends and use the internet.

On the other hand, from a more theoretical framework, it is interesting to recover Lazzaro's analysis [12] regarding the ability of games to generate emotions and how they make game an entertaining didactic instrument. She has categorized emotions into four groups, *Hard Fun* emotions provoked with the intention of overcoming obstacles and progressing, *Easy Fun* emotions evoked by visual and sound features, *Serious Fun* emotions that arise when playing ins intended to have a meaning, to be useful for something, and finally *People Fun* which is the emotion that arises from the interaction with other players, cooperation and competition between them.

In short, the expansion of information and communication technology (ICT), the everyday use of social networks in all areas and the number of daily hours children spend playing must be used / exploited for other purposes and not just for fun. The data obtained from surveys and the undoubted emotions that social games provoke, led to the design of a serious social game that aims besides being fun, to help raise awareness among children about the problems of native peoples. The viral expansion provided by social networks will promote knowledge and values that are to be transmitted to spread more easily and reach the largest population/amount of people as possible.

IV. FEATURES OF SOCIAL GAMES

Social networks can stimulate collaborative learning because they facilitate the formation of effective and affective groups, enable communication within groups and help to strengthen individual and collective identities.

Most games embedded in social networks obey an asynchronous communication. This is due to the fleeting nature of how people use the social network: multiple daily and short sessions. For this reason, games have had to adapt to the player's routines and not vice versa. Asynchronous game

has been successful in social networks as stated by Järvinen [6], who identifies five features causing playfulness in facebook: *physicality*, *spontaneity*, *inherent sociability*, *narrativity* and *asynchronicity*. But now, synchronicity is also an interesting feature that could provide benefits in the interaction of players with the social game. For example, the fact that the game motivates real-time interaction reinforces the sense of "social presence" of children. Players choose social games to become more social. The immediate physical sense of the presence of other players, although in the form of avatars, is one of the factors favoring the creation of a strong sense of social immediacy. This accompanied by the immediate reciprocity that is achieved with this type of interaction, favor retention of the player in the game.

Data collected on game modalities shows a strong preference to share a common space simultaneously playing with other people (mostly friends). Moreover, it is observed that many children also like to play alone. Fig. 2 illustrates the data collected.

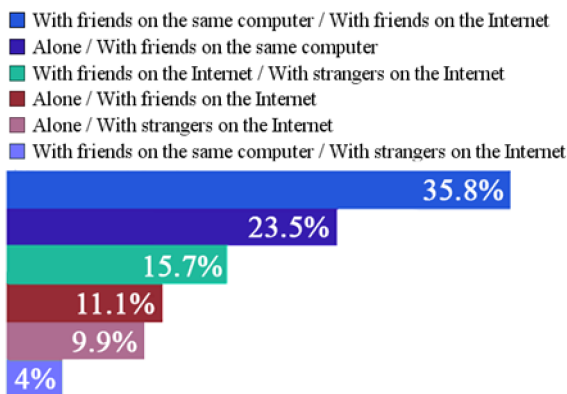


Fig. 2. Preferences regarding game modalities

Attending to the data on the polls, the game we are presenting, called *Raíces*, will contemplate different game modalities: playing alone, with friends and with strangers. To spread the word on the game, several of the functionalities provided by *Facebook* will be used, such as publishing the player's progress on their wall, showing the friends that are using the game and the level they are on, ranking the players, enabling gift sending and invitations, among others [14]. These are *asynchronous* functionalities. However, the game will also exploit some *synchronic* characteristics such as inviting players to the game to solve levels collaboratively, and communicating through virtual chats.

V. GAME GENRE

After analyzing the game genres most chosen by children at the time of having fun and considering that the video game would be embedded in the social network Facebook, we decided to make a platform game. In such games, the character handled by the player must move carefully from left to right jumping on airborne platforms, and overcome various obstacles. This genre, unlike adventure or role games, can

easily be structured in short levels and does not require a continuous game, which makes it ideal for use on social networks, where access may have a fleeting nature.

In platform games, there are different aspects that may be more or less interesting for the players. In [15], three preference patterns or subgenres are identified: combat, flow and puzzle. Based on this classification and in order to make a game that appeals to any child, it can be played in three different ways (three paths). Each of these ways will have specific mechanical elements for these subgenres.

There will also be levels which combine elements of various subgenres and require the presence of other players synchronously, these players (friends or unknown) come from a different path than ours. Real-time cooperation to achieve goals, encourages the participation of players because each participant feels he is necessary to achieve a goal. Fig. 3 shows the map of the game's levels and subgenres provided.

