A design game for families

Learning essential 21st century skills through a design thinking game

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Master Thesis
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Yours truly,
Wouter van Strien

Abstract

This graduation project has been carried out in the context of the research project 'Co-Design with Kids: Early acquisition of 21st century skills' at the TU Delft.

To prepare families with kids for the open-ended challenges of the 21st century, essential skills such as creative thinking, communication, and empathy should be mastered early on. Due to the growing interest in acquainting children with these creative problem-solving skills at a young age, research has been being carried out on design toolkits specifically aimed at children.

The central aim of this graduation project has been to explore the potential of a family-friendly design game—with a fun-factor—that engages kids to learn and practice essential 21st century skills through an open and creative mindset. The examination of literature in the interest of this topic outlined the foundation for a set of design criteria.

In the conceptualisation phase, a selection of game mechanisms has been used to generate a variety of ideas. These ideas were then clustered using a morphological map, resulting in three design directions. Through iterative design cycles, these design directions have been developed to a concept level. Using predefined design criteria, the most promising concept has been selected through a weighted scoring method. This concept has been developed into a paper prototype to evaluate with the target group.

A practice-based research methodology has been employed, through 5 playtesting sessions with families with kids ages 8 and up. Qualitative data has been gathered through several sources, such as interviews, observations, generated ideas, and film footage. In total, 3 prototypes have been evaluated and developed through the 'Build, Measure, Learn' loop. The key insights gained through the playtesting sessions with families show a positive relationship between the embedded game elements and a fun-factor. The highest empathic behaviour has been detected when the players define a goal/problem for an in-game character themselves. Also, recognizable characters have the potential to make children think of someone from their own environment, such as a grandmother, making their ideas more personal and diverse. Furthermore, the secret assignment cards with ambiguous words are found to encourage kids to turn their first idea into something different—resulting in sometimes hilarious moments. However, younger kids could benefit from guidance by adults or older siblings in generating ideas. Overall, through a safe game environment with mild competition, a fun gaming experience is evoked through an open and creative attitude.

The insights coming forth from this practice-based study have led to a family-friendly design game for the consumer market. The final design has taken the first steps in making children acquainted with the 21st century skills in a safe and competitive game environment. The findings may be of great interest for other game designers and design education in general. The argument put forth here is that if a game has a fun-factor, players would feel more inclined to play and replay a game. Further research should investigate if repeatedly playing this game increases learning efficiency of the 21st century skills.

Contents

A design game for families

1. Introduction

The rapid changes we see in the world around us through globalization, technological, and cultural changes, require specific skills to meet the challenges of the 21st century (Kereluik et al., 2013). According to Sanders and Stappers (2012), the world in which we live is far too complex and the immense challenges of the 21st century often occur in the 'fuzzy front end' of design. Design Thinking skills, such as visual thinking and conducting creative processes are becoming more important to understand as well as tackling these open-ended design challenges—without a single right answer (Sanders and Stappers, 2008; Wyatt and Brown, 2010).

The past decennia showed a large interest in Design Thinking toolkits to extend the expressive capabilities and creativity of people in creative processes (Sleeswijk Visser et al., 2005; Sanders and Stappers, 2012). Design toolkits enable a user-centered design approach by involving all stakeholders in the design process (Figure 1-1). However, designing is not only for adults; even kids are involved into the design process to assure that dreams and needs for future experiences are being met. The design based research project 'Co-Design with Kids: Early acquisition of 21st century skills' at the TU Delft, explores the creative problem-solving skills of primary school children. Among others, creative thinking, communication and empathy are identified as essential 21st century skills to solve design problems.

Knowledge gap

According to earlier work (Nicholl and McLellan, 2008; Schut et al., 2017), research shows that kids have difficulties with divergent thinking in creative processes. This includes 'design fixation' when kids stick to an initial first thought—

Figure 1-1 - Co-design toolkit by Sindsdien & Studio LVWP.

A design game for families

hindering the creative development of ideas. Kids tend to think creatively through the 'path-of-least-resistance', characterized by pre-existing ideas that are already known. Due to the growing interest in making children acquainted with creative problem-solving skills at a young age, research is being carried out on design toolkits specifically aimed at children (Schut et al., 2017). According to the Design Thinking philosophy, an open, playful and creative attitude is found to be an important mindset to solve design problems (Bakker et al., 2010; Wyatt and Brown, 2010; Thoring et al., 2014). This can be seen as an opportunity, not only for children but also for families with kids, to learn and practice creative problem-solving skills—in a playful way—through a Design Thinking game. However, this project does not focus on design toolkits for an educational setting, but on a design game for the consumer market.

Research question

To my knowledge, Design Thinking games are generally used as a co-creation tool or research tool for organisations. These kind of games make use of the various skills and expertise of players to explore different design possibilities, within a safe game environment. As such, design games are found to be a good basis for mutual learning between players (Brandt, 2006). However, what is lacking in the consumer market is a design game for families with a 'fun-factor'. A playful game environment offers opportunities to overcome 'design fixation' and to show kids that creative problem-solving can be fun as well. With this in mind, the following research questions have been formulated and will be explored throughout this graduation project:

1. How to evoke the essential 21st century skills in a design game?
2. What makes learning the essential 21st century skills through a design game fun?

Approach

The aim of this graduation project is to show the potential of a family-friendly design game with a fun-factor that engages kids to learn essential 21st century skills through an open and creative mindset. First, a literature research has been conducted to map existing knowledge about the essential 21st century skills; the creative thinking process; designing with kids; learning through games; and design games in general. These insights have led to a set of criteria for a family-friendly design game with a fun-factor. Then, through iterative design cycles, ideas have been generated and developed into low-fidelity prototypes that are eventually tested to learn about key issues, patterns of use, and to identify specific interaction and experience problems. Through playtesting sessions with several families, a concept has been evaluated and developed into a final design. Finally, an evaluation of the project elaborates on the extent to which the final design has succeeded in addressing the 21st century skills in a game. Moreover, limitations of this graduation project are discussed and opportunities for further research are suggested.

2. Literature research

2.1 Introduction

In this chapter, a literature research has been conducted to map existing knowledge in the interest of a family-friendly design game. First, essential 21st century skills, such as creative thinking, communication and empathy are discussed. Both opportunities and limitations related to these skills have been analysed, since these skills are relevant to the creative problem-solving process. The Design Thinking mindset is also discussed to understand how open-ended design challenges can be addressed within multidisciplinary teams. This includes an investigation of how to embrace an open and creative attitude as a mindset. Furthermore, various studies related to co-designing with kids are discussed to understand the challenges and limitations that should be taken into account when designing with kids. Then, six important game elements are explored in order to find out how games can be used as motivational and engaging tools to foster learning. Finally, literature related to design games has been examined to explore ways to embrace an open and creative attitude in a safe play environment. The insights coming forth from this literature research formed the foundation for a set of design criteria.

2.2 Essential 21st century skills

2.2.1 Introduction

Technological innovations have lifted us to a new way of living that we could not imagine 20 years ago. This also brought us today's toughest challenges, such as climate change, waste and pollution. According to Tim Brown, CEO of the successful design innovation firm IDEO, we must innovate our way of thinking to tackle these world-changing problems—relying on technological innovations is not enough. Unlocking creative abilities to solve complex problems could make a positive impact on our society.

To prepare ourselves for the immense challenges of living in the 21st century, it is important to get acquainted with the required competences. The 21st century is often described as a knowledge society, in which ideas and knowledge function as commodities (Voogt and Roblin, 2012). Many routine jobs have been replaced by IT-solutions, resulting in different kind of jobs demanded by the knowledge society. Educational systems should prepare young people for these dynamic modern jobs, which require skills such as as the ability to communicate, to solve problems, and to manage information within multidisciplinary teams (Voogt and Roblin, 2012).

The design based research project 'Co-Design with Kids: Early acquisition of 21st century skills' at the TU Delft, explores the creative problem-solving skills of primary school children. Among others, creative thinking, communication and empathy are identified as essential 21st century skills to solve creative problems. Implementing these skills in educational practice can be seen as a major challenge, given the importance of learning and practicing these skills in an integrated manner. In order to learn these skills in a design game, the most important aspects of these 21st century skills are discussed in the following paragraphs.

Figure 2-1 - Multidisciplinary team discusses ideas. Photo by Mert Tosun

2.2.2 Creative thinking

Creativity is one of the 21st century skills needed to solve design problems (Yilmaz et al., 2016; Schut et al., 2017). Creativity is defined as the ability to create something novel and useful (Nicholl and McLellan, 2008). It is argued that the ability in association tasks is related to creativity, as the ability to create new ideas highly depends on associative skills (Howard-Jones, 2002). Generating ideas is one of the six steps in the Design Thinking process (see paragraph 2.3.2). Divergent thinking and convergent thinking are found to be essential skills when generating and clustering ideas (Figure 2-2). However, 'design fixation' is considered to be the biggest barrier to effectively apply these creative thinking skills. According to Schut et al. (2017), a fixation on a specific idea could hinder the generation of alternative ideas—resulting in less variations on the initial idea. People tend to think creatively through the 'path-of-least-resistance', characterized by pre-existing ideas people already know (Nicholl and McLellan, 2008). Obvious thoughts are restricting the design space, leaving no room for novel ideas (Yilmaz et al., 2016). Neglecting divergent thinking seems to have a negative impact on creative solutions (Schut et al., 2017). Both divergent and convergent thinking are required for creative thinking, ideations, and successful designs. Therefore, attention must be paid to both types of thinking to address design fixation during the creative thinking process (Yilmaz et al., 2016). Fixation is not limited to domain or age; especially kids, who struggle with divergent thinking to come up with many ideas, could benefit from guidance by adults (Nicholl and McLellan, 2008).
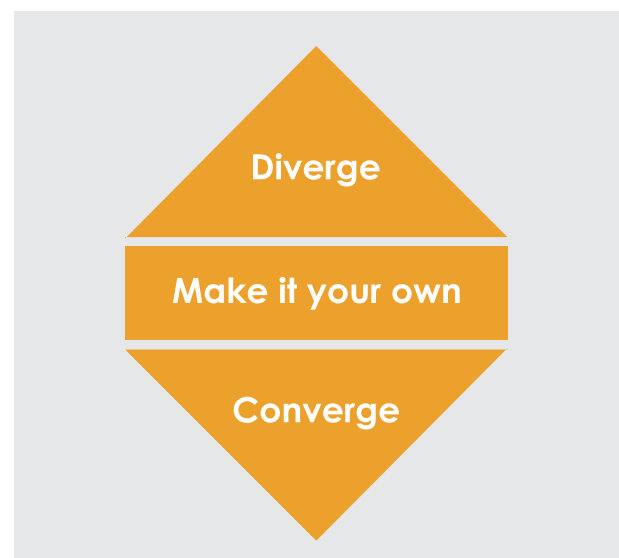
Figure 2-2 - Divergent and convergent thinking are used in most creativity models.
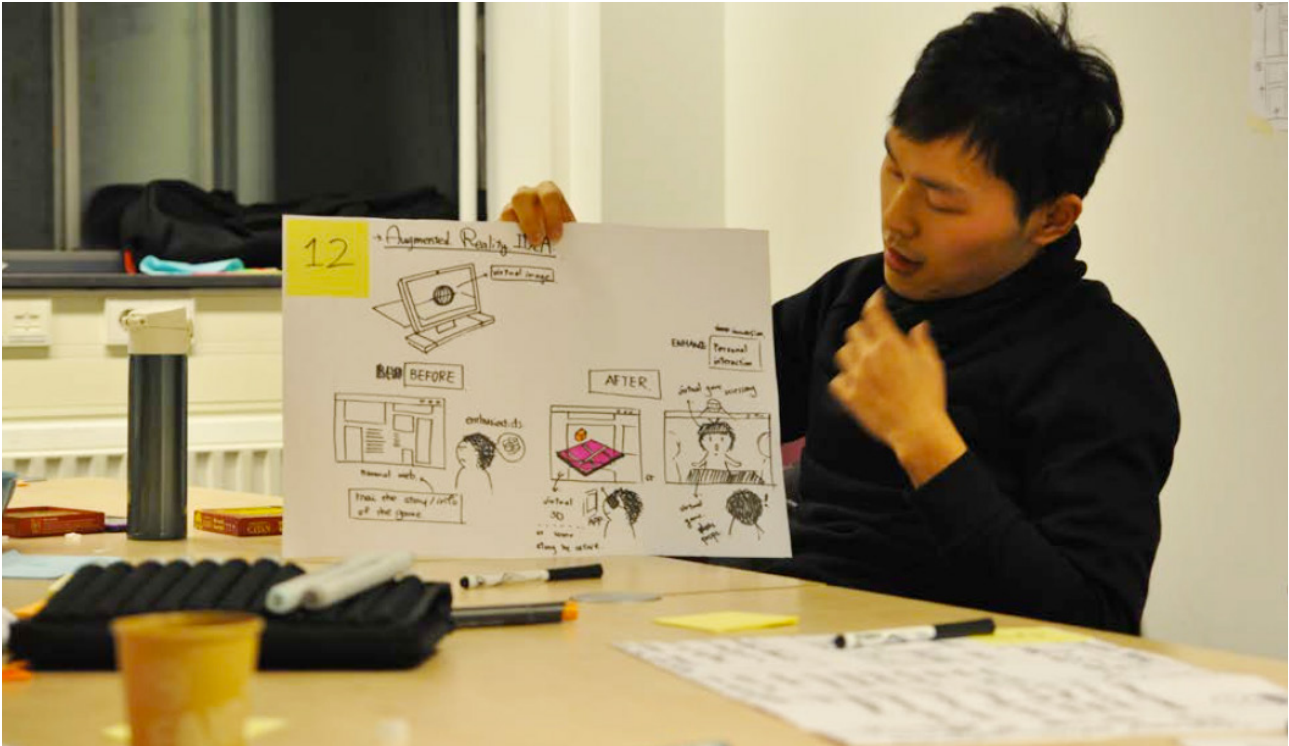
Figure 2-3 - Design student presents his idea through visuals. Photo by Mert Tosun

2.2.3 Communication

Communication is regarded as an essential aspect in the success or failure of a project. According to Cardoso et al. (2016), knowledge is shared through communication which influences creative collaborations. As such, communication is an essential part of providing feedback, and requires the necessary skills and practice. Questions are often used as a mechanism to provide feedback and to help people break away from design fixation and routine behaviour (Cardoso et al., 2016). Examples of approaches involving questions to stimulate creative thinking are SCAMPER (Substitute, Combine, Adapt, Modify, Put to another use, Eliminate, Reverse) by Eberle (1996) and 5W+1H (Who, What, Where, When, Why, and How). Team members could help to diverge with these generative questions, such as "What other materials could you use except wood?" or narrow down with convergent questions: "What type of wood could you consider?"

These different types of questions are clustered by Cardoso et al., (2014) in three classes: 1) low-level questions that focus on verification and definition; 2) deep reasoning questions aimed at analysis and orientation; and 3) generative design questions that focus on ideation and conceptualization. These different ways of asking questions could help to properly provide constructive feedback to guide the design process. Research shows that asking questions, raising problems and giving suggestions could help overcome design fixations (Schut et al., 2017).

In addition to oral communication, visual communication is an important skill as well to share knowledge. It is a useful way to support oral presentations (Figure 2-3). According to Sanders and Stappers (2008), visual thinking is an essential skill when conducting creative processes. Assuming that everyone is creative, even non-designers should be able to express themselves creatively to make necessary decisions when working in teams.

2.2.4 Empathy

Empathy is defined as "the cognitive ability to recognize and to understand the thoughts, perspectives, and feelings of another individual" (Barnett, 1987). Empathy as a skill involves the ability to have an emotional connection with people to understand why specific experiences are meaningful. According to Barnett (1987), children have been found to respond more empathically to those who are seen as similar to themselves. These similarities are defined in terms of a shared characteristic, such as race or gender, or in terms of a common personal experience (Barnett, 1987).

By training, the empathic skill to identify with other people's thoughts and feelings can be extended (Kouprie and Visser, 2009). This can be done through discussions and an open attitude towards others. The core mechanism of empathy consists of two components: cognitive and affective. According to Kouprie and Visser (2009), designers should gain an understanding of users through thought and experience (cognitive), and by 'feeling' their emotional state (affective).

According to the framework of Kouprie and Visser (2009), a process of four phases can be identified when empathizing with a user: (1) discovery, (2) immersion, (3) connection and (4) detachment. First, the designer should step into the user's world; second, the designer should discover what aspects would have an influence on the user; third, wandering in the user's world (Figure 2-4); and finally, detach and try to understand how the user would feel. When the user is not there in real life, designers could try to connect with the user through role-playing (Kouprie and Visser, 2009). However, when taking the skills of kids into account, a child below the age of 7 is found to be incapable of empathizing through role-playing. After
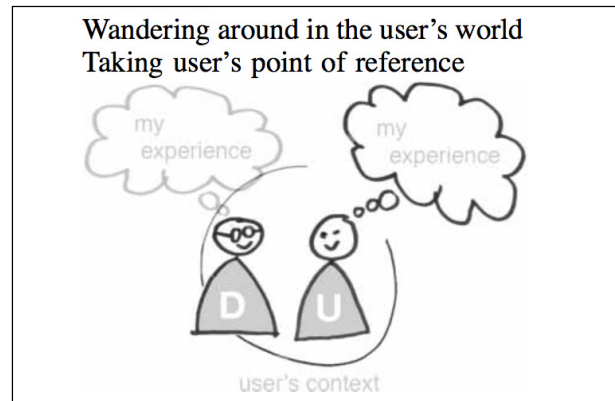
Figure 2-4 - Wandering around in the user's world (Kouprie and Visser, 2009).

the age of 7, egocentrism decreases and logical cognitive thoughts evolve— resulting in the development of the ability to empathically respond to the feelings of others (Barnett, 1987).

2.2.5 Conclusion

In order to tackle the immense challenges of the 21st century, essential skills such as creative thinking, communication, and empathy should be mastered early on. Design fixation is considered to be the biggest barrier in creative thinking processes (Nicholl and McLellan, 2008; Schut et al., 2017). Obvious thoughts are restricting creativity, leaving no room for new ideas. Especially kids, who struggle to come up with many ideas, could benefit from guidance in divergent thinking (Nicholl and McLellan, 2008). Questions are often used as a mechanism to provide feedback and to help people break away from design fixation (Cardoso et al., 2016). Also, both oral communication as well as visual communication are seen as relevant skills when conducting creative processes. In order to meet the user's needs, empathy is regarded as an essential skill to get closer to the motives and experiences of users by "wandering in the user's world". When the user is not there, designers could try to connect with the user through role-playing.

2.3 Design Thinking

2.3.1 Introduction

In the past, designers focused on improving the aesthetics and functionality of products. Today, successful innovation firms address the user's experience to bring them value and to solve problems from their perspectives. This human-centered approach is often called 'Design Thinking' and transferred to a more general problem solving approach with a high potential for many domains (Wyatt and Brown, 2010). Tim Brown, CEO of the acknowledged innovation and design firm IDEO, is a leading advocate of Design Thinking—a method to develop innovative solutions to challenging problems in multidisciplinary teams (Thoring et al., 2014). According to Brown (Figure 2-5), Design Thinking can lead to many ideas and, eventually, have a positive impact on the success of a company and the problems they want to tackle. Design Thinking is a method which helps to set a mindset to work intuitively, to identify patterns, to generate many ideas that have an emotional value, and to express ourselves in other ways than just words (Wyatt and Brown, 2010).

Figure 2-5 - Tim Brown. Photo by Core77

Although Design Thinking as a method can be applied in many different domains, it can be quite a challenge to apply it well in multidisciplinary teams— with people of different backgrounds and with different experiences (Thoring et al., 2014). This raises the question which criteria are important for the success of the Design Thinking methodology in multidisciplinary teams. Based on a literature review, a list of four criteria suggested by Thoring et al. (2014) are discussed in the following paragraphs, namely: (1) the Design Thinking process; (2) the team constellation; (3) the workspace; and (4) the Design Thinking mindset.

2.3.2 Design Thinking process

Applying Design Thinking in teams generates a lot of uncertainties; it is hard to map the route to the solution fully beforehand (Brown, 2009). Design Thinking can feel chaotic for people who experience this for the first time. According to Brown, multidisciplinary teams go through three main phases when using Design Thinking as a mindset: (1) during the inspiration phase the team will encounter a problem or an opportunity; (2) in the ideation phase the team will generate and test many ideas through iterative cycles; (3) in the final 'implementation' phase the team will make their innovation ready for the market.

As soon as the problem or opportunity becomes a project, writing a design brief will help to set goals as guidelines for the team. A well-constructed brief allows the team to experiment, open up to serendipity, and to ask for novel ideas. According to Brown (2009), the team will cycle through four mental states while working on the brief: (1) divergent thinking helps to generate many ideas
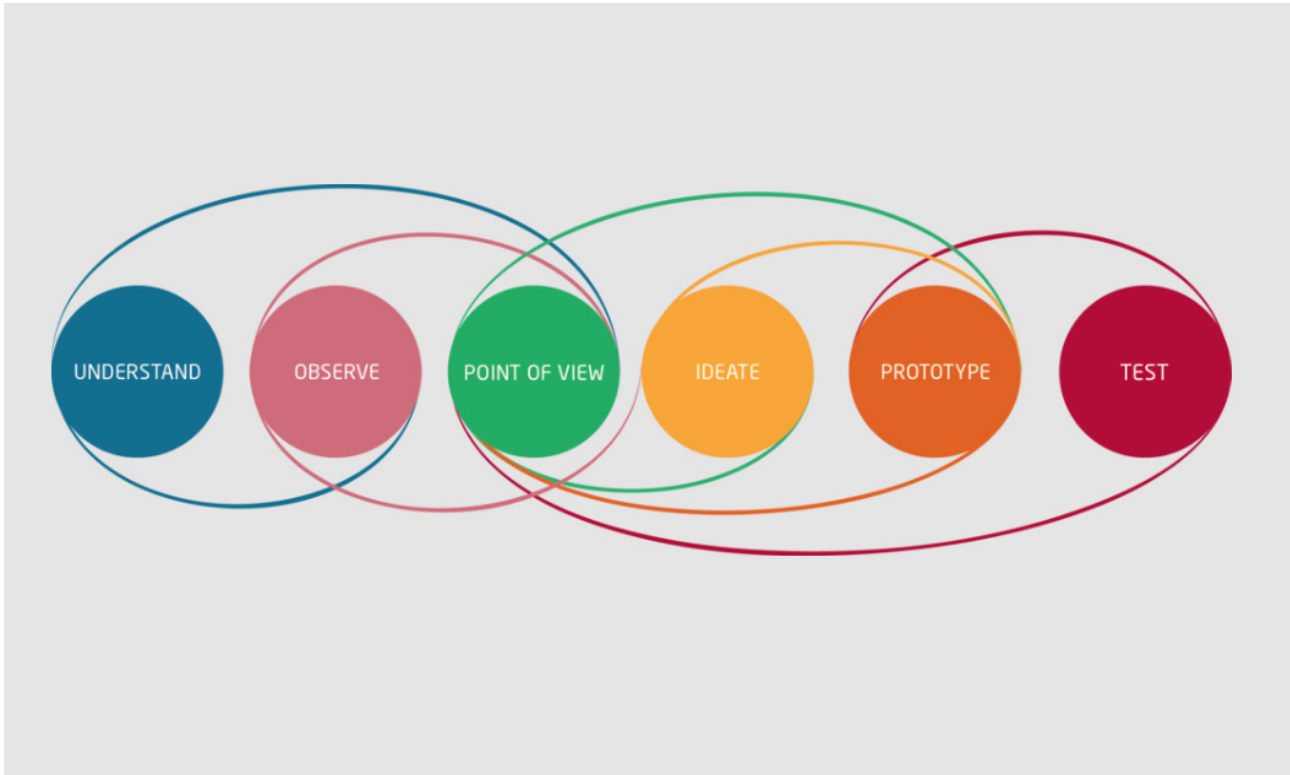
Figure 2-6 - Simplified model of the Design Thinking process (HPI D-School).

and alternatives; (2) convergent thinking helps sorting the options; (3) analysis breaks patterns down; (4) synthesis aids identifying meaningful patterns. The team will possibly cycle through these steps many times and often start the whole process all over again (Brown, 2009).

IDEO has been marketing the Design Thinking process since the early 1990s. David Kelly, founder and chairman of IDEO, was also involved in the foundation of educational institutions for Design Thinking—the so called D-Schools. One of those D-Schools is the HPI D-School in Potsdam (Germany). This institution trains students to apply the Design Thinking methodology in multidisciplinary teams. Figure 2-6 shows a simplified model of the Design Thinking process as applied and taught at the HPI D-School in Potsdam (Thoring et al., 2014). The six steps of the process that are executed in iterative loops are:

(1) Understand: Study available information in the public domain.
(2) Observe: Use qualitative user research to find something significant.
(3) Point of View: Create a user's Point of View by structuring, evaluating and identifying problems from the gathered data (synthesis).
(4) Ideate: A persona and How-Might-We Questions (HMW) are used to generate many ideas (even wild) by using different media.
(5) Prototype: Low-fidelity prototypes, such as drawings, mock-ups, and paper-prototypes, are used to visualise the selected idea(s).
(6) Test: Gain feedback through tests and interviews to implement the feedback into improved iterations.

There are several variants in circulation of this Design Thinking process. Some variants are simplified and other variants are slightly expanded. Nonetheless, they
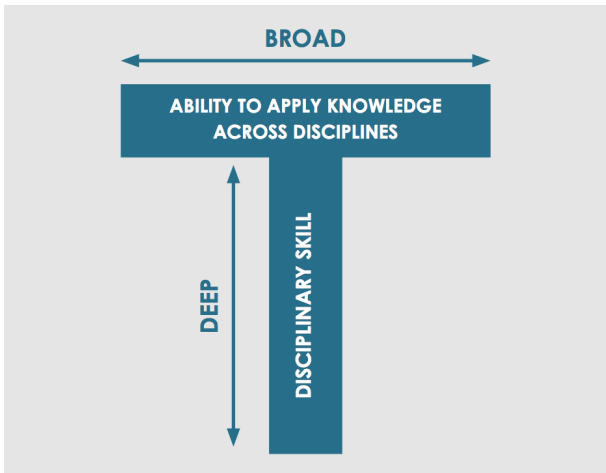
Figure 2-7 - T-shaped people have both depth and breadth in their skills and knowledge.

all highlight the iterative character of the process and the open creative attitude of the Design Thinking mindset.

2.3.3 Design Thinking teams

Design Thinking teams are typically characterized by their mixture of different disciplines, genders and nationalities, with flat hierarchies (Thoring et al., 2014). Team members can play different roles during a session, such as note taker, timekeeper and moderator, to guide the creative session. In addition, as our knowledge society requires essential 21st century skills, a team member can benefit from being a 'T-shaped' person (Figure 2-7). The vertical axis of the 'T' stands for the expertise in one or two fields to be able to make a tangible contribution, while the horizontal axis refers to complementary 21st century skill such as communication (including negotiating), creative thinking, and the empathy to understand people with different backgrounds. According to Wyatt and Brown (2010), people with a T-shaped profile have the mindset to successfully operate in multidisciplinary teams in the 21st century. Furthermore, one important rule in Design Thinking is to prohibit judging other people's

ideas. Instead, team members should be encouraged to come up with as many ideas (even wild) to be able to group and identify patterns later on in the design process (Thoring et al., 2014). As Wyatt and Brown (2010) believe: to find a novel idea you first have to generate lots of ideas. As such, having a diverse group of multidisciplinary people sparks creativity and divergent thinking.

