

^{1*} Carlos R. Jaimez-González

² Miguel E. Solis-Pérez

³ Betzabet García-Mendoza

Towards a Web Application to Create Lottery Games for Educational Purposes



Abstract: - This paper presents a proposal of a web application to create lottery games for educational purposes, which can be adapted to several disciplines. The paper presents various studies that prove that lottery games allow people to practice reading, writing and pronouncing a language. In addition, this game puts into practice visual and auditory perception, visual discrimination, visual and auditory memory, as well as motor coordination. The paper also makes a comparative analysis of digital tools similar to the proposal, and describes their main features, such as: administrator mode, interactive graphical interface, timer, language selection, sound, number of players, among others. The web application is planned to have two users: teachers and students. Teachers will be able to add their own cards (images) and audio files about their course topics, in order to create their own lotteries; while students will be able to play the different lotteries created by the teachers.

Keywords: Lottery game, educational tool, web application, visual memory, teaching-learning process.

I. INTRODUCTION

The lottery has become a game with a lot of flexibility and versatility, before reaching Clemente Jacques' version, people could create their own versions of the lottery with different topics, but always respecting the rules of the game [1]. The reason for analyzing the lottery is because it can help teachers and students to complement the teaching and learning process in a more entertaining way. The lottery is a well-known game, so using information technologies can give it a greater scope. The lottery game has visual and auditory elements, which are capable of helping to practice reading, writing and pronunciation of various languages, or topics of a particular subject or discipline [2]. Playing the lottery allows people to put into practice visual perception, audio, visual discrimination, visual and auditory memory, as well as motor coordination [3].

Existing web applications for playing the lottery could be oriented towards various educational areas or disciplines, such as language learning, since some of them are very visual. As an example of this, there is the case of the sign language, where there is the universal fingerprint alphabet, which is a manual representation of the letters of the alphabet. The Japanese language is another case, where there is the Japanese alphabet in Hiragana, which is a syllabary used in Japanese writing. Both languages have visual elements that adapt very well to the use that could be given to digital lottery games.

The work proposed in this paper is a web application that offers the creation of personalized lotteries that allows teachers to create their own lotteries and students to play the created lotteries, with the aim of reinforcing, complementing or practicing some topics of different disciplines. The rest of the paper is organized as follows. Section II provides the theoretical framework, along with the importance and benefits that games have provided to education; it also includes some studies about the use of games in educational institutions. Section III presents an analysis and comparison of the features of some existing similar systems, including the proposed web application. Section IV describes the proposed web application, along with its functionality and some preliminary interfaces. Finally, conclusions and future work are presented in section V.

II. THEORETICAL FRAMEWORK

This section describes the importance and benefits that games have provided to education, from the basic to the higher level; video games in education, educational hybrid games; the lottery game as educational tool; and the

^{1*} Corresponding author: Information Technology Department, Universidad Autónoma Metropolitana, cjaimez@cua.uam.mx

² Information Technology Department, Universidad Autónoma Metropolitana, miguel.solis@cua.uam.mx

³ Information Technology Department, Universidad Autónoma Metropolitana, bgmendoza@cua.uam.mx

bingo games. It summarizes some studies that have been carried out in different entertainment and educational institutions about the use of games for education, specifically lottery games.

A. *Importance of games in education*

The games that children play every day at school, whether during free time or in a break, help them to develop and strengthen important aspects for their adult life, which are mentioned in the following paragraphs [4,5,6].

Intellectual development. Many of the games require a great imagination, as children face problems that they have to solve, focusing their attention on the activity they are doing; games like memory or lottery require memorization and reasoning.

Emotional development. The game teaches children to manage their feelings, since in any game, physical or digital, they face the problem of losing, which requires them to concentrate and manage negative emotions.

Physical development. Because some games require good physical condition to win, as well as coordination, players stay in good physical condition and develop these coordination skills.

