
LudoPor – Plataforma de Criação de Jogos de Palavras

LudoPor - Word Game Creation Platform

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Resumo

Este artigo apresenta uma abordagem para uma plataforma digital para criar Jogos de Palavras. Para a elaboração deste modelo pesquisámos jogos de palavras como o Trivial Pursuit, Scrabble com a intenção de saber as razões do seu sucesso. Baseados nesta pesquisa propusemos um modelo conceptual utilizando conceitos chaves presentes em muitos desses jogos. Este modelo define um Mundo de Jogo e os seus conceitos: o Tabuleiro, o Jogador, os Desafios, os Objectivos e os Indicadores de Desempenho. De seguida criámos o LudoPor. O LudoPor é uma plataforma que utiliza parte deste modelo para criar jogos de língua portuguesa. Esta plataforma foi criada iterativamente começando em simples protótipos de papel até um protótipo de alta funcionalidade utilizando testes com utilizadores como principal linha de orientação. Para ajudar nesta tarefa tivemos a ajuda de muitos utilizadores incluindo pessoas do Ciberdúvidas (uma comunidade de língua portuguesa). Este protótipo de alta funcionalidade tem também como objectivo criar jogos para o Ciberdúvidas de modo a que possam ser utilizados no seu Portal da Internet.

Palavras-chave: Jogos de Palavras, Plataforma para criação Jogos, Mundo de Jogo, Mecânicas de palavras

Abstract

This article presents an approach for creating a platform for creating Word Games. We researched successful word games such as Trivial Pursuit, Scrabble and more to establish reasons for their success. Based in this research we proposed a conceptual model using key concepts present in those games. The model defines the Game World with concepts such as the World Representation, Player, Challenges, Links, Goals and Performance Indicators. Afterwards we created LudoPor - a prototype of a platform using some of the referred concepts. The prototype was made using an iterative design starting from paper prototypes to high fidelity prototypes using user evaluation tests to guide the right path. In this task we had the help of many users including persons of Ciberdúvidas (a Portuguese language community). Another objective of LudoPor was to create games for Ciberdúvidas that would be shown in their website.

Keywords: Word games, Game Creation Platform, Game World, Word games Mechanics

1. Introduction

This article shows an applied investigation to develop that can be used to create successful word games. To create such model, we first researched successful Word Games to establish their reasons for success and, based on those reasons, we elaborated a proposal for such

model. Finally we made LudoPor, a platform that uses a trimmed version of the proposed model to create Word Games. So our goals and contributions with this work are:

- Discussion about success elements in Word Games;
- A conceptual model for creating word games that incorporates those success elements,
- A platform with the key concepts of the conceptual model able to create word games.

This research was motivated by two factors: the increase in the interest in word games and the possibility of their use for education and learning.

Our main focus in word games was the casual games. Developed for the general public and families, casual games are video games that are fun and easy to learn and play. They have simple controls and additive Gameplay, but still played in a short amount of time.

There are several types of gameplay in the casual gaming such as Click Management, Hidden Objects, Adventure, Match 3 or more and Word games. The Word Games had a recent grown in the number of available games and popularity as we can see in the following figure 1.

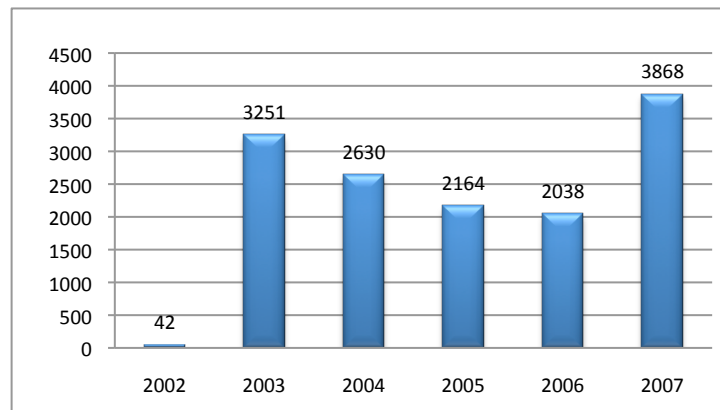


Figure 1 Evolution of Word Games Scores

Figure 1 shows the progress of the popularity of word games. The score relates the genre of casual game with the top of most played games per week. In the figure we can see the cumulative scores per year for the genre Word Games. [1].

As we can see Figure 1 Word Games are popular. But could this popularity be used not only for relaxing but also for learning purposes? Recently a series of report and studies about the use of games in schools has been conclusive.

As stated in “Games in Schools Report” [2], made for a partnership between the European Schoolnet¹ (EUN) and the Interactive Software Federation of Europe² (ISFE), games can provide a valuable resource in schools and education. They can extend outside the classroom and provide a digital platform for study aids.

Also teachers who use games have a positive, opinion of the impact of games on their pupils learning. The positive impact on a wide range of skills is emphasized: personal skills, spatial and motor skills, intellectual, technical and social skills. Also a very important result is the

¹ <http://www.eun.org/>

² <http://www.isfe-eu.org/>

effect on pupils' motivation to learn, closely followed by the support given to pupils with difficulties [3].

This relationship on the use of videogames and students with difficulties is also established in "The Therapeutic Value of Video Games" [4]. In this paper the author states that, given the correct context, games can have a positive therapeutic benefit to children with particular emotional and behavioural problems (Attention Deficit Disorder, impulsivity, autism).

