

PARAMETERS, STRATEGIES AND TECHNIQUES OF GAME ANALYSIS¹

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ABSTRACT: The development of a game with educational purposes, similar to a game focusing on fun, requires an analysis process, which must evaluate positive and negative points, to support a plan of product improvement. The game *A Mansão de Quelícera*, supported by the CNPq project “*Diálogos entre Arte e Design*” (Dialogues between Art and Design), was reviewed by a group of researchers from different institutions of higher education in Brazil. Different parts of the game were the subject of evaluation and redesign, as presented in two articles presented in SBGames 2012. In this article, the research explores parameters, strategies and analysis’ techniques of digital games, pointing out existing approaches and the ones organized by researchers of the group, whose action part of the game-player interaction. The theoretical foundation for this research considered the parameters of quality for computer games and the parameters defined by the MEC (Ministry of Education-Brazil) to evaluate educational technologies, as well as made use of strategies and techniques for data collection.

KEYWORDS: Educational Games; Evaluation of Games; Game Analysis; Methods and Techniques; Ontology.

RESUMO: O desenvolvimento de um jogo com fins educacionais, similarmente a um jogo com foco na diversão, requer um processo de análise, o qual deve avaliar pontos positivos e negativos, para embasar um plano de aperfeiçoamento do produto. O jogo *A Mansão de Quelícera*, contemplado pelo projeto CNPq “Diálogos entre Arte e Design”, esteve em processo de análise por um grupo de pesquisadores de diferentes instituições de ensino superior brasileiras. Diferentes partes do jogo foram objeto de avaliação e de remodelagem, como apresentado em dois artigos no SBGames 2012. Neste artigo, a pesquisa explora parâmetros, estratégias e técnicas de análise de jogos digitais, pontuando abordagens existentes e as organizadas por pesquisadores do grupo, cuja ação parte da interação jogador-jogo. O embasamento teórico para esta pesquisa considerou os parâmetros de qualidade

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para jogos de computadores e os parâmetros definidos pelo MEC para avaliar tecnologias educacionais, bem como utilizou-se de estratégias e técnicas para a coleta de dados.

PALAVRAS-CHAVE: Jogos educacionais; Avaliação de jogos; Análise de jogos; Métodos e técnicas; Ontologia.

1. Introduction

Initiated in March 2012, the research project *Diálogos entre Arte e Design: processo de avaliação e revisão de jogo eletrônico educativo em arte* (Dialogues between Art and Design: evaluation process and review of electronic educational game in art), funded by CNPq (Universal Edict 2011), includes the participation of a group of six researchers from different institutions and backgrounds. The group, starting from the empirical and theoretical repertoire of its members, critically debated the aesthetic, technological, pedagogical and communicational solutions adopted in the game *A Mansão de Quelicera*, authored by two of the researchers in the group, with the aim of identifying production parameters in digital educational games and listing the possibilities of improvements and enhancements in the present game. In order for this process to be implemented in a scientifically defensible way, it is necessary to establish analyses parameters. This article discriminates analyses parameters and some evaluation approaches, discussing the strategies and techniques used to analyze the referred game, and presenting the results achieved in this process.

Defining what is important, and even necessary, to be assessed in a digital game, is not an easy task, especially if one considers the complexity that characterizes this object. Developers, academic or not, according to their theoretical and empirical studies in the area, punctuate several parameters and strategies used to analyze games. Therefore, in the aforementioned research, primarily, the research was done about some of these parameters and, in sequence, discussions about the strategies and techniques used by the group researchers.

2. Assessment and analysis of interfaces

In general terms, as proposed by Cybis, Betiol and Faust, cited by Cascaes (2013), assessment approaches about the interface of computer sys-

tems can be divided in two groups: one focused on ergonomic assessment; and the other on the usability of the system. The correction of a problem of ergonomic interface, when remedied even before the system being brought to the target audience; can avoid a problem of usability, outlining a possible obstacle that can hinder the user in performing a task within the system. Thus, the approaches of both groups are listed in their order; however, differ on the principles and procedures applied, as well as on the individuals involved in the evaluation process.

Both approaches, of ergonomics and usability, can be used simultaneously and the problems through each of them can be classified according to the severity, combining three factors: frequency with which the problem occurs (whether it is common or rare), the impact (if it was easy or difficult for you to overcome it), the persistence of the problem (occurs only once and can be bypassed or repeated and users will be bothered by it). Thus, it is defined a priority list about what will be adjusted on the system, with a view on the resources available for the development.

The reviews of ergonomics, in particular, are usually made by a group of specialists, without the concern of involving people with the profile of the end user. Is held inspection, verification and it emits the diagnostic of the interface from recommendations and predefined ergonomic criteria. Now, the usability tests are done by observing people with a coherent profile with the end user they use the system. Thus, it attempts to detect obstacles to the use of the system, in addition to measuring the negative impact of each problem and to recognize the cause of it in the interface elements.

A heuristic evaluation is an example of ergonomic evaluation. The term heuristic (from the Greek verb *Heurisko*) designates the art of discovering and solving problems by the experience, whether is it from the researcher himself or observed in others. But the heuristic evaluation is usually done by a small group of evaluators (three to five specialists) who that use the system

themselves, taking into hand a list of heuristic principles to be evaluated (Cuperschmid, 2008). The analysis of each evaluator is made separately and the problems encountered by each one are discussed in group and consolidated into a final document.