Social development. There are some cases in which team communication and coordination is required, whether in online, board or physical games, so the game itself will force children to coexist with other players and communicate with them to create a strategy. Online games promote people meet other people who potentially speak another language, forcing players to establish communication in some intermediate language.

B. *Video games in education*

The world of video games is one of the largest commercial industries, so it didn't take long for video games to be sold for educational purposes. A problem that was identified when video games came to the market was that they were not very attractive, so the number of copies sold was very low. However, companies like Microsoft Xbox had the idea of combining Arcade video games with education, being Minecraft their main product at that time [7]; in this game, a large part of the points provided by physical games are implemented, the game requires learning to manage resources, introduces programming concepts thanks to mods and commands, problem solving, teamwork and development of creativity [8].

In video games, the mod or modification is an extension of the program that modifies the video game, either in the way it is played or in some aesthetic aspect. The mods have been applied to mathematical concepts such as length, surface area or volume because in the video game you can create 2D and 3D figures. There are projects based on a wide range of variants and disciplines, from architecture to role-playing games, that is, one part focuses on building a replica of a city or historical place and the other has to take the roles to obtain materials, build, supply food, among others [6].

There is an edition of Minecraft focused on education, where teachers can create an environment with which students can interact, it is also possible to have whiteboards where text can be written. Some of the latest modifications that have been made to Minecraft are those that use external programs, such as Makecode or Scratch, with which it is possible for children or young people to learn to program using a robot within the game.

C. *Educational hybrid games*

Various aspects of the games have been raised; on the one hand, board and physical games, and on the other hand, digital games. It should be noted that it is possible to merge both types of games. The use of cardboard mixed with the technology of the video game console could be a general idea of the combination of these games.

Nintendo and the Institute of Play created Nintendo Labo, which is a cardboard kit with which it is possible to build various figures. With the help of the Nintendo Switch console it is possible to merge physical play with the creativity of digital play, resulting in benefits that each one possessed individually [9].

Over time, Nintendo Labo has been brought into the curriculum of 100 schools in the United States; therefore, the Institute of Play created a guide for teachers with examples of some lessons.

D. *The lottery game as an educational tool*

The origins of the lottery come from Italy in the year 1400, where the lottery game consisted of choosing five numbers out of 90 possible, the winner was the person who correctly predicted or guessed the winning numbers [10, 11]. Some time later, the lottery game was brought to New Spain in 1769; although this game was exclusive to the upper classes, this did not prevent it from becoming popular among the rest of the population, mainly among the soldiers of the war of independence.

After these events, the lottery tradition was brought to traveling fairs; without an official version of the game, people made their own versions of the lottery, until Clement Jacques, who was a French businessman, marketed the definitive version of the lottery at the end of the 19th century.

The lottery is one of the most fun and easiest classic games to play, since a large part of people know its rules. Teachers have manipulated this game to take it from a simple entertainment game to a good method for teaching and learning. For example, a lottery with multiplication tables, which allows students to practice them and reinforce their knowledge. Thanks to the ease of making your own version of the game, the lottery has been adapted to learn mathematics in several schools [10].

Another example of lottery is the following: the teacher gets a card with a number, and the student must find an operation that results in that number. These types of games force children to perform mental calculations and due to the pressure applied by the game, children must quickly process the arithmetic operations [11]. Some other complex lotteries could be created, carrying out mathematical calculations according to the educational school level at which it is aimed.

E. *The Bingo game*

In a paper about the Bingo game [12], an interesting proposal is shown, which suggests taking a well-known game and making small modifications to it, such as adding questions. This method was used for evaluation at the American Osteopathic College of Radiology Breast Imaging Innovations conference. With this proposal, students were able to obtain additional knowledge that would benefit their studies. In addition, teachers who apply the game in their activities, retain information from the questionnaires, also managing to keep their students entertained. Although it may not be the perfect game, since it was commented on the fact that there is a little luck on the part of the classic Bingo game and the lack of immediate feedback, it is a good start, since it can be improved until reaching the desired results.