But for these games have to be made by specialists or communities which may not have the gaming and computer knowledge to make them. So with this work we tried not only to show success elements in word games but also to create a conceptual model that incorporates those elements.

To create a platform able to generate Word Games, based on this work we had the help of Ciberdúvidas¹. They are a community specialized in the Portuguese Language. In their internet portal, they answer questions send about several subjects concerning all aspects of Portuguese Language, for example, the origin of words, grammatical issues, and more.

They want to add some dynamic and interactive content, such as games to increase diversity in the website. So they cooperated with us to provide information and help in creating a platform that allows them to create such games. The games themselves should not be the main reason the users go to the website, but to increase motivation for them.

Since the platform is made to be used by this community, the generated games must have distinct characteristics. They should be able to be educational, use word games, must be able to approach an adult audience (the main target of the website) and must able to be distributed over the internet.

The platform is focused to be used by a community that has little or none computer programming skills so the platform has to be graphical and should be easy to work with.

In conclusion, word games are popular, can be used for education and are made for a specific content. Therefore it raises the need of a platform for creating word games which can be usable by teachers, educators and others that have little knowledge in creating computer games.

2. Word Game Mechanics

In this section we present a review of several word games. With this review we have two goals, to understand and collect the success factors and to retrieve the basic rules and mechanics in the most successful word games.

Word Games are usually played has a source of entertainment, but they also have an educational purpose. The most important characteristic to retain of those games is the way that they are played – their gameplay mechanics.

¹ <http://www.ciberduvidas.pt/>

We reviewed over 12 games – Crosswords¹, Hangman², Scrabble³, Trivial Pursuit⁴, Word Chain⁵, Boggle⁶, Scattergories⁷, Bookworm⁸, True or false quiz, Mad Libs⁹ and Matching games.

While reviewing the word games, one of our focuses was identifying the mechanics of the reviewed word games. What are their characteristics and indications and discuss the problems and advantages of using each one.

Game mechanics shows how these games are played. Separating the way that they are played from other components such as setting or story is very important so that the future platform create games that use predefined mechanics. We found six word game mechanics: *Questions and Answers*, *Multiple Choice*, *Matching*, *Filling in the Gaps*, *Word Forming* and *Word Searching*.

Questions and Answers consists in asking a question to a player. The player must remember or discover the answer. As we can see in Figure 2, Trivial Pursuit is a good example of how this mechanic can be used. They can also have *hints* to help the player find the answers. By example, the game of crosswords shows the size of the word and may show some letters of it.



This mechanic has one problem – it is difficult to do automated correction correctly. In direct questions it is only possible by accepting as correct various equivalent answers. But even then we cannot program the game with having every synonym that the answer has. This problem is visible in Trivial Pursuit where a written answer is equivalent (but not the same) that the players answer. In those cases usually team asking the questions recognizes and allows the answer. When using hints we can force an exact answer, but it is frustrating for many players.

The mechanic has a very good characteristic, it is very luck independent since a player can try and guess an answer, but he or she has to do it with his own knowledge.

The Multiple Choice is a mechanic similar to the *Questions and Answers* with the difference that the correct answer is shown together with some wrong answers while *Questions and Answers* does not show any answers. Multiple questions can take two different forms – *Dual Answer* and *True or False*.

Dual Answer is a *multiple choice* that has only two answers. The correct answer depends on the sentence that it is inserted. It is usually used in grammar so that it is possible to test difficult situations where two similar words can be used. In this situation the luck factor became more critical as there are fewer options.

¹ <http://en.wikipedia.org/wiki/Crossword>

² [http://en.wikipedia.org/wiki/Hangman_\(game\)](http://en.wikipedia.org/wiki/Hangman_(game))

³ <http://www.mattelscrabble.com/>

⁴ <http://www.hasbro.com/trivialpursuit/>

⁵ <http://www.wordchains.com/>

⁶ [http://www.hasbro.com/common/instruct/Boggle_\(1973\).pdf](http://www.hasbro.com/common/instruct/Boggle_(1973).pdf)

⁷ <http://scattergories.net/>

⁸ <http://www.popcap.com/gamepopup.php?theGame=bookworm>

⁹ <http://www.madlibs.com/>

True or False is a mechanic where the player has to find out if a sentence is true or false. The player has to use his own knowledge to assert the sentence. It may be required that the player justifies its answer. This technique is used to stop some players that try to guess the answer by luck (the luck became more critical due the lack of choices).



Figure 3 - True or False Quiz Screenshot

Multiple choices as the disadvantage of having luck involved and players may rather guess instead of trying to determine the correct answer. One other problem of *multiple choice*, is that it must be well made, or it can create ambiguity in interpreting the question. In that case it may result in an incorrect answer even that the reasoning is right. On the other side *multiple choices* is easy to correct since they allow automated correction and can be a fast way to assess knowledge.

A popular way to test player's knowledge is to make them play a game that requires *Matching* two elements. Match games are played by a player creating a sort of connection, such drag and drop in the digital version or a line in the paper version, between two or more elements of the game, such as words and a sentence, two words or two sentences or many other possibilities. The classical *Matching* mechanic is having two columns and having to connect elements from the left column to the right column.