2.3.4 Design Thinking space

According to Thoring et al. (2014), Design Thinking spaces are often characterized by open spaces with moveable whiteboards and other (playful) furniture elements. These spaces can be easily set up for the purpose of Design Thinking, and should have plenty of space for the people, whiteboards, and prototyping materials to play around. Whiteboards and (sometimes) walls can be written on with dry-erase pens. Prototypes can be made with the many different materials and tools which should be easily within reach. The ideal Design Thinking space should be a comforting environment with plenty of space, and tons of materials to play with.

2.3.5 Design Thinking mindset

Several rituals and mindsets are found to have a positive impact on teamwork and the outcome of a Design Thinking session (Thoring et al., 2014). Rituals, such as warm-up games and exercises, can be used to start a session to get everyone in the right creative mood. An important mindset in Design Thinking is to embrace failing. A quick try-out could potentially fail, but it saves time and resources when problems are revealed early on (Thoring et al., 2014). Visualizing ideas and making prototypes should be encouraged, instead of talking about them. According

to Wyatt and Brown (2010), quick, cheap and dirty experimentation is part of a vibrant Design Thinking culture. Fear of failure is one of the biggest obstacles to adopt Design Thinking as a mindset. With the right Design Thinking mindset, people can be open minded, playful and empathetic to search for solutions while dealing with 'fuzzy' input (Bakker et al., 2010). According to Roger von Oech, author of the bestseller 'A Whack On the Side of the Head' (1983), we should play with our knowledge and experiences; crazy, foolish and silly ideas spark novel solutions. The secret of creativity lies in what you do with your knowledge. Embracing an open and creative attitude opens doors for novel and creative ideas.

2.3.6 Conclusion

Design Thinking is found to be a successful method to develop innovative solutions to challenging problems (Wyatt and Brown, 2010). Four important criteria are identified to help to set a Design Thinking mindset (Thoring et al., 2014). First, the six steps of the Design Thinking methodology help to support the iterative character of the Design Thinking process. A team will go through three main phases: (1) the inspiration phase; (2) the ideation phase; and (3) the implementation phase. Understanding these phases will help to structure the 'chaotic' and 'uncertain' nature of the Design Thinking process. Second, Design Thinking teams are characterized by their mixture of different disciplines, backgrounds and flat hierarchies. Having a diverse group of multidisciplinary people sparks creative thinking (Thoring et al., 2014). Third, Design Thinking spaces are characterized by their playful nature. The team should have plenty of space to draw on whiteboards and to play with different materials. Lastly, the fear of failure is one of the biggest obstacles to adopt Design Thinking as

a mindset (Wyatt and Brown, 2010). Embracing an open and creative attitude opens doors for novel and creative ideas. According to Von Oech (1973) we should play with our knowledge and experiences; crazy, foolish and silly ideas spark novel solutions.

2.4 Designing with kids

2.4.1 Introduction

Various research has been done on techniques and tools to support the Design Thinking process (Sanders and Stappers, 2012). Many of these tools and methods don't take the skills of kids into account (Gielen, 2013). Research shows that when kids are involved in a creative design session with adults, certain challenges should be taken into account. Kids express and respond to creativity in different ways, and therefore generative tasks in existing methods may not have the desired effect. As such, tools should be adjusted accordingly to children's skills (Vaajakallio et al. 2009; Gielen, 2013). In the following paragraphs, the challenges, group dynamics and motivating elements when co-designing with kids are discussed. These insights are of great importance to define criteria for a family-friendly design game.

Figure 2-8 - Co-designing with Make Tools. Photo by Greg Walsh

2.4.2 Make Tools

When kids are asked to visualize their ideas with various materials, crafting can be time consuming. The so-called 'Make Tools', introduced by Sanders (2006), are found to be time saving in creative sessions. According to Vaajakallio et al. (2009), kids ages 8 and up get motivated and enthusiastic when visualising ideas with Make Tools (Figure 2-8). These tools can be blocks, cardboard pieces, or pre-made shapes in various sizes that kids can use to make different configurations to visualise ideas. The ambiguity of these Make Tools calls for many interpretations that can be transformed into meaningful representations of new features in a design. As such, Make Tools are seen as an accessible starting point for the ideation phase and are found to have a positive effect on the creativity of children (Vaajakallio et al., 2009).

2.4.3 Group dynamics

When having a creative session in a group, group dynamics can influence the mood and creativity of kids. For example, certain children may be more dominant than others. Extroverted children can hinder introverted children in their contribution to the creative collaboration and discussions. Therefore, cooperation between children within groups is not always flawless. For example, parts are often made apart from each other without properly communicating what everyone's contribution is to the final design; also called the 'apart together' phenomenon (Vaajakallio et al., 2009; Van Mechelen et al., 2014). On the other hand, some groups may want to please each other by meeting everyone's wishes—also called the 'groupthink' phenomenon (Van Mechelen et al., 2014). This way, a positive atmosphere in the group is being safeguarded, resulting

in a design without vision and too many functionalities. To make sure that many different ideas are being generated by the kids, heterogeneous groups of four to six gender-mixed groups are found to be most fruitful (Van Mechelen et al., 2014). Therefore, design toolkits used in co-creation sessions with kids should take group dynamics into account, to ensure that the group doesn't significantly affect the creative output.

2.4.4 Adult guidance

Creative sessions with many tasks and rules can put children off. Over-designed methods and tools are found to be counter-acting in creative collaborations with kids (Vaajakallio et al., 2009). Kids can be distracted quickly; an extensive series of tasks can sometimes be difficult to follow. Methods and tools with many rules and tasks should therefore be guided by adults (Figure 2-9). Active participation of adults can help children focus on discussions and the various tasks during creative sessions. As discussed earlier (paragraph 2.2.2), kids who struggle with divergent thinking could benefit from guidance by adults as well, as 'design fixation' is considered to be the biggest barrier to effectively apply creative thinking skills (Nicholl and McLellan, 2008;

Figure 2-9 - Adult guidance.
Photo by ISTOCK

A design game for families

Schut et al., 2017). Adults must also keep an eye out on introverted kids to give every kid a fair chance to contribute to a creative session (Gielen, 2013).

2.4.5 Ice-breakers

The structure of a creative session greatly influences group dynamics and the creative output. Ice-breaker games are found to work well as a warming-up task to bring kids in the right mood (Figure 2-10). They encourage an open attitude towards creative thinking (Gielen, 2013). When performed well, an ice-breaker can show kids the purpose and opportunities of a creative session. In addition, an ice-breaker can give introverted kids a safe feeling to experiment with the provided tools and could potentially eliminate fear of embarrassment (Gielen, 2013).

2.4.6 Competition

Mild competition could potentially have a positive impact on children's creativity in creative collaborations (Gielen, 2013). Especially boys in their puberty (ages 10 and up), could benefit from having a sense of competition in their tasks to increase their creative output. In order to prevent unexpected competition, competitive game elements could be implemented in specific tasks to embrace intrinsic motivation. As such, the intrinsic motivation to compete is deployed to enhance extrinsic motivation to generate creative output (Gielen, 2013).

2.4.7 Conclusion

Research shows that when kids are involved in co-creation sessions, certain challenges should be taken into account (Vaajakallio et al., 2009; Gielen, 2013; Van Mechelen et al., 2014). For example,

Figure 2-10 - Ice-breaker as a warming-up session. Photo by Carrie Kellenberger

crafting artefacts can be time consuming with kids. The so called 'Make Tools' are found to be less time consuming and research shows that they have the potential for a positive effect on the ideation phase (Vaajakallio et al., 2009). Group dynamics can have an influence on the mood and creativity of kids as well (Van Mechelen et al., 2014). For example, dominant kids could significantly affect the creative output. In order to make sure that many different ideas are being generated by the kids, heterogeneous groups of four to six gender-mixed groups are found to be most fruitful. However, methods and tools with many rules and tasks should be guided by adults (Vaajakallio et al., 2009). Furthermore, ice-breaker games are found to encourage an open attitude towards creative thinking (Gielen, 2013). Finally, mild competition could potentially have a positive impact on children's creativity.

2.5 Learning through games

2.5.1 Introduction

Educational games have been around for some time now. In the 18th century, the army used war games for educational training purposes to simulate field battles. Over the past decades, the demand for games in which players learn through gaming have increased. According to Van Staalduinen (2012), educational games should motivate and engage players to foster learning. This raises the following questions: How can we learn something through gaming? And what important game elements make people want to play and replay a game? The argument put forth in this chapter is that if a game has a fun-factor, players would feel more inclined to play and replay a game. Based on arguments of successful game designer Bruno Faidutti, the importance of a fun-factor in games will be discussed as well.

2.5.2 Fundamental process of learning

With an extensive analysis of theoretical learning models, Van Staalduinen (2012) shows that replaying a game increases the efficiency of learning. He defines learning through Illeris' fundamental processes of learning (Figure 2-11), which is based on three important aspects, namely: content, incentive (stimulus) and interaction. As such, a player is encouraged by a motivational game element to pick up content through interacting with a game environment. When playing with multiple players, this game environment can be seen as a social context to make learning
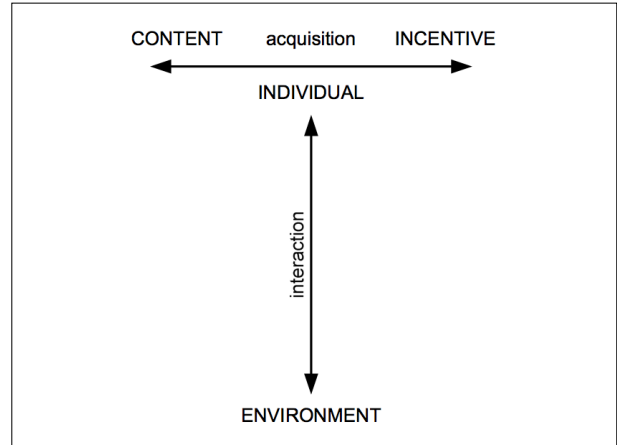
Figure 2-11 - Fundamental processes of learning (Illeris, 2007).

meaningful. The effects of these interactions are mentally being translated into knowledge or skills. According to Van Staalduinen (2012), repetition of these processes increases the learning efficiency. Using this theory, games can be seen as educational tools with motivational and interactive elements—two strengths of games.

2.5.3 Important game elements

Based on a literature research and observations, Van Staalduinen (2012) established a framework (Figure 2-12) to develop educational games with typical game elements of entertainment games—resulting in higher learning efficiency through a 'fun-factor'. This framework (Appendix L) is not based on mechanisms inherent to a game itself, but on the player's perspective; how players look at a game and how they experience it. The framework defines six core principles for educational game design (the six hexagons in the middle of Figure 2-12): player autonomy; player incentive (stimulus); social interaction; game structure; learning content; and challenges. Within these six core principles, six game elements are experienced as critical aspects to

motivate players to play and replay games—to make them 'fun'. These are defined as: feedback, difficulty, control, choice, safety and social activity. These six game elements are found to matter the most from the perspective of players and should therefore be considered when designing fun educational games:

• **Feedback:** Indicator for a player's skill and competence at a game.
• **Difficulty:** Amount of effort and skill that is required of a player when trying to achieve the game's goals. This should be scalable to challenge players with different skills.
• **Control:** The game's options for active and direct manipulation of specific aspects of the game by the player. Players want a sense of control.
• **Choice:** The ability to make in-game choices and decisions.
• **Safety:** Allows players to take risks and experiment without any real-life consequences; important for player's motivation.
• **Social activity:** Provides an opportunity for achievements to be acknowledged by others; challenges become meaningful.
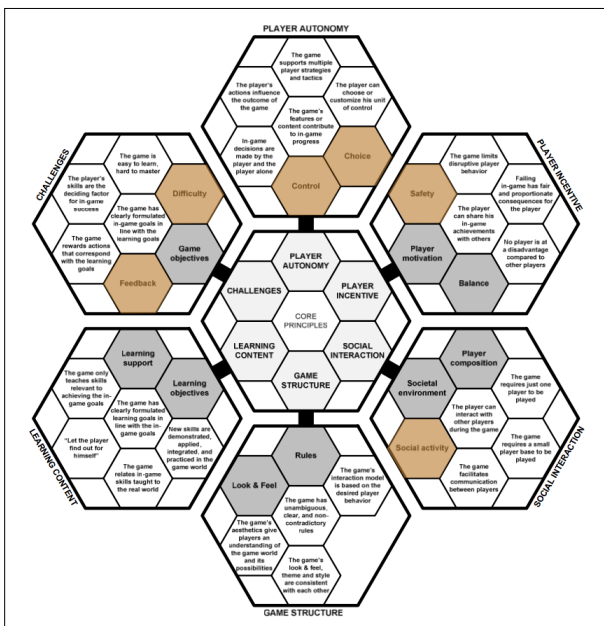
Figure 2-12 - Framework for educational games (Adapted from: Van Staalduinen, 2012).

2.5.4 The importance of a fun-factor

According to French historian and sociologist Bruno Faidutti, author of over 40 published board and card games (such as his successful title Machiavelli, sold over 2 million copies worldwide), good games should be tense and challenging, with game elements that evoke a moment of frustration. Successful party games, like 30 Seconds, Jungle Speed and Twister are fun because they require skill and they have an element of competition in them. However, the gaming pleasure does not merely come from the concentration needed for these kind of games; "but from the crazy fun they create" (Faidutti, 2011).

Dutch historian Johan Huizinga analysed several fundamental characteristics of 'play' in his famous book 'Homo Ludens' (1950), which means "playing man". According to Huizinga, play is an experience of fun and enjoyment and a fundamental quality of life. Huizinga argues "limitedness" as one of the main characteristics of play: "Play is distinct from "ordinary" life both as to locality and duration. It is "played out" within certain limits of time and place. It contains its own course and meaning." (1950, p 9). As such, play can be considered as an activity in which rules of our daily life don't apply.

According to Bruno Faidutti, if the only goal of a game is to teach something, the game will automatically fail to be successful. Players should enjoy the ride and have a fun time together, without the sole purpose of just learning something new. The true nature of games is to be disconnected from reality (Huizinga, 1950), and as Bruno Faidutti like to argue: the only measurable effect of educational games is that players have less fun with them. "The best proof of this is that the

best games don't pretend to be anything else than just games, and that the so-called educational game are usually not very exciting as games" (Faidutti, 2004). Therefore, the challenge is to embed a fun-factor and an element of tension in educational design games.

2.5.5 Conclusion

Educational games should motivate and engage players to foster learning (Van Staalduinen, 2012). Through Illeris' fundamental processes of learning, games can be seen as educational tools with motivational and interactive elements. Six important game elements should be considered when designing entertaining educational games: feedback, difficulty, control, choice, safety and social activity. According to Bruno Faidutti (2004), without a fun-factor, educational games are born to fail in the consumer market. The true nature of games is to be disconnected from reality (Huizinga, 1950). As such, the challenge is to embed a fun-factor in educational design games—to make them fun.

Figure 2-13 - Design Game by Flex/design.

2.6 Design Games

2.6.1 Introduction

In recent years there has been an increased interest in design games as a tool to support creative sessions, especially for research purposes. Design games enable users and stakeholders to envision future experiences in a playful way (Iversen and Buur, 2002). In a safe play environment, players are challenged to explore and understand past memories, present experiences and future dreams (Vaajakallio and Mattelmäki, 2014). As such, design games provide a familiar atmosphere inviting collaboration and negotiation between designers, stakeholders, and users with different professions, visions, and motives (Iversen and Buur, 2002). However, design games are based on the acceptance that everyone is creative and thus all players can contribute to the design process when supported with suitable tools (Sanders and Stappers, 2008). What kind of framework, mechanisms and materials are needed to evoke creative problem-solving skills in a playful game environment? Through a literature research, existing knowledge about design games has been mapped to be able to define criteria for a design game. Furthermore, existing design games and creative games on the consumer market has been analysed to discover which important game elements are common in these types of games.

2.6.2 Design game framework

The framework of design games can be broken down into two separate but linked components: 'design' and 'games' (Vaajakallio and Mattelmäki, 2014). The 'design' part can be used to explore

and manipulate a context, whereas the 'game' part uses game elements, such as conditions and actions, to accompany its gameplay. According Vaajakallio and Mattelmäki (2014), design games can be used in four different ways: (1) for research: to study design choices in a manipulative environment; (2) to build design competence: to teach through a playful game how to evoke social interactions; (3) to empower users: to use a game as a tool for a shared narrative between designers, users and stakeholders; and (4) to engage various stakeholders: stakeholders are stimulated to express, negotiate and create a shared understanding of users, to develop conceptual solutions (Vaajakallio and Mattelmäki, 2014). Brandt (2006) refers the latter as 'explorative design games' (Figure 2-13), and these type of design games may function as: (1) games to conceptualise design; (2) games to exchange perspectives in design; (3) games to understand the context; and finally (4) games to create scenarios of the intended user. Though, Brandt (2006) stresses that there isn't a generic explorative design game that can be used for every project or context. Looking at these frameworks, an 'explorative design game' seems to be most suitable for a family-friendly design game, as these types of games have the most potential to embrace an open and creative attitude to explore creative problem-solving skills in a safe game environment.

2.6.3 Design game mechanisms

Explorative design games involve communication, negotiation and entering compromises between all involved players (Brandt, 2006). Just like regular board games, rules and physical game components accompany its gameplay. However, existing design games do rarely have a competitive game element

in order to win the game. They rather provide a safe play environment to explore design solutions and different strategies (Iversen and Buur, 2002). Creative solutions and strategies derive from the input of different players in the game. Designers, stakeholders and users often have different backgrounds and interests, and the challenge is to take advantage of the different skills through game mechanisms such as turn-taking, question-asking and combining words and images—to evoke novel ideas (Brandt, 2006). In addition, role-taking can give players a new perspective on design problems. Design games allow players to switch between different roles to gain an empathic understanding of other people's perspectives and experiences (Vaajakallio and Mattelmäki, 2014).

2.6.4 Design game materials

Design game materials should be safe playful tools to support idea generation and the dialogues that come into play (Brandt, 2006). Explorative design games are in nature a collaborative generative activity aimed at gaining knowledge about the users, context and creative solutions. According to Vaajakallio and Mattelmäki (2014), ambiguous shaped game materials help players to suggest new interpretations and alternative options in a playful way. Abstract game materials reduce obvious thoughts and experiences players could have. Various game materials can be applied to support the expression of experiences and desires, such as the so-called Make Tools with ambiguous shapes. Brandt (2006) argues that when different players build creative solutions together, negotiations and discussions take place during the game. The dialogues in explorative design games are found to be even more important for guiding the design directions than the tools itself.

2.6.5 The fun-factor in design games

Salen and Zimmerman (2004) define games in their often cited publication 'Rules of Play' as follows: "A game is a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome." In games on the consumer market, a player has either won or lost, or gained a numerical score. According to Brandt et al. (2008), exploratory design games don't have a winner; they are meant for co-creation. Instead, a safe playground is found to be essential; players should be stimulated to experiment and try out new ideas, without being afraid to make mistakes. According to Vaajakallio and Mattelmäki (2014) there is still the feeling of tension in explorative design games through chance (dice/cards) and the feeling of chasing success. As argued by Johan Huizinga (1950), tension is one of the core qualities of play. As such, the tension that derives from solving the different challenges is found to be an engaging element to have fun in explorative design games.

2.6.6 Game elements in design games

Contrary to Brandt's claim, there are existing explorative design games in which a mild form of competition is applied. An example of such a game is the 'Design Game' by Flex/design (Figure 2-13). This game involves consumers in a co-creation process to gain a better insight in their behaviour. It is a turn-based game in which two teams compete against each other to win a challenge with their generated ideas. The game uses dice to move around the board where players have to answer questions or to fulfil tasks. This will eventually result

in a flow of ideas that are visualised by a designer in each team. An example of a challenge could be: "Based on consumer research, LEGO believes this game can be won with the development of a durable packaging solution." The winner is then chosen by the problem owner or a moderator. This example shows that there are opportunities to experiment with a competitive game element in explorative design games, since mild competition could potentially have a positive impact on children's creativity (Gielen, 2013).

In Appendix A, several design games have been mapped based on the important game elements as discussed in paragraph 2.5.3. In addition, the essential 21st century skills are mapped as well. Both game elements and skills are rated on a 4-point scale, from "(0) not present" to "(4) fully present". The mapping shows that particular emphasis is placed on safety, control and choice in explorative design games. Three elements important during the exploration of problem-solving skills in a safe game environment.

2.6.7 Game elements in creative games

On the board game market, games with elements of design games are scarce. However, there are a few 'creative' games available with game elements that can be found in design games. For example, in 2015, the successful game Codenames was launched, which partly makes use of the word association principle—an ability strongly related to creativity. In Codenames, two teams compete to see who can make the smartest clues. Spymasters give one-word clues that can point to multiple words on the table. Their teammates try to guess words of the right colour while avoiding those that belong to the opposing team.

The game mainly focuses on empathic and creative thinking skills; you have to crawl into the head of your fellow player to find out what he means with his clues. The more often you play this game, the more easily you can link words together with your creativity.

In Appendix B, several creative games on the consumer market have been mapped, based on the six important game elements that are found to be critical aspects to motivate and engage players. In additions, the essential 21st century skills are mapped as well. Both game elements and skills are rated on a 4-point scale, from "(0) not present" to "(4) fully present". The mapping shows that 'feedback' is a strong recurring game element in consumer games. As such, feedback is found to be an important element to enhance engagement and motivation, both important aspects of competition and replayability.

2.6.8 Trends in consumer games

Ten years ago, highly tactical games dominated the market, such as Agricola (2007) and Dominion (2008), whereas today, skills like communication and (fine) motor skills are applied as well. To illustrate this, in the disc-flicking game Flick 'em Up! (2015), you're flicking tokens to fight enemies instead of playing cards, and in the successful party game Spyfall (2014) you're only using communicative skills to drive gameplay. Competition-wise the market shows a trend towards cooperative games, for example together saving the world from diseases in Pandemic Legacy (2015). As such, players win or lose as a team. It seems that, for many, playing board games is all about having a fun time together: "I value board games more because playing a board game simply means I am with my friends," says a gamer on Reddit.

2.6.9 Footprint on the table

These days, the interaction with high-tactile game components is an important aspect of the analogue gaming experience. Especially when targeting families with kids, games need to have some sort of 'footprint on the table'. According to Liesbeth Bos, Dutch game designer specializing in children's games, kids are less attracted to a game when you just have cards in 2D on the table. Instead, games should have some high-tactile game components: "It should be something three-dimensional, or a value investment like a few cute pieces, or a lot of cool thingies, instead of a ton of tiles… there must be something in the game that attracts the child to play with it (...) this is what they call the 'footprint on the table' these days."

2.6.10 Conclusion

Design games embrace an open and creative attitude to explore creative problem-solving skills in a safe game environment. The challenge is to take the different skills of players into account. According to Brandt (2006), design game materials should be safe playful tools to support idea generations and discussions. Ambiguous and abstract game materials reduce obvious thoughts and experiences players might have (Vaajakallio and Mattelmäki, 2014). The discussions in explorative design games are found to be even more important for guiding the design direction than the tools itself. In terms of fun, the tension that derives from solving the different in-game challenges is found to be the engaging element in design games. However, games on the consumer market rather make use of a competitive game element to engage players. As such, 'feedback' on the player's skill is found to be an important game element to increase replayability.

2.7 Conclusions

This chapter has, through an examination of literature in the interest of a design game for families, outlined the foundation for a set of criteria relevant to the central aim of this graduation project—to evoke and apply the 21st century skills in a game with a fun-factor. Moreover, the insights gathered through this literature research demonstrate the opportunities and constraints when exploring creative-problem solving skills with kids.

Mastering of the 21st century skills

To prepare families with kids for the open-ended challenges of the 21st century, essential skills such as creative thinking, communication, and empathy should be mastered early on (Voogt and Roblin, 2012).

Creative thinking is a skill required to create something novel and useful (Nicholl and McLellan, 2008). To come up with something new, divergent thinking and convergent thinking are found to be essential skills when generating and clustering ideas. However, among others, 'design fixation' and thinking through the 'path-of-least-resistance' are found to be the biggest barriers to effectively apply these creative thinking skills (Schut et al., 2017). An explorative design game could potentially help to address these barriers with its game mechanisms and game components (Vaajakallio and Mattelmäki, 2014).

Communication is seen as a relevant skill when conducting creative processes in multidisciplinary teams. It greatly influences the success of a project (Cardoso et al., 2016). Both oral and visual communication are found to be useful ways to share knowledge and to make necessary decisions in creative collaborations (Sanders and Stappers,

2008). As such, explorative design games are found to be a good basis for mutual understanding between players (Brandt, 2006).

Empathy is regarded as an essential skill to "understand the thoughts, perspectives, and feelings of another individual" (Barnett, 1987). When this 'individual' is not there in real life, designers could try to connect with the user through role-playing (Kouprie and Visser, 2009). When taking the skills of kids into account, kids after the age of 7 are found to have the ability to empathically respond to the feelings of others (Barnett, 1987). This means that children aged below 7 might struggle to apply empathy in the game.

A safe and family-friendly game environment

Ice-breaker games are found to give introverted kids a safe feeling to experiment and to potentially eliminate fear of embarrassment (Gielen, 2013). As such, a safe game environment fosters the exploration of creative problem-solving skills, without the fear of making mistakes (Brandt, 2006). The components in a game environment should be safe playful tools to support idea generation and the discussions that come into play (Brandt, 2006). Given that the dialogues in explorative design games are found to be even more important for guiding the design process than the tools itself (Brandt, 2006).

An open and creative attitude

The fear of failure is one of the biggest obstacles to adopt Design Thinking as a mindset (Wyatt and Brown, 2010). Embracing an open and creative attitude opens doors for novel and creative ideas. According to Von Oech (1983), we should play with our knowledge and experiences; crazy, foolish and silly ideas spark novel solutions. As such, explorative design games are found to embrace an open

and creative attitude to explore creative problem-solving skills in a safe game environment (Iversen and Buur, 2002; Brandt, 2006; Vaajakallio and Mattelmäki, 2014).

Acknowledging the six important game elements

Educational games should motivate and engage players to foster learning (Van Staalduinen, 2012). Six important game elements should be considered when designing entertaining educational games: feedback, difficulty, control, choice, safety and social activity. These game elements are found to matter the most from the perspective of players to feel more inclined to play and replay a game—to make educational games fun.

An element of tension

According to succesful game author Bruno Faidutti, good games should be tense, with game elements that evoke a moment of frustration. In explorative design games, the tension that derives from solving the different challenges is found to be an engaging element to have fun (Vaajakallio and Mattelmäki, 2014). As such, tension—mainly caused by uncertainties—is found to be one of the core qualities of play (Huizinga, 1950).

Mild competition

In most of the games on the consumer market a player has either won or lost, or gained a numerical score. As such, games on the consumer market rather make use of a competitive game element as an intrinsic motivation to compete. When looking at kids, mild competition could potentially have a positive impact on their creativity in explorative design games, especially when their extrinsic motivation is to be creative (Gielen, 2013).

Ambiguous game materials

Design fixation and thinking through the 'path-of-least-resistance' are considered to be the biggest barriers in the creative thinking processes (Nicholl and McLellan, 2008; Schut et al., 2017). Obvious thoughts are restricting creativity and are found to hinder the development of new ideas. Ambiguous and abstract game materials are found to reduce obvious thoughts and experiences players might have (Vaajakallio and Mattelmäki, 2014).