In another paper about the game of Bingo [13], the complexity of some concepts such as non-technical skills is presented, this being a complex and sometimes boring topic for students. The paper proposed to acquire this knowledge in a more interactive way by using the Bingo game, so the participants are provided with game cards and videos are shown, of which the students have to look for a similar example in the cardboard they have. Subsequently, the students must go on to defend their answer in a discussion with the teacher and his other classmates; this is where it is possible to provide more knowledge in case the justification is superficial.

This activity provided an interesting solution to the problem presented previously, despite this, problems such as the following were found again: that some players took longer to understand the game, that not all the players liked watching the videos. In this sense, it should be considered that everything can be improved in these aspects.

III. EXISTING TOOLS

This section analyzes a series of lottery games and tools, indicating their features and limitations. The objective of the analysis was to compile information about the relevant features of each lottery, with which it was possible to determine the features that the proposed web application would have. A comparative analysis of the tools is also provided at the end of the section.

A. *Cholla*

It is a website to play the Mexican lottery [14]. At the beginning of the game, the website provides the option to choose a room and shows the number of players in each room. Once a room is selected, the website allows users to assign a name and choose one of the nine boards available to be played with. Each board has various drawings related to the classic Mexican lottery.

Concerning the game interface, the left side panel of it displays informational messages about the game; there is a counter that indicates the time left until the game starts; and the ways in which a game can be won are specified, with their corresponding scores. The central panel of the interface shows the lottery card with which users are playing, with a total of 16 images. Finally, in the panel on the right side users have the room number and the participants in the game; in addition to a chat that is shared by all participants in the game.

Cholla has automatic players or bots, which allows a player to play alone. On the negative side, this website does not have the option to customize the cards, that is, they are all already preloaded in the system. It should be noted that the proposed web application will allow their users to load new cards, which will be created from images that the teacher specifies.

B. *JusoGames*

It is a game [15] that was developed in Unity. The mobile application has a screen where the user can select the lottery to play, in this case there are nine different lotteries available, there is also a button to return to the main menu and a button to show more lotteries. If the player selects the classic Mexican lottery, the cards of the lottery are displayed at the top of the screen, and the player can start playing.

It is not possible to create new lotteries with different images in this mobile application, only the classic Mexican lottery and some variants of it are available. It should be noted that it was not possible to play with this mobile application, since its servers were not available at the time of testing its operation; this game may have already stopped operating.

C. *PlayLoteria*

It is a website [16] where a person has to be the host of the game and provide a code to the rest of participants to enter. The system will show random cards on the screen, which the host must read. Although the idea of this game is good, since it tries to represent the way in which a physical lottery is normally played, its dynamics necessarily require other people to be able to play it, since they must select the spaces of their cards according to what the host is reading. Due to this reason, it is a game that is not intended to be played completely online with other random people or alone.

At the beginning of the game there is a web page where users have to provide the room number (code) to which they want to enter. It should be noted that any user has the possibility of serving as host of a new game. In the main web page, the host must read the cards to the rest of the players; at the top right of the web page is the room number the user is hosting. It should be noted that in this website is not possible to create new lotteries with different images, only the classic Mexican lottery and some variants of it are available.

D. *Bingo lottery*

It is a website [17] that presents a home page, where users can start a new game or join an existing one. On the same page it is possible to log in and select the language. There is a web page where users can choose the board they want to play with; the available boards in the website are from the classic Mexican lottery. Once the user has chosen the card and the game starts, it can click on each image to select it. There are some text areas to send and receive messages from the system or other players.

The website shows the cards and an audio is included, simulating that a person is reading each of the cards. There is also a chat to interact with other players. A disadvantage of this game, like the other games described in this section, is that the Mexican lottery is the only one available, and it is not possible to create new lotteries with other topics or different disciplines.