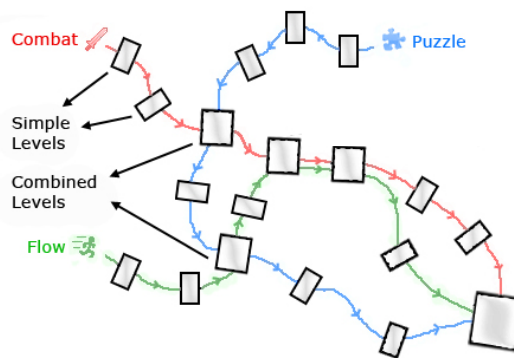


Fig. 3. Game level map

All roads have one thing in common: to complete each level certain items must be collected (level pieces) and the player must get to a door (end of level).

Below, the basic characteristics of each subgenre are described:

Combat: based on struggles against various enemies to get to the next level. These enemies are creatures that hinder the progress of the player and should be eliminated until the end of the level. The enemies in this game are characters representing people who have been hostile to the story along with the native peoples. At different levels, appear different characters in the story line, such as Spanish settlers, landowners, soldiers, harvester machinery, etc.

Flow: the player must move skillfully, jump obstacles, etc. In this subgenre the rhythmic patterns of the jumps and movements are central. Levels have more cliffs, faster movements, elements that follow the character or fall from the sky, time constraints, etc. The objective of running in the game is getting to retain aspects of native culture before a certain time, arriving before their languages are lost, arriving before their ceremonies, music, etc. are extinguished.

Puzzle: the player must carefully observe the level identifying which objects and paths exist, and based on this, reason as to combine together all the pieces of the level. The objective of this subgenre is favoring the incorporation of elements of different cultures by children. We will make a particular emphasis on the communion of these peoples with nature. The player must interact with various elements looking for the right strategy to solve each level.

Next, we describe the game art, visual and sound aspects that have led each subgenre to have its own aesthetics, colors and iconic characters, native music and much more, for each native people selected for this game.

VI. GAME ART

Video games are a complex interplay of narrative, images and music which, from a digital platform, brings a unique experience to users. The plot provides the context in which actions take place in an environment that offers the player stimuli from an artistic discourse where different disciplines meet: music, sound, animation, painting and drawing. Below we describe sound and visual art composition of the videogame *Raíces*.

A. The sound as a narrative

According to the theorist Henri Pousseur [16], sounds must be considered as acoustic messages. They obey their own sound language syntax applied to different artistic media such as music, movies, video games, dance, etc. Henri Pousseur classifies sound messages into two types: unintentional: those that are evocative of the source producing the sound, like rain, a car passing, the wind; and intentional: those which are organized with the intention of communicating something. The latter classification can be divided into two sub types: verbal and nonverbal. Speech is part of acoustic verbal messages. Sound montage, background sound and music are considered nonverbal. Note that the background sound is the sound mimesis expected to be heard in a given area to be represented.

The sound montage is the composition of sounds that may or may not be evocative. One of the features of sound montage is the sound organization guided by the links between sounds and images. A rhythm that goes in sync with the actions of the accompanying image can be generated by sounds that evoke the represented space. The music alone, when executed by a machine or played by a musician or band, has no evocative properties, does not tell a story, just answers to the musical language and communicates through its own statement. But when being part of a sound montage it acquires contextual characteristics evoked in relation to the accompanying image: contextualizing an epoch, a feeling or a character for example.

The sound montage applied to video games serves to facilitate the player's comprehension, accompanying his actions, capturing his attention, providing an appropriate setting to achieve the immersion of the player in a virtual world, thus reinforcing emotions. To create the sound montage of *Raíces* we opted to use sounds which evoked space and actions of the character as well as sound effects that

semantically reinforce other actions without pretending to represent mimetically what is seen on the game screen.

The music of the first prototype has been made in relation to the region and culture of the native people involved in the story, with the presence of typical instruments of each region mixed with electronic effects generated by Musical Instrument Digital Interface (MIDI). The soundscape obtained is a hybrid made of two realities involved, the digital universe together with the native aspects of the country. The instruments used at this stage for the sound of the Collas uses local instruments such as *huayno*, *charango*, *the caja*, *quena*, *sikus*, *erkenko* and *anata*. Also we are beginning to produce the sounds for the Guarani people using the sounds of the *mimby*, *mbaraká*, *ravê*, *anguapú* and *takuapú* and for the Mapuche people we are using the *trutruca*, the *cultrín* the *huada* and the *kunkulkahue*.