Easy to explain

Over-designed methods and tools are found to be counter-acting in creative collaborations with kids (Vaajakallio et al., 2009). Design games with many rules and tasks should be guided by adults (Vaajakallio et al., 2009). When a design game is easy to explain it means that there are fewer rules that may counteract children's creativity and attention during the game.

Short playing time

Kids can be distracted quickly; an extensive series of tasks can sometimes be difficult to follow (Vaajakallio et al., 2009). A short playing time allows children to stay captivated throughout the game, since a negative atmosphere within a group could potentially affect the mood and creative output of kids (Van Mechelen et al., 2014).

Playable up to 6 players

Four to six gender-mixed groups are found to be most fruitful in co-designing sessions with kids (Van Mechelen et al., 2014). A family-friendly design game should therefore be playable with at least 4, and up to 6 players—to have the group dynamics at its best.

3. Design goal

3.1 Introduction

In this chapter, a design goal is presented in the form of a design statement coming forth from the conclusions of the literature research. In order to generate ideas and to evaluate concepts in the next phase, a list of criteria is defined to support this design statement.

3.2 Design statement

As the current consumer market is lacking family-friendly design games with a fun-factor, it is important to find out how to motivate and engage players to play an educational design game. Therefore, to make an educational design game fun, the design challenge is to develop—through iterative design cycles—a concept proposal for a design game that meets the following statement:

"A family-friendly design game that evokes an open and creative attitude through a safe game environment, while learning the essential 21st century skills in a fun way."

Japanese kids exploring a stacking game in a safe game environment.
Photo by Takashi Hamada

3.3 Design criteria

Based on the insights of the literature research, the following criteria have been defined for the ideation phase—to eventually evaluate three concept proposals. The selected criteria have been weighted (1-5) based on their relevance to comply with the design statement.

Criteria	Weight
1. Mastering of the 21st century skills *In order to tackle the immense challenges of the 21st century, essential skills such as creative thinking, communication, and empathy should be mastered early on (Voogt and Roblin, 2012).*	**5**
2. A safe and family-friendly game environment *A safe game environment fosters the exploration of creative problem-solving skills (Brandt, 2006).*	**5**
3. An open and creative attitude *Embracing an open and creative attitude opens doors for novel and creative ideas (Von Oech, 1973).*	**5**
4. Acknowledging the six important game elements *Educational games should motivate and engage players to foster learning (Van Staalduinen, 2012).*	**5**
5. An element of tension *Tension is found to be one of the core qualities of play—to make games fun (Huizinga, 1950).*	**5**
6. Mild competition *Mild competition could potentially have a positive impact on children's creativity (Gielen, 2013).*	**4**
7. Ambiguous game materials *Ambiguous game materials reduce obvious thoughts and experiences players might have—to overcome design fixation (Vaajakallio and Mattelmäki, 2014).*	**4**
8. Explainable in 2 minutes *Design games with many rules and tasks should be guided by adults (Vaajakallio et al., 2009).*	**3**
9. Short playing time of up to 30 minutes *Kids can be distracted quickly; an extensive series of tasks can sometimes be difficult to follow (Vaajakallio et al., 2009).*	**3**
10. Playable with 4 to 6 players *Four to six gender-mixed groups are found to be most fruitful in co-designing sessions with kids (Van Mechelen et al., 2014).*	**2**

A design game for families

4. Conceptualisation

4.1 Introduction

The aim of this conceptualisation phase is to develop a concept proposal that meets the following design statement:

"A family-friendly design game that evokes an open and creative attitude through a safe game environment, while learning the essential 21st century skills in a fun way."

In order to do so, a selection of suitable game mechanisms are identified to generate a variety of ideas for a family-friendly design game. These ideas are generated with the design criteria, presented in Chapter 3, in mind. Then, a selection of these generated ideas are clustered through a morphological chart, resulting in three design directions. Subsequently, these design directions are evaluated and further developed through a series of playtesting sessions with actual human beings. This way, several iterations are eventually developed to a concept level. Using the predefined design criteria, three concepts are evaluated through a weighted scoring method. The selected concept that follows from this evaluation method is used in the next phase for several playtesting sessions with the target group—families with kids ages 8 and up.

4.2 Game mechanisms

According to the online board game database BoardGameGeek.com (Figure 4-1), a game mechanism is a term referring to a functional aspect of a game that drives a game. For example, you roll a set of dice, and the amount of pips on the dice indicates the amounts

of steps you move on a board, also called a "roll-and-move mechanism". On BoardGameGeek.com over 50 of these mechanisms can be found. Some games make in an original way use of a combination of these game mechanisms, while other games just make use of a single mechanism. The aim of this graduation project is not to invent a new mechanism but to find out which mechanisms can be applied in a family-friendly design game—to make them fun. A selection has been made of suitable game mechanisms that are applicable to creative games, such as an explorative design game. Mechanisms, such as a "Chit-Pull system", commonly used in war games have been filtered out. Please consult Appendix C for a complete overview of this selection. Different game ideas have been generated based on this list and they are going to be discussed in the next section.

Figure 4-1 - Online board game database BoardGameGeek.com

4.3 Idea generation

Based on the selected game mechanisms (Appendix C), a variety of game ideas have been generated (see Appendix D). These ideas are then clustered in the six different steps of the Design Thinking process (as discussed in paragraph 2.3.2), to explore ways to evoke an open and creative attitude in a safe game environment. An example of such a game idea is, for example, Variable Player Power: "Each player receives at the start of the game a unique brainstorm-card with a special feature, such as Subsitute, Combine, Adapt, Modify, Put to another use, Eliminate, or Reverse. These special abilities can be used during the game to alter or generate ideas during ideation" (Figure 4-2). In each cluster, there are at least seven different ideas to choose from—resulting in a total of 42 ideas. The clusters make it easier to map them in a morphological chart, to eventually combine them into testable games.
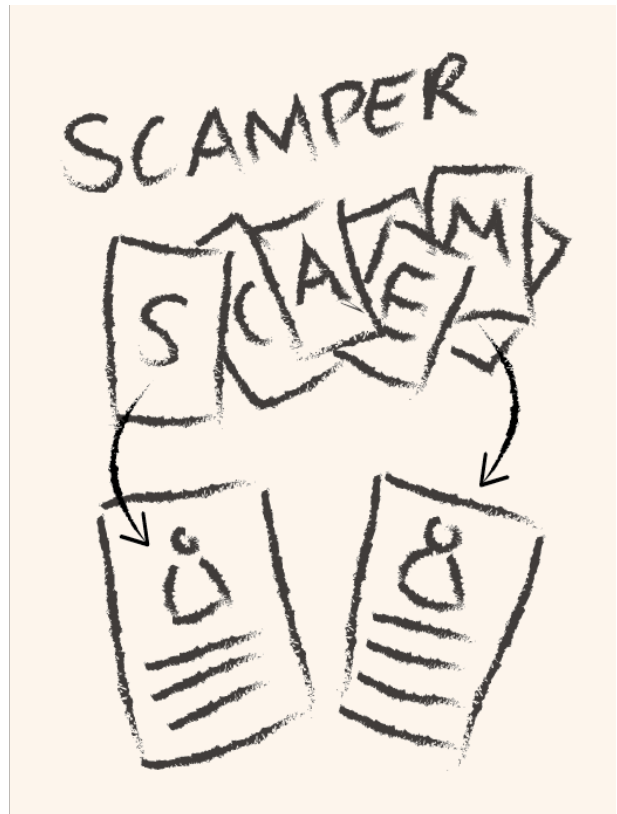

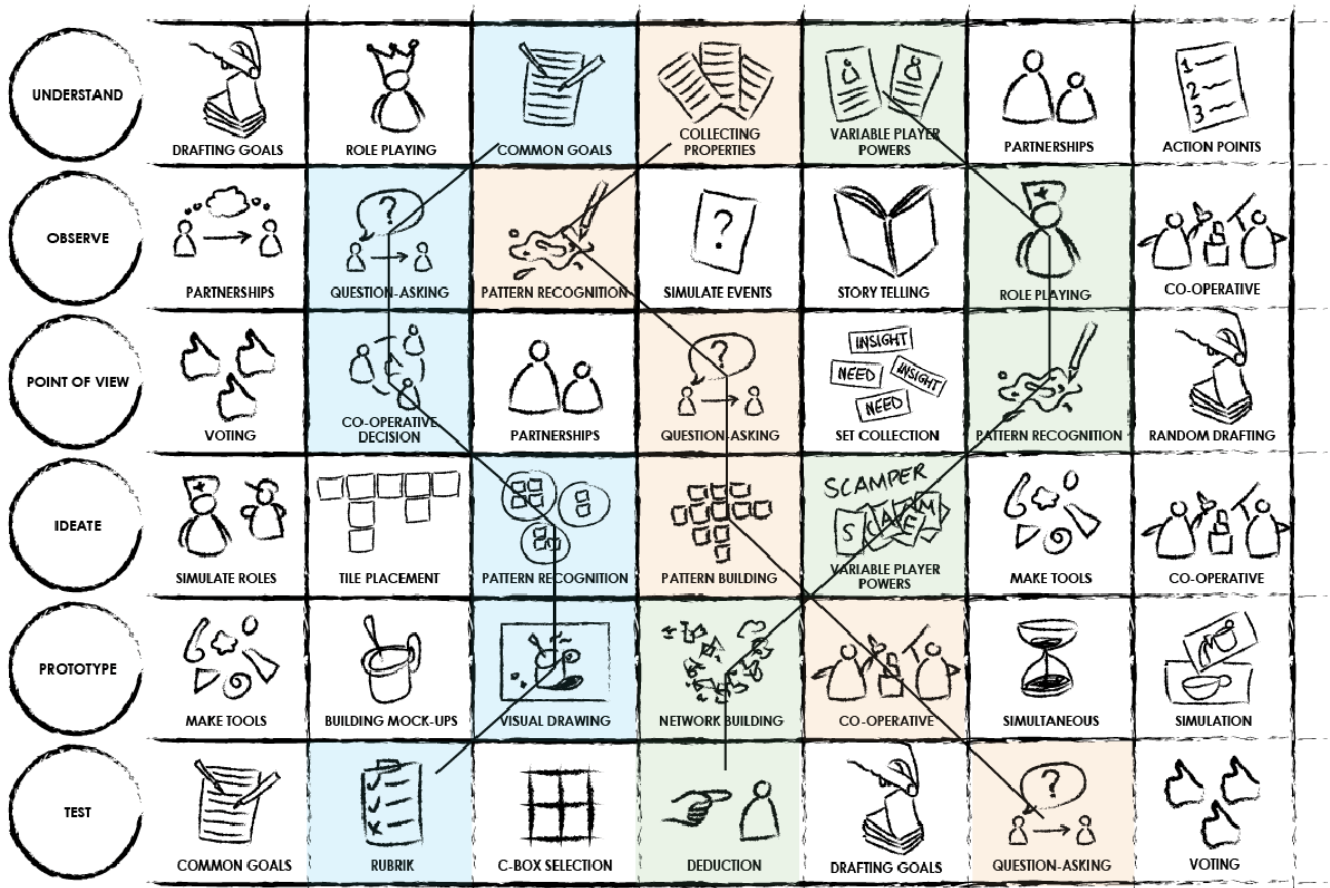**Figure 4-2** - SCAMPER-method as Variable Player Powers.

Figure 4-3 - Mapping of game ideas into a morphological chart.

4.4 Morphological map

In order to generate design directions in an analytical and systematic way, the generated game ideas (Appendix D) are mapped into a morphological chart (Figure 4-3). This results in a matrix of game ideas to choose from. Through carefully selecting and combining a set of game ideas—complying the design statement while at the same time making sense—three different design directions are formed. Each design direction includes all six steps of the Design Thinking process. The three design directions that are formed are:

Direction 1 (Blue): The Mash-Up Game
This design direction consists of common goals, question-asking, co-operative decision making, pattern recognition, visual drawing, and a rubric.

Direction 2 (Green): The SCAMPER Game
This design direction consists of variable player powers, role-playing, pattern recognition, variable player powers, network building, and deduction.

Direction 3 (Orange): The Frustrated King
This design direction consists of collecting properties, pattern recognition, question-asking, pattern building, co-operation, and question-asking.

These three design directions have been developed into fully functioning and testable games in the next paragraph. Eventually, through iterative design cycles, these three design directions are going to be developed to a concept level to meet the criteria as defined in Chapter 3.

4.5 Design directions

Three design directions have been set up to further develop through a series of iterative playtesting sessions. The three game directions are diverse in their nature and are developed analytically and systematically as three independent directions. The aim of these design directions is to explore a design game for families that engages kids to learn and practice essential 21st century skills through the Design Thinking mindset. Among others, an open and creative attitude, a safe play environment, and an element of tension are found to be important ingredients. The three design directions are explained briefly below.
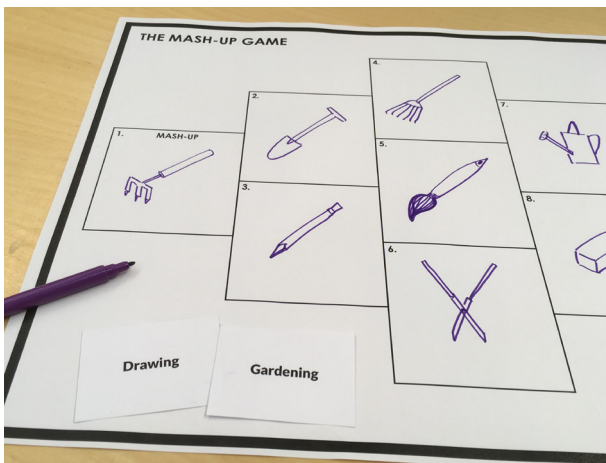
Direction 1: The Mash-Up Game
Players use creative associations to get an interesting 'mash-up' of 2 product categories. This could be 'drawing' and 'gardening'. The starting player begins the game by drawing a mash-up. The other players try to guess the mash-up. Each round, the main player draws a hint on the grid. The other players may ask a low-level question (yes/no) or try to guess the mash-up. The game ends as soon as the mash-up has been guessed.
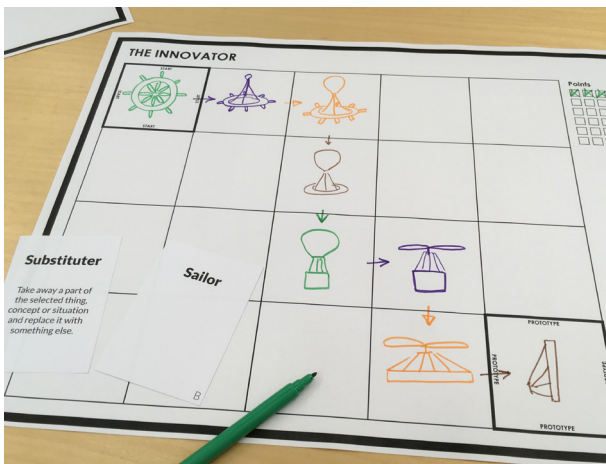
Direction 2: The SCAMPER Game
This game uses the SCAMPER-method (Substitute, Combine, Adapt, Modify, Put to another use, Eliminate and Reverse) as actions. During the game, one player is 'The Innovator', trying to come up with something new. The other players will get a SCAMPER-card. Starting with a base object, the players draw an iteration—based on their SCAMPER-action—on the game board. The goal of the game is to guess who the Innovator is.

Direction 3: The Frustrated King
Through role-playing, one players plays the Frustrated King. At the start of the game, the players make up the frustrations of the king. With a question round, the players try to find out what the King's opinions are about his frustrations. The King knows the winning conditions of the game, for example, a silly solution that solves at least 1 frustration. Based on this knowledge, the king tries to guide the players with hints and constructive feedback to appropriate solutions.

A design game for families

4.6 Iterative design cycles

Through a series of iterative playtesting sessions, the three design directions are judged based on their positive and negative aspects regarding the design statement as defined in Chapter 3. These positive and negative aspects are used to evaluate systematically the effect of the integrated game elements and game mechanisms. This way, positive aspects can be enhanced and negative aspects could be improved.

To evaluate and develop a moderately large selection of different iterations through a series of playtesting sessions, the PMI-method (Plus, Minus, Interesting) is used to evaluate the playtesting sessions in a quick and effective way—just like the Design Thinking mindset. Per iteration, the positive, negative and interesting aspects are listed, to be able to tackle them in a next iteration. The PMI-method (De Bono, 2006) is used as follows:

The PMI-method:
1. Plus (+) - positive aspects
2. Minus (-) - negative aspects
3. Interesting (i) - interesting aspects to keep into consideration

For these playtesting sessions, various participants are used, such as students or housemates, to gain feedback through quick and effective iteration cycles (Figure 4-4). In Appendix E, the highlights of these iterations can be found. In the next paragraph, the results of these iterative design cycles are presented in the form of three concept proposals. These three concepts are then evaluated using a weighted criteria method, as can be found in paragraph 4.8.
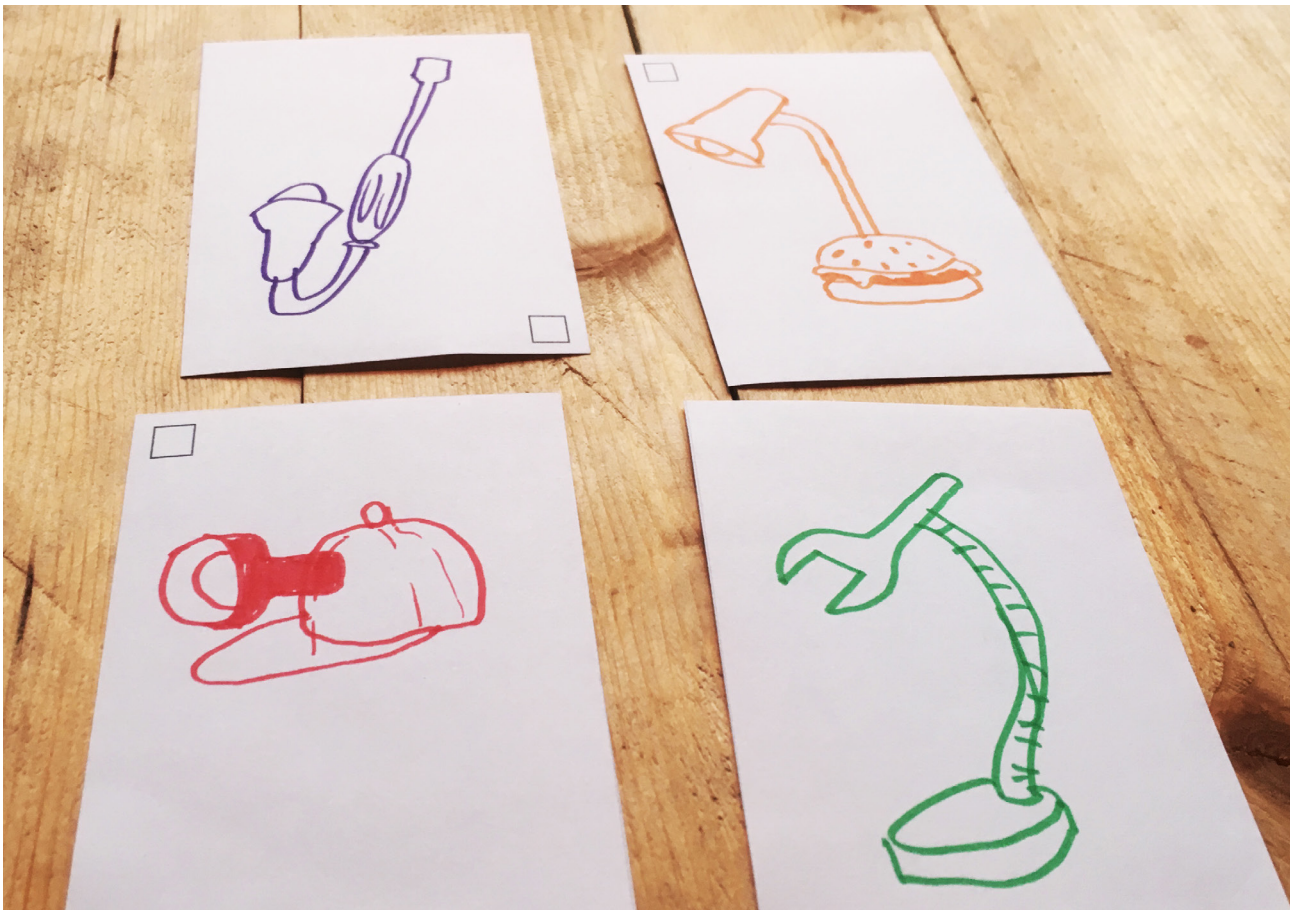
Figure 4-4 - One of the many iterations that can be found in Appendix E.

4.7 Concept proposals

Concept 1: The Mash-Up Game

In The Mash-Up Game, players create machines based on a variety of objects in order to fulfill a list of functionalities.
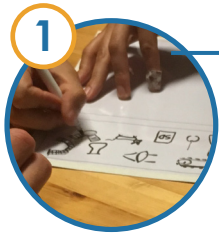
1 Creative associations
The players associate objects based on a list of required features. Generated objects can be used by all players. The functionalities are first collected in the upper part of the game board.
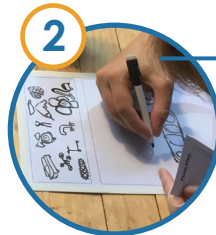
2 Combining items
The items generated by the players in the upper part of their game board are combined into new creations. Players can magnify, reverse, and combine elements to give them a new function.
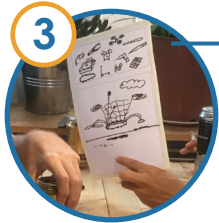
3 Presenting creations
In turn, each player presents their creation to the other players. During the presentation, the functions of the various elements in the design are explained. Players may ask for clarifications if objects aren not explained clearly.
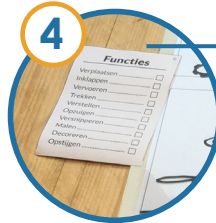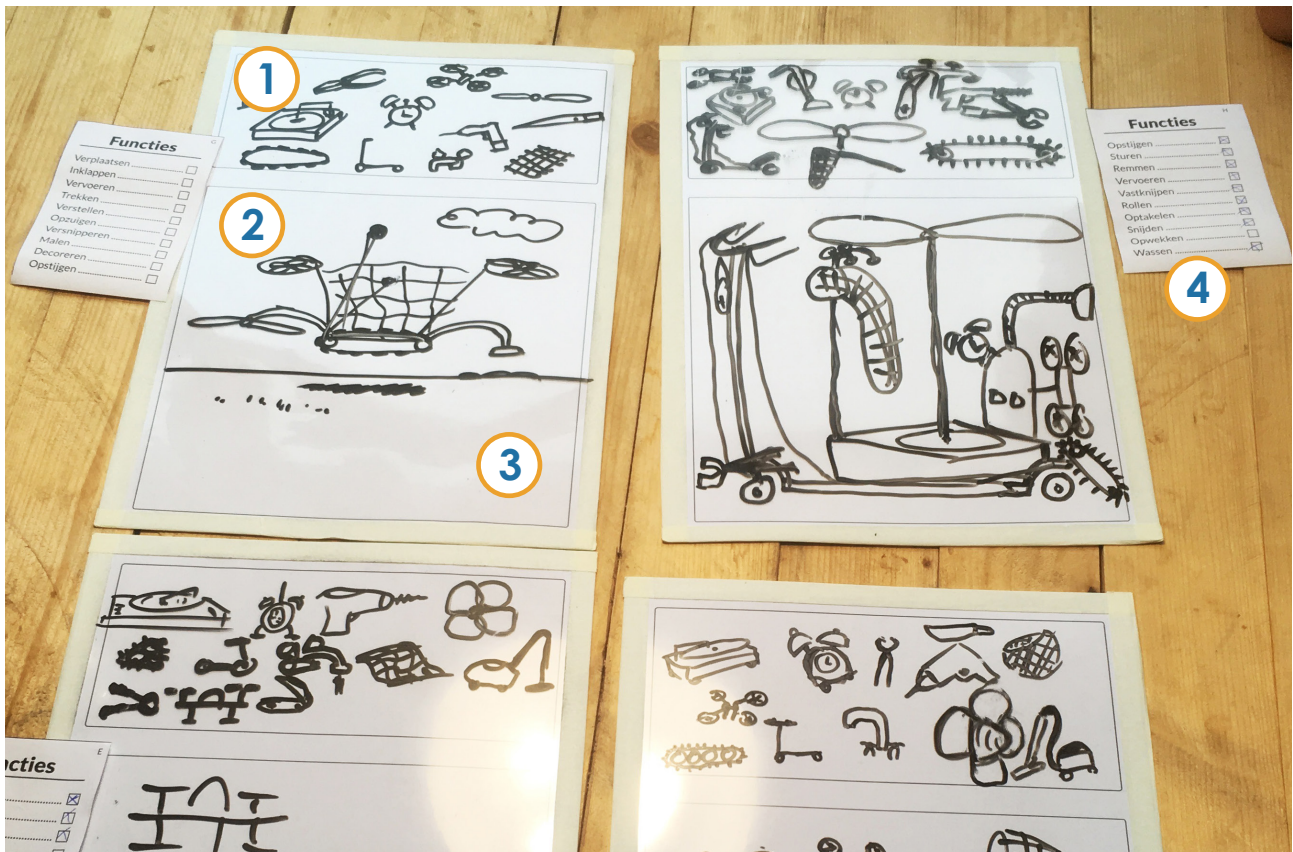
4 Scoring
Each player gets an amount of points equal to the number of corresponding functions on the assignment card. There is little communication when counting the scores, but sometimes a judge is required for clarification.

Concept 2: The Combine Game

In The Combine Game, players try to combine pre-generated items to come up with novel ideas.
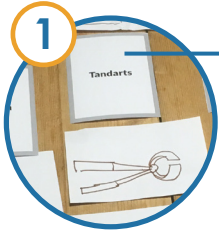
1

Empathize with a role
Each player is assigned a role. On the basis of this role, players associate characteristic attributes. Each player generates approximately 3 attributes. A dentist could think of, for example, 'pliers'.
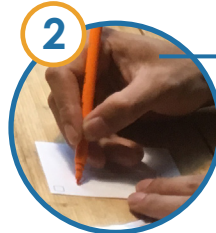
2

Combining the attributes into new ideas
The generated characteristic attributes are combined by the players into new ideas to solve problems. Such a problem could be 'fines'. By combining attributes on the table you make a solution.
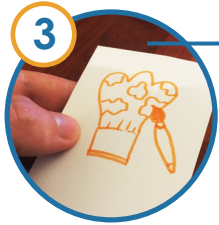
3

Ideas are presented
Players present their idea to the group and explain how their idea solves the common problem. All players do this sequentially. The ideas are placed in a row next to each other so that they can be compared well.