The researches, who adopt this way of assessment, usually start from the ten principles of the Heuristic Evaluation, formulated by Nilsen (1995):

- Visibility of status, evaluating whether the system informs the user what is happening and at what stage it is;
- Relationship between the interface and the real world, by evaluating whether the language used is familiar to the user;
- Control and liberty, by evaluating whether the system gives the user conditions to do, undo and redo actions;
- Consistency and standardization, by evaluating whether there is no risk for the user to assign different meanings to elements associated with the same purpose;
- Prevention of errors, by evaluating whether there is no situations prone error, or user actions that are prone to error;
- Recognition, evaluating if the system does not require to the user to remember, without having conditions to reaccess, previously seen information;
- Flexibility and efficiency, evaluating if the system satisfies users with more and less experience;
- Aesthetic and minimalist design, by evaluating whether there are no excesses, if the system has only what is relevant to its purpose to be realized;

- Help the user, evaluating if the system gives conditions to the user to recognize, diagnose and overcome mistakes;

- Offer help and documentation for easy access and reading for the user.

The principles of Nielsen were drawn from a survey of 294 recurrent problems in the interfaces that he analyzed, along with Molich, around 1990.

This origin reaffirms the fact that the heuristic methods have deductive character, in other words, the evaluator is based on assessments already made and, in problems discovered in previous experiments (Bailly, 2000). Therefore, they are beyond the heuristic phenomena that exist, but escaped from the knowledge formulated by previously lived experiments.

The gap of the method, here indicated, can be illustrated with a question posed by Bertrand Russell in *Problemas da Filosofia* (The Problems of Philosophy) (Russell, 2005): will the sun rise tomorrow? If we rely on past experiences, our answer is yes. However, it is possible that occurs a phenomenon not controlled by us, in which produces a different result. It is understood then, that the known experiments are not the only suitable for a process of analysis, especially when you want to raise new horizons on the digital object to be analyzed. In this sense, it is essential to include the philosophical contribution and the observation of the object use from a point of view that exceeds the look of an expert in computer systems.

3. Parameters of evaluation and analysis of games

Whether is by the perspective of ergonomics or the usability, for a consistent evaluation, it is necessary to take into account that digital games have distinct usability features from other types of computer interface. The ISO 9241-11 (ABNT, 2002) describes usability based on three

criteria: effectiveness, efficiency and satisfaction. However, in the case of digital games, not always completing a task with less expenditure of time and work is synonymous of a good play. As highlighted by Nielsen (1993), to the extent that the activity is for entertainment, the user may want to spend more time with it. Including, the willingness to delay is one of the advantages of digital games when used in the processes of teaching and learning.

On the analysis of digital games, should be considered the differences to other types of media entertainment (Aarseth, 2003), such as those highlighted by Consalvo and Dutton (2006) and referenced in previous analyzes by Petry (2011) and Petry & Petry (2012). Performing analysis of digital games is more difficult than the one of a film, for example, according to the user interaction, for the game's objects to move and hide, explaining its condition of dynamic objects.

The elements present in digital games (like the rules, conflicts, goals and decision making) are also part of human life in general. The digital games are a type of object with inherent characteristic that either participates in the culture as, above all, it acquires a redefinition (Manovich, 2001 and Salen and Zimmerman, 2012). Moreover, they themselves do not cease to transform and have an impact even wider and profound to the current culture. Much is the fact that is it is common to find absolutely particular visions between players and developers from what the digital game is, as well as conflicting positions about what it can be. Therefore, the report of *the International Game Developers Association* (IGDA) from 2008, aware of the need of finding an identity which embraces the digital games epistemic and materially, in order to describe the complexity and breadth open, semi-permeable and hybrid.

The conceptual imprecision complicates the formulation of a methodology of analysis for digital games which allows to understand the fundamentals, possibilities and applications of each game. It also turns questionable the limitation

of the analysis process to the assessment of the prescribed formal aspects, as well as for the look of specialists in computer systems of this type. This because, when observing players from a multidisciplinary perspective, the researcher will discover facets on the game that go beyond the ergonomic principles, and even, the possibilities imagined by the designers of the analyzed game.

Faced with this scenario, researchers of digital games interested in defining principles of evaluation, as well as parameters of analysis of the experience of playing, configure analysis processes that consider not only the play of the specialists, but in particular the play of the target audience. The contributions of some of these researchers are described below.

Chuck Clanton (1998) points out three specific dimensions for the analysis of digital games. They are: game interface, game mechanics and gameplay. The interface includes any device by means of which the player interacts with the game, including peripherals (such as a mouse or a keyboard), visual representations of the controls, tutorials, mobility tips, resources to save, go back, and exit a play, among others. The *mechanics* relates to the way of functioning of the digital game, being a combination of animation and programming. The gameplay is the process that allows the player achieving the goal of the game, involving the problems and challenges to be faced, the rhythm of the game and the cognitive efforts required of the player (Crawford, 1982). The three dimensions are held simultaneously in the game; even so, Clanton suggests that they should be analyzed separately.

Based on the structure of Clanton, considering the heuristic bias, Federoff (2002) wrote a list for evaluation of digital games, which he called "guide for creation and evaluation of fun in games". The list includes 23 aspects related to the gameplay, 13 to the interface and only 4 to the mechanics of the game. While evaluation of heuristic approach, the proposed verification by Federoff, should be done with the participation

of specialists. Certainly, it can be complemented with the observation of players playing, which would approach this type of evaluation of other which follows the approach of usability. However, if it is not made the observation of the players and the evaluation stays restricted to the eyes of the specialists, even considering the competence of professional appraisers, it will not be possible to evaluate the usability precisely. In other words, the game may eventually provide a young person or a child, the target audience of the present game.

From the critical reading of Federoff, including other authors of heuristic approach, Desurvire et al. (2004) formulated another listing for Heuristic Evaluation for Playability, abbreviated as HEP (*Heuristic Evaluation for Playability*), specific to digital games. Desurvire did not keep the interface between the aspects to be evaluated separately and included narrative as the differential and important aspect in the evaluation of digital games, which involves everything from the storyline to the development of the game characters. Another distinguishing feature of this list is the inclusion of the usability as one of the dimensions to be evaluated. In summary, the listing of Desurvire embraces four dimensions: *gameplay, narrative, mechanics and usability*.