B. The visual identity of each ethnic group

The concept art is the visual universe and product design such as a film, a comic book, a video game, etc., which involves the study, development and aesthetic coherence of the characters, fonts, sets, animations, environment and other elements. It is essential to communicate to users or viewers the genre and style, time and place, as well as the atmospheres that make the different moments of a story, the characteristics and personality of the actors or characters.

For the visual art of this videogame regarding the clothes, ethnic features, landscapes and other elements of daily life in each community, was defined a style with geometric accents. We chose an aesthetic of valued lines, outlined in black for character design, with color lines in the background and elements: clouds, mountains, trees, rocks, etc. After performing several samples and sketches, we defined geometric lines as an articulating visual motif: synthesis of strokes and shapes, typical of textile art and aboriginal pottery, which was applied to all the art elements in the game.

Once we determined the prevalent morphology and visual style in the game, a production scheme was carried out with the first sketches, where the following items were ordered according to the native group: distinctive landscape depending on the geographic location of the people, characters of both sexes, wise community elder or shaman, typical animal and finally, in a story line, the people's enemies were plotted. Fig. 4 shows this production scheme of the game.

PRODUCTION SCHEME OF "RAICES"						
	BACKGROUNDS	CHARACTERS		ELDERLY SHAMAN	ANIMAL	ENEMIES ACROSS LEVELS AND HISTORICAL PERIODS
		MALE	FEMALE			
MAPUCHE						
GUARANI						
KOLLA						

Fig. 4. Production scheme of the game

From this system, was determined that the backgrounds of each village would have a chromatic identity through color palettes featuring the natural landscape in which each culture settled in Argentina. They also took into account typical colors of clothes, ornaments or utensils, and a wide color symbolism in the worldview of each culture.

For the Colla people, we selected a palette of reds and oranges. This culture settled in northwest of Argentina, where hot climate prevails, so this warm range was chosen. In addition, this combination takes as reference the colors the popular area of the *Quebrada de Humahuaca* and the *Cerro de los Siete Colores*, an icon of the region, where there are predominantly reds, earth colors, yellows and oranges.

As for the Guaraní people, a palette of green and yellow was selected. The chromatic combination draws on dominant colors in the jungle landscape according to the habitat of these aboriginal communities. Also these colors are present in corn, which beyond its importance as food has a strong symbolic presence. The green color was typical of the necklaces worn by women, as well as the color they chose for their headband feathers and body decorations. Wicker was an important element for building crafts and everyday objects, in yellows or golds, led us to choose these colors for the palette that identifies the natives of this region that inhabited northeastern Argentina.

Finally, for the Mapuche, a palette of blues and violets was selected. This combination adopted to identify this native people of Patagonia, was chosen taking as reference the blue seas and lakes that fully visually identify the landscape of southern Argentina and Chile where these communities lived and live. The monumental mountains and vast spaces between them generate an atmospheric perspective that makes blue colors predominate. The continental ice and snow also bring colors in these ranges. Blue is not just a visual reference, but also spiritual, blue color is associated with energy and great forces that occur in the location of the Wenu Mapu (above land).

In addition, for the design of the characters, features were synthesized considering physical characteristics and taking into account the costumes of the native peoples, giving the user the possibility to choose from a repertoire of traditional clothing of each region to customize clothing and accessories of his avatar. Fig. 5 shows the characters of the Colla people in the video game. The color palette for clothing was defined taking opposite colors from the chromatic circle to the predominant palette in the landscape to achieve color contrast and visibility.



Fig. 5. Characters and clothing of the Colla people

So, landscapes and elements of the different levels of *Raíces* refer to aboriginal weaving and textile forms that allow linking to modular geometric aesthetic and which refer to pixel art, as seen in the elderly, in Fig. 6.

