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Defining a Conceptual Framework for a Toolkit to Game Design: The Gamers4Nature Project

Mónica Aresta
University of Aveiro, Portugal
m.aresta@ua.pt
0000-0002-7629-934X

Pedro Beça
University of Aveiro, Portugal
pedrobeca@ua.pt
0000-0001-7332-4901

Rita Santos
University of Aveiro, Portugal
rita.santos@ua.pt
0000-0001-9741-6210

Ana Isabel Veloso
University of Aveiro, Portugal
aiv@ua.pt
0000-0002-5070-0756

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Abstract
Seeking to capitalize the interest of younger audiences in game creation activities, the Gamers4Nature project aims to develop a toolkit designed to support game design by allowing the manipulation of the several elements that compose a game. Prior to the toolkit's development, there was the need to establish the respective conceptual framework. This paper describes the process of defining the project's conceptual framework. Based on Fullerton's perspective on game design, the framework was defined following a participatory design approach with the participation of different stakeholders (postgraduate students with extensive knowledge about game design and experts in the game design field). To ease the discussion sessions, a physical artifact (19 hexagonal pieces, and a honeycomb structured board) was developed. Results suggest that a non-linear approach to game design may promote not only the definition of the game's structure and gameplay but also allow a contextualised analysis of all its elements.

Keywords *Conceptual Framework; Game Design; Game creation; Gamers4Nature Toolkit*

1. Introduction

In recent years, digital games have conquered part of the territory previously occupied by traditional games, bringing significant changes to the way we spend our free time (Connolly et al., 2012). Despite research on the impact of games on human behaviour has, for many years, focused on the negative aspects of digital games – in particular on the promotion of aggressive and violent behaviour (Anderson, 2004; Anderson & Bushman, 2001) and on the consequences for self-regulation of playing time (Ogletree & Drake, 2007), the development of addictive behaviours (Griffiths & Davies, 2002) and social isolation (Merhi et al., 2007) – the development of research in this area revealed the existence of positive impacts of digital games in terms of learning, motivation, knowledge acquisition, skills development and behavioural change (Boyle et al., 2012; Briot et al., 2011; Earp, 2015; Gee, 2008; Robertson, 2012; Vos et al., 2011). Whether through the application of gamification strategies (cf. Majuri et al., 2018) or by developing games centred on educational subjects or themes, the potential of games in activating transversal skills related to the ability to solve problems, creativity and exploration of information and communication technologies has been considered as an alternative or complementary to more traditional models of education (Earp et al., 2014). By presenting contextualized and meaningful learning activities into environments controlled by learners, games have the potential to arouse curiosity and interest in educational content (Vos et al., 2011), stimulate attention and

awareness, learn by doing, foster collaboration and exchange points of view and ideas and enhance the development of critical thinking skills (de Grove et al., 2012; Giannakos & Jaccheri, 2018; Gee, 2008).

With technological developments and the appearance of tools designed to be used by individuals with little experience in the field of programming, the line between game creators and players has softened, giving the latter the potential to design their own resources. Considering the creation of games as a very attractive activity and profession (Clement, 2021), young people feel motivated to create games similar to those they like to play (Good & Howland, 2017) – an interest supported by the recent growth of the games market, namely for mobile, which kept this area as one of great interest and motivation for young audiences. Seeking to capitalize this interest in the area of digital game development, the Gamers4Nature project (University of Aveiro, Portugal) developed a toolkit to game design, designed to facilitate the process of conceptualizing games through the manipulation and exploration of the various elements that comprise them.

Prior to the toolkit's development (i.e. in the ideational phase) there was the need to establish, define and validate the conceptual framework that would frame the Gamers4Nature toolkit. Defining a conceptual framework can be seen as the starting point of any research design (Ivey, 2015). Often translated through visual or written artifacts (Bickman & Rog, 1998) that present a hierarchically organized statement of the ideas that constitute the core concepts (Joel Michael et al., 2017), conceptual frameworks explain and scope the core concepts (i.e., the main ideas that are central to the addressed discipline or subject (National Research Council, 2007), the relationships between core concepts, and the related ideas that are critical for the comprehension of the core concepts (Joel Michael et al., 2017).

The Gamers4Nature conceptual framework definition process, developed through a User-Centred Design approach design (Sharp et al., 2019) approach, was guided by the following questions: RQ1) which game elements should be considered as core for the design and construction of a game?; and RQ2) what possible relationships can be identified or established between the elements?

Following the Introduction, Section 2 presents some background concepts around the games and games as systems. Section 3 introduces the Gamers4Nature project and its main goals, and contextualizes the conceptual framework evaluation process. Section 4 describes the adopted methodological approach and introduces the artifact developed to stimulate the brainstorming evaluation sessions. Section 5 presents the study's main results, which are discussed in Section 6. The paper ends with some final considerations and directions for future work.

2. Literature review

"Game design is the process by which a game designer creates a game, to be encountered by a player, from which meaningful play emerges" (Salen & Zimmerman, 2004, p. 80).

Present in childhood and throughout most of adult life, in leisure activities and in more structured contexts, games and playing have been part of human nature since ancient times,

playing an important role in the development of intellectual skills, physical capacities and social aspects of the individual (Boyle et al., 2012). Resulting from the human desire to play and from the human ability to pretend and represent, games emerge as activities that take place in the context of a make-believe reality and where participants – voluntarily submitting to pre-defined rules – strive to achieve a certain or several certain objectives (Adams, 2014). Simultaneously being a social activity and a cultural phenomenon (Huizinga, 2001), the game is an experience that keeps the player involved through the uncertainty of the result and the freedom of action within what is defined by the rules (Caillois, 1990).

Games are activities limited in time with pre-defined objectives and rules, artificial conflicts defined by rules, and with a measurable end (Salen & Zimmerman, 2004), designed to trigger in the participant a satisfaction that derives from the very act of playing (Huizinga, 2001). Tensions, rules and limits are components of the game valid only during the time and/or the space in which it takes place: when entering the game, the player enters a “magic circle”, in a temporary arena within the real world where conventions, day-to-day hierarchies and norms are temporarily abolished (Huizinga, 2001).