Desurvire took HEP into the field, in parallel with a usability test (observation of players in a two-hour session experience), aiming to compare the data obtained from each of the evaluation methods for a same group of digital games. Desurvire concluded that each method has its advantages and particularities, recommending the combined use of these two evaluation approaches. The number of problems identified from HEP was greater than that found from the observation of player. However, the nature of the identified problems with each approach differs from each other, so the combined use brings consistency to the assessment procedures. For example, by observing as player, it was possible to assess issues related to the motivation of the player (feeling of boredom or challenge), to the pace of the game and the adequacy of the

verbal language used. Such problems were not detected by the HEP, whose major contributions deal with the general principles (mechanical and usability) of the evaluated digital games.

Desurvire is not the only to propose the use of plural looks, of different approaches on the same digital game. Aarseth (2003), inspired by the ideas of Lars Konzack, follows this position. Lars Konzack had proposed the analysis of digital games considering the existence of seven distinct layers and equally important: hardware, program source code, mechanics, gameplay, meaning, referentiality and sociocultural factors. Aarseth highlights such proposal as innovative, to deepen and diversify the areas of knowledge that underlie the analysis process. However, Aarseth criticizes the idea that each of these layers has equal weight in the process. According to him, for example, the mechanical should have higher weight than the hardware layer of a digital game.

In spite of inspired by Konzack, Aarseth builds his own list of analysis parameters. He scores three different layers: *gameplay*, understanding it as the actions of the players, their strategies and motivations of play, the *structure of the game*, including the rules of the game, and the *game world*, characterized by the narrative content and fictional, the topology, the levels, the textures, and other constituent aspects of the simulation. He highlights the structure of rules as the most important layer in the analysis process, because this defines the advances, the victory and the failure of the process of playing. However, depending on the game, another layer may prove be more relevant. Examples are RPG games, in which the layer of gameplay is the key.

Returning to the previously mentioned idea that digital games have more complex structure than other computer interfaces, it is worth mentioning that the propositions of aforementioned authors differentiate not only in the analysis parameters, but by the conceptual bias that underlies its parameters and guides the analysis process. Some authors maintain their interest

in guiding principles from assessments of computational interfaces. Others recognize digital games not only as computer system, even place this dimension of the object as the most important over others in the process of analysis. In this line, Aarseth maintains that digital games are a new cultural phenomenon, with points of similarity with objects commonly analyzed in the Arts and the Human Sciences.

Therefore, Aarseth (2003) proposes the construction of a model of analysis that considers these games as an object that has aesthetic density and conceptual comparable to an artwork, naming such model of *aesthetic analysis* guided by a method capable of overcoming the “blind spots” that usually affect the aesthetic analysis analyzes focused on visual and textual aspects. The aesthetics of the digital game is beyond the game itself, it emerges from the experience that the player performs by interacting with the system.

4. Strategies and techniques for analysis of games

As for the method of analysis, Aarseth poses that playing is essential, but should be combined with other forms of data collection about the digital game and the playing. Therefore, distinguishes three main ways to know a digital game, composing what the author calls the hermeneutic cycle of game analysis. First, *study the game*, trying to obtain knowledge through documents and interviews of developers and users. Second, *observe someone playing* as well as read reports and hear from players. Third, *play the digital game by itself*. Aarseth highlights the importance of the third form, but emphasizes the need for it to be used in conjunction with the first ones.

As regards the first form, Aarseth (2003) suggests taking as a source of study about the game digital: the knowledge about the genre of the game; knowledge about the game system, game development documents, reports of tests conducted during the development process; guidance pro-

vided to players, players reports, commentaries, discussion environments used by players; interviews with players, interviews with developers.

As to the second form, must include the direct observation of players in action. Direct observation is especially important because much of the data to be considered in the analysis process are not verbalized by the player. The author points out that there is a dialectical relationship between player interaction and the design of the digital game, in other words, the play is not something prescribed by the designer, even only depend on the player, is something that emerges from the relation itself that the player establishes with the game. Therefore, in addition to the multiple possible routes to be traversed in the game, it is interesting to consider the existence of players with different personalities in the definition of the subject to be observed in the field.

A typology of styles of playing was defined by Bartle, cited by Aarseth (2003), and is composed by four profiles: *socializer player* who enjoys the company of other players, *killer player* who attacks other players; *entrepreneur player* who seeks obstinately the victory; *explorer player* who seeks to unravel secrets, hidden mechanical and errors of the digital game. However, Aarseth suggests that this typology is combined with another, defined by the level of experience of the player (*beginner, casual, hardcore*), multiplying the number of player's profiles. He ponders saying that some combinations are unlikely to happen, for example, the “casual explorer” player. So, the important thing is to consider the existence of such profiles on the definition of the group of players to be observed, by privileging one of them, the one considered more suitable for digital game analyzed, by diversifying the profiles in order to evaluate how each profile relates to the same digital game.

Aarseth highlights the importance of the researcher to be familiar with the game when making the observations on other players, that is, he suggests that the researcher start to play

even before the observation. Therefore, the third way of study of the digital game can occur before and after the first and the second form.

There are many possibilities of strategies and techniques of analysis, thus, the researcher must choose those that prove more consistencies with the reasons that lead him to the field, as well as reconcile the strategies and techniques with the conditions in which the research will take place, meaning that, from the researcher's skills as a player, from his professional experience, from the time that he offers to perform the search, and mainly, his ethical stance. Even because every technical choice chosen, whether it is in analysis context or development of a digital game, brings political meaning, ethical, social, cultural and ecological, without precedents (Petry, 2013).

5. Process of analysis of the game *A mansão de quelícera*

The analysis of the digital game *A Mansão de Quelícera*, aimed at the *Ensino de Arte* (Art Education) (MEC, 2009), was performed in two distinct moments and by two researchers from the team of the research project referred in the introduction of this article. Each analysis followed proper theoretical references, but haven't conflicted with each other, and both were based on database obtained by observing players, questionnaire and interview.