Match Games is a type of mechanic to consolidate knowledge or train memory of players. Most times this is used in definitions and to complete sentences. This mechanic is capable to be corrected automatic, since it is just needs to know what are the correct connections between elements.

Filling in the Gaps is a mechanic that can be also a form of assessing knowledge. It consists in having open spaces that the player must fill in other to complete a sentence or a text. It can be played in two basic ways that can change it's the educational value.

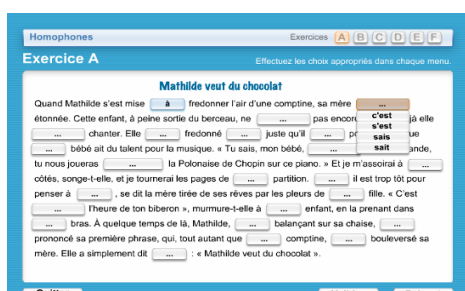


Figure 4 - Filling in the Gaps in Educational Variant

As we can see in Figure 4, the mechanic for education is played with the player knowing the text. It exists usually in two different methods. One is using several options (*multiple choices*) for each gap. Another is showing the word (on a present tense) first so that the player has to conjugate the word in the correct tense of the phrase. This mechanic is easily adaptable to other educational content.

It is very good to consolidate knowledge since it requires interpreting the text while training grammar. It is also of easy correction since it is just necessary to check the word filled. A problem of filling in gaps it is that is necessary to create a whole text to make one exercise and the gaps in the text must not allow second interpretations or the player can became confused.

Word Forming is the mechanic that using a limited number of letters a player forms one or more words. It is one of the most popular mechanics of the games in casual games distributed in the Internet.

This mechanic is usually used for vocabulary. It can be used for other subjects like grammar or text interpretation, but it is not because the mechanic is difficult to control. The most effective way in controlling is to limit the formed words to a category.

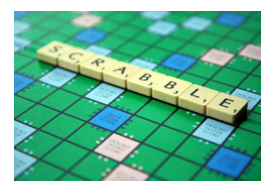


Figure 5 – Scrabble Word Forming Example

The correction of this kind of mechanic is pretty straightforward. It is just necessary to see if the formed word exists and is valid or not. It is possible to be done automatically provided that we have a list of all words in digital form.

Many of the games reviewed use this mechanic - Scrabble, Word Chain and Chicktionary. *Word Forming* allows several variations being the most popular: *Board Word Forming*, *Letter Rearrangement* and *Word Substitution*. *Board Word Forming* is played by having a limited number of letters and form words by joining them with words or letters already made in the board. It is the type present in Scrabble.

In *Letter Rearrangement* we have a limited number of letters and the task is to form words reusing only those letters. The main difference between *Board Word Forming* and *Letter Rearrangement* is that in the latter we reuse the same letters to form words. Chicktionary is an example of a game using this type of *Word Forming*. Finally *Word Substitution* is type of *Word Forming* where from a previous word we replace only one letter to form another word.

Word Searching is a mechanic played by having a grid and searching a word in the letters on that grid.

The game can be played by searching words in the 8 directions on a grid. The words can be shown before searching or not. The words can be searched in a straight direction or changing directions after a letter as we can see in Figure 6. Today almost all the reviewed games use a random letters in the grid.



Figure 6 - Bookworm Screenshot using a Word Searching mechanic

Educationally this mechanic is very similar with *Word Forming*. It is indicated for vocabulary but it is easier to adapt into asserting any educational subject. The biggest problem of that is that like the answers are in the grid so the mechanic rewards good searchers (provided that if they see the answer they will recognize it) and not people that knows the answer.

One good characteristic is that this mechanic is easy correction and is possible to have automated correction as well – it is just necessary to have a list of solutions for each grid (if pre-made) or assert if the word made exists and is valid

Luck	No	Yes	No	No	No	No
Adaptability to Content	Easy	Easy	Easy	Easy	Difficult	Difficult
Hints	Yes	Yes	Yes	Yes	Yes	Yes
Automated Correction	No	Yes	Yes	Yes	Yes	Yes

Following is a table comparing the several mechanics by hints, adaptability to content, luck and possible automated correction.

Table 1 - Word Mechanics Comparative Table

As we can see the only word game mechanic where luck can play a determinant role in gameplay is in Multiple Choice. All mechanics can have hints supporting the game and only questions and answers don't have automated correction. In terms of Adaptability to Content, Word Forming and Word Searching are difficult to adapt while other are easier. From this table we can see that the best mechanics to create a word game are filling in the gaps and matching since they allow hints, automated correction, and easy adaptability to content and are less influenced by luck.

The reviewing of games allowed understanding some factors for their success. The first important conclusion was that all the mechanics are simple. But in order to be very good at those games requires learning a great deal of information and that is one characteristic that we are very interested – the educational purpose. For example anyone can play Scrabble but the best have huge knowledge of their vocabulary

A feature common to some is that they are Party Games. These games are made to be played in groups and require an amount of social interaction, making them adequate to be played in a community. This also adds an interesting aspect to games, the competition. Adding some competition to educational games is a good technique to try to push its players to learn but it's also something to be careful about since not all players are competitive.

The individual word games are usually games with none or little pressure. They are made to relax the player while “teaching” them. Mechanics of such games are simple but have some sort interaction like searches on internet for hints or a possibility of losing based on the player performance. These techniques increase playability and decrease the monotony of these games when played for a long time.