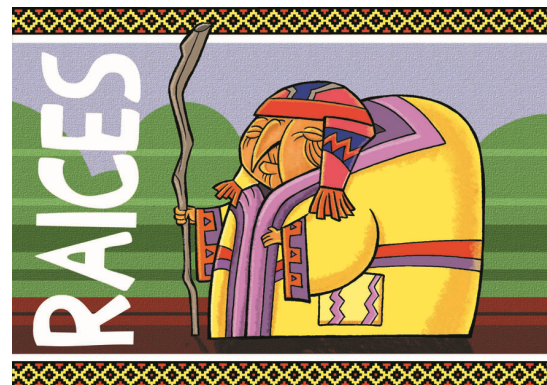


Fig. 6. Pixelated image of elderly Colla (Shamán)

This choice is based on the translation of data on daily life according to the dialogue between the cultural layer and informatics layer. Formal synthesis operations, geometrization, chromatic organization and texturized surfaces in the design of characters, objects and interactive backgrounds was defined in relation to the processes of aesthetic research and technical resolution in accordance with the codes of the gaming device .

VII. TRANSMISSION OF KNOWLEDGE THROUGH PLAY

It is intended that as they progress in the game, children can recognize and incorporate aspects of the culture of these native peoples such as language, dress, music, customs, etc. The avatar customization contributes in this direction by including traditional clothing and accessories specific to each culture, allowing children to play with different combinations and, almost without seeking it, through to descriptions, discover why and on what occasions it was used. Also each character will transit through their own geographical areas, enabling the transmission of information about the places of origin of these people.

Cultural aspects such as musical instruments, traditional medicine, artistic events (pottery, silverware, etc.) and religious symbols are represented in the game. The pieces to obtain at each level will correspond to these elements, allowing the player to discover through the levels the various elements that are part of each culture. For instance, when the player gets a piece representing a musical instrument, the real sound of the instrument will be reproduced, thus letting the children recognize their sonority.

Also important is the existence of cross-cutting themes that address common to all subjects. Respect for nature and the wisdom of the elderly are some of them. To reflect the first issue, respect for animals and plants will be stressed. If during the course of the game, a player causes unnecessary damage to nature, they will be warned and punished accordingly. With regard to the wisdom of the elderly Shamans, at each level there will be a character (elder) who gives advice to the player on how to move on, provides information on the meaning of the different elements and at certain levels narrates little stories.

As for language, an approach to the various sounds will be sought. Many of the items that appear will have their names in the original language as well as some words from the story of the elderly. The virtual chat necessary to communicate with other players include prefixed messages with bilingual text for children to recognize basic words.

During loading levels, time will be used to include information as a trivia offering the possibility to add additional points.

Finally, and to complete the educational aspect of the game, as the different pieces or objects are obtained, or certain stories told by the elderly are "heard", certain items will be unlocked in a kind of game album. This section can be accessed at any time to view all items achieved and the information about.

VIII. TECHNICAL DETAILS

The selection of technologies for the implementation of the videogame *Raíces* (which, as anticipated, was thought for *Facebook*) was based on two requirements: the game should work in most web browsers and the web technologies used should be open. For these reasons, we chose to develop the game in javascript and HTML5. Flash technology, widely used for this kind of development, was discarded.

After analyzing the features provided by several existing game engines, small prototypes were implemented, initially with Construct2 [18], then with Impact [19], and finally, with Turbulenz [20]. This latest open-source 2D/3D engine provides a set of functions for handling graphics, sound, user input and resources, and has a complete and efficient 2D physics engine, which encouraged its selection for the implementation of *Raíces*.

WebGL [21] is an immediate mode 3D rendering API designed as a rendering context for the HTML Canvas element. The HTML Canvas provides a destination for programmatic rendering in web pages, and allows a better performance for that rendering using different rendering APIs.

Although the use of WebGL enables superior performance, not all browsers support this technology and Turbulenz graphic renderer works exclusively on WebGL. To solve this problem and in order to look for greater compatibility, the graphics engine management was replaced by the Pixi.js [22] library, a 2D canvas with WebGL renderer fallback. Thus, Pixi.js automatically identifies the best option: the rendering is done through WebGL when this technology is available and through the Canvas object for the case of non WebGL browsers.

Turbulenz engine also provides facilities to manage leaderboards, badges, networking and multiplayer. Although these features are heavily tied to Turbulenz game platform, they will not be used. Instead, the server-side part of the game will be supported through NodeJS, Javascript-based platform for data-intensive applications Real-time [23].

The integration of *Raíces* with Facebook will be done through the Javascript Software Development Kit (SDK) provided by the platform [24]. This SDK, among other things, allows Facebook Login and manage calls to the Graph API interface from which the application can read and write data and interact with the different components of the social network.