The first analysis was made by Luciana Rocha Clua (2011) and was presented in the dissertation defended in 2011, under the guidance of Dr. Rita Maria de Souza Couto, along with the *Laboratório Interdisciplinar Design/Educação do Departamento de Design da Pontifícia Universidade Católica do Rio de Janeiro* (Interdisciplinary Laboratory Design/ Design Education Department of the Pontifical Catholic University of *Rio de Janeiro*). The second analysis was part of the postdoctoral research of Arlete dos Santos Petry (2012) - FAPESP No. 2011/09778-9-with the *Escola de Comunicações e Artes da Universidade de*

São Paulo (School of Communications and Arts, University of *São Paulo*).

As Aarseth reminds us, the choice of methodological procedures for analysis of digital game depends on the research objectives, the conditions to conduct research and how it is intend to use its conclusions of the analysis. In the cases reported here, it is worth saying that Clua (2011) aimed to identify parameters related to *game-play* and entertainment that pointed subsidies for new projects of educational games. This because, the first contact of the researcher with the game mentioned occurred in a games exhibition, with players having fun, despite it was a game with educational purpose. In addition to performing its primary objective, Clua (2011) concluded the analysis by listing some *game-play* issues that could be corrected to improve the game.

In order to better understand what defines a good gameplay, was adopted parameters listed by Schell (2011). They are: the gameplay should privilege the ability in relation to the luck; the complexity of the game should grow, the punishment must not be excessive to avoid discouragement of the player (to encourage him to try again); some kind of reward to the effort should be received (sounds, images, points etc.); the game should be balanced between difficulty and easiness; and, create opportunity ways so that the player can survive in the game. Searching the balance on these parameters allows us to evaluate and adjust the playability of a game.

Clua (2011) also took as reference tests *game-play* that according to Shuytema (2008), aim to verify the existence of errors in the game, either by design or software, and ascertain whether the difficulty curve is appropriate for the target audience and if the player's performance is acceptable. For some designers these tests can be internal, made by experts, members of the building team of the game, or external, involving the audience (Fullerton, 2004).

By taking the search of Clua (2011) as background, the analysis of Petry (2012) aims to identify what is relevant to be modified and what should remain in the game in question, considering both the guiding concept and the educational objectives of the game. This because, some aspects that could be considered problematic in a digital game of entertainment are constitutive of the pedagogical objective of *A Mansão de Quelicera*, the one to provide an experience similar to that experienced with the artwork (Bahia et al, 2012). The researcher also has also taken into consideration the principles of gameplay of games of the RPG genre, being the kind of reference for the construction of the game analyzed.

In sequence, we present specificities of the two review processes.

5.1. First analysis

Clua (2011) organized her evaluation of the game *A Mansão de Quelicera* in two distinct phases:

Pre-test – the objective was to observe the overall understanding of the game, the difficulties and the ease found, besides obtaining subsidies to select the children with which would deepen the observations on the playability test. Thus, were selected four children which best developed in the game and which had partnered with other colleague, from these, half should be girls, and half boys to observe if there were gender changes in the understanding of the narrative of the game. The pre-test took place in two sessions of two hours each, and was attended by 26 children of the fifth year (10 and 11 years) in a public school in the city of Rio de Janeiro. The children were on schedule of extracurricular activities, in the computer room of the ONG K House located at PUC-RJ. Before starting the first session of the pre-test, the researcher presented to the children the commands that could be used in the game and before the second ses-

sion, showed some print screens of the main scenarios of the game.

Test- occurred following the pre-test at the school and during extracurricular time. Four children selected in the pretest attended to it. There were two observation sessions (the first lasted 1:30 hour and the second one lasted 3 hours), each followed by semi-structured interviews performed in groups. The sessions were registered by recording audio and video in addition to the notes taken by the researcher.

The observations were direct and participative, performed in relation to a script. The contents discussed in the beginning of each session were created by the researcher according to the needs observed on the previous sessions. These and other interventions were performed in order to drive players into the reflection and the verbalization of thoughts and feelings that erupted during the play.

To address the data analysis, Clua (2011) listed aspects that are considered significant for this type of digital game: solidarity collaborative interaction; competitive interaction; learning of content; development of strategies; fun; playability; and difficulties overcome and not overcome. For the choice of these aspects, it was considered the fact that a digital game of the RPG genre has an educational purpose. Anyway, it is known that some of these aspects (gameplay, for example) would be present regardless of the type of game analyzed.

The theoretical basis of the analysis that supported Clua (2011) is based mainly on Vygotsky (1991) and Leontiev (1978). From Leontiev (1978) came the contribution of Activity Theory, in which he highlights the importance of the dominant activity in an action, which is the responsible for the most important changes in the mental development of the child. From Vygotsky (1991) the researcher incorporated the study of concept formation in children, as the author noted the existence of two distinct developmental processes: the *spontaneous concepts* present on

the day-to-day life, and *scientific concepts*, taking into account the mediation with the school, although not be restricted to it. Vygotsky (1991) emphasized the role of the school in the formation of the scientific concepts as a catalyst in this process. Having as background these two authors, at the same time separate and complementary, Clua (2011) encouraged the children to externalize their thoughts, at specific times of the observation sessions and interviews, to better monitor the major activity in their thinking. The children were also observed in their mediation with the game and the formation of concepts that these were in relation to the narrative and the new objects presented by the game.

The analysis of *A Mansão de Quelicera* led to the following conclusions on each of the six aspects observed:

Solidary collaborative interaction- it was observed that the students were helping themselves in the performance of the activities to overcome the challenges, choose the surest ways and up to reach the end of the game. Clua (2011) commented that the moment of the end of the game "could have been more competitive, but prevailed among all cooperation to achieve a common goal: to win the game".