4

Distribute scores
Each player may assign a score to an idea, depending on the number of players. For example, in a 5-player game, you may give an idea max 4 points and at least 1 point (1,2,3, and a 4-points card). The player with the most points wins.
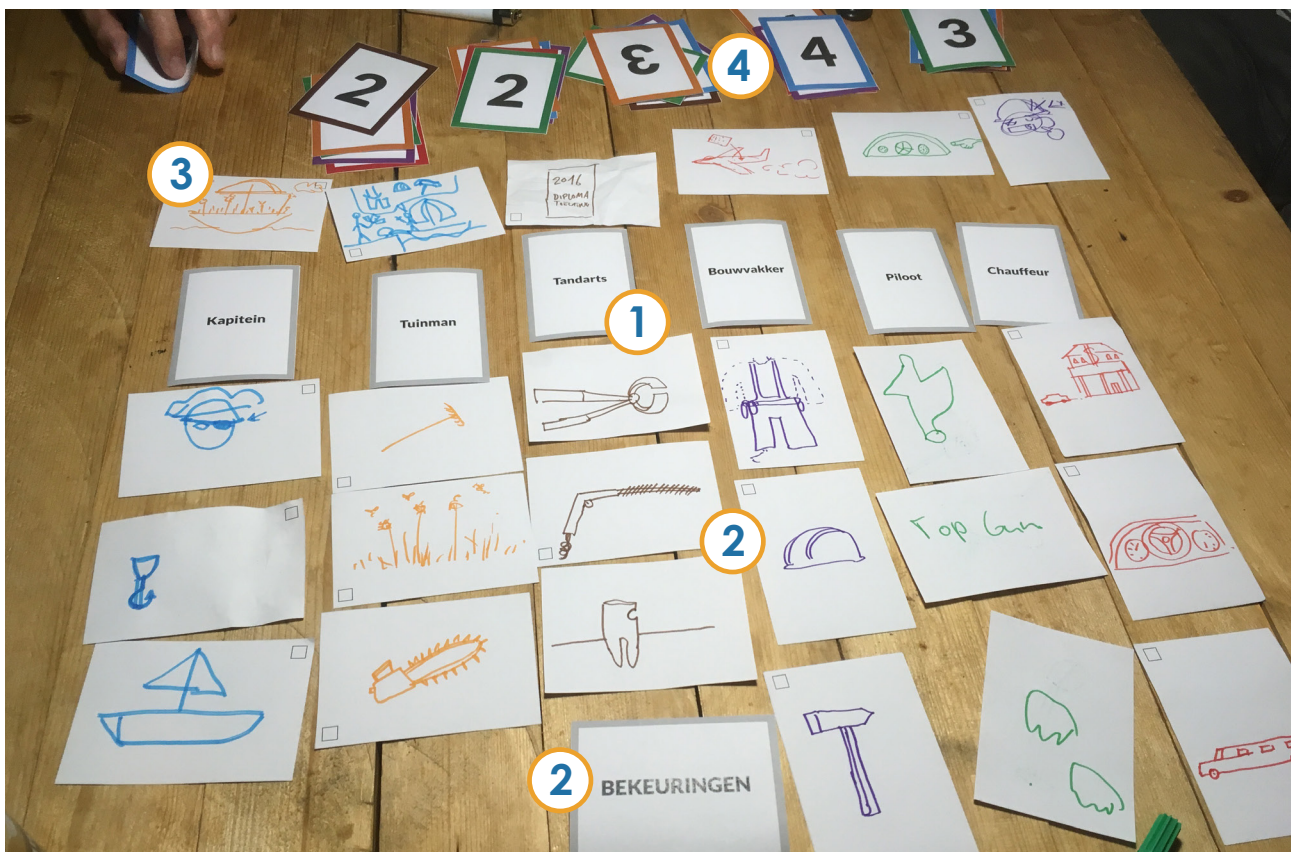
Concept 3: Frustrated Clients

In Frustrated Clients, each player tries to solve the frustration of different clients (king, grandma, etc) with their idea.

1

Empathize with an in-game character
The players empathize with an in-game character with random frustrations. The characters and frustrations are recognizable, and provide inspiration for many different solutions.

2

Generating ideas based on intentions
The players come up with an idea, by drawing it on a piece of paper, based on an intention card. They get this card at the start of the game. An intention could be 'genius' or 'crazy'.
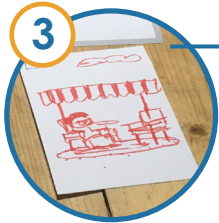
3

Pitching ideas
In turn, players present their solutions for the in-game character to the team. For this, each player gets approximately 30 seconds. They do this both visually with a sketch and oral by explaining their idea to the group.

4

Guessing the intention
At the end of the pitch, the team tries to guess the intention of the player. Is it for example a crazy idea or a simple idea? The players get 1 point if they guess correctly. The player who held the pitch will also get 1 point per correct guess.

A design game for families
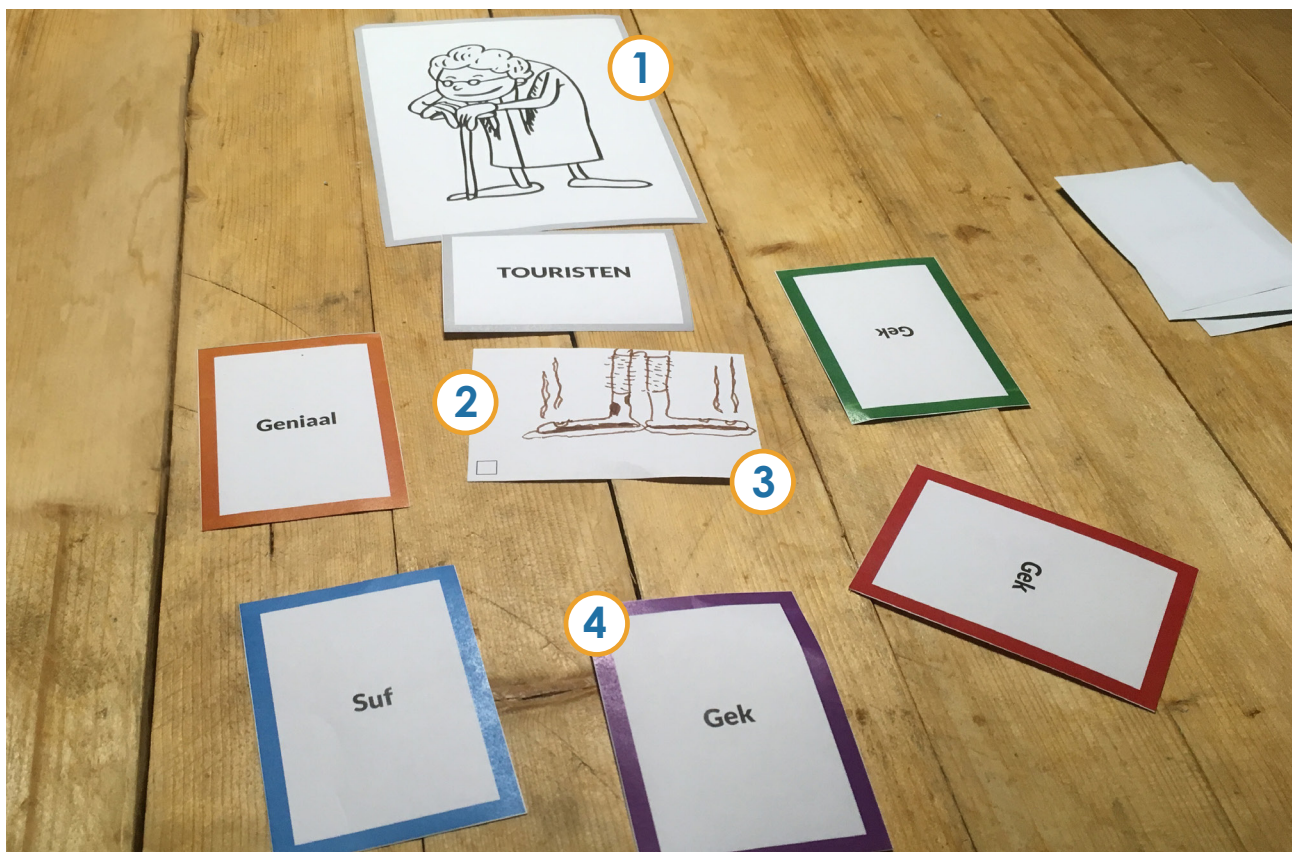
4.8 Concept evaluation

The three concept proposals are evaluated through a weighted criteria method. Using the predefined criteria and the design statement, each concept has been evaluated, on the basis of the various aspects that are important to a family-friendly design game. As such, the following aspects were considered the most important: mastering of the 21st century skills, a safe and family-friendly game environment, an open and creative attitude, acknowledging the six important game elements, and an element of tension. The added weight factors help to prioritize the design criteria. As can be seen in the table below, 'Concept 3: Frustrated Clients' is found to be the most promising concept (score: 4,4). In the next chapter, this concept has been evaluated by the target group—families with kids ages 8 and up.

Criteria

	Weight	Concept 1	Concept 2	Concept 3
1. Mastering of the 21st century skills	**5**	3	4	4
1.1 Creative thinking		5	4	4
1.2 Communication		4	4	4
1.3 Empathy		1	4	5
2. A safe and family-friendly game environment	**5**	5	4	4
3. An open and creative attitude	**5**	5	4	4
4. Acknowledging the six important game elements	**5**	4	4	4
5. An element of tension	**5**	3	4	5
6. Mild competition	**4**	4	4	4
7. Ambiguous game materials	**4**	4	3	5
8. Explainable in 2 minutes	**3**	5	4	5
9. Short playing time of up to 30 minutes	**3**	4	3	5
10. Playable with 4 to 6 players	**2**	4	5	5
Weighted average		**4,1**	**3,9**	**4,4**

4.9 Discussion

Through various iterations cycles, low-fidelity prototypes are evaluated—on the basis of a design statement—with the aid of the PMI-method (Bono, 2006). The qualitative data gathering resulted in valuable key issues, patterns of use and specific interaction/experience problems to tackle (Appendix E).

Illustrated in-game characters
First of all, empathy is found to be difficult to simulate in a game through role-playing. The design direction 'Frustrated King' shows that a player can hardly play a role with "unknown" problems through role-playing. As such, the problems—that are already known to the player who plays the role—and questions related to these problems, will often lead to obvious answers. Therefore, it does not make sense to 'role-play' a character with "unknown" problems. However, 'Concept 3: Frustrated Clients' shows that players can empathize with in-game characters printed on a playing card. This way, the players are able to connect to the problems of the character by developing appropriate, and often creative, solutions. This offers opportunities for calling for empathy through different illustrated in-game characters. Further research should investigate which type of characters a family-friendly design game should consist of.

Design Thinking mindset
In terms of creative thinking, all three design directions evoke an open and creative attitude; they support the expression of a visual way of thinking and doing. The question is whether divergent and convergent thinking skills are embedded in the games, as these are found to be important skills when generating and clustering ideas. The iteration cycles of the 'Frustrated King'

show that diverging, clustering and converging ideas takes a lot of time in a design game. It makes the game more tedious, thereby also affecting the tension of the game—and tension should make a game fun according to Huizinga (1950). Therefore, the emphasis in all of the three concepts is on the Design Thinking mindset, rather than on the entire iterative design process of Design Thinking.

Clichés
One of the biggest culprits in basically most of the iterations are clichés. When players know that something has to be guessed, they will fall back on clichés—the most obvious thoughts. The challenge was therefore, especially during the different iteration cycles, to explore different ways to win, while at the same time, preventing clichés. In the many iterations (Appendix E), various ways of winning are investigated, such as guessing ideas, giving awards, rating ideas, scoring based on criteria, and guessing design intentions. Guessing design intentions was seen as a scoring mechanism with the most tension, and resulted in less clichés. The various ambiguous words on the intention cards are interpreted by players in their own way. For example, 'Concept 3: Frustrated Clients' shows that if 'crazy' ideas are asked, players rather come up with new ideas, than when only asked for 'just a solution'. Thus, the intention behind an idea plays a major role in originality.

Essential 21st century skills
In the player journey in Appendix F, the concept proposals are compared regarding the essential 21st century skills—creative thinking, communication, and empathy. The journey shows that Concept 3 evokes all three skills, and empathy even slightly stronger. Also, the concept evaluation in paragraph 4.8 shows that this concept has the most potential to become a successful family-friendly design game. Therefore,

A design game for families

'Concept 3: Frustrated Clients' has been chosen to further develop in the next phase. Through playtesting sessions with families, the six essential game elements (Van Staalduinen, 2012) are going to be evaluated as well, to be able to meet the wishes of the target group and to improve engagement with the game.

4.10 Conclusions

In this conceptualization phase—through an iterative design process—'Concept 3: Frustrated Clients' (Figure 4-5) has been chosen using a weighted criteria method, to further develop with the target group. This concept makes most use of

the essential 21st century skills; enables a safe game environment; evokes an open and creative attitude; evokes tension through mild competition; has a short 30-minute play time; is easy to scale for different numbers of players; and can be explained quickly within 2 minutes. To be able to find out if the game actually has a fun-factor—a typical element of entertainment games—a prototype of the game has to be played with families with children ages 8 and up. In the next phase, the six essential game elements—feedback, difficulty, control, choice, safety and social activity— have been evaluated through a series of playtesting sessions with families.

Figure 4-5 - Concept 3: Frustrated Clients.

A design game for families

5. Playtesting

5.1 Introduction

The chosen design direction 'Concept 3: Frustrated Clients' is selected through a weighted criteria method (paragraph 4.8) as the most promising concept for a family-friendly design game with a fun-factor. The central aim of this chapter is to show the potential of a design game for families that engages kids to learn and practice essential 21st century skills through an open and creative mindset. The application of these skills—creative thinking, communication, and empathy—are evaluated through several playtesting sessions with different families. In addition, the six important game elements to engage players—feedback, difficulty, control, choice, safety and social activity—are evaluated through observations and an interview as well.

The argument put forth in this research is that if a game has a fun-factor, players would feel more inclined to play and replay a game—which increases the potential to become a successful game on the consumer market. Through observations and interviews with the selected families, the fun-factor of learning the essential 21st century skills in this game, is covered as well.

This chapter documents both key findings gained through playtests with 5 different families as well as the development of 3 iterations—resulting in a final design. At the end of this chapter, a table can be found in which all key findings are summarized to get an overview of the game's fun-factor per phase.

5.2 Goal

This study investigates the relationship between the embedded game elements and an experienced fun-factor. The objective of this study is to identify opportunities to make an educational design games fun. The key findings in this research could also be relevant to other game designers and design education.

Research question
As current design games on the market lack a competitive game element and an entertaining fun-factor, it is important to find out how to motivate and engage players to play an educational design game. Therefore, the general research question explored throughout several sessions with different families is:

What makes learning the essential 21st century skills through a design game fun?

5.3 Method

This study is carried out through a practice-based research approach. As a result, insights are obtained through several playtests with families with kids ages 8 and up. The playtest sessions are conducted through the 'Build, Measure, Learn' loop ideology of Eric Ries (Ries, 2011). After playtesting with two families, a new 'build' (paper prototype) is made—with small tweaks—based on the main findings of the previous tests. After two builds, a final iteration is evaluated by a 'gamer family'. This method focuses on learning from potential users by iterating through quick builds, as also applied in the development of digital apps and games.

Sample

In total, 5 families are selected with children around 8 to 12 years old, to evaluate the different builds. The first build has been evaluated by two families with 'non-gamers' as well as 'casual gamers'. The second build has been evaluated by families with 'non-gamers' and 'casual gamers' as well. The third build has been evaluated by a 'gamer family'—a family who regularly plays board games together. This way, families who rarely play board games (non-gamers), as well as families who like to play board games (gamers), are taken into account in this study to gather a wide variety of insights of potential players.

Stimuli

Each family is faced with a build based on the insights of previous tests. After having played with the paper prototype for 30 minutes, the game is evaluated based on its gameplay and usability, through a series of questions and observations.

Set-up

During a playtest session, a family with at least one child (age 8-12 years old) is present. The researcher is both the moderator as well as the observer. The researcher participates during play when there are less than six players; as a group of four to six players is found to be the most optimal group size. A GoPro is used to record the behaviour and thoughts of the participants during the sessions.

Procedure

The study consists of five parts (Figure 5-1). First, the researcher introduces himself to the family. Then, the game is explained to the family. During the explanation, it is emphasized that there are no wrong ideas and that the game is not about the most beautiful or the best idea. Next, three rounds of the game are played, with three different in-game characters, locations

and goal/problem cards. During these rounds, the family is asked to generate an idea to solve a problem and to present these ideas to the group. The group is asked to guess what kind of idea it might be, based on their guessing cards. At the end of the game an interview is held with the family and an evaluation scale with the six important game elements is used as a conversation tool (Appendix G). At the end, every family is thanked.

Data Collection

The qualitative data gathered during the different playtesting sessions have been collected through several sources: the quotes from the interview; observation notes; ideas generated during the game; and GoPro film footage. The footage of the GoPro has been analysed and the quotes and behaviour of the players have been used to identify usability and user experience problems. The key findings of the sessions are covered in the following paragraphs.

1. INTRODUCTION
(3 minutes)

2. EXPLANATION OF THE GAME
(2 minutes)

3. PLAYING THREE ROUNDS
(30 minutes)

4. INTERVIEW
(45 minutes)

5. CLOSURE
(2 minutes)

Figure 5-1 - Schedule of a playtest.

5.4 Playtest build 1

The first build has been tested with both non-gamers as well as casual gamers. The family with non-gamers (Figure 5-3) consists of a 9-year-old girl, a 10-year-old girl, a 24-year-old man, and a father. The family with casual gamers (Figure 5-4) consists of an 11-year-old girl, a 12-year-old boy, a 15-year-old boy, and a 17-year-old boy. The researcher participated in the user tests to increase the player count.

5.4.1 Build 1

The components in build 1 (Figure 5-2) are similar to 'Concept 3: Frustrated Clients'. Four characters have been tested: a grandmother, a farmer, a police officer, and a pirate. The red coins are used to track scores; every time you guess correctly you'll get a coin (1 point). When other players guess your idea correctly you will also get a coin. Several frustrations have been tested (grey card under character), such as 'mosquitoes', 'broken shoes', 'advertisements' and 'broke'. All players have a set of guessing cards, in their own colour (blue in the picture). The grey cards are the secret assignment cards; each player will get one of these randomly at the start of a round. The different assignments are 'crazy', 'brilliant', 'simple', 'dull' and 'extraordinary'. These also correspond with the guessing cards.

Figure 5-2 - The components of build 1.

Figure 5-3 - A non-gamer family.

5.4.2 Key findings build 1

Through qualitative data gathering the following key findings were found:

Creative thinking

The different assignment cards are found to influence the creative ability of kids. Especially 'crazy' is found to stimulate the creativity of kids: "I already have 2 ideas, may I draw both of them?" asks a 10-year-old girl. However, some children may get stuck on a particular card; a 9-year-old girl in the non-gamer family could not think of an 'extraordinary' idea. The more open problems, such as 'broke', were found to stimulate creativity the best: "because then you can invent many thing," says a 15-year-old boy.

Communication

The kids seemed to like to present their ideas to each other. Some did it in a few sentences, other kids made a whole story for their idea. However, an 11-year-old girl had some troubles to communicate her ideas to the group. She rather wrote some words on paper. The first round was seen as a round to learn the game. In the second round, there was already more drawn on the papers, because the kids started to understand the game better. Finally, the boys in the second group felt that the presentations of everybody should be timed as well, so that everyone gets the same amount of time.
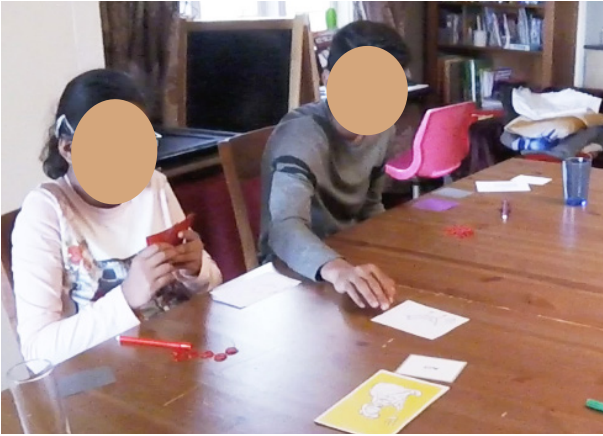
Figure 5-4 - A casual gamer family.

Empathy

When solving the different problems of the in-game characters, the girls wondered what they would do themselves in their situation: "what would I do when I was a Pirate," wonders a 10-year-old girl. The Pirate was found to be the funniest character to create something for: "because with this character you can use the most your imagination". The casual gamers had with the farmer the most associations, this made it easier to think of ideas for this character. Some characters make kids think of someone they personally know: "she looks very much like my grandma," says a 10-year-old girl. She came up with a hat with a net against the mosquitoes for the grandmother (Figure 5-5).

Feedback

The kids preferred the larger drawing sheets over the smaller ones; to have more space for drawing and writing. The kids didn't find the coins attractive and it was difficult to get an overview of what position everyone was. In addition, there weren't enough coins for everyone when playing with six players.

Difficulty

The 'extraordinary' card was found to be the most difficult for the 9-year-old girl to generate ideas for. During the first round,

she couldn't think of an idea to solve the problem. While the 10-year-old girl liked this card the most: "I like to invent extraordinary ideas". Some problems were found to be hard to solve because they didn't match the in-game characters very well; such as the police officer that didn't like 'commercials'. The more practical problems were found to be the easiest to solve, such as 'mosquitoes'.

Control

According to the boys in the casual gamer family: "it depends very much what kind of role you have... how hard it is to think of an idea to solve a problem." The random and sometimes 'awkward' combinations between the character and the problem can make this more difficult as well—resulting in less control over the solution space.

Choice

While guessing, 'dull' and 'simple' were seen as almost the same by the kids: "The difference is sometimes very small. This also makes the game unclear," according to a 17-year-old boy.

Safety

In both groups there was a kid that didn't like the drawing aspect. But when they realized that writing is allowed as well, they could still enjoy the game. The casual

Figure 5-5 - Generated ideas for a grandmother and a pirate.

gamers felt they had enough time to come up with ideas. Sometimes even too much time. According to the boys, the game could use an hourglass to boost the pressure. "It is also fair if everyone gets equal time to think of an idea," says a 17-year-old boy.
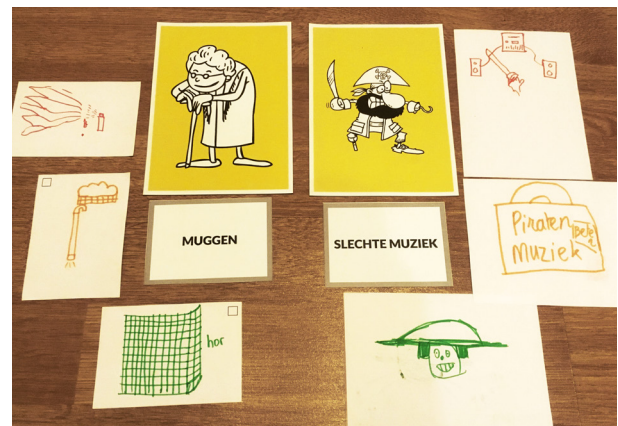
Social activity

Both groups felt that it was fun to listen to each other's ideas and to guess them with the 5 different guessing cards. The moments that the children had the most fun was to hear the crazy ideas of other players. There was a lot of laughing at each other's ideas during the presentations.

Fun-factor

A 10-year-old girl liked the drawing aspect the most, especially to come up with 'extraordinary' ideas. A 9-year-old girl had the most fun with the Pirate: "because with this character you can use the most your imagination". 'Crazy' was found to be the most fun card to generate ideas for. Listening to the crazy ideas of others was also seen as fun, and there was often laughter.

5.4.3 Conclusions build 1

The distinction between 'dull' and 'simple' was too confusing for the children. The generated ideas for these assignments were too similar as well. Extraordinary was seen as the most difficult assignment, although some children seemed to like to generate ideas for this assignment. Also, it was found to be difficult to get a clear overview with the coins who is winning. Furthermore, some of the frustrations were found to be hard to solve because they didn't match the in-game characters very well. Overall, the most fun part of the game was to come up with crazy ideas.

Figure 5-6 - The components of build 2.

5.5 Playtest build 2

The second build (Figure 5-6) has been tested with casual gamers and non-gamers. The family with casual gamers (Figure 5-7) consists of a 7-year-old girl, an 8-year-old girl, a 9-year-old boy, a 12-year-old girl, and a mother. The family with non-gamers (Figure 5-8) consists of an 8-year-old boy, a 10-year-old girl, a 10-year-old girl, a 10-year-old girl, a 12-year-old boy, and a father. The researcher participated in the first user test to increase the player count to a total of six players.

5.5.1 Build 2

The key insights from the previous build have led to the following adjustments:
- 'dull' and 'simple' were found to be the same, therefore, 'dull' is replaced by 'complex'.
- 'extraordinary' was too difficult for the younger players, therefore this card has been replaced by 'inconvenient'.
- the coins have been replaced by a score board, to better track the positions of the players.
- an eccentric character, with a random environment, should make it easier for the family to come up with a goal/problem themselves, that fits the world of the in-game characters.

5.5.2 Key findings build 2

Through qualitative data gathering the following key findings were found:

Creative thinking

The game invites children to express themselves creatively in a personal way. For example, an 8-year-old boy had several 'naughty' ideas: "The thief will first knock on the door and then he will hide around the corner and then he goes into the castle haha..". "Actually something like ringing a doorbell but then differently," says a girl. "I really think that is something typical of Ari," says another girl. The next round, the 8-year-old boy had another 'naughty' idea: "This is my idea: breaking a tree apart." Father: "That's really an Ari-idea, isn't there a card with Ari in the game?"

Communication

In the game, children use communicative expression means where they find themselves the most comfortable with: "I'm not the best in drawing so I will just write it down," says a 12-year-old boy. Some kids prefer to just show their idea, without telling something about it: "We see a hook, a rope, aha… do you want to add something to this?..," says the father. Sometimes, kids believe that their drawing has failed so they won't show anything, they rather just tell their idea to the group:

Figure 5-7 - A casual gamer family.

Figure 5-8 - A non-gamer family.

"I have nothing to show, so I'll just tell you: my idea is a rubber suit, all green, with a tight capouchon," says an 8-year-old boy.

Empathy

When determining the problem, children take the character's trait into account, such as 'stubborn': "She doesn't have mushrooms anymore, so she has to go into the woods to pick up some new mushrooms," says a 10-year-old girl. "But what has this to do with stubbornness?" says a 12-year-old boy. He suggests the following problem: "The stick of the stubborn grandmother is broken and she still wants to go to the forest." However, when coming up with ideas, the children especially liked the fact that solutions don't have to be logical. It was particularly fun to think of silly ideas, like an old granny who kicks down a tree.

Feedback

The score board draws a lot of attention during the game; the players are constantly evaluating their position. This also causes confusion when moving the pawns (Figure 5-9), because the children move the pawns at the same time together—making it unclear which pawns have already been moved. "I will also get a point," says an 8-year-old boy. "No, that has already happened," says a 12-year-old boy. Sometimes kids don't believe each other, resulting in discussions.

A design game for families

Difficulty

The younger players do sometimes have some troubles to come up with ideas that fit well with their assignment: "Can I have another card?... I don't know anything," says an 8-year-old boy. The 7-year-old girl had some trouble to come up with ideas in general. The mother helped her out by whispering ideas in her ear (Figure 5-10), this way she could still participate in the game. She seemed to enjoy in particular to listen to the ideas of others and to guess them. Also, 'simple' was found to be the easiest to generate ideas for; children just come up with the most obvious solution: "My idea is that he just buys a new pair of pants," says a 10-year-old girl. Although, simple ideas are sometimes perceived as 'brilliant' ideas: "I just found it super brilliant," says an 8-year-old girl.

Control

The players felt they had quite some control while guessing, but the most tension was experienced when the guessing cards of the others were revealed—where kids have the least control on. Sometimes kids can't wait to see what the others think of their ideas: "We can't turn them around, Sara hasn't chosen yet," says a boy.

Figure 5-9 - Kids move pawns on the scoreboard at the same time.