E. *Google lottery*

It is an online lottery game [18], where users can choose to play with friends or play a random game. The game has two sections in the left panel: the upper section indicates that it is possible to win the game by completing any of the four corners of the board that the user has; the bottom section shows the four opposing players. In the central part of the page the board owned by the player who is playing is shown. Finally, on the right side of the screen there are images that represent the beans that players normally place on the board when playing the lottery physically;

the deck of cards is also presented, which will be passed one by one with the audio of their name (the fish, the world, the watermelon, the bell).

An important feature of this lottery is that each card has an associated audio, which plays when the card is changed; it also has typical Mexican music playing during the game. It is not possible to create new lotteries with images from other areas or disciplines, nor is it possible to modify existing cards or boards. The game only has the classic Mexican lottery already predetermined.

F. Platform of lottery games

It is a platform [19], where it is possible to edit the lottery cards and modify some other aspects of the game. There is a free limited version of the platform, which allows a certain customization of the game, it is only possible to have 3x3 boards, and with respect to the images it is only possible to choose from those that are already preloaded in the system. It should be noted that the platform generates the games, but it is not possible to play them online, since its objective is for users to print them to play physically. It is possible to create different types of games in the main page of this platform.

Focusing attention on the lottery or bingo, it is possible to create and print 3x3 boards with the desired selection of images. The user can select 15 images and then click on the create button, which will randomly generate 16 different bingo boards. Users have the possibility of returning to choose other images, print the boards, reload the page or close it. It should be noted that these boards are for printing and playing the lottery physically, since it is not possible to play online.

There are more existing lottery websites, however, they are not included in this section, because they only allow the generation of cards and boards to be printed and played physically. While it is interesting to have websites like those mentioned, they are not relevant to this work.

G. Comparison table

This section provides an explanation of important features found after analyzing the previously presented tools, as well as the features that the proposed web application is expected to have. Table 1 shows a comparison of these features. The tools shown are the following: T1) Cholla; T2) JusoGames; T3) PlayLoteria; T4) Bingo lottery; T5) Google lottery; and T6) The proposed web application. The tick indicates that the tool has the feature, while the cross indicates that the tool does not have it.

Table 1. Features of the analyzed tools and the one proposed

Features	T1	T2	T3	T4	T5	T6
Administrator mode	×	✓	✓	✓	✓	✓
Web Application	✓	×	✓	✓	✓	✓
Add images	×	×	×	×	×	✓
Add audio files	×	×	×	×	×	✓
Store the generated game	×	×	×	×	×	✓
Interactive graphical interface	×	✓	✓	×	✓	✓
Timer	✓	✓	×	×	✓	✓
View Score	✓	✓	×	×	×	✓
Chat	✓	×	×	✓	×	×
Help button	×	×	×	×	×	✓
Restart	×	×	×	×	×	✓
Language selection	×	×	×	✓	×	×
One player	✓	×	×	✓	✓	✓
Sound	×	✓	×	✓	✓	✓
Bots	✓	×	×	×	×	×

Administrator mode. This feature is essential for the system, and it refers to the functionality that allows the teacher to create new types of lotteries, including boards and cards.

Web application. This feature refers to the fact that the tool is a web application, which resides in a web server and can be displayed through a web browser.

Add images. This feature refers to the functionality that allows a teacher to load or change the lottery images, create new boards and lottery games.

Add audio. This feature indicates that it is possible to add audio files associated with each lottery card, which is very useful for practicing the pronunciation of a word.

Store the generated game. This feature refers to the functionality that allows users to save in the system the created lottery games, along with its cards, images and audio files.

Interactive graphical interface. This feature refers to the functionality of the system to interact with the user in response to certain events.

Timer. This feature indicates that the system allows to know how much time the user has before switching to the next lottery card.

View score. This feature indicates that the tool provides a form of scoring according to the game, which can be viewed in a specific screen.

Chat. This feature refers to the functionality provided by the tool to have a chat window to establish communication between players.