Competitive interaction- was less present than the collaboration, having been more evident on the first day of the test, when players have been arranged on two pairs (a pair per computer) and a pair competed among them.

Learning content- assessing the learning of artistic content has not been the focus of the research for Clua (2011). Still, she concluded that the game promotes the aesthetic experience with images that come with the player meanings and reframes all the time. Clua considers appropriate the mediation of an educator to occur a reflection on the artistic content steeped in visual elements of the game. Furthermore, the author comments that the players learned terms that were unknown, as artist names, passwords in Latin and words in an old language.

Strategy development- the players used the strategy of trial-and-error at various times. They also developed specific strategies, such as: creating alternative ways of traveling between environments; use the death of their character as a resource to change character, escaping the difficulties of continuing the game with that character; and write in a notebook the clues they needed to be memorized.

Fun- Clua comments that the use of terms such as "irado" ("awesome"), "exciting", "eita" ("wow"), "let's go", "caraca" ("oh boy") and "funny", at various times on the sessions, demonstrates that players were having fun with the game. The researcher relates that this fun with the structure of the flow of the game, alternating two types of interaction: (a) research and interpretation of cues; (b) the facing of challenges with time control and which require agility, exciting the players. These challenges keep the player interested, despite the difficulties in unraveling the enigma of the narrative and from the frustration with the inevitable failure experience in occasional moments in the game.

Playability and difficulties overcome and not overcome- the players have expressed the feeling of being lost and the difficulty of building a whole meaning to the narrative. According to Clua (2011), "the game has become too fragmented, which makes difficulty in the connection between clues and solving challenges". In addition, the researcher observed gameplay issues in some of the challenges, but reflected that, despite this, the players were persistent, in trying to overcome challenges in which they had "died" to find victory. Players also regretted the end of the research on the last test session.

5.2. Second analysis

At the methodological level, Petry (2012) was based on the ideas of Aarseth (2003), emphasizing that games are object and process, therefore, can not only be read as texts or listened to as a song, they also need to be played. Thus, Petry,

in a deployment of methodology applied previously (Petry, 2011), set three actions of research: (a) *play the game*; (b) watching two children playing the game by applying a technique called *watched game*, referring to the forged Heideggerian expression *Sorge*, word which retrieves the meaning of care, as a follow-up to play of the other; (c) *interviewed the two players*.

The action of research "a" was the first to be held. Petry (2012) experienced the game in two 1-hour sessions in a single day. The researcher opted to play without seeking extra information about the game (the website *Educador* gives contribution to this game, to the research on the game, among others), is based only on prior information coming from informal comments of the developers themselves and of an article.

The action of research "b" took place with the participation of two children: a girl of 10 years and a boy of 9 years. With a girl, there were three play sessions watched, being the first 60 minutes, the second 53 minutes and the third 50 minutes, totaling almost three hours of play. Only one session of 68 minutes was held with the boy.

As for the choice of the age group, it is worth remembering that the game was designed for children between 9 and 14 years old. However, the pilot application included only children from 12 to 14 (Gaspar, 2006) and the tests made by Clua (2011) showed that the younger have excessive difficulty with some challenges. Therefore, Petry (2012) chose to conduct sessions of watched game with children of 9 and 10. Thus, an attempt to reassess the extent of the group age and level of difficulty of some of the challenges of the digital game, outlining cognitive abilities and skills compatible with the target audience.

It was used direct observation in the watched game sessions, with minimal intervention by the researcher. The role of the researcher was to observe and to do interventions restricted to provide instructions about the game when asked by the player, or to say something when neces-

sary for the continuity of the activity. While the subject observed was playing, the researcher's attention was divided between the observation itself and record notes (field journal). The intention was to confront children with the new, check if the game was successful in the category of being self-explanatory, desired feature for digital games.

The accurate analysis of the behavior of the player was performed subsequently from filming. This is because, besides the field journal, the research actions "b" and "c" were documented by filming done in two perspectives: the player shooting; and capture of the computer screen, with the help of the free software Fraps. This last technique was adequate and efficient, enabling the researcher to pay attention to the sequence of movements and events in the game screen from the use of the mouse and a keyboard. Therefore, the behaviors unnoticed during the direct observation could be better analyzed by shooting.

Besides the analysis of each shoot separately, Petry (2012) issued a third video synchronizing the frames of the videos, matching the cursor movements (shooting of the screen) with the verbalization and physiognomic expressions (footage of the players). Thus, she obtained a valuable data analysis to correlate behaviors of the player with the events of the interaction with the system. In particular, for the analysis of the understanding of the game by the player and the actions necessary to move towards the end.

From the data collected in action of research "b", Petry continued the process of analysis into three parts: (a) *analysis of the game as a whole*, (b) *analysis of the challenges* (mini-games) and (c) *analysis of the avatars chosen* (Petry, 2012). Such elements were guided on this specific game, being considered the most relevant to this second analysis.

From each part, the researcher focused on three aspects previously selected for analysis: (1) *socio-emotional content* (psychodynamic) contained

in the game, (2) *cognitive skills* (psychogenic approach) needed to advance in the game, (3) *technical aspects of game production*. Based on Aarseth (2003), Petry understands that the first two aspects have narrative feature, and the socioemotional contents are manifested mainly in the script, characters and environments. The technical aspects, on the other hand, can be understood through game design, object inventory, interface study, interaction map, gameplay, rules and mechanics of the game.

Petry (2012) lent greater attention to the role of the narrative in the digital game, even considering that one of the conclusions cited by Clua (2011), was the account of the difficulty of the players to understand the meanings of the game narrative as a whole.