Figure 5-10 - Mother whispers ideas in the ear of a 7-year-old girl.

Choice

While guessing, the meaning of the words on the vote cards can cause confusion; the meaning of words sometimes seem the same: "Inconvenient / complicated ... they could both be good I think", says a father. And: "It's complicated, but I think it is also a very inconvenient idea. If I had inconvenient then I probably would have drawn the same". A boy also indicates that it is sometimes difficult to make a decision: "Inconvenient / complicated look very similar to each other." Kids felt that they had to gamble with these cards.

Safety

The younger players sometimes feel insecure about their writing and drawing qualities. A parent can take away this uncertainty: "I wrote it dawn too, but I think I wrote it wrong," says a 10-year-old girl. Father: "It's not a dictation, but a game." And: "My idea is that he's going by plane, but the drawing is a bit flawed." Father: "That doesn't matter, it's about people understanding your idea". Failure to draw may cause irritation to some kids: "This paper is also quite full now," says an 8-year-old boy. He had made many mistakes. Some children like to know that they are allowed to write as well as to draw: "It's nice to draw a little bit, but are you still allowed to write?" says a 10-year-old girl.

Figure 5-11 - Girl presenting her idea.

Social activity

The fact that the game is a social group activity becomes clear when players have to wait for each other. Some children need extra time to make their drawing beautiful: "10… 5 seconds left..." says an 8-year-old boy". "I'm almost done," says a 10-year-old girl. Father: "She makes a whole piece of artwork". If children have to wait for other children than they can become irritated: "It was only a pity that you had to make such slow drawings." This can cause the feeling of unfairness when other kids get more time for their drawings.

Fun-factor

Children like the fact that they can use their imagination to come up with silly ideas: "It's nice that you can use your imagination," says a 10-year-old girl. Boy: "The ideas don't have to be logical". The kids liked the Crazy card the best: "Then you can think of everything that wouldn't be possible at all." Also, listening to the ideas of others was experienced as fun: "The most fun part of the game was to hear from other people what they found the best solution for the character". Children also liked the fact that they don't have to work in groups, as they might be used to at school: "The nicest thing I found was that you could think of an idea yourself and that you don't have to discuss it in groups," says a 10-year-old girl. The first family liked the word 'brilliant'. During the game they were often saying "Brilliant!", and even when the game was finished they were still saying "Brilliant!".

5.5.3 Conclusions build 2

Children like to present in the way they like best. When a drawing fails, children can become irritated. When generating and presenting ideas, a parent can provide a safe feeling by emphasizing that it is just a game. Also, young children sometimes ask for a new assignment if they cannot come up with an idea. Moreover, 'inconvenient' and 'complicated' were considered the same, and they resulted in similar ideas (maze-like ideas). When determining the problem, children take the character's trait into account—resulting in more appropriate problems. Lastly, the scoreboard caused confusion during the game because children move their pawns together at the same time.

5.6 Playtest build 3

The third and final build (Figure 5-12) has been tested with a gamer family—a family who plays board games at least twice a week, from light strategic games to party games. This gamer family (Figure 5-13) consists of a 12-year-old girl, a 13-year-old boy, and their mother. The researcher participated in this user test to increase the player count to a total of four players.

Figure 5-12 - The components of build 3.

A design game for families

Figure 5-13 - A gamer family.

5.6.1 Build 3
The key insights from the previous build have led to the following adjustments:
- 'Inconvenient' and 'Complicated' have been eliminated from the game; seemed too similar and resulted in too many of the same type of ideas (maze-like ideas).
- 'Extraordinary' is back in the game because some children in the first test enjoyed this one.
- introducing 'Foolish'; this has to lead to new ideas, according to Von Oech (1983)
- introduction of 'Copycat', a variant for children who find 'Extraordinary' too difficult. This variant will be tested as well.
- The score board has been replaced by stars that the children can grab themselves in the centre of the table.
- Special prizes are designed to collect and to determine the end of the game. For example, in a 4-player game, you can get a prize by exchanging 4 stars.

5.6.2 Key findings build 3

Through qualitative data gathering the following key findings were found:

Creative thinking
The open problem cards, in combination with the randomly chosen character and location, are found to stimulate creativity already at the start of a round: "I know a nice problem: that she walks through the forest with her dog and that the line gets tangled between the trees," says the boy. The problem is accepted by the group and the problem immediately stimulates the creativity of the girl: "Are you already allowed to imagine what kind of solution it could be? I actually have some ideas already," says the child with a smile. Mother: "Well, that's lovely, imagining is part of this game right?"

Communication
The players listen carefully to each other's presentations. During the presentations, kids also get the chance to show their communicative skills. Mother: "Really a very clear stand, beautiful, even in perspective (Figure 5-14)." Drawing is seen as easier than writing: "Then you can show your idea better," says the boy. Also, discussions sometimes arise for clarification: "Why a Copycat?," says the girl. Mother: "There are many of those stalls in front of the supermarket, like, look… self-made, authentic…"

Empathy
The way the characters are represented in the game affects the way how the character is interpreted during play: "It's funny to see how you're controlled by a picture, because of this picture I immediately think of a field keeper and not a cattle keeper (Figure 5-14)," says the mother. In terms of evoking empathy,

Figure 5-14 - Ideas for a hobby for a farmer.

it differs per character per player: "With the stubborn grandmother, I felt I had to immerse the most, because she, for example, does not want to lose her dog," says the girl. But the boy thinks differently: "I had the most feeling with the Thief, for example, what do you all need to break in." When thinking up problems, all players come up with suggestions for possible problems of the characters.

Feedback

The stars and prizes ensure that the players keep an eye out on each other during the game: "Oh Emma already has 2 stars, Mom does not have anything yet," says the boy. And: "Why does Emma has 2 stars more? Ohja, she already had 2 more in the first round," says the boy. Also, the open transparent game environment allows children to easily get inspiration from their fellow players: "You can easily peek at everyone when they are drawing, this can sometimes be useful for inspiration," says the girl.

Difficulty

The different secret assignment cards can sometimes make it difficult for the players to match their idea with the assignment: "Sometimes I have an idea, but that does not fit the assignment I have," says the boy. Eventually the idea is adapted to fit the assignment. Also, some assignments were found to be more difficult than others: "I really found it difficult to think of something 'Extraordinary'," says the girl. Also, when guessing, kids are sometimes in doubt between 2 cards. This can cause a moment of frustration when kids have chosen the wrong card: "No! This was my second choice."

Control

The kids are looking for ways to control the game. For example, kids want to start presenting when they see other players having similar ideas: "Are we going to do another turn order in the next round?.."

says the boy. Also, while guessing all 5 options are seriously considered to score points. But kids are also looking for ways to sabotage: "But when you definitely know someone got a crazy idea… can't you just give him a brilliant-card for example so he doesn't get any points?.." says the boy. Researcher: "Yes you can, but then you don't get any points yourself." "Ohja," says the boy.

Choice

The most room for making choices is in the beginning of a round, when players determine together the design direction by means of a problem or a goal for the character. Boy: "It would be nice if the thief is always seen by the guards." Mother: "Floors in the palace are old and everywhere where he comes it starts cracking." Girl: "He can't enter the palace." Eventually the group forms a problem together, where the mother takes the lead: "So, the problem is that every time he comes to the water he is seen by the guards." The players thus jointly create the solution space.

Safety

The players feel safe during the game to develop ideas further, even when presenting them: "And what I actually wanted to add is that there is also food on the string so that the dog is pulled on the other side," says the girl. The boy even

Figure 5-15 - Family has fun with a crazy idea.

Figure 5-16 - Kid playing with the prizes at the end of the game.

found presenting his own ideas more fun than listening to the ideas of others. This indicates that players did not feel limited by the game to express themselves.

Social activity
During the game it is clear that the players are doing a social activity together: "Emma hurry up," says the boy. Girl: "I really have to change one thing." "You just can tell your idea, you don't have to make a perfect drawing," says the mother. Children also say loudly what they think of other people's ideas: "I just think that's a super smart idea!" Mother: "That's possible, but you do not have to guess for the others what they think of it." It turns out to be a crazy idea: "I did not think it was a crazy idea at all! When I had crazy I would make a flying disk with the grandmother on top, and if the dog ran away then this disk would fly after him..." says the girl with a smile. Mother: "I think you're a bit more creative than I am, I can't imagine such crazy ideas haha..." This example indicates that ideas are acknowledged by the group and, if necessary, assessed and discussed.

Fun-factor
Coming up with ideas is seen as the most fun part of the game: "I think it's very fun to come up with ideas. Sometimes

it is a bit hard… during the last round I had 'Brilliant', but I could not think of a brilliant new hobby for the farmer," says the boy. Girl: "I also thought it was fun to come up with ideas, but sometimes also a bit difficult, but that makes it funny too, and it's always a surprise what the other people think of your idea." Players also have fun with the ideas of others (Figure 5-15). The boy had an idea to keep the dog in line with an electromagnetic field: "so she can pick up the dog in a second haha," says the mother. Girl: "And if she keeps it up, the dog goes all the way into the air haha." "I can imagine it well, haha," says the mother. The kids are also fond of the prizes you can collect: "they are real collectibles." At the end of the game, the kids are playing with the stars and different prizes (Figure 5-16).

5.6.3 Conclusions build 3
The discussions that arise after guessing the secret assignments provide an insight into the reasoning behind an idea. Especially when players are surprised by a remarkable choice, this can cause a moment of fun. Also, when children have an idea in their head it is the challenge to convert them so that it fits their secret assignment. Furthermore, the way the characters are represented in the game affects the way how they are interpreted by the players for their ideas. Also, during the game it becomes clear that the children are undergoing a social activity; some children do not like to wait for other children to 'finish' their drawings to make them beautiful. The stars and prizes are found to give children a good overview of their position during the game. Moreover, the children can easily grab the stars and prizes themselves, without creating confusion about the scores.

5.7 Discussion

The key findings in this study show the potential of a fun-factor in a family-friendly design game that engages kids to learn and practice essential 21st century skills in a safe game environment.

Creative thinking

In terms of creative thinking, the various assignment cards with design intentions such as 'crazy', 'brilliant', and 'foolish' are found to stimulate the creativity of children to come up with less obvious—and sometimes even novel—ideas. These ambiguous words are interpreted by players in their own way, which is also reflected in literature (Vaajakallio and Mattelmäki, 2014). As such, each of these design intentions have more than one meaning and this way they help to overcome design fixation and thinking through the 'path-of-least-resistance'. They determine—together with a random context—how kids think of an idea to solve the problem of an in-game character. However, generating ideas is for some kids more difficult than others. Especially the younger players, 7 to 9-years-old, could benefit from adult guidance to give them a helping hand. A new game environment seems to need some guidance in pointing out the expressive possibilities—and mistakes are not penalized in this game environment. It is about having an idea and how it solves the problem.

Communication

In terms of communication, this study shows that children like to present their ideas in their own way. Some kids like to draw, other kids like to write, and sometimes if a drawing has failed, they prefer to just tell a little story about their idea. This way, when kids are allowed to decide themselves how to present their ideas, they will enjoy the creative problem-solving aspect even more and, eventually, the feeling of safety to experiment will be enhanced. By embracing a safe game environment, there is room for an open and creative attitude towards novel and personal ideas. However, failure to draw may cause irritations to some kids when communicating their ideas. The key findings in this study show that children can be bothered by errors made in writing and drawing. The pens used in this study are found to be perceived as 'definitive' on paper, and should therefore be changed to something more temporary.

Empathy

In terms of empathy, this study shows that illustrated in-game characters are able to evoke empathy on the players. The more realistic characters, such as the grandma and the farmer, are seen as characters that evoke the most recognition during play. This isn't that surprising because kids recognize these kind of characters from their daily life. However, in terms of a fun-factor, the more fantasy-like characters, such as the pirate and the thief, are experienced by some players as more fun to design something for. A possible explanation could be that kids search for ways to escape from reality through games, which is also reflected in literature (Huizinga, 1950). The question is, however, whether these types of characters call for 'real' empathy, since these kind of fantasy-themed characters are often created by the movie industry. Looking at the clusters in Figure 5-17, differences in diversity and depth can be observed between the generated ideas for the characters. The generated ideas for the pirate seem to be superficial (sable, ship, hat, etc.) compared to the thief and the grandmother. This could be due to the group, but it could also be that players have less personal associations with this character. Because of the small sample in this study it is too early to say that fantasy-

Figure 5-17 - Clusters of generated ideas for a pirate, a grandmother and a thief.

themed characters do not work in this game. However, it has been decided to take this character out of the game, due to a lack of diversity in ideas and future ideas are expected to become too similar as well—affecting the game's replayability. Furthermore, the highest empathic behaviour by the players has been detected when defining a common goal/problem through the open problem cards. The open problem cards evoke discussions when defining an appropriate goal/problem for the character and its context, while incorporating the character's trait (such as 'stubborn'). This is also reflected in the literature, since the dialogues in explorative design games are found to be even more important for guiding the design directions than the tools itself (Brandt, 2006).

Feedback

In terms of feedback, this study shows that game components are able to increase motivation and engagement through competition—as an indicator for a player's skill. Collecting points through the guessing mechanism raises children's attention during turns. Not only during their own turn but also during the turn of others, children pay careful attention when other players present their ideas—to increase their chance to score points. Furthermore, the key findings in this study show that kids want to clearly see the scores between the different players. In addition, children also want to track their own score. A central scoreboard is found to cause a lot of confusion among the children. Centrally located tokens that children can grab themselves is found to

work the best with kids. The latest build shows that exchanging stars for prizes works best to compare scores easily. In addition, the collectable prizes are found to work thematically as an attractive game timer as well—to determine the end of the game. However, some families with younger kids seem to care less about scores; they just want to have a fun time together.

Difficulty

In terms of difficulty, kids are found to have problems with some of the assignment cards. Especially the younger kids might struggle with figuring out ideas that fit well with their assignment. This could be due to the type of problem, character and/or location as well. Findings in this study show that when kids have the freedom to exchange their card, the feeling of safety to generate ideas is enhanced. The ability to allow children to choose between two assignment cards (for example, 'crazy' or 'extraordinary') at the start of a round could be a solution to increase this feeling. This way, the game becomes scalable to challenge players with different skills. Furthermore, some children like to put their creativity in more dream-like ideas, such as 'extraordinary'. While younger kids prefer to stick to the reality with 'simple' and 'brilliant'. In the last build, a variant has been tested with the 'copycat', as a replacement for 'extraordinary'. This variant offers a solution for groups, with younger players, who would like to stay closer to reality. However, this variant is found to make the game a lot easier, because you are allowed to make use of existing ideas.

Control

In terms of control, the combination of the assignment card, the character, the location, and the problem determine the freedom that children have when generating ideas. The key findings in this study show that players have more control over the solution space with the open problem/goal cards. Some groups prefer to find solutions to more abstract problems, such as "being broke", while other groups need more concrete problems, such as "broken shoes". As such, some groups might benefit from having a few examples of what kind of goals or problems they could think of.

Choice

In terms of choice, the 5 provided guessing cards enable the players for in-game choices to score points. While guessing, all 5 options are seriously considered. As such, scoring lies in the hands of players. The most tension was experienced when the guessing cards of others were revealed. The key findings in this study show that this tension was found to make the game fun—as tension is found to be one of the core qualities of play according to Huizinga (1950).

Safety

In terms of safety, through the different game elements as discussed above, kids are engaged to express themselves in a way they wouldn't normally do on a daily base. Especially younger kids can feel insecure about their skills, such as generating and communicating their ideas. The key findings in this study show that they could benefit from guidance by adults or older siblings. They could take away uncertainties by emphasizing that it is just a game and not a test. However, the feeling of a test could also be evoked by the arrangement with the GoPro camera.

Social activity

In terms of social activity, the game elements embedded in this design game provide a means to have meaningful interactions with challenges acknowledged by others. The guessing mechanism, which is the main mechanism in the game, ensures that both generating

ideas as well as listening to the ideas of other players are essential elements in the game. As a result, all players are always actively involved in the game. However, kids can become irritated when they have to wait for other players. This can cause a feeling of unfairness when kids believe other kids have more time to finish their ideas. Therefore, some groups could benefit from having a timer, to take away these irritations and unfair feeling.

Fun-factor

In terms of a fun-factor, the embedded game elements invite children to express themselves creatively in a personal way. Children like the fact that they can use their imagination to come up with silly and crazy ideas—ideas that might not be possible at all. This evokes a moment of fun; they often have to laugh at each other's ideas. Some kids appreciate the freedom they get, because at school they are used to work in groups. Several kids enjoyed the drawing aspect of the game, while other kids had fun with listening to the silly ideas of others and trying to guess their assignments. Overall, coming up with ideas for different eccentric characters is seen as the most fun part of the game, something kids wouldn't normally do on a daily base. However, sadly due to the limited time, only a small selection of characters has been tested with the selected families. More research is needed to evaluate the fun-factor in more realistic characters that match the world of children.

5.8 Conclusions

This research extends earlier work (Brandt, 2006; Nicholl and McLellan, 2008; Vaajakallio et al. 2009; Sanders and Stappers, 2012; Van Staalduinen, 2012; Gielen, 2013; Van Mechelen et al., 2014; Vaajakallio and Mattelmäki, 2014; Schut et al., 2017), by showing the potential of a

fun-factor in a family-friendly design game that engages kids to learn and practice essential 21st century skills through an open and creative attitude. The key findings in this study show a positive relationship between the embedded game elements and a fun-factor. First of all, the open goal/problem cards ensure that families can define recognizable problems themselves for the characters and their location. This way, the solution space for the players becomes more personal and therefore also more fun. Also, the more realistic characters have the potential to make children think of someone from their own environment, such as a grandmother. By having more associations with these kind of characters, makes the ideas even more personal and diverse. On the basis of the 5 secret assignment cards—brilliant, simple, crazy, foolish, and extraordinary—kids are encouraged to turn their first idea into something different. However, when coming up with ideas, kids especially liked the fact that solutions don't have to be logical. It was particularly fun to think of crazy ideas. Moreover, the most tension was experienced when the guessing cards of the other players were revealed— kids could not wait to see what others players thought of their ideas. However, some kids could benefit from guidance by adults or older siblings to generate ideas and to communicate them to the group. During one of the test sessions, a mother helped a 7-year-old girl out by inspiring her with a few possible ideas. This shows that a team variant could help some kids out by exploring creative problem-solving skills in teams together. Furthermore, failure to draw may cause irritations to some kids. The key findings in this study show that children can be bothered by errors made in writing and drawing. Erasable pens could potentially provide a way to give children a more secure feel to experiment in their visual communication. Also, some groups might benefit of have a timer to

make the game fairer for all players. If children have to wait for others than they can become irritated. Furthermore, the collectable stars and prizes ensure mild competition and they provide a good overview of the player's position during the game. However, some families with younger kids seem to care less about scores; they just want to have a fun time together. For those kind of families, a co-operative variant could be a solution, in which all the players are playing together 'against the game'.

The findings in this study may be of great interest for other game designers and design education in general. The argument put forth here is that if a game has a fun-factor, players would feel more inclined to play and replay a game. To summarize the game's fun-factor, Table 5-19 shows an overview of the fun-factor per phase including its educational value. Further research should investigate if repeatedly playing this game increases learning efficiency of the 21st century skills. In addition, more research is needed to evaluate the game's fun-factor with more realistic characters that match the world of children. Based on the observations and interviews with families, two new characters are included in the final design: a 'naughty schoolboy' and a 'forgetful father'. These two characters are inspired by a 'naughty' 8-year-old boy during one of the playtesting sessions, and the jokes that were made about a forgetful father (outside the game). Follow-up research should explore more of these recognizable characters within a family context.

Figure 5-18 - Generated ideas for a farmer with many problems.

Table 5-19	Game elements	21st century skills	Fun-factor
Game setup	**Difficulty:** choice character/location. **Control:** influence on the solution space with type of character. **Choice:** availability of different characters/locations.	**Communication:** discussing the choice of a character and location.	A random character and location creates a surprising effect. Children can also choose a character and location themselves, if they have a favorite.
Phase 1: determining goal/problem	**Difficulty:** type of goal/problem **Control:** influence on the solution space with type of goal/problem. **Choice:** they have all the freedom to invent a goal/problem. **Safety:** space to experiment. **Social activity:** it is a group activity.	**Creative thinking:** associations with possible (realistic) goals/problems of a character and its context. **Empathy:** showing the behavior of emphatically responding to the feelings/problems of someone else.	Children can determine the goal/problem of a character themselves. This also makes the game more personal; children reacted enthusiastically to the fact that they can solve their own 'invented' problems for a character.
Phase 2: generating ideas	**Difficulty:** type assignment card. **Control:** way of visualizing idea, such as words/drawings. **Choice:** type of idea to work out. **Safety:** it is not about the best idea. **Social activity:** everyone is visibly generating and drawing ideas.	**Creative thinking:** the secret assignments encourage kids to view the problem from a different angle. **Communication:** exploring visual skills **Empathy:** children show the willingness to help in-game characters with their own solutions.	In this phase of the game it is especially fun to invent crazy/foolish ideas, mainly due to the fact that ideas for these secret assignments do not have to be logical.
Phase 3: 3.1 presenting	**Control:** the way how to present. **Choice:** oral / visual communication **Safety:** it is not about the best pitch. **Social activity:** everyone looks and listens to a presentation.	**Communication:** exploring oral and visual ways to present an idea. Some children use drawings, others only words, some children only tell stories, or a combination of all of this.	In this phase of the game it is especially fun to watch/listen to the ideas of the other players. Some children indicated that they also enjoyed to present their own ideas to the group.
3.2 guessing	**Feedback:** amount of correct cards. **Choice:** choice of 5 guessing cards. **Social activity:** everyone tries to guess the secret assignment.	**Empathy:** empathize with another player: what kind of assignment would that person have on the basis of his/her presentation and behaviour?	In this phase of the game it is especially exciting to see what the other players are going to guess; what do the other players think of the idea?
3.3 scoring	**Feedback:** gaining stars/prizes. **Choice:** you can choose from 5 prizes. **Social activity:** scores are compared.	**Communication:** discussions arise about the thoughts and feelings behind certain ideas/presentations.	It is fun to discuss ideas afterwards. Sometimes ideas have been interpreted in a completely different way by the players. Also, players enjoy gaining stars.
End of the game	**Feedback:** indicator of a player's position at the game **Social activity:** comparing stars/prizes.	**Communication:** after talking about fun ideas/moments during the game.	Playing with the wooden game tokens, such as building towers.

A design game for families

STAR DESIGNER

Learning essential 21st century skills
through a design thinking game

My idea is the Twigs Shoe! It works like this: Twigs from the forest are fixed to the bottom of the broken shoe to close the hole. This way the stubborn grandmother can still go for her walk in the woods.

Hmm... I think it's a crazy idea... how would this make grandma's shoes waterproof?... maybe it's not even crazy, but foolish...

Grandma has broken shoes

Gek

Onnozel

3-6 PLAYERS

AGES 8+

~30 MIN.

Components

- 30 guessing cards
- 15 assignment cards
- 8 character cards
- 8 location cards
- 1 erasable goal/problem board
- 6 dry-erase pens

- 6 erasable drawing boards
- 30 wooden prizes
- 30 wooden stars
- 1 hourglass
- 1 rulebook

FULLY ANALOG

A design game for families

6. Final design

6.1 Introduction

This chapter describes the final design of this project—Star Designer—and how the decisions in its game components and game elements link to the gained knowledge coming forth from the literature review and playtesting sessions with kids ages 8 and up. Furthermore, a cost calculation of the final design has been sorted out and is reflected on. Finally, a selection of potential publishers is discussed to define the game's market potential in the global tabletop game market—focussing on party games.

6.2 Game overview

Star Designer is a design game for families with kids ages 8 and up, in which players explore the essential 21st century skills—creative thinking, communication, and empathy—with an open and creative mindset. During the game, different characters drop by with all kinds of problems. All players are asked to come up with handy—but sometimes crazy or foolish—solutions. The game consists of three phases. First, together you determine the goal/problem of a character. Then, all players invent an idea based on their secret assignment card, using their individual drawing boards to visualize their ideas. Finally, you present your idea to the group by explaining how it works and how it helps the character. However, this game is not about having the best idea—it is about guessing the secret assignments of your fellow players. After a presentation, players try to guess the designer's secret assignment based on 5 different design intentions: brilliant, simple, crazy, foolish

and extraordinary. You'll gain stars when you guess correctly, and these stars can be exchanged for prizes. The player who has collected the most prizes wins the game. Please consult Appendix K for a complete overview of the game's rules, in which all phases are discussed in more detail.

6.3 Guessing & assignment cards

In Star Designer there are 5 different guessing cards with the following design intentions: brilliant, simple, crazy, foolish and extraordinary. These design intentions are inspired by the book of Von Oech (1983), in which he states that we have to 'play' with our knowledge and experiences to embrace an open and creative attitude. The same 5 words are also on the secret assignment cards that players get at the beginning of a round (Figure 6-1). For example: "Can you come up with a foolish idea?" The 5 different assignments are the result of the playtesting sessions with kids, in which the relationship between these 5 design intentions has proven to work the best. The ambiguous words are interpreted by the players differently—which leads to sufficient tension when guessing the secret assignments. Also, these 5 words ensure enough variation in ideas, to increase replayability of the game. The key insights gathered through the playtesting sessions with families have led to an additional rule for younger kids, which allows them to exchange a secret assignment card once per round if they cannot come up with any ideas—to increase the safety feeling of the game environment.

6.4 Character cards

The final design contains 8 different characters (Figure 6-2), for which each player comes up with a solution to help them out. The key insights gathered through the playtesting sessions show that recognizable characters with eccentric traits, such as a 'stubborn grandmother' and a 'proud farmer', have the potential to spark a variaty of original ideas. The 'naughty child' and the 'forgetful father' are inspired by behavior during playtesting sessions. These have yet to be tested with children, together with the other invented characters. It has been chosen to express the in-game personalities in a cartoon-esque illustrated style. Cheerted Keo, a Rotterdam-based illustrator, has been instructed to emphasize the personalities of the different characters in their body language and facial expression. In addition, each character has attributes to be inspired by.