2.1. Games as systems

Games evolve within a previously delimited field - limited in a material or imaginary, deliberate or spontaneous way - a temporary world with rules and tension that exist during a specific activity (Huizinga, 2001). This relationship between rules and the game is established by various authors, as shown by Salen and Zimmerman in the book “Rules of Play” (2004). For the authors, games are systems in which players engage in artificial and structured conflicts, defined by rules, and which resolve their uncertainty in a quantifiable and unequal outcome.

Adams (2014) states that games are built upon complex systems composed of several elements – rules, resources, players, results, uncertainty, involvement and objectives, among others – that are related in order to create a unique experience for the player. In this system, rules play an important role, providing the players with the necessary information to optimize their choices and to see the consequences of their actions.

From the perspective of a game as a system, Juul (2003, 2005) also describes games as systems based on rules, with negotiable consequences and variable and measurable results, processes and activities in which the player becomes emotionally involved while trying to influence their result. For the author, these games’ characteristics can be organized in three dimensions: the game as a formal system; the interaction between the player and the game; and what relates to the game and the rest of the world.

In an approach that includes game design and development, Hunicke and her colleagues (2004) presented the MDA (Mechanics, Dynamics and Aesthetics) Framework, a lens for understanding games where the player's experience (Aesthetics) emerges through interactions (Dynamics) with the rules of the game (Mechanics).

Elias, Garfield and Gutschera (2012) approach the game as a system, reinforcing the importance of playing time, number of players and heuristics as basic rules in game design. For the authors, the perceived uncertainty and randomness of games are important to maintain the player's attention and interest, and heuristics (present in the reward and feedback system) are important as they allow the player to know if they are winning or losing, and what to do next.

Fullerton (2014) describes games as formal systems that involve players in a conflict, subject to rules, which results in an uneven outcome. For the author, a game has formal elements (players, objectives, procedures, rules, resources, conflicts, limits, outcome) that form the structure of the game and that are articulated to create in the player the experience of facing a game; and dramatic elements (challenge, game, premise, characters, history, world-building and dramatic arc) that emotionally involve the player and contribute to the player's commitment to the game. Fullerton states that games are systems, where formal elements contribute to a dynamic experience with which the players engage, and where objects interact with each other according to their properties, behaviors and relationships, changing the state of that system.

As for Macklin and Sharp (2016), these authors refer to actions, rules, objectives, game space and players as basic elements of game design, from which an infinite number of experiences emerge.

3. The Gamers4Nature toolkit to game design: background

The motivational power and relevance of digital games has been recognized for some years, with its potential in activating transversal skills related to the ability to solve problems, creativity and exploration of information and communication technologies being considered as an alternative to more traditional models of education (Earp et al., 2014). By presenting contextualized and meaningful learning activities into environments controlled by learners, games have the potential to arouse curiosity and interest in educational content (Vos et al., 2011), stimulate attention and awareness, learn by doing, foster collaboration and exchange points of view and ideas and enhance the development of critical thinking skills (de Grove et al., 2012; Giannakos & Jaccheri, 2018; Gee, 2008).

More than simply using games as an educational strategy – one that may not necessarily translate into educational benefits, as there is no consensus about the relationship between playing a game and its expected learning outcomes (Earp et al., 2014) – giving students the possibility of creating games with themes related to the learning curriculum may lead to a better understanding of the value of what is learned and to the acquisition of scientific concepts, as well as to the development of digital literacy throughout the design process (Huizenga et al., 2017).

As research indicates that involving students in the creation of their own games may increases the interest towards the addressed theme (Huizenga et al., 2017), it also points out some obstacles that emerge when adopting this strategy: low or undeveloped programming skills and a lack of interest in the educational subject (Pontual Falcão et al., 2018), a tendency to focus on the storytelling and

character development, and ignoring gameplay mechanics and content integration (Howland & Good, 2015; Ke, 2014).

Taking all these concerns into consideration and seeking to capitalize on students' interest in the area of digital game development, the Gamers4Nature project (University of Aveiro, Portugal) developed a toolkit to game design to be used by younger audiences (secondary education and undergraduate students) along game development sessions. One of the core principles that guided the design of the Toolkit was that the artefact should facilitate and support the process of conceptualizing games by allowing users the manipulation and exploration of the several elements that compose a game. Starting from this premise, it was considered that the first step would be to identify, amongst authors and researchers whose work focus on game design, the ones that approached game and game design as a structure made of elements (concepts) working together as parts of a mechanism or interconnected network – a system.

3.1. Choosing a base approach

As addressed by several of the authors mentioned in Section 2, game design emerges from the relationship between the result of the game development process and the player's experience felt during the game. From the analysed perspectives, three were considered as being aligned with the Gamers4Nature project's frame: i) Juul's (2003) perspective of game as a structure that evolves around its formal system, the relations between the player and the game, and between the game and the rest of the world; ii) Hunicke's et al. (2004) MDA framework; and iii) Fullerton's playcentric approach to game design (2014). Taking into account that the Gamers4Nature Toolkit's should ease and support the process of conceptualizing games by allowing the manipulation and exploration of the several elements that compose a game, Fullerton's (2014) perspective was considered as being the one that reflected the project's goals and therefore should be considered as the basis for the project's conceptual framework.

Fullerton (2014) breaks the game down into nineteen elements, organized into three categories – formal, dramatic and system elements. The formal elements form the structure of the game, articulating to create in the player the experience of facing a game. These elements are: the player (voluntary participant, who makes decisions, makes choices and can win the game); the objectives (they represent what the player tries to achieve, respecting the rules of the game); the procedures or actions (they determine what the player can do to achieve the objectives of the game); the rules (they define game objects and setup the permitted actions by the player); the resources (items that, when reached, help the player to achieve the objectives of the game); the outcome (it defines the end of the game); the conflict (situations that prevent the player from directly reaching the objective); and the limits (what separates the game from what is not the game: the real world). The dramatic elements give the game a context, involving and integrating the formal elements into a meaningful experience. These elements involve the player emotionally and contribute to the player's commitment to the game. In the author's perspective, the dramatic elements of a game are: the challenge (tasks that the player is called upon to perform during the game and that are designed to keep the player involved); play (process of

experimentation and exploration, during which the player becomes emotionally involved in the game); the premise (starting point of a story, scenario or metaphor that establishes the game's action); character (helps to build the story and to establish an emotional connection with the game); story (establishes a context and scenario for the game situation); universe (design of a fictional world, capable of giving greater depth to the game); and dramatic arc (story's development throughout the game). Finally, when mentioning that games are systems where the formal elements contribute to a dynamic experience with which the players get involved, Fullerton presents the objects, properties, behaviours and relationships as the basic elements of a system; in this structure, objects interact with each other according to their properties, behaviours and relationships, changing the state of the system.