Finally some of the games reviewed are “training” games –where the player has the perception that he has problems in some Language aspect (like grammar) and wants to train that aspect. These games are made to be educational.

3. Conceptual Model

Many successful word games like Trivial Pursuit do not have only mechanic as their unique components in the whole game. They have players, spaces to navigate, tasks to complete, goals to win and more. These components make the game more entertaining and more compelling and are the foundation of the Game World.

The Game World is the universe that is represented in the game. These games with story, several paths, players and different goals can create longer and better player experiences.

Each game has its own game world and while some are simple, like in Tetris¹, other can be very complex like in World of Warcraft². The use of such game worlds has different effects on players. Some players like the richness of these game worlds and it increases their enthusiasm to play while others may be bored by the amount of time and effort used to detail the world especially if the story or setting adds little to the game. A common way used by games to reduce the time and information needed to present the game world is to use worlds or parts of worlds already known to players.

We researched about the characteristics of Game Worlds in the in the reviewed word games and made a list of 5 key concepts. They are: a World Representation, Players, Challenges, Performance Indicators and Goals. In our model we chose a Board to represent the world.

The Board is a common world representation used with success in many games like Trivial Pursuit or Scrabble. It consists of a set of tiles that represent the environment of the game.

The use of the board as the world representation has the benefits of being flexible since it allows different contexts to be used (just like using maps for geo-positioning or timelines for time). Also, since it has been widely used, it provides a familiar feeling to players.

Boards can be either dynamic or static. Static boards are characterized by not having any changes relevant to gameplay by itself throughout the game. They are “player-centric” were the player actions are responsible for the changes on the board which increases the focus on the challenges.

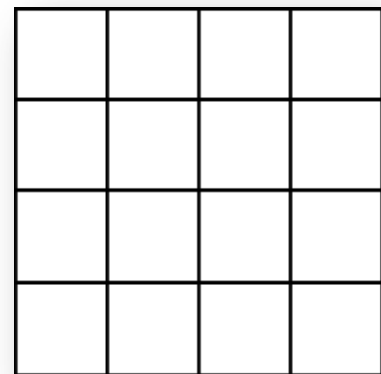


Figure 7 - Set of empty Tiles

In dynamic boards the board changes on its own throughout the game. For example in a war game where non-playing characters (NPC) fights each other and the player for resources. The evolutions of the NPC are parallel of the player and the world changes besides the player actions. In addition to other players there are some other elements that can influence dynamic game world like time or specific items. For example, the player has a special item that make a multiple choice challenge to remove an incorrect answer automatically.

Games may require the use of one or more different boards to describe the game world. Allowing several boards adds a possibility of having different rules and layouts on each board. For example, a game where in one board is dynamic and in another board where is static. It is important to allow this, because it may be necessary to extend the story or to stimulate players.

Challenges are specific tasks that the player must perform to advance in the game, for example, in trivial pursuit the challenges are the questions made to



Figure 8 - Tile with a challenge

¹ <http://en.wikipedia.org/wiki/Tetris>

² <http://www.worldofwarcraft.com/>

player when he stops on a space.

Previously we identified six word mechanics (questions and answers, multiple choice, matching, filling in the gaps, word forming and word searching) that are the core of the challenges.

These simple mechanics can lead to many different implementations and we can always add gameplay elements to the mechanic to change it. For example, adding a multiplayer support to a mechanic of multiple choices where both players compete for the fastest time.

Challenges can also adapt based on the game world. For example in case a player who has low performance indicators the challenge could reduce the difficulty by providing a tip or increasing time limits.

In the same perspective of an adaptive challenge, they could adapt not only according to the player, but also according to context of the game or how many times the challenge have been played. For example, in Monopoly if a player stops at a land that no one owns he can buy it, but if he stops at a land already bought him must pay the rent.

It is important that the game designer can provide a feedback to motivate the player. It can also be used to add educational content. This feedback are multimedia messages from the game for the player and can be shown as video, text, images, sound, presentations or even other games.

Challenges can provide feedback on the player Performance Indicators (time, score and items). There are two types of feedback depending on the player performance, either the player passed the challenge and he gets rewarded or he failed it and gets a penalty. Usually rewards or penalties change score and time, but they can use other methods such as give or remove items of the player or even change the game world altering the layout of the board influencing the player position, player movement or the links around the challenge. This feedback is important to the players to encourage them to continue playing and to create a feeling of accomplishment.

Challenges are connected by links which can be of three types – directional, bidirectional or conditional. Links are very important since they help define the layout of the board as well as the paths that the player can travel.

In directional links the player can only move in one way. These links force the player to choose between paths, in case there is more than a single path, and blocks the possibility of the player to repeat a previous challenge. These links help making games more interactive and to involve the players. Also these links can increase the longevity of the game since most players may want to repeat the game to try other paths.

Bidirectional links offers the choice for the player to come back to the previous challenge. They are important since they add diversity to the games created by the platform and allows more freedom to players.