It is understood that it is necessary to expand the traditional concept of narrative, so, go beyond oral or written text (theater, literature), of moving images (film and television) and include the action of the player to play the game. Therefore, think the narrative on digital games involves considering, at least, three discursive voices: the game designer, the narrator and player. Furthermore, it must be remembered that digital games are produced with a hybrid language, characteristic of hypermedia language (Santaella, 2001), overcoming verbal language (used by the writer and the narrators), the visual language (used by graphic artists on the scenes and characters) and sound language (used by sound design).

In the analysis performed by Petry (2012) a positive indication of appropriation of the narrative content is how the girl observed, she was constructing relations between rooms in the house, in other words, a knowledge which was getting in extent that the route was constructed. With this data at hand, Petry questioned whether spatial understanding of the game environment (something that could be realized on a map, for example) should or should not be given to the player as it is something to be built mentally through the route that each player performs.

Such conclusion of Petry is based in the research of Piaget (1983), when this refers to the vertical offsets, and understands that the sensorimotor intelligence, while being the first to produce schemes of action, continues to have a key role throughout life. That is, whenever we encounter a "new object", we seek to know what it is about through our sensory and motor skills. In the case of navigation for a "new digital game," the intellectual tools driven to solve problems will be, initially, our eyes, ears and, especially, hands. Those is, just as our unconscious, in the case of McDonald (2012), when playing digital games and manipulate its controls, intelligence required has its centrality in our fingertips.

Some aspects presented in the game should be rethought from the decision that the game will be available on the network to be played online, abandoning the idea, now rarely used even in commercial games, of games on CD-ROM or DVD. This will lead to the use of the game beyond the school environment and, hence, to play experiences without restriction and/or support of an adult. Thus, on the one hand, the language used in the texts can evoke a historic old moment, for example, can become a barrier, even more significant, for solving the challenges of the game. On the other hand, "dedicated" players usually search the web for solutions to their difficulties in games, forming even stronger community discussion about them (called games forums). As the game *A Mansão de Quelicera* (The Mansion of the Chelicera) has a website with a teacher support, a lot of informations can be sought there.

Another suggestion placed from the analysis is to offer the player visible access to their inventory, meaning that the objects conquered by him or her in the course of the game are saved and can be accessed through an interface element of the digital game. In this way, returning to the game after some "death" would not need to redo the challenges already due and past achievements. The perception of progress would thus be a strong motivational element for the player wanting to stay in the game.

6. Application of analysis of *A Mansão de Quelícera*

Being a reassessment of the game *A Mansão de Quelícera*, the goal of the research project “*Diálogos entre Arte e Design*” being performed by the six co-authors of this article, the analysis performed by Clua (2011) and Petry (2012) are part of a dialogue that unfolds for more than an year, and even took the game developers to play with other eyes, and rediscover intricacies of the labyrinthine experience of the game. To the extent that the project is also aimed to develop an improved version of the game, such dialogue has been consolidating in the definition of what should be reaffirmed and what needs to be re-designed, so that the ultimate purpose of the game is performed more consistently. The aspects to be kept have general character, being constitutive principles of the concept of gaming promoter of the artistic experience; has suggestions for modification dealing with details of the interface and game mechanics, as listed below.

6.1. Aspects to be reaffirmed

Coerência com os Parâmetros Curriculares Nacionais (Consistency with National Curriculum) (MEC, 1997) – this document of the *Ministério da Educação* (Ministry of Education) structures the *Ensino de Arte* (Art Teaching) in three areas: *production, appreciation and contextualization* of art. The game aims to promote learning in art history (contextualization), but rather it aimed at the practice of interpretation (appreciation), this area that the Ministry itself says to be the lack in the classrooms.

Understanding the appreciation while game – the strategies of promotion of the interpretation were created keeping in mind the concept of experience with the artwork formulated by the philosopher H. G. Gadamer (1996), understanding that the interpretation of the artwork is *party, symbol*, in particular, is *game*; and that experience itself constitute the *cognitive sense* of the artwork, as it puts the subject in a condition

of *being-interpreted* for another way of knowing the world. Among other possible interpretations, digital games with works of artistic tradition lead the player to know the actual “art world” in a different way, and just as important as, the institutional modes, through other promoter interfaces of the artistic knowledge as catalogs, galleries and art museums (Bahia, 2008).

Separation of promoter resource of the interpretation (game) that promotes the teaching of art history (site)- this separation is an important differential of the game *A Mansão de Quelícera*, because it prevents the experience of the interpretation of being buried by an unreasonable historiographical information. So, on the one hand, the game promotes exercise of interpretation, leading the player to discover and engage himself in narrative storyline. The player faces textual clues and, especially, visuals that must be confronted and related to each other to construct a meaning for its play. Many of these clues are citations from art works and artists from the history of art; however, the interpretation of the clues does not imply in decoding because the interpretation is here merely an instrumental and informational form of historiographical data. On the contrary, the player must find in these pictures, links with the game scenario itself, because what is wanted to promote is the game of interpretation itself. On the other hand, the teacher is also motivated to teach art history (axis of *contextualization*) from the game, using the *Site of Support to the Educator*, especially developed to accompany the game, in which will find specific texts for 63 works, 20 artists and 18 topics that compose the game content, above pedagogical guidelines for the use of the game in the classroom.

Aesthetic consistencies of the game- all graphic files of the game were produced from techniques and concepts of the tradition of artistic painting of representation. The main scenarios were drawn in pencil and paintings; others were made from appropriation of works from this artistic tradition, practice this recurrent in contemporary art (Bahia and Vargas, 2012). Therefore,

the game has a differential aesthetic quality, when compared to other games, and consistent with the covered content.

Timeliness of content– though to traverse about some art works created between the XV and XIX centuries, the way how the works were incorporated into the game (not just as pictures, but as characters and parts of the internal and external scenarios), update the content and the own way of how to relate to the art works of the tradition, functioning as a dispositive of deconditioning of the contemplative look (Bahia, 2008); promoting the immersion in a playful-fictional environment permeated by characters and fragments of art works.