Help button. This feature indicates that the system has a help button with instructions or indications to carry out certain activities in the game.

Restart. This feature refers to some button or image within the tool that allows the user to restart the game that is currently being played.

Language selection. This feature indicates that the tool allows users to change languages. For example, between English and Spanish.

One player. This feature refers to the functionality that the tool provides so that a player can play alone. It does not need other player to start a game.

Sound. This feature indicates that tool has the functionality of providing music or ambient sound while the user is playing the game.

Bots. This feature refers to the functionality of having one or more bots that automatically play against the participants who are playing.

IV. PROPOSED WEB APPLICATION

This section presents the proposed web application. It describes the modules with the functionality that the web application will have, and shows some of the interface prototypes created.

A. Functionality

The proposed web application has an interface through which the teacher can create and save custom lottery games to be played by students. The modules that compose the web application are the following.

Lottery main page. These are a set of modules in charge of managing the different types of lotteries that will be possible to have in the system: classic Mexican lottery, customizable lottery and lotteries created by users.

Game mode selection. This module corresponds to the functionality that allows users to choose the way in which they will play the lottery game.

Card selection. This module refers to the functionality that allows users to choose the lottery card they wish to play with (the cards will be randomly generated).

Lottery game. This module corresponds to the functionality that allows designing the classic lottery game. This module may be reusable for the customizable lottery.

Customization screen. This module refers to the functionality to request the number of lottery cards and accordingly it will allow the creation of the corresponding spaces.

Image and audio customization. This module corresponds to the functionality that will allow editing a lottery game, loading images and audio files.

Responsive web design implementation. This module refers to the functionality to allow the web application to be displayed correctly and proportionately on any type of device, whether desktop, laptop or mobile device.

Repository for user-created games. This module corresponds to the functionality to have a repository that allows the storage of games created by users.

Database design. This module refers to the functionality associated to the relational database, with its entities and attributes, making a representation through an entity-relationship diagram and a relational diagram.

B. Interface prototypes

The design of the web application interface was represented through prototypes, which allowed greater clarity to develop the functionality of the system.

Figure 1 shows the initial page of the web application, which shows three cards with the options that the user can choose: *Classic Lottery* (in blue), with which the user can play the classic Mexican lottery; *Create your own lottery* (in yellow), with which the user can create a personalized lottery; and *Existing Lotteries* (in orange), with which the user can access all the lotteries already created in the web application. Additionally, there will be two buttons at the top: the first button is the system help, with instructions about the game, and the second button is the login to access the system as teacher or student.

When selecting the *Classic Lottery* (in blue) from Figure 1, the web application will prompt the user to choose the game mode, as shown in Figure 2. The game modes available in the web application will be the following: 1) *complete a row*, which means that the lottery game will be won by completing any of the rows on the board; 2) *complete a column*, which means that the lottery game will be won when the user completes any of the columns on the board; 3) *complete a quadrant*, which means that the lottery game will be won if the user completes any of the quadrants on the board; and finally, 4) *complete card*, which means that lottery game will be won only if the user completes the entire card.



Figure 1. Web application home page.

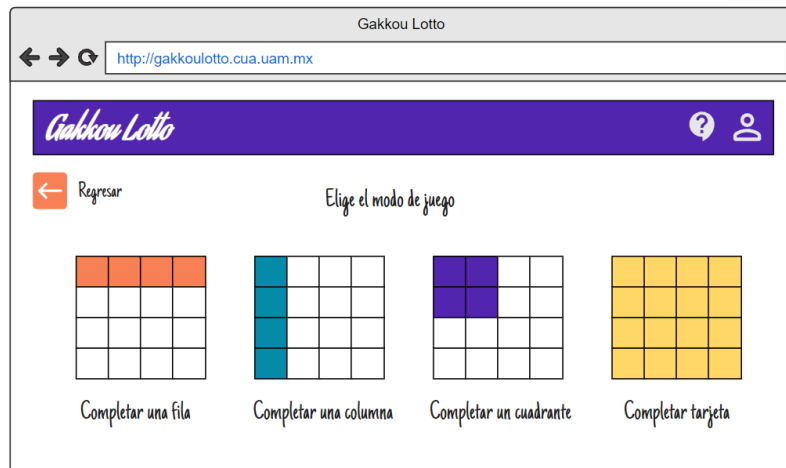


Figure 2. Interface to select the game mode.