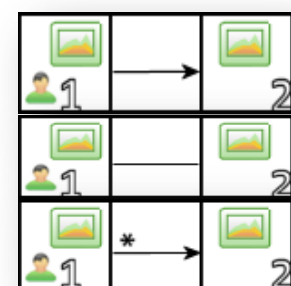


Figure 9 - Directional, Bidirectional and Conditional Link

Conditional links forces the player to complete the condition before allowing advancing in the game. These conditions can be simple, as completing all challenges in a certain place or getting a key to pass a door or a gate. They are very important since they create a sense of accomplishment on players and can work to measure the advancement in the game.

Adding complexity to the game world by increasing exploration can be a double edge sword. In one perspective it can motivate players in exploring the board, but can also bore players that simply want to go to the challenges.

Now that we established the Game World, Challenges and links providing the basic blocks for creating a game, we will now introduce the most important component of the game, the player.



Game worlds have three types of special spaces relating to players: the starting point that is where the player starts, the finishing point (or one of them, in case there are many finishing points) and optionally one or more intermediate goals.



Figure 11 - Tile with a Challenge and the finish line

The starting point does not need any special representation on the game world since it is where the player starts. The finish point has some indication to show that is different and it is goal point for the player. It is usually a mark or a special position on the layout of the board like in Trivial Pursuit. We can also represent the intermediate goals in the board to add a feeling of accomplishment to the player and increase motivation.

The finishing point and the intermediate goals relates with the game Goals. In case of the finishing point is implicit that the game ends there so reaching that point represents a final goal.

An important aspect of players is their state and representation on the game world. The State of a player is basically their actual condition. There are games where the player is stateless and the player remains the same throughout the game. But there are games where the player has different states, for example Trivial Pursuit where the number of wedges represent different states of the player. The player state is normally a reflection of their performance throughout the game.

The avatar is the player representation in the board and it can be a motivation to players. The avatars can create powerful feelings of accomplishment and can motivate players, for example completing a set of challenges awards the player to a special feature that distinguishes him from the other players.

Basically there are two kinds of avatar customization, one which the player is awarded with a special item, and “equips” on the avatar with the purpose of making it look different. In this customization is decided by the player. The second is a feedback of the game between the avatar and the player state – for example, if player fails a challenge the avatar can reflect that using subtle changes like displaying tears on the avatar eye.

Another important aspect of players is their movement. The player movement relates only to games where the player has a choice and therefore has to make a decision in its movement.

Player movement can be linear (moving a pre-established number of tiles) or random. It can also be dependent on player performance (for example, one tile of movement for a challenge won), hybrid (random movement with bonus for good performance) or it may not be dependent and the player always moves a number of tiles per turn.

Also movement can be predictable or not. Predictable movement is if the player can understand that, by achieving a certain performance he will go to a certain point of the world. This implies that the player has enough knowledge of the world to understand where he will go.

Game goals are objectives that the player must accomplish in the game. These objectives can be dynamic, depending on the performance of the player, or static being pre-established by the game designer.

Goals can also be primary, secondary or final. The distinction between these types of goals is how they affect the progress of the player in the game. Overcoming primary goals progresses the player towards final goals. These final goals are where players determine the outcome of the game (either by winning or losing). Secondary goals do not advance the player and exist to reward players and extend the game playability.

The main use of secondary goals is to encourage players in completing different tasks for several reasons. One is to increase the playtime of the game; it can be sometimes used to show non-essential elements of the game world and to appeal to a feeling of accomplishment (for example, completing challenges with a higher difficulty than the required to advance in the game). The principal aspect of the secondary goals is that, while they are not fundamental, they add freedom to a player to explore the game world (world representation, setting, story, etc).

For last Performance Indicators which are statistics to establish the performance of a player throughout the game or a challenge.

There are three usual indicators (score, time and items) which can be applied to the game or to a single challenge. When they are applied to challenges it concerns the player performance only in that challenge.

Score is an arbitrary indicator of a player's skills (usually numeric, but it could also be graphical).

Game Time is a measure of time the player took to finish the game. The Game time is a representation of the time in the game world and not time on real life. In games time can be distorted, illogical and with its own economy (in some games players can trade time for items). Designers also introduce in challenges or goals several different time limits with rewards and penalties.

Finally items are object representations that the player collects and uses. Depending on the setting these can also be used as representation for player's evolution throughout the game.

Items are important to players since they are relevant to the setting and story where the game world takes place. It is also relevant that some players see some items not only for its usable

aspect but as a trophy. In fact in some games it is the only use of the item. For example, it may be motivating for a player to record its score in sort of an item, like stars in Super Mario.

We believe that the use of these concepts as the basis of the Word Games will allow game designers to create games that can motivate players.

4. Implementation

LudoPor was the sixth of an evolution of prototypes with two low fidelity prototypes (made using pencil and paper), one game prototype (made in a computer and printed to be played) and two high fidelity prototypes made in Adobe Flex. All prototypes were tested with possible users of the system with special focus on teachers and educators. We also had help by Ciberdúvidas and their community. In this paper we describe the first paper prototype, the game prototype and the final high fidelity prototype since they were the most important.

The first was a low fidelity prototype made with pencil and paper as we can see in the following Figure 12. This prototype had the main objective of establish if the concepts referred in the conceptual and their hierarchy were clear to the end users.