4. Methodological approach

4.1. Data collection

The Gamers4Nature conceptual framework definition and evaluation process was developed through a User-Centered design approach (Sharp et al., 2019), with individuals with extensive knowledge about the game design process and experts in the game design field being invited to discuss the project's approach and to share their own perspective about what a game is. Data was collected through brainstorming sessions implemented through focus groups and individual interviews, aiming to answer the following questions: RQ1) which elements should be considered as essential for the design and construction of a game?; RQ2) what possible relationships can be identified or established between the elements?

Nine 9 ICT postgraduate from a Master's degree course with extensive knowledge about the game design process and 4 experts in the field of Game Design – three academic researchers from the game design field, and one game developer –were invited to participate in brainstorming sessions.

The focus groups and individual interviews took place during the month of May 2019. Focus groups had an average duration of 90 minutes and individual interviews an average duration of 50 minutes. Non-participant observation was used as the data collection technique. Interventions were recorded in audio format and later transcribed and analysed, with the results of each session presented in the next section.

4.2. Gamers4Nature brainstorming tool: the hexagonal cardboard pieces

It was intended that, along the brainstorming sessions, it each game element should be discussed independently and not within the groups defined by Fullerton (2014). This way, participants could freely talk about each game element, discard any they would not consider as being relevant for the game design process and suggest possible relationships and links between the different elements.

In order to focus the discussion on the game elements and promote a non-linear approach to the game design process throughout the brainstorming sessions, a physical artifact was created. Each one of Fullerton's game elements was represented by a piece of cardboard – a 3cm sided hexagon with the element's name printed on each side. When used in the construction or deconstruction of ideas, hexagonal shapes are effective in aggregating different perspectives or in branching concept maps.

Moreover, and as suggested by Sousa et al. (2021), the use of the several pieces would allow participants to add and remove mechanisms and, at the same time, to accurately identify each game element and the role it plays on the game system. They are the ideal way to convey the non-linearity and freedom of exploration characteristic of digital games and, at the same time, convey the idea of game as a system.

In order to avoid any prior hierarchy of the game elements, each card had only the name of the game element (in Portuguese and in English) and the project logo printed on it. This way, participants would have the conditions to explore and address each game elements freely, without being conditioned by any information able to transmit its importance, connection of hierarchy.

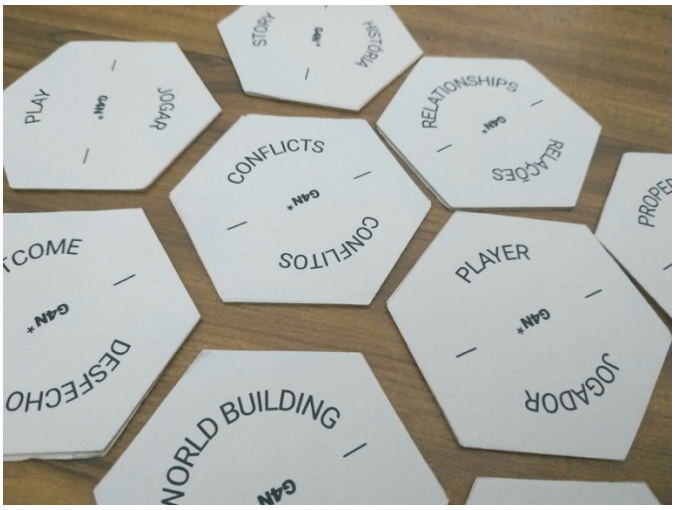

Figure 1 - Hexagonal pieces "game elements", used in the sessions

As one of the brainstorming session's goal was to identify what possible relationships can be identified or established between the elements, it was necessary to encourage – but not to guide – participants to establish relations and articulations between the elements. In order to promote that discussion, a tray (A3 format) with a honeycomb structure that replicated the hexagonal structures of the pieces was also developed.

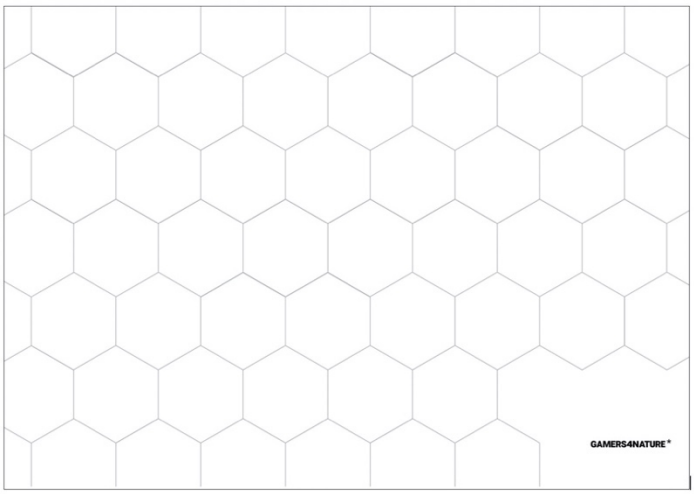

Figure 2 - Board with honeycomb structure used in the sessions

Each participant received a set of hexagonal pieces and honeycomb tray at the beginning of the brainstorming sessions. Following the presentation of the project and project objectives, participants were first invited to explore the artefact and then, following the think aloud protocol, to share their individual and personal perspective about what a game is, what elements compose a game and what relations (if any) can be established between the several game elements.