6.5 Location cards

The 8 different illustrated location cards (Figure 6-2) are used to determine the goal/problem of an in-game character. Cheerted Keo has been instructed to Illustrate recognizable locations with a lot of atmosphere—to enhance the feeling that it can be a space in the players' own world. In addition, on every card the suggestion is made that the world goes beyond the framework—to give players the opportunity to make their own interpretation of this world. The playtesting sessions with families show that children want to create their own world around the illustration. For example, by including elements in their solutions that are not illustrated on the card, such as a 'market' associated with the city location card, or a house near the forest. That is why there are no words printed on the cards; to leave room for different interpretations by the players.
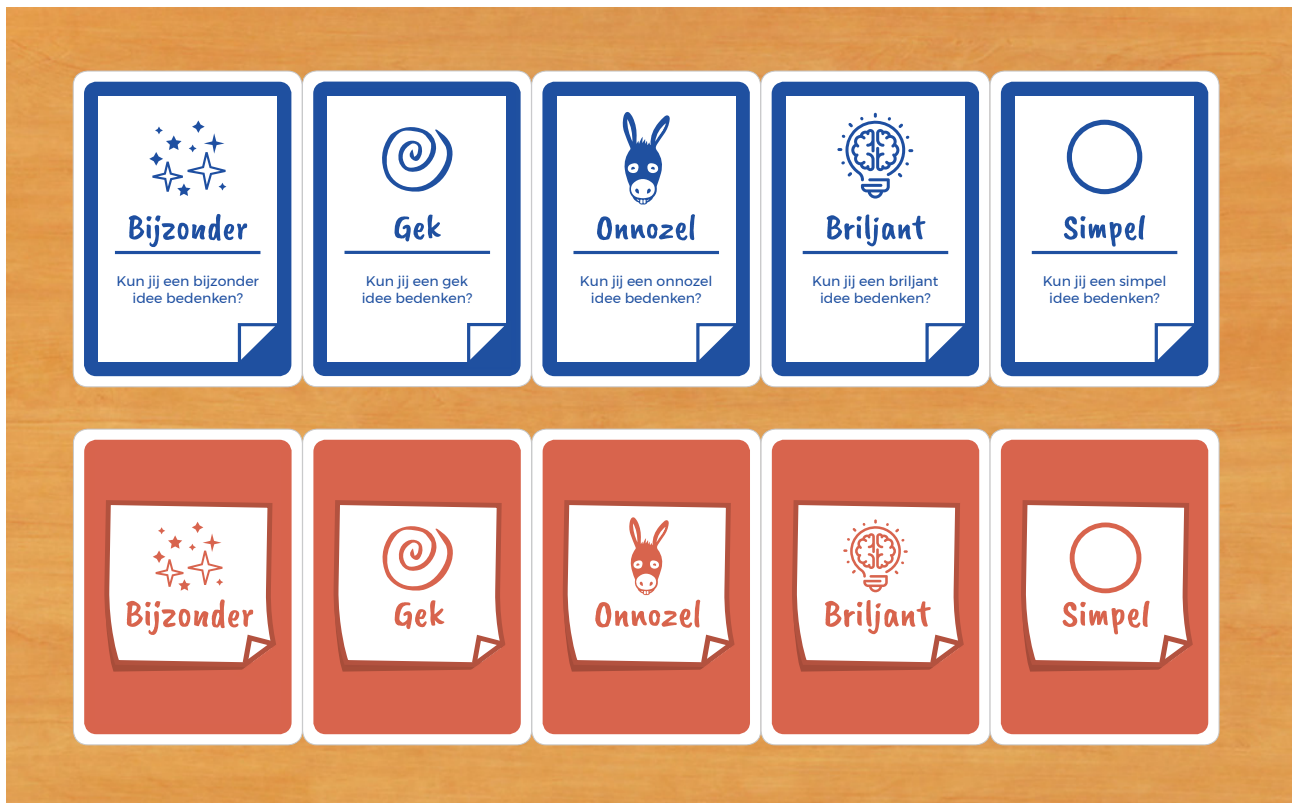
Figure 6-1 - The 5 secret assignment cards (top) and 5 guessing cards (bottom). The guessing cards come in 6 different colours; a colour for each player.

Koppige Oma

Verstrooide Papa

Ondeugend Kind

Trotse Boer

Klunzige Klusser

Knorrige Visser

Sluwe Dief

Jolige Agent

Figure 6-2 - The final design contains 8 different characters and 8 different locations.

6.6 Erasable goal/ problem board

Through the open goal/problem board, the players collectively determine the goal/problem for a random in-game character, in conjunction with its location. The highest empathic behaviour of children has been detected when they define the goal/problem of a character themselves. This is also reflected in the literature; children after the age of 7 develop the ability to empathically respond to the feelings of others (Barnett, 1987). Also, the playtesting sessions with families show that kids in this age show the willingness to help a character out with their ideas. The traits of the different in-game characters, such as 'stubborn' and 'cunning', are recognizable for children and they are discussed while composing a goal/problem for the different characters in the game.

6.7 Dry-erase pens and drawing boards

The final design includes a dry-erase pen and an erasable drawing board for each player. The playtesting sessions with children have shown that children can become irritated when a drawing fails or when a drawing sheet is full of errors— resulting in a feeling of discommode during presentation. It has been found that the pens used in the playtesting sessions with families make every line on

Figure 6-3 - Mock-up of the final design with some drawings by kids.

A design game for families

paper feel definitive. With the included pens in Star Designer it has become easier to fix errors. Therefore, the final design makes use of dry-erase pens to maximize the feeling of safety in the game environment.

6.8 Stars and prizes

An essential feedback element in the final design is to gain stars through its guessing mechanism. During the game, all players pay careful attention when players present their ideas to maximize their chances to guess the secret assignment correctly. In this game, both the designer of an idea as well as the guessing players can win stars during a round—to maximize mutual involvement during play. This way, the feeling of a social activity is enhanced to make the in-game challenges become meaningful. Also, when collected enough stars (equal to the number of players) they can be exchanged for prizes. In a short game (30 min), players win the game by collecting 3 prizes of their choice (scissors, tape, glue, wrench, pen). This way, an intrinsic motivation to compete evokes an extrinsic motivation to explore creative thinking skills—to collect stars and prizes. As discussed in paragraph 2.6.9, in order to attract kids to play with a game, games should comply with a certain 'footprint on the table'. That's why the final design includes three-dimensional wooden stars and prizes with high-tactility.

6.9 Hourglass

The final design includes an hourglass of 1 minute. The playtesting sessions with kids have shown that some families could benefit from having an hourglass to ensure fair-play. Some children get a feeling of unfairness when other children get more time to draw, or they can become irritated when they have to wait

each round for some players. In the final design, when players get the feeling that someone takes too much time to visualize his/her idea, then the hourglass can be used to count down.

6.10 Team variant

Several playtesting sessions with families confirm that children ages 8 and up are able to participate in this game. However, to a certain extent, there is a difference in creative thinking skills identified between the ages of 8 and 11 years. For example, there are 8-year-olds who can easily come up with crazy ideas, while some 9-year-olds are found to have difficulties with ideating in general. These observations have led to a team variant, included in the final design (Appendix K). The team variant allows children to discuss ideas with a parent or an older sibling, to explore creative thinking skills in pairs. The team variant is therefore advised in the rules for families with younger children who could benefit from guidance by adults, or who would like to work in teams.

6.11 Cooperative variant

As discussed in paragraph 2.6.8, the market shows a trend towards cooperative games, in which players win or lose as a team. This indicates that there are gamers among the target audience who prefer to work together, instead of playing against each other. Also among the families, it has been found that a cooperative variant could make the game more attractive for some of them— to enhance a sense of togetherness during the social activity. As such, in the final design there's a cooperative variant included, without changing the gameplay or adding additional components.

Star Designer DESCRIPTION	QTY	Please Quote: 1,000 2,000 3,000 4,000 5,000 DIMENSIONS	CONSTRUCTION	COLORS	FINISH	EMBOSS	NOTES
Full Telescoping Retail Box	1	Top: 232mm x 162mm x 51mm Bottom: 226mm x 156mm x 51mm	157gsm Art Paper over 1.3mm Greyboard 1.5mm Total Thickness	4C/0C	Single-Sided Matte PP Lamination	—	—
Poker Playing Cards • Guessing Cards	30	63mm x 88mm	320gsm Blackcore	4C/4C	Double Sided with Aqueous Coating	Linen	Round Corners, Full Bleed, Shrinkwrap
Poker Playing Cards • Assignment Cards	15	63mm x 88mm	320gsm Blackcore	4C/4C	Double Sided with Aqueous Coating	Linen	Round Corners, Full Bleed, Shrinkwrap
Double Poker Playing Cards • Character Cards	8	88mm x 128mm	320gsm Blackcore	4C/4C	Double Sided with Aqueous Coating	Linen	Round Corners, Full Bleed, Shrinkwrap
Double Poker Playing Cards • Environment Cards	8	88mm x 128mm	320gsm Blackcore	4C/4C	Double Sided with Aqueous Coating	Linen	Round Corners, Full Bleed, Shrinkwrap
Dry-Erase Drawing Board • Goal/Problem Board	1	176mm x 63mm	320gsm Blackcore	4C/4C	Single-Sided with Dry-Erase Coating (UV)	—	Round Corners, Full Bleed
Dry-Erase Drawing Boards • Drawing Boards	6	176mm x 128mm	320gsm Blackcore	4C/4C	Single-Sided with Dry-Erase Coating (UV)	—	Round Corners, Full Bleed
Custom Wood Shape • Artifacts	30	35mm x 35mm x 9mm	Wood	Pantone 14-0848 (Mimosa)	—	—	—
Custom Wood Shape • Stars	30	20mm x 22mm x 9mm	Wood	Pantone 11-0601 (White)	—	—	—
Dry-Erase Pens	6	113mm x 13mm	Plastic	Black	—	—	—
Hourglass (1 minute)	1	—	—	Black	—	—	—
Zip Bag	3	150mm x 200mm	Plastic	—	—	—	—
Rulebook	8 Pages	297mm x 210mm Flat (A4) 148mm x 210mm Folded (A5)	128gsm Gloss Paper	4C/4C	—	—	Fold, Saddle Staple

Figure 6-4 - Bill of Materials with all the components for the final design.

6.12 Production costs

Based on a Bill of Materials (Figure 6-4), all components and specifications of the game have been mapped in order to request quotes from manufacturers to mass produce the game. Based on experience with various board game publishers (dV Giochi, Superlude, HobbyWorld), a first print run of a board game for the consumer market is on average between 4000 and 5000 copies. Using a quote from China-based board game manufacturer YoRi Games (Appendix I), a print-run of 5000 copies makes the total manufacturing costs per game around US $4.35, which is about €3.75. Adding to this transportation costs, customs fees and storage costs, makes €5 per game. Assuming that a party game shouldn't cost more than € 25 euros (Appendix J), and that a retailer requests 60% of its retail price (€15), means a profit of €5 (€25-€15-€5=€5) for the publisher, per game. This means a total profit of €25.000, on a first print run. This seems to be a profitable amount to pay the author of the game (4-10%), the illustrator (fixed amount), the publisher's expenses (fixed amount), unforeseen costs (?%), and to invest in new projects (?%). Given the fact that the game designer has spent the most time on the project (880 hours); researching, prototyping, playtesting, validating, and documenting, it seems to be a 'small' investment risk of €25.000 (€5x5000) for a first print-run. In case of success, the publisher only has to fire the printers and sign contracts with partners!

6.13 Market potential

Based on the feedback by 999 Games (Appendix J), the final design is positioned as a 'party game' in the board game market. According to crowdfunding platform Kickstarter, this is the best selling segment, which means that Star Designer is going to compete with other party games in the market. The unique selling point of the final design is that it uses the application of the essential 21st century
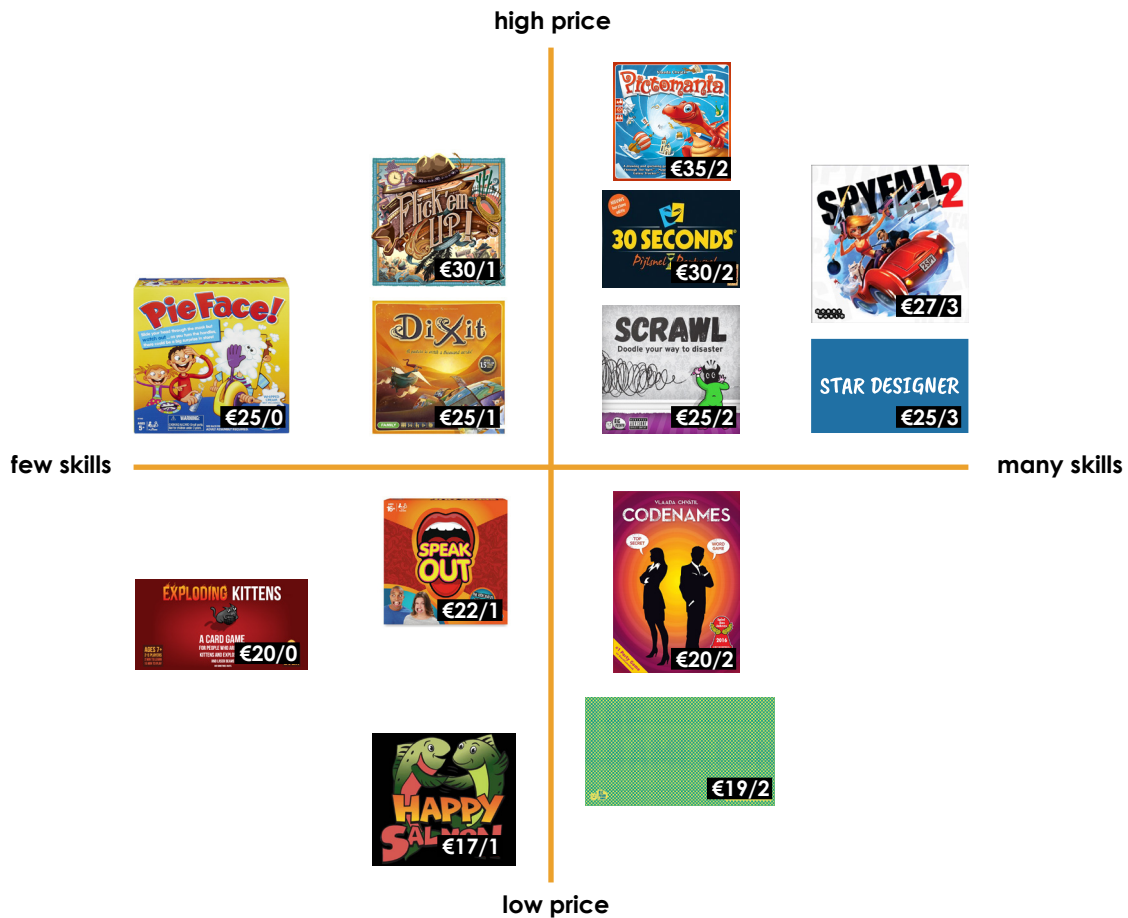
Figure 6-5 - Mapping with potential competing party games.

skills as a driving force for its gaming pleasure. Figure 6-5 shows a mapping with potential competing party games based on price and applied skills, such as motor skills, communicative skills, creative skills, and empathic skills. With the cheapest game Happy Salmon (€17) and most expensive game Pictomania (€35). Spyfall is identified with the most skills (creativity, communication and empathy), and PieFace! is identified with the least skills (0). This mapping shows that there is still space on the market for affordable games with many skills being applied. If we look at publishers who invest in games with many applied skills then the publishers Czech Games Edition (Pictomania, Codenames), Big Potato Games (Scrawl, Chameleon), and HobbyWorld (Spyfall) pop out. Looking at this mapping, there is a high potential of having Star Designer released by one of these publishers on the market.

6.14 Conclusion

This chapter describes Star Designer and how the gathered insights are expressed in the game. In Appendix K a complete overview of the game's rules can be found, in which all phases are discussed in more detail. The cost calculation shows that the productions costs are around €5 per game, and that a profit of €25.000 can be made over a first-print run of 5000 copies. Also, it can be said that there's a market potential for the final design to engage families around to world to learn the essential 21st century skills though this game. In Chapter 7, these learning goals in the final design are evaluated. Overall, given its reasoned design decisions, investment costs and market potential, it seems that it is worth the risk to invest in this game and to release it on the market.

Doel / Probleem

lijn hond raakt verstrikt

Spelers:

Datum:

Dat er een magneetje magneet aan de lijn zit bij de hond en bij het gene dat de oma ust heeft

WAF

1+1

7. Evaluation

7.1 Introduction

The design-based research project 'Co-Design with Kids: Early acquisition of 21st century skills' at the TU Delft, explores the creative problem-solving skills of school children in primary education. Essential 21st century skills for solving design problems are— among others—creative thinking, communication and empathy. The purpose of this graduation project has been to explore how to best engage families with kids to learn and practice these skills in a design game; as design games are found to stimulate an open and creative attitude towards exploring creative problem-solving skills in a safe playing environment (Iversen and Buur, 2002; Brandt, 2006; Vaajakallio and Mattelmäki, 2014). This was done through a literature review and several playtesting sessions with families. Contrary to the research project at the TU Delft, however, the focus of this graduation project is not on design tools for an educational setting (such as a primary school), but on a game for the consumer market— with a fun-factor. The argument put forth here is that if a game has a fun-factor, players will feel more inclined to play and replay a game—which is important for learning the essential 21st century skills. The following paragraphs will elaborate on the extent to which this graduation project has succeeded in applying these three skills—creative thinking, communication, and empathy—in the final design. The comments by Alice Schut and Remke Klapwijk of the TU Delft, who are specialised in co-designing with kids, have been included in this evaluation for a critical 'second opinion' on the final design.

7.2 Addressing creative thinking skills

Most creativity models for generating as well as elaborating on design ideas use divergent and convergent thinking to create something novel and useful (Nicholl and McLellan, 2008; Schut et al., 2017). Without the right mindset, however, people are not open to be creative while dealing with 'fuzzy' input to tackle the open-ended challenges of the 21st century (Von Oech, 1983; Bakker et al., 2010; Wyatt and Brown, 2010; Thoring et al., 2014). Therefore, the focus in the final design is not on the development of the divergent and convergent skills, but on the development of a mindset open to creativity—which is also necessary to take away the fear of failure (Brown, 2009). To evoke this open mindset, the final design 'plays' with the knowledge and experiences that we already have. The 5 different assignment cards with ambiguous words—crazy, foolish, simple, brilliant, and extraordinary—reduce obvious thoughts and experiences, by looking at the problem from a different perspective. For example, a 'foolish' mindset lets you come up with ideas that you would have never thought of otherwise, because they might not be a logical solution. This way, a 'foolish' mindset prevents falling back on obvious first thoughts. When looking at the Design Thinking process, divergent thinking is found to be essential for coming up with many ideas in order to identify meaningful patterns, ultimately to develop new and original ideas. When playing the final design, it may seem that in each round only a single idea is generated per

player. However, key insights gathered through playtesting sessions with families show that first thoughts sometimes have to be converted to an idea that fits the assignment card—which in a way can be seen as divergent and convergent thinking on a micro-level. As such, the ambiguous words on the assignment cards have the potential to help overcome thinking through the 'path-of-least-resistance', and eventually 'design fixation'. According to Alice Schut and Remke Klapwijk, to actually evaluate this in further research, the diversity of ideas could be examined by playing with the same problem again and again in subsequent rounds. This way, the ideas that have already been devised in a round could lead to the development of new ideas in a next round. This can be seen as an opportunity to apply the game as a tool in design education. However, when looking at this game from a consumer's perspective, the question is whether this adjustment is beneficial for its replayability. Playing multiple rounds with the same problem (and character) could be less exciting. Further research could investigate if this adjustment is able to boost the efficiency of learning the creative thinking skills, without losing the game's tension. Overall, looking at the results of the playtesting sessions with kids, this design game for the consumer market has taken the first steps in making children 'play' with their knowledge in order to come up with less obvious—and sometimes even original—ideas, by solving the problems of in-game characters.

7.3 Addressing communicative skills

Designing in teams is a social process, in which communication is an essential aspect in the success of a project (Cardoso et al., 2016). In the game,

communicative skills are applied through practicing with both oral as well as visual skills. As the key insights show, each child has his own preference in communication. Some kids like to draw, other kids rather write, and some kids prefer to just tell their idea. The question is whether the game stimulates children enough to discover all forms of communication. If children only tell and do not draw, then they will never develop their visual skills in the game. According to Alice Schut and Remke Klapwijk, what could help stimulate children to explore their visual skills is to put some visual cues on the drawing boards, so they do not start with a blank sheet of paper. And to get kids in the drawing mood, the introduction of an ice-breaker game in which you have to draw could help as well. On the other hand, the rules of the game could also give advice to parents. For example, by letting parents ask questions if an idea is not entirely clear, such as a 'generative design question' (as discussed in paragraph 2.2.3): "What do you mean with… could you draw this out please?" The playtesting sessions with families show that parents can play a major role in making children feel safe to explore their communicative skills. As such, during the game it is important to emphasize that it's just a game, and not a test. When looking at the final design, the phases in the game clearly indicate when to explore ways of visualising ideas and when to present them. This way, the game's rules can ensure that both drawing ideas as well as presenting ideas belong to this game-world—and thus do not belong to the real-world, in which mistakes could be disapproved. Further research could investigate how children can be best instructed by the game's rules to discover their communication skills in all areas, and to have a competitive advantage doing this. As competition could be an intrinsic motivation to explore all aspects of communication to win the game.

7.4 Addressing empathic skills

Empathy is defined as "the cognitive ability to recognize and to understand the thoughts, perspectives, and feelings of another individual" (Barnett, 1987). As many have argued (Brandt et al., 2011), teaching creative problem-solving skills isn't only about learning specific predefined methods—such as divergent and convergent thinking—it is also about the designer's social abilities to have an emotional connection to people and to empathically respond to the feelings of others. In the final design, empathic skills are called upon when solving the problems of various in-game eccentric characters. Through the playtesting sessions, the highest empathic behaviour has been detected when the family all together define a problem or a goal for the character. Through analyses of the discussions that come into play, it can be said that a character's traits—such as stubbornness—provide a helping hand in considering a problem that would fit into the world of the character. According to Alice Schut and Remke Klapwijk, to enhance this moment of empathy in the game, players could even determine the character's trait themselves. To give an example: "What could be the character's trait of your own grandmother?" This adjustment could potentially let the children reflect on their own experiences with the characters, as portrayed in the final design. However, from a consumer's perspective, this raises the questions whether too many to-be-filled-in cards adversely affect the smoothness of the game, as an extensive series of tasks could drag a design game down (Vaajakallio et al., 2009). Follow-up research could look into smart ways to integrate this adjustment to the game. Overall, kids seemed to have the most fun to come up with foolish and crazy ideas

for the different characters, which may not be logical or helping at all. Eliminating the secret assignment cards related to these kind of ideas could potentially have a disastrous effect on the fun-factor of the game. Still, if we look at this behaviour from a psychological point of view, the willingness to help other people—whether or not with foolish/crazy ideas—is related to empathetic skills. As such, it can be said that this design game for the consumer market has taken the first steps towards providing a game environment in which children are able to explore their abilities to emotionally respond to the problems/goals of other people—which are illustrated personalities in the final design.

7.5 Conclusion

The final design coming forth from this graduation project shows the educational potential and relevance of evoking the 21st century skills in a design game for families. The insights gathered through the playtesting sessions with kids, show that when playing the game, the skills of children differ within a group. As many have argued, it is found that a safe game environment fosters the exploration of these skills. However, in practice, it appears that in a new gaming environment, kids could benefit from guidance by adults—as a new game can put children off. Parents should be carefully instructed how to deal with the different skills of kids, because they are often the only one who read the rules beforehand. As such, the wording, examples, and messages in the game's rules need careful attention to address the 21st century skills and to increase learning efficiency. Therefore, in the final design, it is not about the best design or the most beautiful drawing, the game's rules rather emphasize that visualizations help to clearly present your ideas to the group.

8. Recommendations

The final design has been evaluated through a practice-based research approach with the intended players—families with kids ages 8 and up. The intent of this particular project was to show the potential of a family-friendly design game with a fun-factor that invites kids to learn and practice the essential 21st century skills in a game. To a certain extent it has been established that children have fun exploring these skills in the final design. However, due to the time span of this project, this approach did not allow the evaluation of its effectiveness in achieving the development of these skills. Looking at Illeris' fundamental processes of learning, the repetitive play of the game should lead to the development of these skills. Given the status of the final design, this project leaves room for such approaches to be tested and analysed in more detail in the future.

Within the time frame of this project, it has not been possible to thoroughly evaluate all the different characters and locations in the game. During the test sessions, the grandmother, the farmer, the thief, and the pirate were tested several times. The results show that the recognizable and real-world characters, such as the farmer and the grandmother, resulted in a wide variety of different ideas—with a lot of depth. Whereas the generated ideas for a more fantasy-like character, such as a pirate, resulted in more superficial and predictable ideas. For the replayability of the game, unpredictable and varying ideas are important to keep the tension in the game when guessing the secret assignments. Unfortunately, not all in-game characters are tested often enough to be able to say how much depth they have by comparing them with each other. However, the pirate has been removed from the game because it is the most superficial character, and is based on too many clichés (sable, ship, hat, etc.)

Two characters in the final design—the 'naughty child' and the 'forgetful father'—are inspired by the observations and interviews during the tests. As such, there was a child with lots of naughty ideas, and a family made jokes about a forgetful father. The expectation is that these in-game characters are able to offer a lot of depth and replayability, because many families will recognize the problems and goals of these types of characters. Follow-up research should investigate more of these recognizable real-world characters that match the world of children. Context-mapping sessions with children might help to define other recognizable real-world characters (and locations) suitable for the game. Furthermore, the replayability of all the different characters and locations should be examined in more detail as well.

In this game, kids are engaged to express themselves in a way they normally would not. To enhance the feeling of safe experimentation, dry-erase pens are included in the final design. Key findings show that kids can be bothered by errors made in writing and drawing—resulting in a barrier to present. Dry-erase pens could potentially make their drawings feel less definitive, and this way they can easily erase errors as well. However, the effect of these erasable pens have not yet been validated with children. Follow-up playtests should investigate if the dry-erase pens lower the threshold to start drawing and if they have a positive effect on the development of their creative thinking and communicative skills. The final design can be seen as 'structured

play', with its own set of rules. This way, the rules of the game determine the boundaries of play, in which 'play' can be seen as the player's experience of this 'designed system'; what is allowed and what is not allowed. However, playtesting sessions with kids have shown that they like to 'test' those boundaries. For example, a child came up with a crazy idea that had nothing to do with the problem of the character. Of course, this can easily be identified as crazy. Therefore, the final design includes specific rules that are applicable to presentations. For example, it is not allowed to present ideas that have nothing to do with the problem of a character. There are probably children (or adults) who will find even more of these tricks to circumvent the rules. Further research should investigate more of these 'hacks' to prevent breaking the game's rules—to ensure fair play.

The findings coming forth from the playtesting session with kids suggest that there is a positive relationship between the embedded game elements and a fun-factor. Although this study is based on a small sample of families, the findings suggest that 'fun' is something personal for children; there are different elements about the game identified as 'fun'. The question is, however, whether the optimal interaction in the game has been achieved. For example, could the game be even more fun? And also, for how long does this game continue to be fun? In the game world you encounter the phenomenon of families sharing their own 'house rules' online, because they found out that these kind of adjustments make the game even more fun for them. The question is whether this is wrong, or can you also see this as a compliment that people care about your game. In an ideal world, you would like to test the game with hundreds of different families from all around the world, to also get feedback from other cultures. But in reality this is not so easy to achieve. Follow-up research should therefore find out how the game can be made even more fun, or how the game's fun-factor can be extended.

A design game for families

9. Reflection

This graduation project set out to investigate how to evoke the 21st century skills in an explorative design game for families, and to identify what makes learning these skills fun. In order to contribute with this graduation project to design game theory and knowledge, a reflection on the project has been carried out. In the following sections, the relevance of the used methods, theories and models throughout this project are discussed.

Design Thinking process (HPI D-School)

As many have argued, the Design Thinking process is found to be a successful method to structure the 'chaotic' and 'uncertain' nature of open-ended design challenges. Understanding the different phases of this process helps to define the starting points for an explorative design game. The iterative design cycles in the conceptualisation phase show that implementing all six phases in a design game can make its gameplay feel tedious. By testing all phases in a design direction, the following phases of the Design Thinking process were found to work the best for the final design: (3) Point of View, (4) Idea, and (5) Prototype. However, for the second design direction, phase (1) Understand, appeared to work well. This shows that all phases of the Design Thinking process should be considered when generating ideas for an explorative design game.