Plurality in the game flow– Despite of the situations that require correlation of clues, part of the navigation on the game, the encounter of challenges (obstacles between one environment and another as those found in platforms games, in fight games, in memory games, and other nine) that, as highlighted Clua in its analysis, they add dynamics to the play and require a different behavior of the player. The sensations experienced

are also plural by players who: manifest fear (of entering in certain environments and meet some characters) and good mood (especially, with the scatological sounds issued when interacting with objects in a given environment); feel the difficulty to interpret clues and retake the enthusiasm when he or she is able to use a password and overcome an obstacle. This diversity strengthens the player's interest.

6.2. Aspects to be improved

Having this dual background of general aspect to be reaffirmed and of problems identified in the analysis process, the developers of the game *A Mansão de Quelícera*, now with renewed look, relativize some aspects defined for this game ten years and organize in a table presented below, with specific solutions for each of the identified problems.

The changes suggested above were applied in 2014, with the 2.0 version of the game *A Mansão de Quelícera*.

Table I - Results of the analysis

	Problem	Solution
Game Narrative	Difficulty of comprehending the differences between the 3 avatars to choose.	(a) Present a synthesis of the mission and the characteristics from each avatar before the choice; (b) leave the form of the avatar available in the game, marking the development of skills.
Game Narrative	Difficulty of comprehending the history.	The opening animation, in addition to introduce the player to the esthetics of the game, will communicate the bases of the narrative plot (Battaiola et al, 2012).
Game Narrative	Difficulty to remember names (abilities, ambient and objects).	(a) on the map, identify names of the environments; (b) on the Diary, include pages about the inhabitants of the game place; (c) others objects from the inventory will be with their names.
Game Narrative	Difficulty to understand the function of the character Rafael.	(a) Explicit his narrative role on the opening animation; (b) exclude the two notes left by him; (c) put the content of the notes on Rafael's speech at the library.

Game Narrative	How does Rafael discover the history?	Rafael will be at the library, so the player will pass by, at least, three environments before meeting him.
Game Narrative	Difficulty to read the Diary.	(a) Change the font; (b) review the use of old expressions; (c) insert illustrations on the Diary's pages; (d) it will be an object to be reconstructed by the player.
Game Narrative	The library is not that much significant.	(a) The gallows and the table of the cardinal sins, will reverberate skills of the avatar; (b) Rafael will supply clues there.
Game Narrative	The faint, when he drinks the wine in the dining room, has no real effect on the character.	(a) The animation will pop when clicking on five rotten food/wine; (b) The avatar will get weak on the image of the player bar and will need to confront the challenge of the Fork to recover energy and leave the dining room.

Table II - Results of the analysis

	Problem	Solution
Game Play	Difficulty of displacement between the game's space, as the vertical and horizontal displacement of each environment when it happens the transit between environments.	(a) Substitute the commands of the keyboard by semi occult buttons on the corner of the screen; (b) offer instruction through illustrations and not from explanatory texts; (c) offer a "magic" map, like a White paper with the compatible size of the space of the game (communicating what is the extension of the game space), whose defining lines of the environments and paths are only shown as the locals are discovered by the player.
Game Play	Difficulty to remember the clues/passwords already found.	The clues will be on pages of the Diary that will be incorporated to the inventory of the player.
Game Play	There are levels of difficulty on the challenges, but not always progressives.	(a) Review the level of difficulty of the challenges so the required cognitive abilities for the level be crescent; (b) explicit the progress as levels on the map.
Game Play	The rewards are not evident.	(a) The numeric points of the challenges will be added on the general score table of the player; (b) the specific skills bars of each character progress with puzzles solved and overcame challenges; (c) the inventory adds pages to the Diary and to the key-objects found.
Game Play	The backups are not evident.	(a) Victory and defeat screen in the end of each challenge; (b) positive or negative backup from each interactive event (on the challenges and exploration of environments).
Game Play	It is possible to exit the first environment without reading the mission.	The mission will not be there anymore, it will be communicated on the moment of picking a character.

	Problem	Solution
Mechanics	When it "dies", the player loses what he has already won.	(a) Insert login screen and buttons of "new game" and "continue play"; (b) if the player "dies", to save the state of the player with the chosen avatar.
Game Play	Challenge of the knives – it is not notified what the avatar can choose.	Improve the instructions, telling the advantages and disadvantages of turning down.
Game Play	Enigma of the three ages – it shows to everyone, but is only useful to who plays with Raul.	With the points of the ability of interpretation, it will punctuate all, but who plays with Raul keeps winning something extra (the silver helmet).
Game Play	In the Dungeon cell, there is no pattern on the way out, which causes anguish.	(a) Some will keep with the semi open grade (retouch the scenario) and the spacing will be able to exit; (b) the ones with the closed grade will have to use the letter code that will be in the cage.
Game Play	In the Dungeon, difficulty of getting rid of the Shackle.	If in 15 seconds the player doesn't find solution, the character comes back to the screen with the clue.

Table III - Results of the analysis

	Problem	Solution
Game Play & Mechanics	Challenge of the Labyrinth – it is very hard to win in two curves of the path that are too narrow.	(a) Make wider aisles; (b) permit movements by the keyboard arrows; (b) there won't be a collision with the walls, only in dead ends;(c) the labyrinth will be bigger than the screen, the player will pass through each framework when he or she arrives to the corner of the screen.
Game Play & Mechanics	Challenge of the Mirror – it is very hard to win.	Review the speed of the spiders.
Game Play & Mechanics	Challenge of the Gargoyle - it is very hard to win.	Leave less unequal the intensity of Raul's punch in ration to the Gargoyle.
Game Play & Mechanics	Challenge of the Beetle – it is hard and the dialogue is long.	(a) Synthesize the initial dialogue; (b) review instructions; (c) change the way of collection of leaves (click instead of dragging).
Game Play	In the basement, after assemble the cartographic object, what to do with it?	(a) Insert final animation to the puzzle that reaffirms that is a fragment of Holbein's painting; (b) when returning to the environment, the objects will be kept in the patterns of a drag able object.