5. Results

5.1 – Focus Group I – starting with the premise, define a challenge and then build the story

The first focus group session was attended by 4 former master's students, two female and two males. All participants had plenty experience in programming and game development, and one participant was also very experienced in art, animation, story and narrative, areas in which the remaining participants reported having only some experience.

Participant 1 [P1] introduced game as an experience delimited by rules and boundaries, where procedures and the game's narrative dimension (premise, character, story, dramatic arc and world building) are what makes the player stay in the game. Participant 2 [P2] presented game as an experience articulated between narrative (story, premise and resources) and mechanics (play and challenge). Participant 3 [P3] also addressed game as being composed of a "narrative-related core", where the player reaches the outcome through the premise, story and dramatic arc. Challenges and conflicts are related with the game core mechanics, and rules set up the "line of the game". As for Participant 4 [P4], it was mentioned that game starts with the player, who tries to reach an outcome while going through the game's procedures. Characters and story are elements that can give the game an emotional dimension, and therefore should be included in the game design.

Figure 3 shows the result of using the board and the pieces by each Group I participant. Darker pieces represent the elements each participant considered as core elements when considering game design, and lighter pieces represent elements that, although being relevant for the game design process, were not considered as fundamental when creating a game.

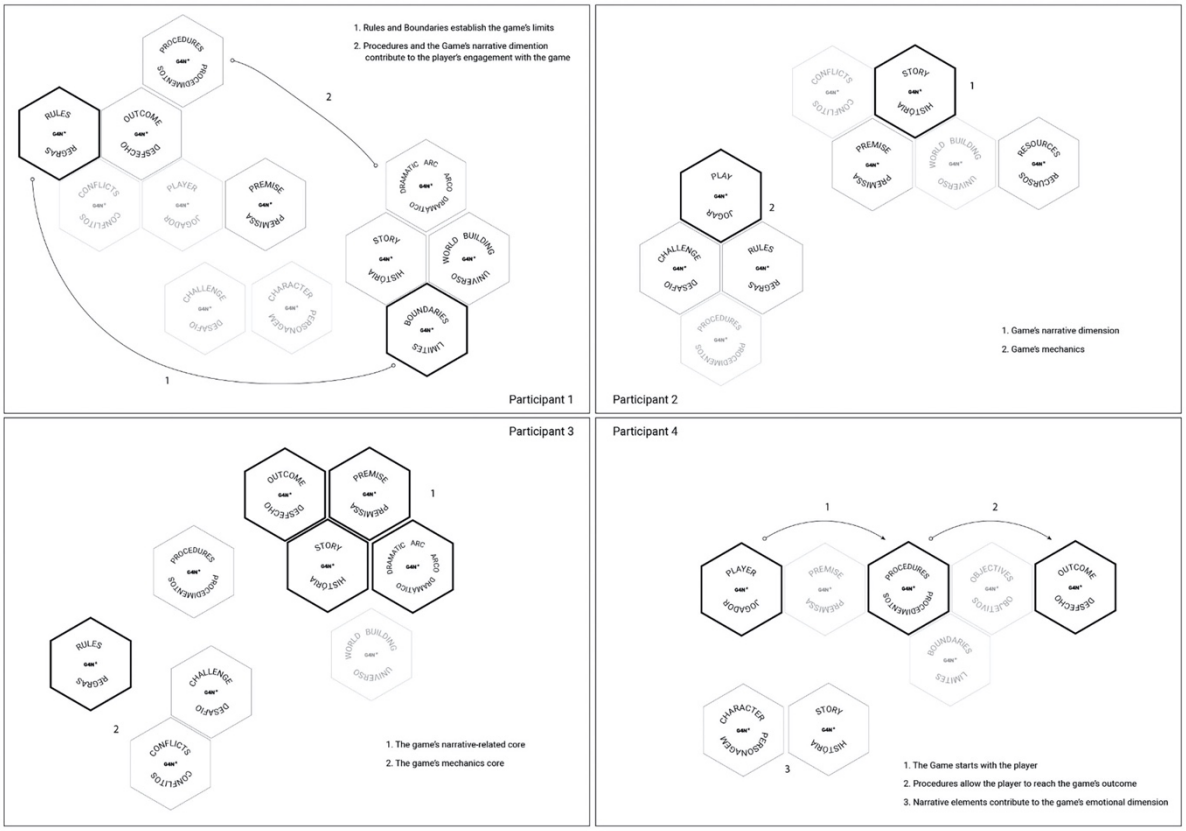

Figure 3 - Maps built by the first Focus Group participants

5.2. Focus group II - the importance of narrative in game design

The second focus group session was attended by 5 former master's students, all male. Three participants had plenty of experience in programming and game development, and two had only some experience in this field. Only one participant reported having a lot of experience in story and narrative.

Participant 5 [P5] introduced game as an experience where premise, challenge, character and world building are central elements. Participant 6 [P6] presented game as the articulations between a core built upon narrative and mechanic elements and another core made of objects, behaviours and relationships that establish the game's experience. Participant 7 [P7] addressed game as being composed of rules, objectives, boundaries and narrative elements. Participant 8 [P8] mentioned that game starts with the player, which moves along a narrative and tries to reach an outcome through resolving conflicts, trying to reach the game's objectives and following the allowed procedures. As for Participant 9 [P9], a game starts with a challenge, exploring a narrative dimension – built upon characters, premise and world building –while following the game's objectives and rules. Resources and boundaries are also considered as important dimensions of a game.

Figure 4 shows the result of the use of the board and pieces by Group II participants. Darker pieces represent the elements each participant considered as core elements when considering game design, and lighter pieces represent elements that, although being relevant for the game design process, were not considered as fundamental when creating a game.