Figure 3 shows the web page for the user to select a card to play. On this page the user will be presented with three different types of cards, so they must choose one of them to continue. Once the user has chosen the card, the game will begin. Figure 4 shows the lottery game interface. On the left side there is the set of cards that will be revealed so that the user can search for them on their card; in the lower left there is the time it takes for one card to exchange for another. In the central part the card that the user chose to play is shown; the user must click on the image that corresponds to the uncovered letter. Finally, on the right side there are the cards of the opponents, where the user can see how their cards are being filled.

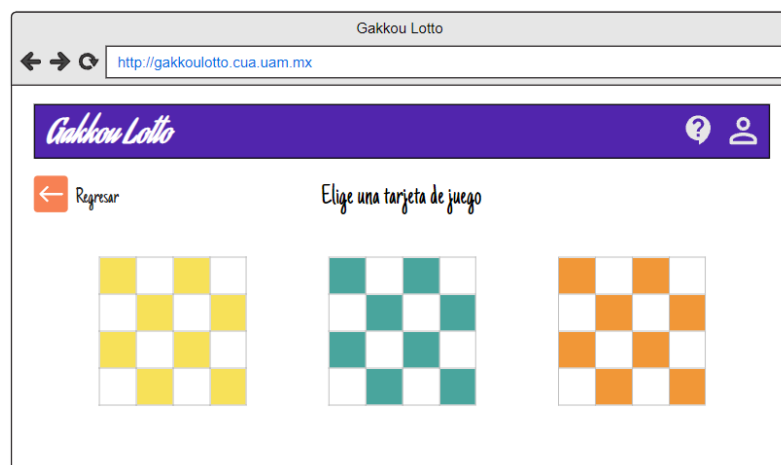


Figure 3. Interface to select the lottery card to play.

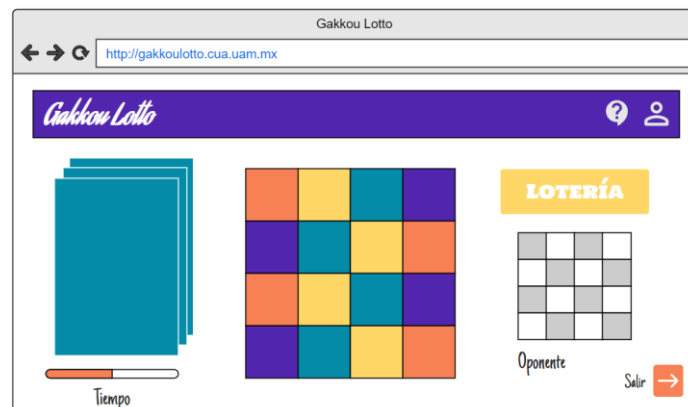


Figure 4. Interface to play a lottery game.

Figure 5 shows the lottery creation page, in which the user is asked to specify the number of cards that the lottery will have. According to the number of cards that the user has specified, in Figure 6 the same number of buttons will be displayed to load the images and audio files corresponding to the cards of the lottery that is being created; it also has a button to save the lottery.



Figure 5. Interface to create a new lottery.