Framework for educational game design (Van Staalduinen, 2012)

Van Staalduinen established a framework for educational game design with typical game elements of entertainment games. His framework highlights what gamers consider as important game elements during play. As argued by many (Illeris, 2007), practice is considered to be the basis of learning. Since gamers need a reason to practice, educational games should motivate players to solve the in-game problems. As such, six game elements within his framework are experienced as critical aspects to motivate players to play and replay games—to make them 'fun'. Since these six game elements—feedback, difficulty, control, choice, safety and social activity—are related to each other and are elaborated clearly in his research, it has been chosen to evaluate these six game elements during the playtesting sessions with families. Other game elements in the framework, such as 'rules', 'balance', 'look & feel', have shown up during the playtesting sessions. However, to focus on the motivational game elements throughout the tests, these other game elements have not been documented separately. This graduation project shows that these six essential game elements can be evaluated within a reasonable amount of time through the 'Build, Measure, Learn' loop (Ries, 2011), to improve the game's overall experience and usability in a family setting. Looking at other frameworks, such as the Playful Experience (PLEX) framework, with over 20 game experiences to evaluate, seems to be an overwhelming tool to use in an iterative design process. Furthermore, the PLEX framework focusses primarily on video games and seems to overlook the social qualities of tabletop games.

Fundamental processes of learning (Illeris, 2007)

The fundamental process of learning by Illeris (2007), shows clearly how learning works in a game. Through the three

important aspects—content, incentive, and interaction—the framework for an educational design game is defined. As such, it needs the six important game elements to drive the player's incentive (motivation) to generate or evaluate content (words, visuals, stories, ideas, etc.) by interacting with the game's components, also called the game environment. In this game environment, game mechanisms evoke interactions by the players, and these mechanisms are therefore called the 'engine' of a game. This way, a player acquirers content (knowledge) by playing and re-playing a game. In conclusion, by understanding this learning process, it shows that an educational design game needs: motivational game elements (feedback, difficulty, control, choice, safety and social activity); content (words, visuals, icons, stories, etc.); game components (cards, dice, boards, pawns, etc.); and a game mechanism (or multiple). All these elements are therefore applied in the final design. Also, from the experience gained throughout this project it can be said that by understanding the organisation of this 'designed system', it becomes easier to clearly write the game's rules down—as games for the consumer market can be seen as 'structured play', with its own set of rules (Salen and Zimmerman, 2004).

Game mechanisms (BGG)
As many have argued (Salen and Zimmerman, 2004), game mechanisms are the drivers of a game and could potentially evoke meaningful interactions. On BoardGameGeek.com, over 50 of these game mechanisms can be found (including sub-categories), which can be a bit overwhelming at first. By making a selection of suitable game mechanisms for the desired game, the solution space can be mapped out with game ideas in a morphological chart to generate design directions (paragraph 4.4). And as the market shows, the best games make

in an original way use of a combination of these mechanisms, such as Spyfall by HobbyWorld. With this knowledge, several concepts can be developed in an analytical and systematic way to meet a list of design criteria. Looking at the final design, it can be said that the main guessing mechanism is based on a 'deduction' mechanism (Appendix C). There isn't a clear definition for this form of deduction yet, as the embedded mechanism in the final design has evolved into a combination of 'signalling', 'hidden roles', and 'simultaneous action selection'. During the playtesting sessions with families, this mechanism has proven to evoke the most tension and 'fun' during the game when the players try to guess the secret assignment of a player. Furthermore, a form of a 'storytelling' mechanism is used when players present their ideas to the group. As such, the secret assignment card, the character, the location, and the goal/problem, form together the stimuli for the player's story behind the idea. Moreover, the player's incentive to collect stars is in a way driven by a 'set collection' mechanism. This way, players are encouraged to collect sets of stars to exchange them into prizes in order to win the game. In conclusion, re-using existing mechanisms is a good way to start the development of a new game. Through an iterative design process, the game will eventually get its own twist and can be positioned as a new game on the market.

The PMI-method (De Bono, 2006)
The PMI-method is found to be a quick and effective way to identify specific interaction/experience problems in the initial stage of a game design project. And as many great game designers like to argue, good game design is mainly about testing, testing and testing. The PMI-method makes it possible to take a lot of iteration steps in a short period of time, by improving its negative aspects,

and to enhance positive aspects. This way, several design directions can be developed into concept proposals in a short span of time. A design statement helps to stay focused on the goal of the project throughout these cycles. However, the danger with this method is that you could continue in principle indefinitely, so it is best to stop when there are more positive aspects than negative aspects— to be able to define the outcomes as concept proposals. A weighted criteria method helps to evaluate these concepts using predefined criteria. The most promising concept should be developed further with the intended players. Especially when designing a family-friendly game, the skills of kids should be taken into account when evaluating the concept with the intended target group.

Build, Measure, Learn loop (Ries, 2011)

The Build, Measure, Learn loop ideology focuses on learning from potential users by iterating through several 'builds'. This method has proven to be successful in the development of digital apps and games. This graduation project shows that it also seems to work to develop and to evaluate a family-friendly design game. A structured practice-based research approach has proven to be effective in gathering useful qualitative data through several builds. This way, the game's motivational game elements and learning objectives, such as the essential 21st century skills, can be evaluated and improved in a next build. Given the time, a total of three builds have been made. This turned out to be enough to identify major experience and usability issues, with regard to the intended players. However, to balance the game completely, in follow-up research there are many more tests needed with different families. For example, some eccentric characters might work better with specific locations than others. This can only be confirmed by testing the game more often with different

families. In conclusion, the Build, Measure, Learn loop ideology appears to be a good method to evaluate and to develop motivational game elements in a design game. Moreover, these motivational game elements are also found to have a positive relationship with a fun-factor. This way, the fun-factor in a game can also be evaluated and further developed through this loop ideology by Ries (2011).

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Game	Info	Game elements	21st Century Skills
Shake it!	Shake it! is a practical Design Thinking game for managers, entrepreneurs, trainers, coaches, teachers and students who want to quickly come up with innovative ideas with their team or organization.	**Feedback:** There is no direct feedback from the game. **Difficulty:** There are no difficulty levels you can choose. **Control:** You have total control on the game's flow. **Choice:** You can choose from 36 methods. **Safety:** The game is a safe environment to fail. **Social activity:** There is a lot of interaction.	**Creative thinking:** The method invites you to come up with fresh ideas together with the other players. **Communication:** You have to communicate your ideas to the other participants. **Empathy:** The game challenges you to empathize from the user's perspective.
Creative Whack	An illustrated deck of 64 creative thinking strategies that will whack you out of habitual thought patterns and enable you to look at your life and actions in a fresh way. Use the cards alone or with others to seek innovative solutions to issues.	**Feedback:** There is a judge to give you feedback. **Difficulty:** Difficulty depends on the interpretation. **Control:** You can decide which card you choose. **Choice:** The are 64 cards to choose from. **Safety:** The game challenges you to make mistakes. **Social activity:** You can play it solo or in teams.	**Creative thinking:** Th cards allow you to discover different creativity strategies. **Communication:** You are allowed to communicate orally and writing. But this is not necessary **Empathy:** To show tolerance, express and understand different viewpoints
ATLAS game	The ATLAS game helps cross-disciplinary teams plan service co-creation projects. The game elements and structure help the teams learn about and go through various dimensions that are essential in planning and conducting of service co-creation projects.	**Feedback:** There is no direct feedback from the game. **Difficulty:** There are no difficulty levels you can choose. **Control:** You are in control of the flow of the game. **Choice:** You can take cards from different stacks. **Safety:** There aren't any fails you can make. **Social activity:** There has to be a lot of discussions.	**Creative thinking:** Players use their creativity to come up with fresh ideas. **Communication:** You have to discuss a lot about the answers to the questions. **Empathy:** The game challenges you to empathize with the user.
Design Game	Design Game is a co-creation tool with the format of a board game. The game is played with consumers and other relevant stakeholders. Using the social environment of a game situation, the tool is highly efficient in both quality and quantity of output.	**Feedback:** There is no direct feedback. **Difficulty:** Difficulty of the game can not be adjusted. **Control:** You can generate many ideas. **Choice:** There is not much choice between options. **Safety:** The game is a safe environment to fail. **Social activity:** There is a lot of interaction.	**Creative thinking:** The results are presented using the words, drawings and sketches during the game. **Communication:** Interaction is valuable to obtain direct consumer insights. **Empathy:** You must answer questions about the behavior of the user.
The User Game	While playing the User game the participants create a shared image of intended users grounded in field data. It is based on 20 – 40 short video-snippets (30 seconds to 2 minutes long) from the ethnographically inspired field studies.	**Feedback:** The game doesn't give you any feedback. **Difficulty:** Difficulty depends on available materials. **Control:** The player is in control of his own story. **Choice:** You can choose from different pictures. **Safety:** There is the freedom to make mistakes. **Social activity:** This game is played in a group	**Creative thinking:** Players make a story based on the pictures on the table. **Communication:** The players tell each other a story based on the pictures on the table. **Empathy:** Players must empathize with the user using the pictures on the table.
Landscape Game	The aim with the Landscape game is to create context for the persons created in the User game. Hereby focus shifts from developing stories about persons, their doings, behaviour, interests and relations to involve their surroundings.	**Feedback:** There is no feedback on the choices. **Difficulty:** Difficulty depends on available materials. **Control:** The players control the outcome of the game. **Choice:** You can choose different cards on the board. **Safety:** There is the freedom to make mistakes. **Social activity:** There has to be a lot of discussion	**Creative thinking:** Players have to envision how the future environment will look like. **Communication:** There are discussions about how the various players interpreted the game boards. **Empathy:** Players must empathize with the user using the cards on the game board.

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Codenames

Info: In Codenames, players make clever associations between words. Spymasters give one-word clues that can point to multiple words on the table. Their teammates try to guess words of the right color while avoiding those that belong to the opposing team.

Game elements:
- **Feedback:** Colored agent cards are used to rate clues.
- **Difficulty:** There are rules for advanced players.
- **Control:** You are in control of the amount of patterns.
- **Choice:** You can choose different words/clues.
- **Safety:** Wrong choices can be misunderstood.
- **Social activity:** You play in teams against each other.

21st Century Skills:
- **Creative thinking:** Players use their imagination and try to find clues from all areas of their knowledge.
- **Communication:** You may only give a one-word clue, you are not allowed to talk.
- **Empathy:** You have to empathize with your fellow player to understand the given clues.

Junk Art

Info: In Junk Art, players compete to stack various shapes of wood into one structure without letting pieces fall to the table. Players travel to cities around the world building structures based on specific rules. The player with the most fans wins the game.

Game elements:
- **Feedback:** You get a reward when you stack well.
- **Difficulty:** There are rules for variants.
- **Control:** You are in control of the placement.
- **Choice:** You can choose from different objects
- **Safety:** Wrong placements can be fatal.
- **Social activity:** There is a battle for certain objects.

21st Century Skills:
- **Creative thinking:** Players use their creativity to stack the various (awkward) shaped objects.
- **Communication:** There is little communication required between the players.
- **Empathy:** There is a little empathy needed to find out what objects others want.

Patchwork

Info: Patchwork is a light two-player game in which players attempt to construct the best quilt. Players each take their own quilt board, a board with 9-by-9 squares. There are various shapes that will be used to build the quilts. The player with the most buttons wins the game.

Game elements:
- **Feedback:** You get points based on choices.
- **Difficulty:** There are rules for variants.
- **Control:** You have limited control on your choices.
- **Choice:** You can choose from several tiles.
- **Safety:** One mistake can sometimes be fatal.
- **Social activity:** This is game can feel solo.

21st Century Skills:
- **Creative thinking:** It's a kind of creative puzzle to get the tiles on your board.
- **Communication:** There is little communication required between the players.
- **Empathy:** The game can sometimes feel solo, there is limited interaction.

Telestrations

Info: In this game each person writes something on the first page. Then, the next person looks at the text, and they draw a picture of it - and hand the picture to the person next to them. Ultimately, it just keeps going until it gets back to the original person.

Game elements:
- **Feedback:** Others interpret your drawings.
- **Difficulty:** You decide yourself the difficulty.
- **Control:** You have partial control over the course.
- **Choice:** You decide what you draw.
- **Safety:** Failing can be funny in this game.
- **Social activity:** This is a party game for teams.

21st Century Skills:
- **Creative thinking:** You decide what you draw on the basis of the previous information.
- **Communication:** Communication in the game goes almost through only the drawings and words.
- **Empathy:** You have to empathize a bit what other people have in mind.

Rory's Story

Info: Rory's Story Cubes is a set of nine six-sided dice, each with a different image on them. They are meant to inspire storytelling and creative play. Using the throws with the dice you can create your own stories.

Game elements:
- **Feedback:** There is no feedback on the choices.
- **Difficulty:** There are rules for variants.
- **Control:** There is quite some luck in the game.
- **Choice:** You can determine the order of the dice
- **Safety:** You decide the course of the story.
- **Social activity:** You can create a story together.

21st Century Skills:
- **Creative thinking:** You use your creativity to make a story based on the rolls with the dice.
- **Communication:** You tell each other stories and you make a story together.
- **Empathy:** You need little empathy because you decide the story yourself.

Pictionary

Info: In Pictionary, both teams' clue givers may be drawing at the same time as players strive to be the first to guess the correct answer. Play continues until one team reaches the final square on the game board.

Game elements:
- **Feedback:** When you guess correct you may roll a die.
- **Difficulty:** There are different difficulties on the cards.
- **Control:** You can choose and give the hint yourself.
- **Choice:** There are several hints to choose from.
- **Safety:** You can lose your turn with an error.
- **Social activity:** You play in teams against each other.

21st Century Skills:
- **Creative thinking:** Players use their imagination and creativity to draw the hint on paper.
- **Communication:** You may only communicate through the drawings.
- **Empathy:** You have to empathize with your fellow player to understand the given clues.

⚙ Suitable game mechanisms

Action Point Allowance System

Each player is alloted a certain amount of points per round. These points can be spent on available actions, until the player doesn't have enough remaining to 'purchase' any more actions.

Betting/Wagering

Betting/Wagering games are games that encourage or require players to bet money (real or in-game) on certain outcomes within the game. The betting itself becomes part of the game.

Card Drafting

Card drafting games are games where players pick cards from a limited subset, such as a common pool, to gain some advantage or to meet objectives within the game.

Co-operative Play

Co-operative play encourages players to work together to beat the game. There is little or no competition between players. The players win the game by reaching a pre-determined objective.

Deduction

Deduction games are those that require players to form conclusions based on available premises. Players use a set of observations and truthful feedback to narrow down possibilities.

Partnerships

Games with partnerships offer players a set of rules for alliances and teams. Partners are often able to win as a team, or penalities are enforced for not respecting alliances.

Pattern Building

Pattern Building is a system where players place game components in specific patterns in order to gain specific or variable game results.

Pattern Recognition

Patterns are placed or added on different random or pre-determined locations. Players have to recognize a known pattern created by the players to win.

Role Playing

Some board games incorporate elements of role playing. It can be that players control a character that improves over time. It can also be a game that encourages or inspires Storytelling.

Roll and Move

Roll / Spin and move games are games where players roll dice or spin spinners and move playing pieces in accordance with the roll.

Route/Network Building

Route/Network Building games feature network(s) using owned, partially owned or neutral pieces, with an emphasis on building the longest chain and/or connecting to new areas.

Set Collection

The primary goal of a set collection mechanic is to encourage a player to collect a set of items.

Simulation

Simulation games are games that attempt to model actual events or situations.

Simultaneous Action Selection

The simultaneous action selection mechanic lets players secretly choose their actions. After they are revealed, the actions resolve following the ruleset of the game.

Storytelling

In storytelling games, players are provided with conceptual, written, or pictorial stimuli which must be incorporated into a story of the players' creation.

Tile Placement

Tile Placement games feature placing a piece to score VPs, with the amount often based on adjacent pieces or pieces in the same group/cluster.

Variable Player Powers

Variable Player Powers is a mechanic that grants different abilities and/or paths to victory to the players.

Voting

Voting allows players to influence the outcome of certain events within the game. The vote may be all or nothing, choosing a target for an effect.

Signalling

Signalling games allow for a set of observations and player-driven feedback (which may not be truthful) to arrive at the right conclusion out of 2-3 main choices.

Source:
https://boardgamegeek.com/item/create/boardgame

1. UNDERSTAND

GOAL
Understanding the purpose of the game and the required mindset through, for example, a warming-up task.

COMMON GOALS
Each player may, in turn, write a goal, dream or frustration. This allows players to see what others are doing. This creates a common mindset.

ACTION POINTS
Players are assigned a set of action points that show them the various options and choices in the game. From this they can choose during the game a certain amount of actions.

DRAFTING GOALS
Players get a role or special feature assigned by drawing a card. Players do not know which role or feature the other players have. On the card is also a condition to win the game.

ROLE PLAYING
Players are secretly assigned a role. Their behavior and/or stories must reveal what kind of role the player is. What are their dreams, wishes and frustrations?

PARTNERSHIPS
Players are assigned a partner at the start of the game. In secret, they choose a context and a common goal. The other team does this as well. The teams must figure out what the goals of the other players are.

VARIABLE PLAYER POWERS
The player is assigned a role with a unique feature. The feature gives the player a unique advantage in the game. The features are visible to the players.
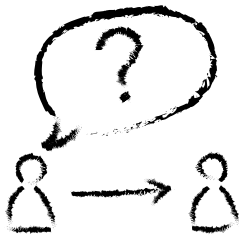
COLLECTING PROPERTIES
The players collect different subjects and categories and see how they are related. The connection must then be further elaborated, which must lead to a unique idea.

2. OBSERVE

GOAL

Learn to develop a sense of empathy through empathizing with other players.

QUESTION-ASKING

Each player is allowed to ask 2 open-questions to another player. Through the questions he learns more about the other player. The other players should also listen well.

STORYTELLING

In turn, players tell a story based on a role. The story must contain hints to what kid of role it could be. The hints may not be too clear, and not too difficult either.

PATTERN RECOGNITION

Based on behavior, players try to gain insight into the needs of a player. This can be done, for example, by looking at hints given in drawings or answers to questions; finding patterns.

SIMULATE EVENTS

By drawing a random card from a deck an eventwill happen. This event will have an effect on the behavior of the players, or asks for certain reactions.

CO-OPERATIVE

Players work together in a team during the game. By studying the behavior of the other players you can learn more about their dreams and wishes.

ROLE PLAYING

Players are secretly assigned a role. Their behavior and/or stories must reveal what kind of role the player is. What are their dreams, wishes and frustrations?

PARTNERSHIPS

In duos, the players try to guess the thoughts of the other players. A player may ask a question, ask for a hint or make a guess.

3. POINT OF VIEW

GOAL
Learn to define a point of view through gained insights; learn to be aware of people's needs.

HOW MIGHT WE....

SET COLLECTION
Players define insights and needs. Then, players discuss if there are patterns in the clusters. Eventually, the point of view is determined collectively.

PATTERN RECOGNITION
Players try to find patterns through gained insights that can lead to a design challenge or point of view.

VOTING
The players vote unanimously on a design challenge. Most votes count.

RANDOM DRAFTING
In turns, players draw a card from a deck with a random point of view. Based on this, they must respond to the behavior of other players.

PARTNERSHIPS
In duos, players define a point of view which, for example, is the opposite of the other players.
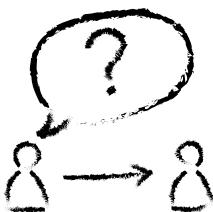
QUESTION-ASKING
Through questions, fellow players try to understand a player's point of view. The questions can also help to define a point of view.

CO-OPERATIVE DECISION
Together, the players define a point of view. It may be necessary to discuss the design space of the various options.

4. IDEATE

GOAL

Learn divergent (and convergent) thinking to generate novel ideas.

VARIABLE PLAYER POWERS
Each player receives at the start of the game a unique brainstorm-card with a special feature, such as Subsitute, Combine, Adapt, Modify, Put to another use, Eliminate, Reverse. These special abilities can be used during the game to alter ideas or elements.

MAKE TOOLS
With the make tools, models can be quickly and simply made to visualise the ideas. After everyone has made an idea, the ideas are presented.
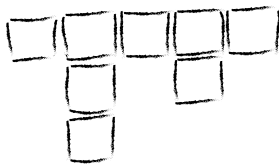
TILE PLACEMENT
Ideas are placed on the basis of relevance. This creates a visual representation of the chronological iterations. It also provides structure and guidance during iteration.

PATTERN RECOGNITION
Each player has a number of ideas. Then the ideas are put together and clustered. Unique ideas will immediately pop out.
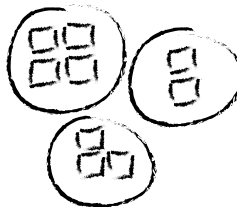
SIMULATE ROLES
The players each get a unique brainstorm card with a special feature, such as subsitute, combine, adapt, modify, put to another use, eliminate, reverse. These characteristics are used during brainstorming.

CO-OPERATIVE
Players work together in a team during the game. By elaborating together on each other's ideas, the forces of the team members can strengthen each other.

PATTERN BUILDING
By combining similar ideas, patterns can be discovered and made in different directions. As a result, the pattern can also become a self-contained idea.

A design game for families

5. PROTOTYPE

GOAL

Learn to convey an idea through a prototype (sketch, model, mock-up) and learn to fail early.

SIMULATION

The players simulate the usage of the design solution through transparent cards. With the transparent cards they can tell their story.

SIMULTANEOUS

At the same time, the player builds a prototype, which they try to do within time (for example, within 5 minutes). Afterwards, the prototypes are presented together and the players give feedback to each other.

CO-OPERATIVE

The players jointly build a prototype. A section will check whether they meet all requirements.

VISUAL DRAWING

By means of pens, players can visualize ideas quickly and easily. The ideas can easily be presented and provided with feedback.

NETWORK BUILDING

Through successive ideas and product adjustments, players can create a network that can ultimately lead to a protoytpe with the desired properties.

MAKE TOOLS

Randon (plastic) shapes, cardboard pieces and craft supplies can make it easier to visualise and present ideas. The players could guess what everyone made.

BUILDING MOCK-UPS

Making 3D models makes it possible to visualize different viewpoints of an idea. The players all see the model from a different view, and should guess what the function of the object is.

6. TEST

GOAL
Learn to give and get constructive feedback; what works and what doesn't work.

C-BOX SELECTION
C-BOX selection method makes it easier to evaluate a product on feasibility and innovation. This can also determine the most innovative idea.

COMMON GOALS
Based on pre-defined goals, the different designs of each player are evaluated. Because the goals are the same for everyone, everyone has the same opportunities.

DRAFTING GOALS
Randomly defined goals through card drafting could increase the tension at the end of the game. At the end of the game, the players will get to know on which points they will be judged.

VOTING
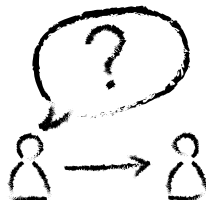At the end of the game the players will vote anonymously on the winning design.

RUBRIK
A section defines which parts in the design will score you points. The total points scored per player are compared.

DEDUCTION
The players try to find out who is the "spy" through hints and feedback during the game. Or... what the winning design should be.

QUESTION-ASKING
Asking questions about the design would reveal who thought best about the specific design solutions. The answers are compared and scored according to specific conditions.

Through iterative design cycles, the different design directions are tested with low-fidelity (paper) prototypes to learn about, key issues, patterns of play and to identify specific interaction/experience problems through the PMI-method (Plus, Minus, Interesting). Among others, an open and creative attitude, a safe game environment, an element of tensions and mild competition are important ingredients of the desired game to make it fun.
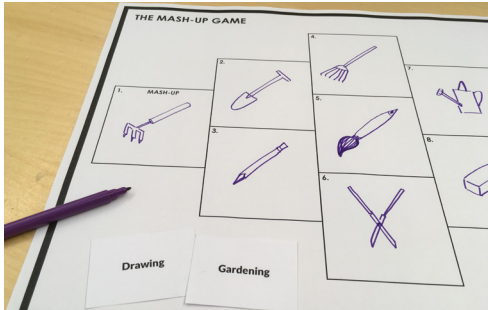
Iteration 1: The Mash-Up Game

+ The players like to make guesses, based on drawings.
- Only the mash-up is original, the hints are often clichés and obvious thoughts. There is only one player creatively active, the other players are only busy guessing the product categories. The game board does not add much value when the categories are quickly guessed.
  Some mash-ups are very easy to guess, others are very difficult.
i Players can easily associate with different categories.
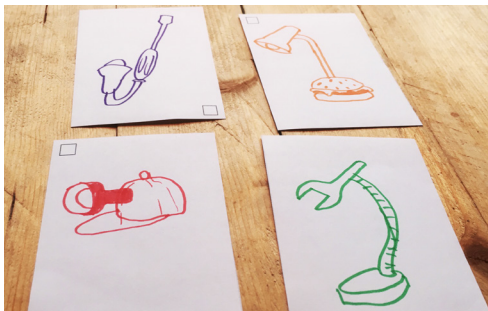
Iteration 2: Mash-Ups without a game board

+ All players are actively involved in this version, everyone makes a mash-up of a given category and a personal category. Removing the game board makes the rounds play quicker.
- Players often fall back on clichés if something has to be guessed by other players to win the game. This makes the designs less original and easier to guess.
  A common category also makes things too similar to each other, which makes guessing the second category too easy.
i Different colored pens add a fun element to the game, as it's easier to find out who made the drawing.

Iteration 3: Mashing-up product elements

+ By instructing the players to create a device that can do something, there is more freedom to determine the different elements to be used in the mash-up.
  Using generated objects from other players also makes use of coincidence and inspiration from others.
- By asking the players for a major function, the machines / objects often look like existing products from our daily lives.
  It is also easy to find out which assignment belongs to a creation.
i The dry-erase boards and pens make it easier to erase errors, making the drawing less definite.

Iteration 4: Mash-Up product functions

+ The list of desired features ensures that the different generated elements are different and a bit random. The list of different product features (random) makes the creations of the players also a bit more unique and original.
  Presenting the different designs is funny because people come up with crazy inventions.
- If all the generated items are used in a design, it may take some time for some players, and designs may feel over-designed.
i The game has a lot of freedom. Sometimes it is difficult to determine if a function is met, therefore it needs some judging.
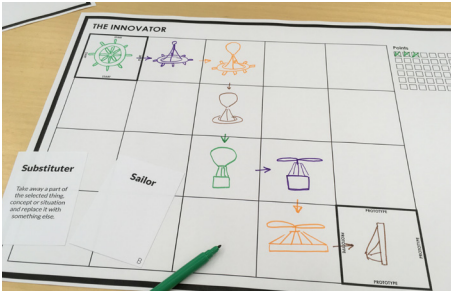
Iteration 1: The SCAMPER Game

+ It's nice to see everyone's adjustments on the previous idea.
- The board feels somewhat redundant because you often follow only one path. In addition, the game also feels too long because everyone has their own board and it is difficult to follow what happens on each board. It's quite easy to find the innovator, because those drawings are often the most crazy.
  Some of the SCAMPER-roles are very similar; should be simplified.
i Removing the game board could make the game quicker to play and easier to follow for all players.
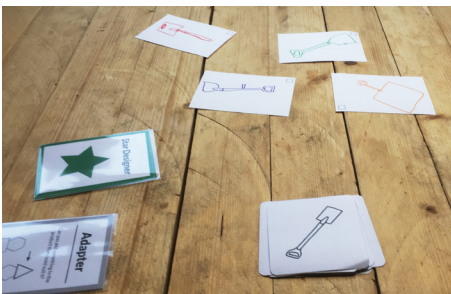
Iteration 2: SCAMPER-roles without board

+ The turns of each player are a lot faster without a game board. The simplified roles are less similar, and the instructions make the actions more clear.
- There is a lot of repetition. You often do the same trick if you have the same role, even if the object is different. And it is too easy to identify all the roles.
i Because you are assigned one role you have less freedom to design. Choosing a role every turn could increase the feeling of freedom. Identifying the roles should not be a goal of the game; the game should rather have the purpose of creating a particular object using the SCAMPER-actions.