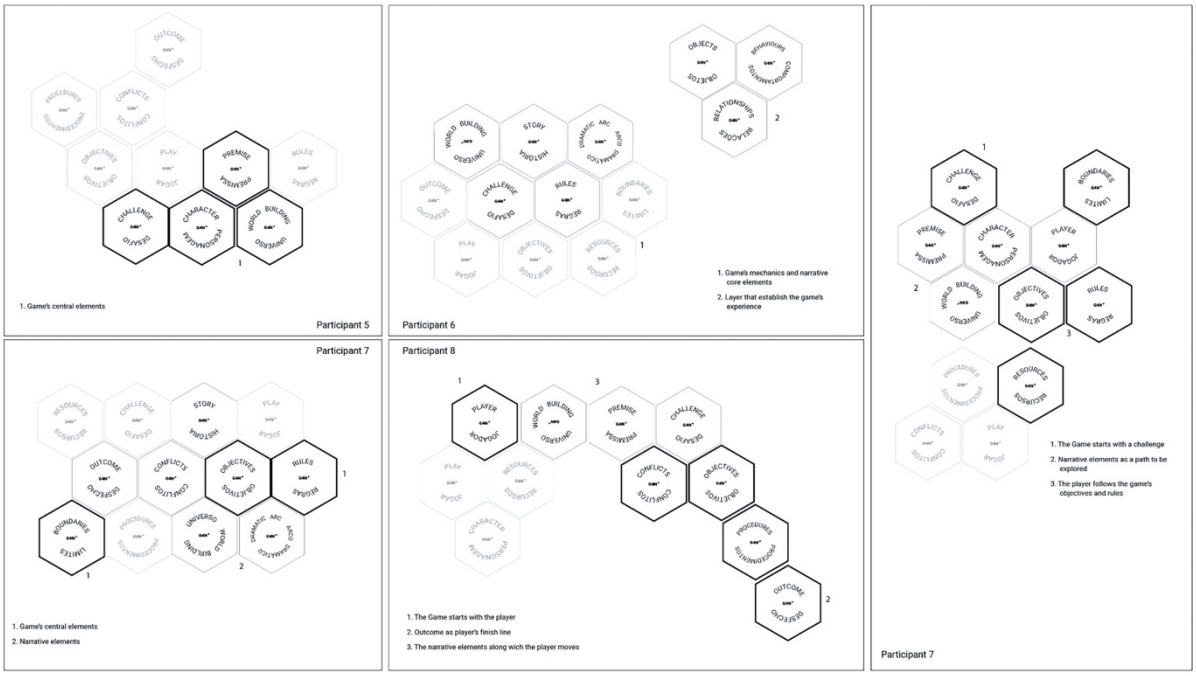

Figure 4 - Maps built by the second Focus Group participants

5.3. Expert A, challenge as the element that separates a game from an interactive experience

In response to the question “what are the fundamental elements in the design of a game?”, Expert A (a professor of Game Design in a Higher Education Institution) defined the challenge as a central element for the design of a game. In the interviewee's opinion, it is the challenge that holds the player throughout the game. It must be engaging to keep the player interested, and it can be represented in the form of an entire game needs a challenge component to be minimally involving. Without this component, “*it is an interactive experience, not a game*”.

Referring that any game - in order to be considered as such - must have an outcome or a termination condition, the expert related the objectives of the game to that termination condition. To demonstrate this relationship, consider a game in which the objective is to reach a certain number of points: when reaching that number of points, the condition for ending the game is reached, and the game is over. The actions or procedures (mechanics) – which define and limit the player's movements – are fundamental for the player to achieve the objectives of the game, leading to the outcome initially mentioned. The rules define the limits of the experience, while the act of playing is deeply related to the mechanics of the game and its playability.

As non-essential elements in the construction of a game, the participant considered the conflict. Interpreted from the perspective of the player's internal conflict, it appears in games capable of establishing a very strong emotional bond with the characters and the events, placing the player in front of choices leading them to reflect on their own identity, attitudes and behaviour; the dramatic arc, universe and character, which help to maintain interest in the game but whose existence is not fundamental in all games; and the story and the premise, which according to the interviewee already represent a granularity that does not exist in the other elements. Properties, behaviours and

relationships were considered to belong to the dynamics of the game, and resources as something that could be addressed in two levels: game resources (assets that the player/ character has to obtain) or as peripherals (e.g. the use of haptics).

Figure 5 represents the map constructed by the participant during the interview and the relationships between the different elements that he considers essential in the design of a game. The process of exploring the pieces and organizing the ideas resulted in a structure that branches out from a central element: the challenge.