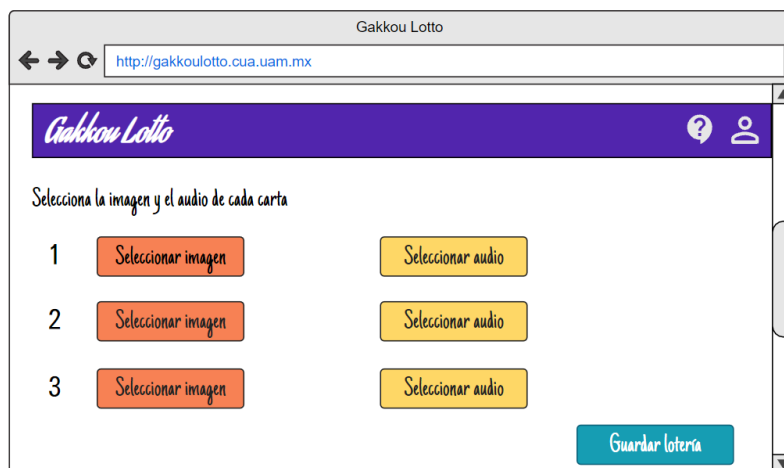


Figure 6. Interface to upload image and audio files.

By clicking on each of the *Select Image* or *Select Audio* buttons, a dialog box will open to select the file the user wants to upload as an image or audio for the lottery, as illustrated in Figure 7. Once the image and audio files have been uploaded, a thumbnail of the image will be displayed and the option to listen to the audio uploaded by the user will be given, as shown in Figure 8.

Once all the image and audio files have been uploaded, clicking on the *Save Lottery* button the system will display a dialog box in which the system requests the name of the lottery. The creation of the lottery is finalized with this step, and it is ready to be played.



Figure 7. Interface to select an image or audio file.

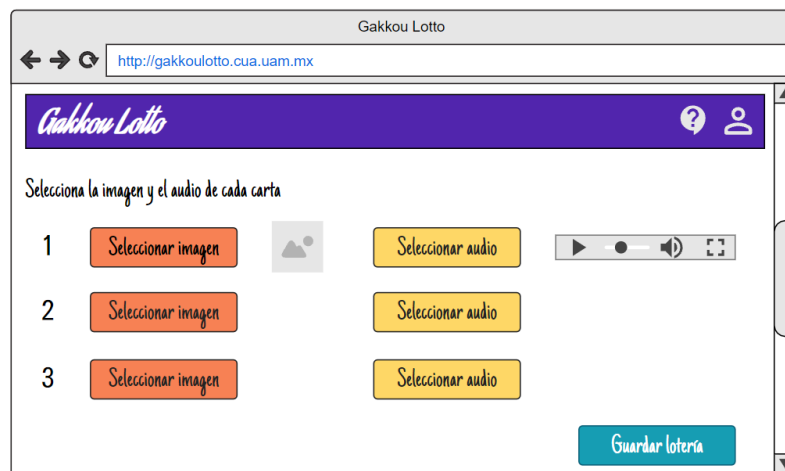


Figure 8. Interface with image and audio files already uploaded.

V. CONCLUSIONS AND FUTURE WORK

This paper presented a proposal of a web application to create lottery games for educational purposes, with the aim to be adapted to several disciplines. The web application will have two users: teachers and students. Teachers will be able to add their own images and audio files, in order to create their own lotteries; while students will be able to play the different lotteries created by the teachers. The modules with their functionality were described and some interface prototypes were shown.

The paper presented various studies that proved that lottery games allow people to practice reading, writing and pronouncing a language. In addition, this game puts into practice visual and auditory perception, visual discrimination, visual and auditory memory, as well as motor coordination.

It was also carried out a comparative analysis of some similar existing tools. The most relevant features were highlighted, such as the presence of an administrator mode, the use of an interactive graphical interface, the possibility of storing the lottery game created, the possibility of adding new images and audio files, the use of a timer, the presence of language selection, the presence of sound, the number of players, the presence of a chat for communication between players, among others.

Further work is needed to complete the development of the web application for both users: teachers and students. The web application will be evaluated by teachers and students in four aspects: functionality, usability, design and didactic features. It is also planned to put the system on a web server so that teachers and students can use it to create and play their own lottery games.

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