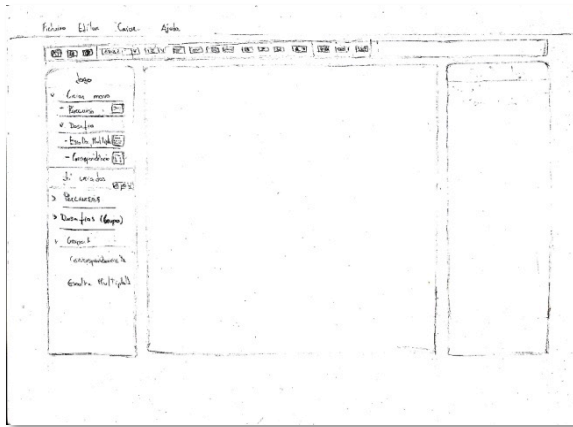


Figure 12 - Board of the first Paper Prototype

This prototype was evaluated by five users. Three of them were teachers that use the computer at a regular basis. The focus on educators occurred since this particular group were the main target audience of the platform. The other users were young adults that worked every day using the computer and were efficient in capturing interface problems.

Users were provided with simple tasks and reported what they would do. It was recorded if the users were able to perform tasks alone or if they needed help and the total time of the session. Besides these stats there were recorded notes of issues and problems that users encountered when experimenting with the prototype.

Users were presented with 11 tasks in this evaluation

- Create one challenge of matching
- Create one challenge of multiple choice
- Create one comment to one of the challenges
- Create rewards and penalties to one of the challenges
- Creating a group of challenges by associating one or more challenges
- Create a path and associate tiles to challenges previously created
- Add a character
- Add Time and Score
- Add time limit to challenges
- Create another path and associate the new tiles to the previous challenges
- Customize the player
- Customize the rewards and penalties

The retrieved measures stated that some users were unable to continue without help and failed in the first five tasks. In those tasks users were lost and did not understand what was to be done and how would it influence the game. The medium time of completing the tasks were about 40 min which most were spending exploring the interface. After learning the interface the users liked the prototype and tried to explore it further.

Since users had problems in understanding the interface it was obvious that the interface had to be simplified. To do so we chose to remove options that users would rarely use. We also fixed consistency problems between windows and interface mechanics.

After this prototype we created a game prototype. This prototype had the objective to establish if a possibly created game with the platform could be fun while supporting educational content.

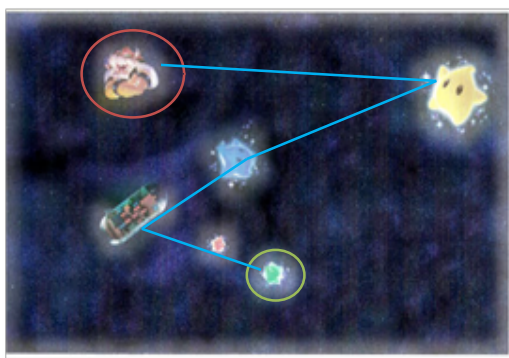


Figure 12 Game Prototype

The game was created using images altered in order to create a board with a path and challenges (Figure 12) as well as characters, comments about the player's performances. We used challenges focusing aspects of Portuguese language.

The evaluation of this prototype was made with a group of five young adult and later with more three young adults individually. The reason for testing in two different ways was that the group

talked and interacted like if it was a party game.

It was not taken any measurement of the player's performance, but notes were taken about the player's feeling towards the game. They were also asked if they liked the game and if they would play it again later. The players had a visible sense of fun and stated that would play the game again.

With good indications on the Game prototype and the feedback on the first paper prototype we elaborated the final low-fidelity prototype.

Evaluation of this prototype was done thought a set of four experts (collages and persons with experience using and creating interfaces). We also contacted some of the previous users to establish if the changes were working. The evaluation was done by presenting the same tasks to users. The results were good with users comparing the two prototypes and choosing the final as the easiest. After some weeks tweaking the design and improving the game creation process with the help of experts and user interface tests it was ready to create a high fidelity prototype.

For last a final high fidelity prototype was made. This prototype was capable of creating word games and featured a reviewed interface. In Figure 13 and Figure 14 we can see a part of such interface.

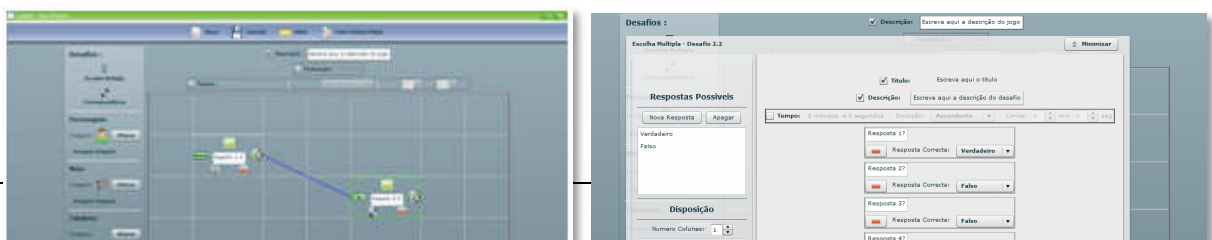


Figure 13 Board with a path

Figure 14 Multiple Choice

Evaluation was made with eight users being four of them educators. It was taken notes and a video about the experience. Users were hand-picked and divided in three separate groups – group one includes teachers or educators, the second includes adults that spend 3-6 hours for week using a computer and finally the last group includes young adults that use the computer more than 10 hours per week. Also relevant for group 1, is that they spend about 1 to 2 hours a week with the computer and use it mainly for professional tasks.