Game Play & Mechanics	In the basement, the use of trial and error to drag objects.	Each wrong attempt made by the player, a feedback directs him to the right attempt.
Game Play	Challenge of the Butterflies –it is not clear when it is right.	Beyond the point and the sound feedback that already exist, insert a visual feedback (butterflies inside the collector).
Game Play & Mechanics	Fork Game – it is very hard from level 4.	Increase the sensitive area of the cursor and the size of the food.
Game Play & Mechanics	Challenge of the Dead Nature – difficulty to comprehend.	(a) On the instruments screen, keep the artwork to be reassembled; (b) reformulate the text; (c) explicit the positive and negative backups (the options appear with reduced glitter until the right piece is clicked).
Game Play	In the Ballroom, the place to drag instruments is discrete.	When “picking up” a musical instrument and starting to move it over the screen, the place becomes evocative.
Game Play & Mechanics	Challenge of the Platform – it is very hard and poorly explained.	(a) Put an illustrated instruction; (b) review the continuity between the screens (the avatar shouldn’t die on the screen 3 if the action of running was initiated on the screen 2).

Table IV - Results of the Analysis (cont)

	Problem	Solution
Interface	Clickable and drag able objects are not evocative.	Define visual/sound effect, having in mind the type of action that can be realized with each object.
Interface	The player bar is little functional and the image of the avatar’s body disrupts on the immersion.	(a) Remove the button of “help” and “close” from the bar and put on the superior corner of the screen; (b) change the avatar’s whole body picture with alternating facial expressions (c) exclude labels; (d) keep the two key-objects; (e) add general punctuation and access to the avatar’s file, to the map and the Diary.
Interface	On the challenges (mini-games), the points registry is little visible.	Create a specific panel and use the bar form to represent the limit of minutes (most of the challenges) or of tolerated errors (Butler Challenge).
Interface	Difficulty to differentiate the Diary form of Rafael’s notes.	As the notes are excluded, every paper found and inventoried will be a page of the Diary.

7. Final Considerations

Part of what we accomplished when analyzing the game *A Mansão de Quelícera* is part of a process of usual testing in the production of digital games: the so-called “test of playability”. Something that relates to the evaluation line of usability of computer systems, but is not limited to this. This is because there are not only as reference the methods from areas of Design and Engineering, but from the Humanities and Arts. Constitutes a bias of analysis of relatively new games, in which there is still much to be built and for which the research that was conducted with the aim of giving contributions.

One of the contributions that the research brings is the reaffirmation of the importance of *playing* (either playing the game, or watching another player) as a step in the analysis process. That is because, as a phenomenon, the game is always here and now. Thus, it realizes the impossibility to access to any game, with a previous absolute classification. Note that: a game is only completed and can be called as such when someone enters the game, in other words, when a game starts to be played (Gadamer, 1997), question crafted from other philosophers in Petry (2010). From the perspective of the concept of *gameplay*, Consalvo (2009) also states that a game cannot be thought without the action of playing, and goes one step further when adds the contexts in which, and the reasons why the player’s actions occur. Reflecting on the elements that participate in the game when it is played also indicates a way to the game analysis, which seeks to achieve through the various records of the plays (field diary, filming, screen capture, interview).

With respect to the “Watched Game”, specifically, the recording from two perspectives proved itself valuable in the process of analysis: of the screenshot and the body shot. This form of analysis was very useful for the observation of details of the playability. However, by employing this methodology, the researcher must be prepared for many hours of observation and analysis. The

synchronization of these videos was also important, combining the body shot (hands, arms and face) with the screen, showing the relation between what was done in the game and the physiognomic changes, as well as the movement of the hand on the mouse. This provided privileged details of the observations.

Another learning to the team was to understand that the analysis of a particular game should not only take into account the parameters of a generic gameplay. It should have in mind the goals and conceptual-theoretical thinking that supports their creation and production, reflecting on how such parameters are more or less relevant to the achievement of the ultimate goal of that game. Forget this means losing sight of the significant uniqueness of the objects in the world, or, as Heidegger (2001) would say, in a reference to games, would losing of sight the being of the game. In the case of the present game, the goal of the analysis was the consideration that it is about a game developer of a specific kind of experience: the experience of the artwork. It means, it always will be expected that the player leaves the game with impressions, some hypotheses, with questions, but, mainly, modified by the experience.

There is an objective with this game of enabling children to realize the art as something close to them, caught up in things that are part of their daily lives, things which they like and that provide them with challenging and pleasurable experiences. This is the perception of the own experience of interpretation of an art work based on Gadamer, on which there is the seeking to promote it by considering that still lingers the idea of interpretation as something dour and somewhat less participatory, emblemized on the cartoon image of the museum as a “temple of art”, a quiet place and of subservience. Then, the process of analysis is not merely finished with the identification of aspects of the game that does not respect the rules of a “good” game design; the team has been in dialogue in order to consider which aspects observed actually interfere negatively in the kind of experience that

the game seeks to provide, and what modifications can enhance the achievement of the goal of the game.

Finally, note that the analyses undertaken of the game *A Mansão de Quelícera* brought up a gained learning from other research contexts: the strategies and techniques selected for the approach to an object of study are supported, having consciousness or not, on the theoretical background with which it views the world and its objects. There would not be different when thinking about game analysis. This implies that the concept of game adopted enables us to analyze/evaluate games with another perspective.

In this way, it is important to realize that the definition of what is a "digital game" is still debated, and is always renewed with every new game genre that arises. Consequently, the debate about the appropriate methodology for games analysis remains open and is not intended to the authors to give the last word, but to contribute with experiences and reflections.

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