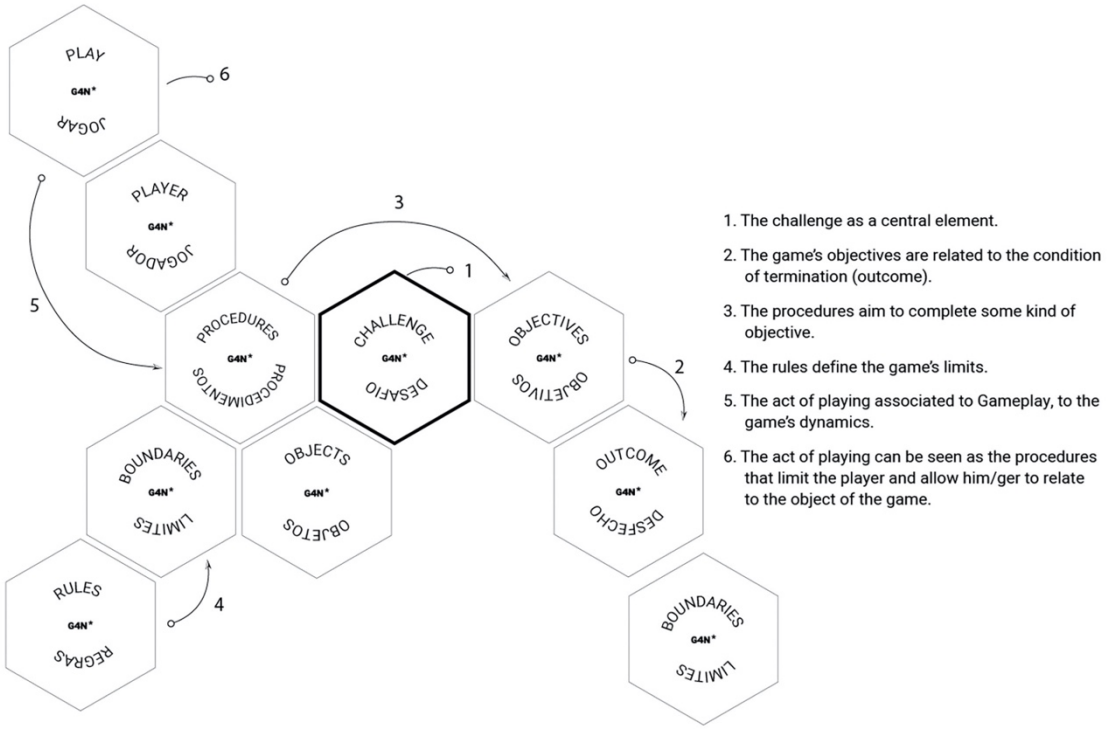

Figure 5 - Map built by Expert A: the challenge as a central element

5.4. Expert B, premise as the basic concept of the game's narrative

After exploring the pieces and safeguarding that all elements are fundamental to the design of a game, Expert B (a game design professor teaching in a Higher Education Institution) further explored the role of some of them. Starting with the premise – which he defined as the concept that helps to create the game's narrative – the interviewee built a map in a linear way, oriented from left to right, where the story, the result of the development of the premise, helps to define the player and to create and develop the characters. For the interviewee, the conflict may be related to the conflicts that the players face during the game, having also mentioned the existence of a relationship between the dramatic arc, the history and the conflict. As for the game procedures, these would be related to the rules, challenges and behaviours.

Figure 6 represents the map built by the participant during the interview, as well as the relationships between the different game elements. The elements that were used by the interviewee but that were

not covered in more detail are represented by a lighter tone. The process of exploring the pieces and organizing the ideas resulted in a structure that expands from a starting element: the premise.

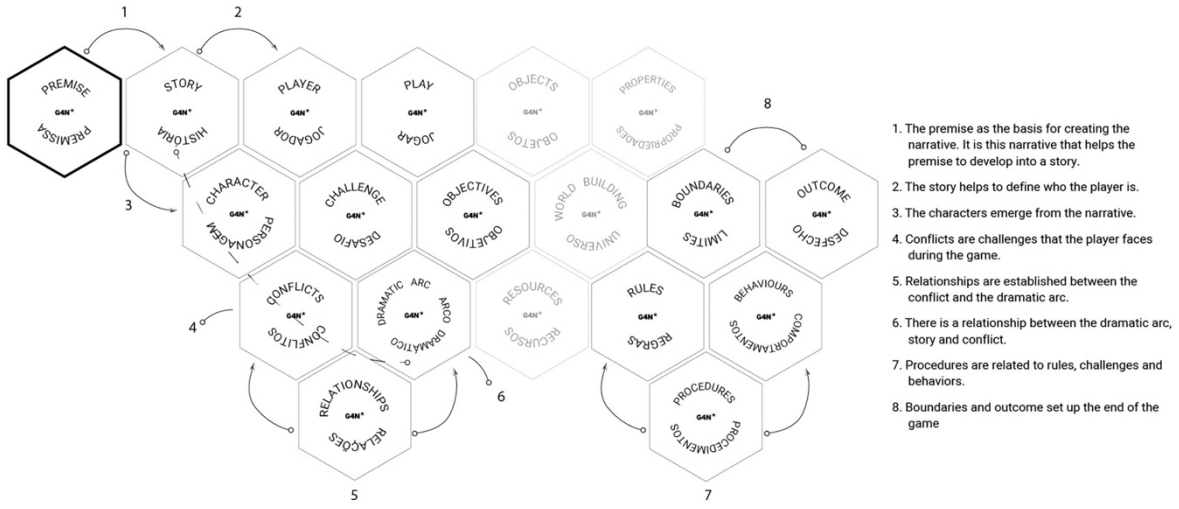

Figure 6 - Map built Expert B: the premise as a starting point

5.5. Expert C, symbolic, explorers or story creators, three player profiles

Expert C (a teacher in the field of video games in a Higher Education Institution) approached the question “what are the fundamental elements in the design of a game?” from the perspective of the player's motivation, the reasons and motivations that lead a player to play.

For the teacher, there are three main player profiles: symbolic or abstractionist players; those driven by the power of simulation and creativity present in games; and those who enter the game for the story and narrative. Symbolic or abstractionist players focus mainly on challenge, procedures and rules, objectives, resources, relationships and properties. They are intense, hardcore players who try to push the game to the limit and explore all its facets. Players of the second profile, driven by the ability to simulate and experiment with games’ creativity, explore the game in order to understand what works and what does not work, to discover what is possible in the game world. For this profile, the premise is the starting point for the game, the first point in the exploration of an entire universe; they explore all possible outcomes, trying to understand their limits. Players who are driven to the game by the desire to explore the stories and narratives, prefer mainly simulation games, where they can learn from the characters, save scenarios and experience realities. For this profile, the story and the dramatic arc, the conflicts between characters and the behaviours in the game appear as the most important elements.

Figure 7 shows the three user profiles mentioned by the interviewee, as well as the elements associated with each profile. In this approach, centred on the motivation of the player, the elements appear grouped in a structure similar to a map of small islands.