In the user interface test they were faced with eight tasks:

- Create one challenge of multiple choice following an example
- Create one challenge of matching following an example
- Creating a path (choosing a starting and ending challenge and creating a link between them)
- Add Time and Score to the game
- Create comments to one of the challenges
- Create rewards and penalties to one of the challenges
- Customize images (character, board background and challenges)
- Save project, create a game and play it

The tasks were told, not presented with a list, which allowed tests to run more freely. This choice troubled the review of the results but allowed more enthusiasm of the users.

Two users preferred to explore the program for themselves instead of simply following the tasks that I would give them.

As we can see in the following Figure 15, Figure 16 and Figure 17 the results were very good and motivating.

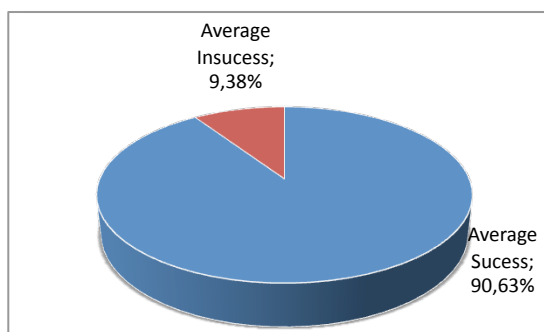


Figure 15 - Average Success Rate in performing tasks

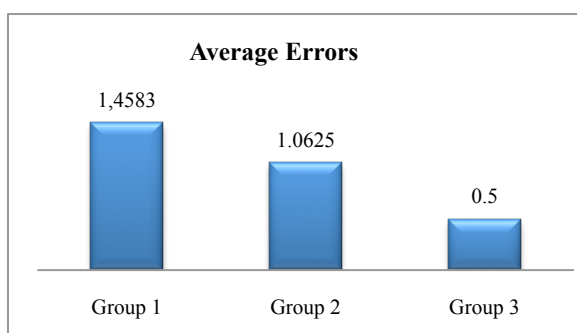


Figure 16 - Average Number of Errors made by group of Users throughout the tasks

There were good results in the average success rate (visible in Figure 15 being over 90% while the number of errors (Figure 16) the average number of mistakes made by the users of target audience (group 1) is 1,5.

In Figure 17, the time taken to complete the tasks was average 06 minutes and 11 seconds by task for the target audience.

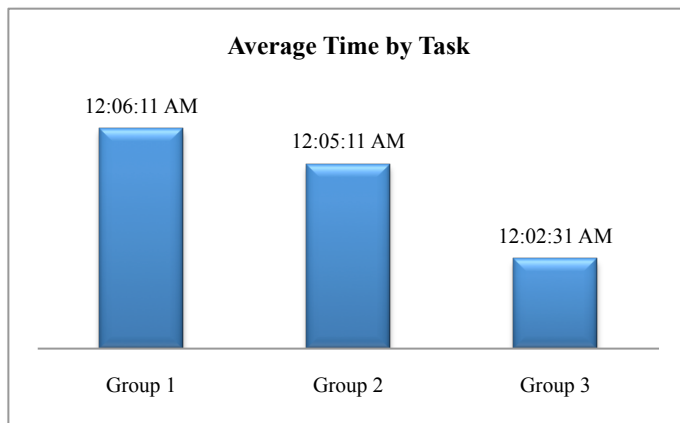


Figure 17 - Average Time that each group took to complete one task

multiple choices and creating a path. These tasks are the core of the process and since they were the most troubled indicates that we must review and further work.

Users also played the games that they generated and seemed to not be disappointed by the outcome. The overall quality of the generated games was good as we can see the following Figure 18 a screenshot of one of those games.

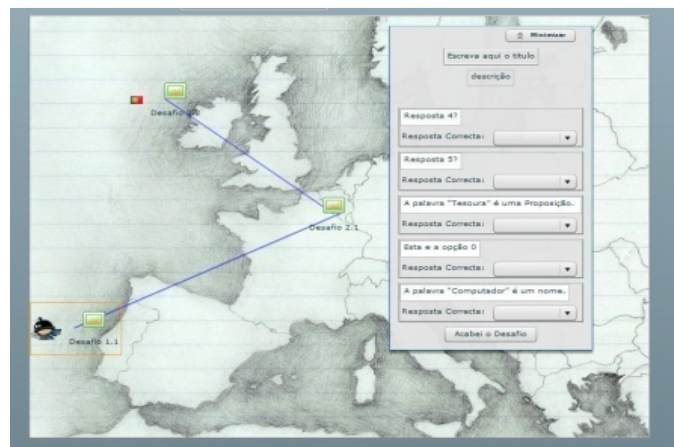


Figure 18 - Generated Game Screenshot

5. Conclusions

In the preceding sections we have discussed the creation of a platform for making word games and showed many success factors, mechanics and possibilities to create word games.

We started by establishing the reasons for success of word games like Trivial Pursuit, Scrabble or Bookworm. We saw that those games could be Party games (played among friends or in a family), games to relax (small games with little or no pressure and made calm down the player) or training games (games focusing of improving skills). An important aspect is that all games were simple to play that required to learn a lot to master.

We also researched and reviewed the mechanics used by these games. We found six word game mechanics: Questions and Answers, Multiple Choice, Matching, Filling in the Gaps, Word Forming and Word Searching.