IX. TESTING OF A FIRST PROTOTYPE

To get a first impression of the impact caused by the basic game mechanics, the dynamics generated from them and the emotional responses of children when they interact with the game, children between 9 and 13 years were convened at the Faculty of Informatics for testing a first prototype implemented with the three genres.

Fig. 7 shows video scenes filmed during the game testing session, where it is possible to observe that the game provokes the emotions and a high concentration.

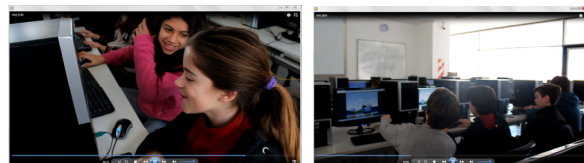


Fig. 7. Prototype testing

There was enthusiasm in passing to the next level and reaching the end of the game. Some faces of frustration were noted in gender *thinking* and less excitement in the *run*. This will be taken into account as feedback on the new stages of development. During the testing they were given a short survey to determine the feelings caused by the different genres. Fig. 8 shows some results. Also as part of the survey, 33% responded that the puzzle was the subgenre they liked most, 45% chose combat and 18% chose the subgenre run. While there are differences between them, each subgenre has its adherents.

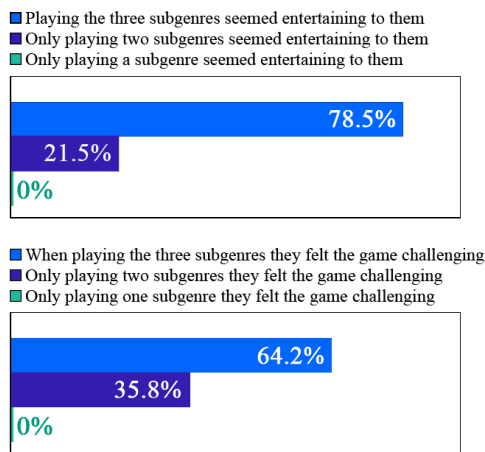


Fig. 8. Emotions caused by the subgenre

After the testing, the children asked to continue playing and were interested in the new levels and stories. Following this, a group on Facebook was created that informs about new versions of the game and the kids comment and suggest new features. This is a way to incorporate them into the game design. In this line of work where a game for children and with children is designed we are also working with a plastic workshop of our city [25], where teenagers have drawn scenes from legends of native peoples with the topics covered in the video game, which then will be collated in legend and may be accessed on demand from the context of the game.

So far, two evaluations of prototypes have been carried out where the game mechanics and the emotions generated by the game were analyzed. In later versions of the game, we will also evaluate if the knowledge the game is trying to convey is acquired by the students, that is, if learning is favored by playing with *Raíces*. For this reason, we are working very closely with teachers from different schools participating in the project, so that we can compare if the learning process in students playing with *Raíces*, is different from that of students who are not.

X. CONCLUSIONS

After long struggles and silences, the aborigines of Argentina are starting to recover their place and rights as native peoples. However, many problems persist and the contribution of education to a final recognition of their rights and full integration is essential. This paper has presented the design of a serious game for *Facebook* that provides an attractive space to promote socialization, cooperation and entertainment for children, while collaborating with the acquisition of knowledge. It is also expected to help raise awareness of the historical and current problems of native peoples.

Regarding the design of the game, we have described the theoretical frameworks taken into account to manage to make it fun and encourage children to play with it, we have also described the game art, both visual and sound aspects.

Finally, it should be pointed out that the data collected from surveys of our own and others confirm that children and

young people today are very crossed by audiovisual culture and consumption associated with new technologies making it positive to leverage these characteristics / traits / peculiarities when generating new educational proposals.

It is expected that this videogame, mark of the time, will be conducive to more effective learning processes than traditional teaching methods, and that along with teachers from educational institutions we may demonstrate the effectiveness of this innovative approach.