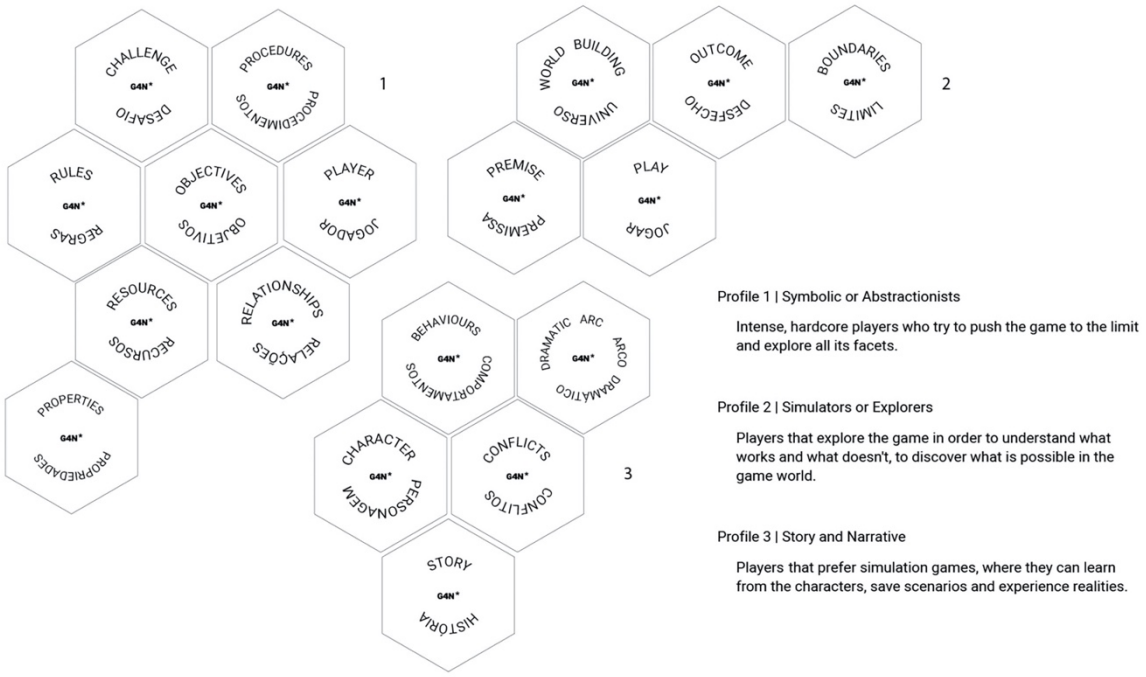

Figure 7 - Map built by the third interviewee: user profiles

5.6. Individual Interview IV - Expert D, objectives, mechanics and gameplay, the core elements in game design

Expert D (a game developer currently working in the game development and creation industry) mentioned that according to his experience, there is no single strategy for creating games and that different teams can adopt different strategies in the organization of work. He stated a preference to start by defining the concept of the game and only then working on its mechanics. Challenged to identify the elements he considers essential in the design of a game, the interviewee referred to the Gamers4Nature project framework to state that, if there is already a main objective – environmental problems awareness – the objectives would appear as a starting point for building a game.

From the interviewee's perspective, mechanics are defined from the objectives: rules, behaviours and properties, which help to establish the experience of playing, the gameplay. In parallel, but not necessarily articulated with the previous dimension, resources or assets can be added to the game as a strategy to increase the challenge and involve the player even more. Related to the objectives, the outcome will establish the end of the game, although it can be considered a starting point. In the interviewee's opinion, one can start by defining the end of the game (victory condition, final scenario) and work on the construction of the route leading to that end. In what concerns the limits, the interviewee related them to time limits, time management and team effort of those who work in developing the game design.

Figure 8 represents the map built by the participant during the interview, as well as the relationships he established between the different game elements. The process of exploring the pieces and organizing the ideas resulted in a map organized into two structures: definition of the game design core

(objectives, mechanics and gameplay) and peripheral elements that, contributing to the game, will not be essential for its construction.

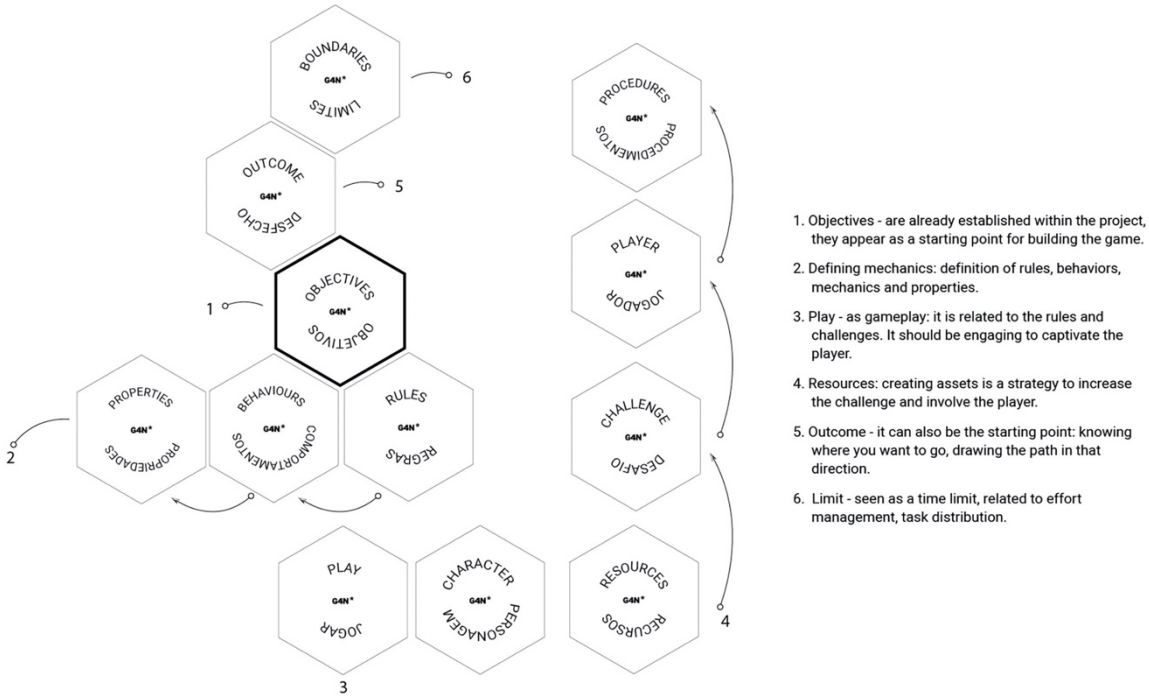

Figure 8 - Map build by Expert D: the core elements of the construction of a game

6. Discussion

The analysis of data collected during the brainstorming sessions allowed the identification of which elements, according to the participants, were considered as core for the design of a game (RQ1) and the relations and associations that, also according to participants, could be established between different game elements (RQ2).