- Question and Answer - where someone, player or not, asks a question to a player that he must answer without any predefined restriction
- Multiple Choice - faced to a question the player must answer one in a set of predefined answers
- Matching - the player is asked to connect two or more items
- Filling in the Gaps - consists in a text or phrase with open spaces that the player must fill to complete
- Word Forming - using a limited number of letters the player must form words
- Word Searching - the player must search and find words in letters disposed on a grid

After reviewing the mechanics for factors as luck, adaptability to content, hints and automated correction we have seen that, for the use in word games, matching and Filling the Gaps were the best mechanics.

From this work we elaborate the Conceptual Model to create a solid basis for creating a platform able to deliver Word Games. This model consists in several concepts present in most of these games which were the world representation, the player, the challenges, performance indicators and goals.

The world representation proposed was a Board representation for its flexibility and to allow a familiar setting to users. Boards can be dynamic or static (if it changes on its own throughout the game), can have multiple boards case if is necessary to game the game world and each board can have any size.

Next are the items that constitute the layout of the board. We call them Challenges and they present tasks to the player to complete. They have a word mechanic (one of the researched in the Related Work) and they can be adaptive or static. Challenges provide important feedback to the player and influence the game world.

To complete the layout of the board it is important to connect the challenges so that we can control and restrict the player movements and present an engaging experience. To connect the challenges we have Links. These can be directional in case that the player cannot go back to a previous challenge, bi-directional where the player can move at will or conditional where the player must achieve a requirement to move to next challenge.

Having the game world layout complete we must define the player, the most important component of the game. There are three important aspects of players: their state, representation on the game world and movement on game world.

The state can be always the same or it can adapt depending on the progress and performance of the player on the game world. For example, in Trivial Pursuit the number of wedges on the piece is a mark of the state of that player towards the final goal. The player representation is called avatar and can be customized to reflect the state or to motivate players.

Another important aspect of players is their movement. It can be linear (moving a pre-established number of tiles) or random. It can also be dependent on player performance, hybrid (random movement with bonus for good performance) or it may not be dependent and the player always moves a fixed number of tiles per turn. Movement can be predictable if the player can understand that, by achieving a certain performance he will go to a certain point of the world.

Following is the Performance Indicators and it refers to common ways to provide capture and provide feedback to the player about its performance in completing tasks.

There are three Performance Indicators: score, time and items. These indicators can be applied in two ways: it can be applied on the game and therefore relates to the player throughout the game. Alternatively it can be applied to challenges themselves and concerns the player performance only in that challenge.

Finally game goals are the purpose that the player must accomplish in the game. These can be pre-established by the game designer (static goals) or depends on the game world (dynamic goals). Goals can be primary, secondary or final. The distinction between these type of goals is how affects the progress of the player in the game. Overcoming primary goals progresses the player towards final goals. These final goals are where players determine the outcome of the game (either by winning or losing). Secondary goals do not advance the player and exist to reward players and extend the game playability.

Also it was discussed of how the use of those concepts influences gameplay and players. Creating a game world by the use of a board consists of establishing 6 concepts:

- Establishing the game world representation
- Challenges, where we have to form the base layout of game world and choose mechanics and their feedbacks to the player and to the game world.
- Completing the layout of the board, choosing where and how are the links between challenges.
- Finally deciding where the player will start and if applicable where will the player end, as well as defining the player movement, the feedback the game on the player
- The performance indicators (score, time and the use of items)
- Game goals, establishing the primaries goals (needed to advance in the game), secondary's (to increase motivation on players) and the final goals

Using the conceptual model we made LudoPor. This platform was created in an iterative way using user test as the drive for evolving. There were many steps of this platform as two paper prototypes, a game prototype and two high fidelity prototypes. Also we had the help of the community of Ciberdúvidas that tested the prototype helping indentifying bugs, problems with the interface or problems with the process of creating games.

The main focus of LudoPor was to be easy to use but powerful enough to make the complete process of creating word games, which has been achieved. LudoPor can deliver platform independent games using Adobe Flash technology. Because of these focus we opted to use a trimmed version of the conceptual model.

To test the prototype we presented it to eight users and asked them to test the prototype using the following tasks.

- Create one challenge of multiple choice following an example
- Create one challenge of matching following an example
- Creating a path (choosing the start and end challenge and linking them)
- Add Time and Score to the game
- Create comments to one of the challenges
- Create rewards and penalties to one of the challenges
- Customize images (character, board background and challenges)

- Save project, create a game and play it

From this evaluation were retrieved notes about the experience, statistics and a video.

The results were very good in the average success rate (over 90%) and the number of errors the average number of mistakes made by the users of target audience was 1,5. We also seen some characteristics as creating feedback for the player (comments) was more easily understood and better used by the group of educators. Users also played the game that were making and enjoyed the experience.

In the future this platform could grow to use more concepts present in the conceptual model such as items, different links and goals. Also it was planned the implementation of more mechanics such as Word forming for its popularity or Fill in the Gaps for its support to more and different games.

In terms of future research there several paths interesting to pursue. One is the use of multiplayer and the competitive and/or cooperative gaming experience that these games could allow. Another path would be the use of these games in social networks such as Facebook and learn about the mechanisms to interact with communities and how could we use them in our games.

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