XI. ACKNOWLEDGMENTS

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REFERENCES

- [1] M. Castells, "The Culture of Real Virtuality: The Integration of Electronic Communication, the End of the Mass Audience, and the Rise of Interactive Networks", in *The Rise of the Network Society: With a New Preface, Volume I, Second edition With a new preface*, Wiley-Blackwell, 2010, Oxford, UK. doi: 10.1002/9781444319514.ch5
- [2] "Digital-Set-Surpass-TV-Time-Spent-with-US-Media", available at: <http://www.emarketer.com/Article/Digital-Set-Surpass-TV-Time-Spent-with-US-Media/1010096>, [Last accessed: February 20th, 2014]
- [3] E. Respighi, "Baja el rating, sube la web", available at: <http://www.pagina12.com.ar/diario/suplementos/espectaculos/8-31237-2014-02-04.html>, [Last accessed: February 20th, 2014]
- [4] J. Constine, "Facebook's Q2: Monthly Users Up 21% YOY To 1.15B, Dailies Up 27% To 699M, Mobile Monthlies Up 51% To 819M", TechCrunch, available at: <http://techcrunch.com/2013/07/24/facebook-growth-2/>, [Last accessed: February 20th, 2014]
- [5] M. Watanabe and T. Zuzumura, "How social network is evolving?: a preliminary study on billion-scale twitter network", International World Wide Web Conferences Steering Committee Republic and Canton of Geneva, Switzerland. table of contents ISBN: 978-1-4503-2038-2, pages 531-534.
- [6] Official 2010 Census Report of the National Institute of Statistics and Census of Argentina (Spanish: Instituto Nacional de Estadística y Censos, INDEC), updated on 2012. Available at: http://www.censo2010.indec.gov.ar/cuadrosDefinitivos/analisis_cuarta_publicacion.pdf, [Last accessed: February 20th, 2014]
- [7] H. Chih-Hong and H. Yi-Ting, "An Annales School-Based Serious Game Creation Framework for Taiwanese Indigenous Cultural Heritage", *Journal on Computing and Cultural Heritage (JOCCH) - Special issue on serious games for cultural heritage JOCCH. Volume 6 Issue 2, May 2013, Article No. 9.*
- [8] Expeditions/Conquistador, available at: <http://conquistadorthe game.com/>, [Last accessed: February 20th, 2014]
- [9] K. Salen, and E. Zimmerman, "Rules of Play: Game Design Fundamentals". 2004, The MIT Press. ISBN=13-978-0-262-24045-1.
- [10] J. Juul: "The Game, the Player, the World: Looking for a Heart of Gameness". *Level Up: Digital Games Research Conference Proceedings*, edited by Marinka Copier and Joost Raessens, 30-45. Utrecht: Utrecht University, 2003.
- [11] M. Carbajal. "The generation of the multiple connections", available at: <http://www.pagina12.com.ar/diario/elpais/1-199322-2012-07-23.html>, [Last accessed: February 20th, 2014]
- [12] N. Lazzaro, "Why we Play Games: Four Keys to More Emotion in Player Experiences", *proceedings of GDC 2005.*
- [13] A. Järvinen, "Game design for social networks: interaction design for playful dispositions". *Proceedings of the 2009 ACM SIGGRAPH Symposium on Video Games*, New Orleans, Louisiana., 2009.
- [14] X. Wei, J. Yang, L. A. Adamic "Diffusion dynamics of games on online social networks", *WOSN'10 Proceedings of the 3rd conference on Online social networks*, 2010.

- [15] N. Nygren, J. Denzinger, B. Stephenson, J. Aycock, "User-preference-based automated level generation for platform games". 2011 IEEE Conference on Computational Intelligence and Games (CIG).
- [16] H. Pousseur, "Semantic music and society", Alianza Editorial, Madrid, 1984.
- [17] M. Carabajal, "La generación de las conexiones múltiples" available at: <http://www.pagina12.com.ar/diario/elpais/1-199322-2012-07-23.html>. [Last accessed: February 20th, 2014]
- [18] Construct2 Game Engine: <https://www.scirra.com/construct2>. [Last accessed: February 20th, 2014]
- [19] Impact Game Engine: <http://impactjs.com/>. [Last accessed: February 20th, 2014]
- [20] Turbulenz Game Engine: <http://biz.turbulenz.com/developers>. [Last accessed: February 20th, 2014]
- [21] WebGL, WebGL Working Group: <http://www.khronos.org/webgl/>. [Last accessed: February 20th, 2014]
- [22] Pixi.js Rendering Engine, available at: <http://www.pixijs.com/>. [Last accessed: February 20th, 2014]
- [23] Node.js, available at: <http://nodejs.org/>. [Last accessed: February 20th, 2014]
- [24] Facebook SDK for JavaScript, available at: <https://developers.facebook.com/docs/javascript>. [Last accessed: February 20th, 2014]
- [25] Art Workshop "The cow with many colors", <http://lavacademuchoscolores.blogspot.com>, <https://es-es.facebook.com/LaVacaDeMuchosColores>. [Last accessed: February 20th, 2014]