The use of the hexagonal cardboard pieces allowed participants to explore and share their ideas and articulate thinking, to establish relationships and identify connections between the 19 game elements and to demonstrate the various perspectives of what could be the design of a game.

6.1. Core elements to be considered when designing a game

During the focus group sessions held with former master students, story was the elements most referred to (six participants), followed by rules, premise and challenge (five participants) and boundaries, character and dramatic arc (four participants). Objectives, outcome, procedures and world building were mentioned by three participants, and two mentioned resources and conflict. Three participants of the first focus group suggested “feeling” as a possible element to add to the Toolkit to Game Design.

As for the individual interviews, when asked to identify which elements they considered to be essential in game design, all experts mentioned challenge, objectives, play, boundaries, outcome and

rules; character, player and procedures were mentioned by three experts and two mentioned story, premise, world building, resources, dramatic arc and conflict.

Figure 9 visually represents former Master students and game design experts' perspective about the importance of each game element. The most addressed elements are represented by the wider hexagons. Properties, objects, behaviours and relationships (system elements) were considered by both the focus groups participants and the interviewees as being elements that require a deeper knowledge of games design and dynamics. Participants suggested that those elements should be introduced in a second game design phase (when users were already familiar with the core elements); therefore, these elements are not represented in figure 9.

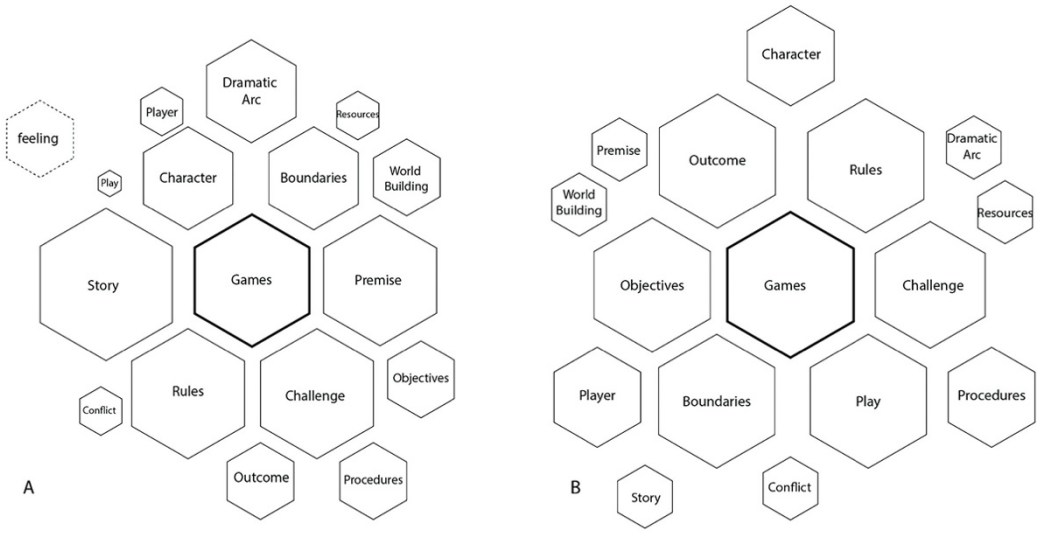

Figure 9 – Game core elements: former Master students (A) and game design expert's (B) perspectives

6.2. Relationships established between the game elements

Throughout the focus group and individual interviews sessions and by using the cardboard pieces, participants addressed the relations that, according to their knowledge and experience, exist or may exist between the different game elements and therefore should be considered when designing a game.

According with their perspective, there are elements that relate with each other in order to create and define the game's narrative: premise, character, story, dramatic arc, character, history and conflict. These elements form the game's narrative dimension, working together in order to engage the player with the game and giving the game its emotional dimension.

Other elements work together to support and define the game's mechanics. Challenge, rules and boundaries delimit the game and define the limits of the experience, and objectives and procedures are related with the game's outcome, as they define the player's movements and the game's termination condition.

7. Conclusions and Future Work

This paper focuses on the process of assessing the conceptual framework of the Gamers4Nature Toolkit to game design, developed to be used by younger audiences along game development sessions. One of the main ideas that scaffolded the design of the Toolkit was that the artefact should facilitate the process of conceptualizing games by allowing its users the manipulation of the several elements that compose a game.

The first step was to define the project's – and therefore the toolkit's – conceptual framework. Several authors, who address games as systems and reflect about game's several elements, were considered for the framework's definition (Fullerton, 2014; Hunicke et al., 2004; Juul, 2003), with Fullerton's (2014) perspective being chosen as it reflected the project's goals.

The Gamers4Nature conceptual framework definition and evaluation process was developed through a User-Centered design approach (Sharp et al., 2019), with brainstorming session held with the postgraduate from a Master's degree course with extensive knowledge about the game design process (N=9) and experts in the game design field (N=4).

For the orientation of the sessions held with former master's students with knowledge and experience in the area of game design, academics and a game developer, an artifact composed of 19 hexagonal pieces (3cm each side) and a honeycomb structured board was developed. This artifact, handed to the participants at the beginning of each session, made it possible to explore the various concepts associated with the different game elements, as well as establishing associations and relationships between those elements.

By using the pieces, participants were able to explore ideas, articulate their thinking and establish dependency or symbiotic relationships between game elements. This exploration resulted in the construction of different structures capable of translating the various perspectives of game design. The possibility of exploring the different elements individually, to build structures capable of translating lines of thought and to establish relationships between the different elements was highly valued by the participants who used the artifact as a tool to support the systematization and exploration of ideas and concepts and they considered it to be a useful tool in promoting reflection.

Nevertheless, the limitations that should be considered in the validation process, namely the fact that participants were invited through convenience sampling and all already had strong or deep knowledge about the process of designing a game, the current results indicate that the approach to game design adopted in the Gamers4Nature project – based in Fullerton's (2014) approach – is adequate and able to be used in the development of the project's Toolkit. Future work will include the use of the Gamers4Nature Toolkit to Game Design in game design sessions with younger audiences (upper-secondary and undergraduate students) and in in different settings (e.g. one day sessions and Game Jam sessions), thereby exploring and strengthening the validation of the adopted approach.

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