Iteration 3: Choosing SCAMPER-actions

+ Choosing a SCAMPER action gives the player more freedom to adjust the object. Combining the SCAMPER-actions also makes the designs more personal, because the combinations of the different actions are always different for each player.
- Using the SCAMPER-actions on one object gives the player a lot of freedom, but it is difficult to determine the limits of the game. For example, when do you add or edit something?
i Some actions are never used, and other actions are very much loved. Scoring is difficult because the limits of the actions are difficult to capture on a single object. Combining objects, instead of customizing, would make the design steps more transparent.

Iteration 4: Using SCAMPER to combine objects

+ Combining a predefined number of objects makes it easier for the players to come up with new ideas.
  The pre-generated ideas are often clichés, but the combined items often create fresh and new ideas.
- The SCAMPER cards make the game too complicated, often the COMBINE-action is the most logical choice to develop a new idea.
i Choosing the most creative idea is often difficult because every idea often has something original. Distributing different scores on a scale could solve this.

Iteration 5: Combining items into new ideas

+ Allowing players to only combine items makes the game faster and easier to play. This is also useful for people who find it difficult to generate new ideas, out of the blue. Combining items to new ideas is also seen as "fun".
- Players do not like to see who gave them a specific score, such as a 1 or 2. This should be done anonymously by means of neutral score cards.
i The pre-generated items could be useful for different rounds, allowing multiple rounds to be played faster.

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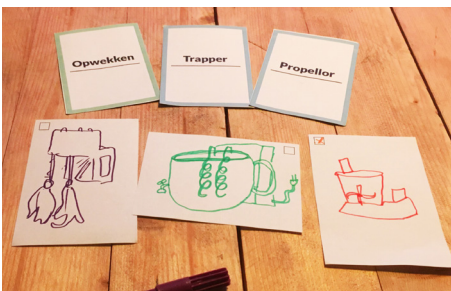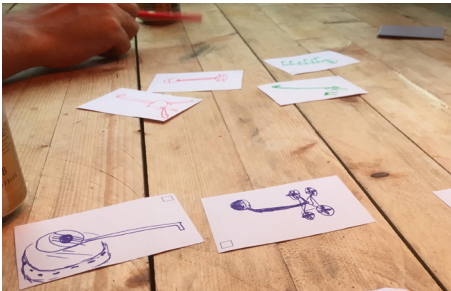
Iteration 1: The Frustrated King

+ It's fun to come up with crazy ideas for the king based on the frustrations. It is also fun to see/hear the ideas of the other players.

- Some of the in the game (divergent/convergent thinking) makes the game a bit too long. Identifying the king's problem and his needs through questions are also unnecessary steps, as players often hook up on frustrations. For the player who plays the king, it's hard to hide his problems and wishes. Because actually the goals are already on the challenge card. Finally, for the king it's hard to choose a winner, because this is actually very subjective.

i Generating multiple ideas works easier for some people than for others. The final ideas are often different from the clustered ideas.

Iteration 2: Finding out the frustrations

+ Generating fewer ideas makes the game play faster, and more fun for the players who have trouble coming up with many ideas.

- Guessing the king's frustrations (only the King knows them) makes the game hard without hints. It's also an unnecessary game element, as it frustrates the players.
The king has little to do in the game except answering questions and selecting the right idea.
Drawing the right solution often generates clichés, not really new and creative ideas.

i Drawing the solutions to the frustrations makes the choice of the winner of the game less subjective.

Iteration 3: The king has to guess the elements

+ Guessing objects in drawings gives the game a fun factor, people like to make guesses.

- Guessing a single object or category creates clichés, and makes the game too easy.
When people know that something needs to be guessed, they go for the most obvious thought.
The king has nothing to do while the other players are drawing, because he is the one who is going to make the guesses.

i When everyone has the same goal, the designs are very similar.
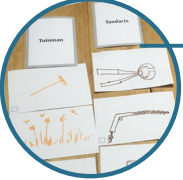

Iteration 4: Solving problems for a fictive role

+ The various assignments that the players get, such as a feasible idea, unrealistic and futuristic, make sure that the generated ideas are diverse. Guessing the type of idea adds a fun-factor to the game and all players are now actively involved in the game.

- The kind of ideas are still difficult to compare, because some are about practical issues, such as "feasibility", and others are about an intention, like a "crazy idea". A futuristic type of idea often causes clichés, such as drones, and makes it also easier to guess.

i Guessing the type of idea creates tension and a feeling of safety, because it is no longer about if someone is skilled in drawing.

Iteration 5: Solving problems with an intention

+ The intention cards are well on one line, although some cards may sound similar to some players and not all the possible options are examined, such as "fun" or "exciting".

- Some frustrations fit better with one client than the other.
Some people need more time than other players.

i By guessing the intention, players can score points. This gives an interesting dynamic to a round. The players aren't only empathizing with a fictional client; the players must also empathize with fellow players to find out about their intention—to guess correctly.

A design game for families   **91**

Concept 1 — Inspiration phase — Ideation phase

Creative thinking

Creative associations
The players associate objects based on a list of required features. Generated objects can be used by all players. The functionalities are first collected in the upper part of the game board.

Combining items
The items generated by the players in the upper part of their game board are combined into new creations. Players can magnify, reverse, and combine elements to give them a new function.

Communication

Empathy

Concept 2 — Inspiration phase — Ideation phase

Creative thinking

Combining the attributes into new ideas
The generated characteristic attributes are combined by the players into new ideas to solve problems. Such a problem could be 'fines'. By combining attributes on the table you make a solution.

Communication

Empathy

Empathize with a role
Each player is assigned a role. On the basis of this role, players associate characteristic attributes. Each player generates approximately 3 attributes. A dentist could think of, for example, 'pliers'.

Concept 3 — Inspiration phase — Ideation phase

Creative thinking

Generating ideas based on intentions
The players come up with an idea, by drawing it on a piece of paper, based on an intention card. They get this card at the start of the game. An intention could be 'genius' or 'crazy'.

Communication

Empathy

Empathize with a character
The players empathize with an in-game character with random frustrations. The characters and frustrations are recognizable, and provide inspiration for many different solutions.

A design game for families

Implementation phase	Scoring	Rating
		++
Presenting creations In turn, each player presents their creation to the other players. During the presentation, the functions of the various elements in the design are explained. Players may ask for clarifications if objects aren not explained clearly.	**Scoring** Each player gets an amount of points equal to the number of corresponding functions on the assignment card. There is little communication when counting the scores, but sometimes a judge is required for clarification.	+
		−

Implementation phase	Scoring	Rating
		+
Ideas are presented Players present their idea to the group and explain how their idea solves the common problem. All players do this sequentially. The ideas are placed in a row next to each other so that they can be compared well.	**Distribute scores** Each player may assign a score to an idea, depending on the number of players. For example, in a 5-player game, you may give an idea max 4 points and at least 1 point (1,2,3, and a 4-points card). The player with the most points wins.	+
		+
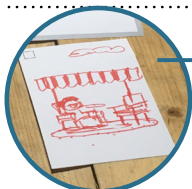
Implementation phase	Scoring	Rating
		+
Pitching ideas In turn, players present their solutions for the in-game character to the team. For this, each player gets approximately 30 seconds. They do this both visually with a sketch and oral by explaining their idea to the group.		+
	Guessing the intention At the end of the pitch, the team tries to guess the intention of the player. Is it for example a crazy idea or a simple idea? The players get 1 point if they guess correctly. The player who held the pitch will also get 1 point per correct guess.	++

Introduction

3 minuten

De onderzoeker:

"Hallo ik ben Wouter en ik ben een spelletje aan het maken. Ik zou vandaag graag met jullie mijn nieuwe spel willen spelen, want ik ben heel benieuwd naar wat jullie van het spel vinden. Ik ga zo eerst het spel uitleggen, daarna gaan we het spelletje 30 minuten lang spelen. En aan het einde van het spel heb ik nog een aantal vragen voor jullie."

"Ik zou graag de testsessie willen opnemen met dit cameraatje om het spelletje later goed te kunnen analyseren. Het is puur voor mijn eigen onderzoek en de opnames worden dus niet op het internet verspreid. Vinden jullie dat goed?"

"Hebben jullie nog vragen?"

Algemene vragen / Ice-breaker vragen:

1 minuten

"Spelen jullie vaker spelletjes?"

"Wanneer hebben jullie voor het laatst een spelletje gespeeld? Welk spel?"

Spel uitleggen en spelen

2 minuten uitleggen, 30 minuten lang spelen (3 ronden)

"Ik ga nu eerst even het spel uitleggen want dan kunnen we het gaan spelen"

Interview

45 minuten

"Dankjewel voor het spelen van het spel. Nu zou ik jullie graag een aantal vragen willen stellen.

User Experience:

Hoe vonden jullie het gaan?

Wat vonden jullie van de verschillende karakters? Welke het leukste / minste leuk? Waarom?

Hadden jullie het gevoel dat je je moest inleven in het karakter?

Hoe vonden jullie het om ideeën te bedenken voor de karakters? Was dit moeilijk of makkelijk? Waarom?

Voor welke karakters zouden jullie graag nog meer ideeën willen bedenken?

Vonden jullie dat je genoeg tijd had om een idee te bedenken?

Hoe vonden jullie het om te tekenen in het spel? Was dit moeilijk/makkelijk? Waarom?

Hoe vonden jullie het om je idee aan elkaar te presenteren? Was dit moeilijk/ makkelijk? En waarom?

Wat vonden jullie van de speelduur? Hadden jullie nog langer willen spelen? Of korter? Waarom?

Usability:

Wat vonden jullie van de verschillende probleemkaarten? Welke moeilijker/makkelijker? Waarom?

Wat voor problemen zouden jullie graag nog meer willen oplossen?

Begrepen jullie de kaartjes met de verschillende rollen/intenties? Welke vonden jullie moeilijker/makkelijker? Welke het leukst?

Welke kaartjes vinden jullie op elkaar lijken? En welke helemaal niet?

Wat vonden jullie van het formaat van de tekenvellen?

Wat vonden jullie het leukste aan het spel?

Naam:
Geslacht:
Leeftijd:

EVALUATIEFORMULIER

Hieronder volgen een aantal stellingen. Geef met een kruisje aan in hoeverre u het eens bent met de onderstaande zes stellingen. Er wordt veel waarde gehecht aan uw persoonlijke mening, er zijn daarom geen "juiste" of "verkeerde" antwoorden. Het invullen van onderstaande formulier duurt ongeveer 2 minuten.

1. **Feedback:** De spelonderdelen geven mij voldoende feedback hoe goed ik het doe tijdens het spel.

heel weinig feedback   1   2   3   4   5   6   7   heel veel feedback

2. **Moeilijkheidsgraad:** Het spel daagt mij voldoende uit om mijn best te blijven doen om het doel van het spel te bereiken.

heel weinig uitdaging   1   2   3   4   5   6   7   heel veel uitdaging

3. **Controle:** Tijdens het spel heb ik het gevoel dat ik genoeg controle heb over de keuzes die ik maak om het spel te beïnvloeden.

heel weinig controle   1   2   3   4   5   6   7   heel veel controle

4. **Keuzes:** Tijdens het spel kan kan ik uit genoeg opties kiezen om het spelverloop te beïnvloeden.

heel weinig keuzes   1   2   3   4   5   6   7   heel veel keuzes

5. **Veiligheid:** Tijdens het spel durf ik te experimenteren en risico's te nemen om speltaktieken uit te proberen.

heel weinig veiligheid   1   2   3   4   5   6   7   heel veel veiligheid

Star Designer — Please Quote: 1,000 2,000 3,000 4,000 5,000

DESCRIPTION	QTY	DIMENSIONS	CONSTRUCTION	COLORS	FINISH	EMBOSS	NOTES
Full Telescoping Retail Box	1	Top: 232mm x 162mm x 51mm, Bottom: 226mm x 156mm x 51mm	157gsm Art Paper over 1.3mm Greyboard 1.5mm Total Thickness	4C/0C	Single-Sided Matte PP Lamination	—	—
Poker Playing Cards • Guessing Cards	30	63mm x 88mm	320gsm Blackcore	4C/4C	Double Sided with Aqueous Coating	Linen	Round Corners, Full Bleed, Shrinkwrap
Poker Playing Cards • Assignment Cards	15	63mm x 88mm	320gsm Blackcore	4C/4C	Double Sided with Aqueous Coating	Linen	Round Corners, Full Bleed, Shrinkwrap
Double Poker Playing Cards • Character Cards	8	88mm x 128mm	320gsm Blackcore	4C/4C	Double Sided with Aqueous Coating	Linen	Round Corners, Full Bleed, Shrinkwrap
Double Poker Playing Cards • Environment Cards	8	88mm x 128mm	320gsm Blackcore	4C/4C	Double Sided with Aqueous Coating	Linen	Round Corners, Full Bleed, Shrinkwrap
Dry-Erase Drawing Board • Goal/Problem Board	1	176mm x 63mm	320gsm Blackcore	4C/4C	Single-Sided with Dry-Erase Coating (UV)	—	Round Corners, Full Bleed
Dry-Erase Drawing Boards • Drawing Boards	6	176mm x 128mm	320gsm Blackcore	4C/4C	Single-Sided with Dry-Erase Coating (UV)	—	Round Corners, Full Bleed
Custom Wood Shape • Artifacts	30	35mm x 35mm x 9mm	Wood	Pantone 14-0848 (Mimosa)	—	—	—
Custom Wood Shape • Stars	30	20mm x 22mm x 9mm	Wood	Pantone 11-0601 (White)	—	—	—
Dry-Erase Pens	6	113mm x 13mm	Plastic	Black	—	—	—
Hourglass (1 minute)	1	—	—	Black	—	—	—
Zip Bag	3	150mm x 200mm	Plastic	—	—	—	—
Rulebook	8 Pages	297mm x 210mm Flat (A4), 148mm x 210mm Folded (A5)	128gsm Gloss Paper	4C/4C	—	—	Fold, Saddle Staple

YORI BOARD GAMES

Tel.: 86-21-3450-5676 ext 803|
Mail: info@bdboardgame.com
Add: RM1613, Build 2, Lone 58, East Xinjian Road,
Shanghai 201100, China

Client Info

Quotation Sheet

Netherlands

Quotation #	Q20171106205
Attened to:	
Project Code	

Create Date:	2017/11/6
Delivery Terms:	EXW

Item	Pcs/Set	Description	QTY/Price 1,000 sets	QTY/Price 2,000 sets	QTY/Price 3,000 sets	QTY/Price 4,000 sets	QTY/Price 5,000 sets
Setup Box	1	Size:Top:232*162*51mm, Bottom:226*156*45mm Material: 157gC2S+1.5mm Grey Board Printing: 4/0C+Matt lamination	US$0.90	US$0.78	US$0.72	US$0.69	US$0.66
Cards 1	30	30pcs of Size:63 x 88mm Material: 300g Blackcore Printing: 4/4C+Card varnish+Linen Shrink wrap	US$0.61	US$0.48	US$0.43	US$0.39	US$0.36
Cards 2	15	15pcs of Size:63 x 88mm Material: 300g Blackcore Printing: 4/4C+Card varnish+Linen Shrink wrap					
Cards 3	8	8pcs of Size:88 x128mm Material: 300g Blackcore Printing: 4/4C+Card varnish+Linen Shrink wrap	US$0.42	US$0.29	US$0.24	US$0.21	US$0.19
Cards 4	8	8pcs of Size:88 x128mm Material: 300g Blackcore Printing: 4/4C+Card varnish+Linen Shrink wrap	US$0.42	US$0.29	US$0.24	US$0.21	US$0.19
Dry-Erase Drawing Board	1	1pcs of Size:176 x 63mm Material: 300g Blackcore Printing: 4/4C+UV varnish+Glossy lamination	US$0.50	US$0.34	US$0.30	US$0.27	US$0.25
Dry-Erase Drawing Boards	6	6pcs of Size:176 x128mm Material: 300g Blackcore Printing: 4/4C+UV varnish+Glossy lamination					
Zip Bag	3	150 x 200mm, Plastic	US$0.06	US$0.06	US$0.06	US$0.06	US$0.06
Rulebook	1	8PP, 148*210mm Material: 128gC2S Printing: 4/4C Saddle Staple	US$0.27	US$0.16	US$0.12	US$0.10	US$0.10
Custom Wood Shape • Artifacts	30	35*35*9mm, Wood, Pantone 14-0848 Put in zip bag	US$1.30	US$1.28	US$1.26	US$1.24	US$1.22
Custom Wood Shape • Stars	30	20*22*9mm, Wood, Pantone 11-0601 Put in zip bag	US$0.76	US$0.74	US$0.72	US$0.70	US$0.69
Dry-Erase Pens	6	Plastic, black	US$0.09	US$0.09	US$0.09	US$0.08	US$0.08

A design game for families

Hourglass	**1**	Standard hourglass, 1 minute	US$0.19	US$0.19	US$0.19	US$0.19	US$0.19
Assembling, Packing	**1**	assembling, each set individual shrinkwrap 6pcs per carton, carton on pallet	US$0.36	US$0.36	US$0.36	US$0.36	US$0.36

Notes:

1. Digital Printed Sample Charge: $300 including courier cost to door.

Set Unit Price:	1,000	US$5.88	**Set Amount Price**	1,000	US$5,880.00
	2,000	US$5.06		2,000	US$10,120.00
	3,000	US$4.73		3,000	US$14,190.00
	4,000	US$4.50		4,000	US$18,000.00
	5,000	US$4.35		5,000	US$21,750.00

Terms and Conditions

Valid for Quote:	Quote Valid for 30 days from the create date due to the fluctuation in raw material, currency or delivery costs.
Payment Terms:	50% Prepayment, down payment to be paid before delivery.
Production Time	30~40 days (estimated) upon receiving approval of digital proof or sample(s)
Additional Destination:	If FOB Terms, it is based on 1 destination(one deliver). US$150 will be charged for each additional dstination.
Pallet Packing:	If no pallet mentioned on quote, it is based on floor-loading. It costs extra $35 for each additional pallet.
Testing:	Price does not included the testing. If game sell to under 13 years in EU or 14 years in US, test must be applied.

A design game for families

101

J.1 Introduction

On Saturday, September 23, the researcher of this graduation project travelled to the Ducosim fair in Amersfoort to present a prototype of his design game to 999 Games—one of the largest board game publishers in the Netherlands, with more than 50 new releases each year. The purpose of this presentation is to get feedback on the market potential of this design game for families. What are the chances on the consumer market for a creative design game? What are the strengths and weaknesses of this game? And what about the components and its recommended retail price? Answers to these questions must be found in order to develop games for the consumer market.

J.2 Feedback

999 Games was surprised by the game idea of the presented prototype (Figure B). The product developer of 999 Games considered the game as original and creative; and she wanted to test the game with their panel. "Today we have 26 people who want to present their game idea and you are the first we invite to send a prototype to test with our groups". But unfortunately she could not guarantee that the game is actually going to be published by 999 Games. She was not sure whether the creative aspect in this

Figure A - The board game publisher 999 Games at the Ducosim fair in Amersfoort.

Figure B - Playing the prototype with 999 Games at the Ducosim fair in Amersfoort.

design game would be appreciated by their play test groups: "The average Dutch population is unfortunately not so creative. It works better if everything is pre-created for the players in our games (...) It is quite difficult for players to be creative on a command and to think of something funny in 30 seconds." For example, the creative story game 'Spyfall' - a worldwide success with over 100.000 copies sold - did not come through their playtests groups because the players did not appreciate the creative aspect in this game. "The success of a similar game with a creativity aspect depends very much on the right group, and unfortunately, our test groups were not that creative enough at that time." As a result, they decided to not publish this game on the market. Eventually, a Belgium publisher picked up this game to release it on the Dutch market. This indicates that there is certainly a market for creative games, but it is a matter of finding the right publisher. Who knows, maybe this creative design game is something for 999 Games; they would like to test it in November 2017, after Essen Spiel.

Strengths and Weaknesses
The combination of the different characters and environments was found to be the strongest aspect of the prototype: "Adding many different

A design game for families

characters and environments to the game increases replay-ability and it gives the player a lot of input to come up with many creative ideas." It was nice to see that, for her idea, the product developer of 999 Games also used the context (a forest) to solve the problem for the grandmother with broken shoes (Figure C). Her idea was to use twigs from the forest to repair the shoes. She found this a genius idea, but once she had drawn it and presented it, she actually thought it was a bit foolish. "It is important that the words are not too close together so that there is no discussion about the meaning of the words in the group. But on the other hand, this can also be the fun element in your game". According to the lady, this design game fits best in the party games category. "In party games it's most important that people have fun. The voting element in your game fits this category well." She also gave the following advice: "Perhaps the game should not force the players to draw something. Some players are better off with words and this could be their strongest point. Perhaps it's better for the players to let them choose which means they use for their pitch, because in the end it's all about a good pitch." She also suggested that example problem-cards with pre-printed problems could be useful to young or inexperienced players—to let them get used to the game. "If I
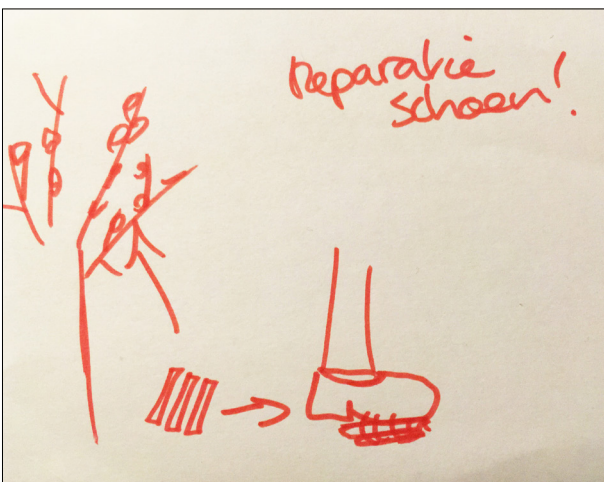
understand correctly you're providing blank problem-cards to increase replay-ability. It could be nice for beginners to see some examples of what kind of problems they could think of."

Components and Retail Price
According to the product developer, a game of this type should not be priced higher than 25 euros. Party games of this type are sold for around 20 to 25 euros. "Our popular party game '30 Seconds' is actually too expensive (30 euros), but this is because the author requests higher royalties because the game is so successful now." The product developer recommended the researcher of this graduation project to make the game as he has in mind: "In the end we can always minimize it. For example, if you need high quality pencils in your game, we can save costs by replacing a game board with chips to count scores. But eventually people still want to move a pawn on an old-fashioned game board—as they are used to."

J.3 Conclusion

The success of a creative game depends on the right group according to 999 Games. In a creative design game, it is important to give the players a feeling of safety. Thus, players should be able to choose which means they use to pitch their ideas to a group. To give the players a lot of input for their ideas, it's important that the characters and environments contain many elements to hook up on. A few example problem-cards can help the players well on their way to learn to think of ideas and to understand the purpose of the game. In party games it is most important that the players have a fun time with each other. For those who love scores, an "old-fashioned" game board can be useful. Finally, a party game of this type should not cost more than 25 euros in the store.

Figure C - Idea of the product developer of 999 Games to fix a broken shoe.

STAR DESIGNER

3-6 spelers, 30 minuten, vanaf 8 jaar

KORT SPELOVERZICHT

Star Designer is een creatief ontwerpspel, waarin de spelers veranderen in vindingrijke ontwerpers. Tijdens het spel komen verschillende karakters langs met allerlei problemen. Alle spelers zullen hiervoor handige - maar soms ook knotsgekke - oplossingen presenteren. Eerst bepalen de spelers samen het probleem van een karakter. Daarna verzint iedereen een oplossing. Maar let op! Elke speler krijgt een geheime opdracht die sturing geeft aan een mogelijke oplossing... En in dit spel wint niet de ontwerper met het beste idee, maar de speler die de meeste geheime opdrachten van andere spelers weet te raden! Welke speler verzamelt de meeste prijzen en wordt de nieuwe sterontwerper?

SPEELMATERIAAL

- 30 raadkaarten (5x6 kleuren)
- 15 opdrachtkaarten (3x5 donkerblauwe opdrachten)
- 8 karakterkaarten
- 8 locatiekaarten
- 1 uitwisbaar doel-/probleembord
- 6 whiteboard stiften
- 6 uitwisbare tekenborden (6 kleuren)
- 30 houten sterren
- 30 houten prijzen (6x schaar, 6x plakband, 6x lijmpot, 6x steeksleutel, 6x pen)
- 1 zandloper
- De spelregels

VOORBEREIDING

① Schud de karakterkaarten en leg deze als gedekte stapel op tafel. Trek een karakterkaart en leg deze open op de stapel met karakterkaarten.

② Schud de locatiekaarten en leg deze als gedekte stapel naast de karakterkaarten. Trek een locatiekaart en leg deze open op de stapel met locatiekaarten.

③ Leg het doel-/probleembord bij de karakter- en locatiekaarten.

④ Leg alle sterren en prijzen in het midden van de tafel, binnen handbereik van alle spelers.

⑤ Geef elke speler een stift, 5 raadkaarten, en een uitwisbaar tekenbord in een kleur naar keuze.

SPELVERLOOP

Elke ronde bestaat uit drie fasen:

1.   Doel/probleem bepalen
2.   Ideeën verzinnen
3.   Presenteren, raden, sterren of een prijs winnen

1. Doel/probleem bepalen

De startspeler (∗) vraagt de groep om suggesties voor een doel/probleem voor het karakter. De locatie kan als inspiratie gebruikt worden. De spelers kunnen de lijst op de laatste pagina gebruiken als basis voor mogelijke doelen/problemen. De startspeler kiest uit de suggesties een doel/probleem en schrijft dit op het doel-/probleembord.

∗ In de eerste ronde is de oudste speler de startspeler.

> *Voorbeeld: De spelers hebben besloten dat de koppige oma een boswandeling wil maken, terwijl ze kapotte schoenen heeft. Paula is de startspeler en schrijft het probleem op: "Oma heeft kapotte schoenen."*

2. Ideeën verzinnen

Schud **alle** opdrachtkaarten en geef elke speler gedekt een opdrachtkaart. Elke speler bekijkt zijn of haar opdrachtkaart, zonder deze aan de andere spelers te laten zien (∗). Op basis van de opdrachtkaart bedenken de spelers een idee om het probleem van het karakter op te lossen, of diens doel te bereiken. De tekenborden kunnen gebruikt worden om ideeën te visualiseren in woord en beeld. De spelers krijgen ± 2 minuten de tijd om hun ideeën te bedenken en te visualiseren. Tip: meestal zegt een simpele schets meer dan heel veel woorden!

∗ Kinderen mogen een opdrachtkaart één keer per ronde omwisselen, als ze deze te lastig vinden. De nieuwe kaart wordt blind getrokken uit de stapel met opdrachtkaarten.

> *Voorbeeld: Paula besluit haar idee te schetsen. Het maakt haar niet uit dat ze niet zo goed kan tekenen, want het gaat in dit spel niet om het mooiste of beste idee. Het gaat erom dat ze haar idee goed kan overbrengen aan de groep.*

3. Presenteren, raden, sterren of een prijs winnen

Presenteren
De startspeler presenteert zijn of haar idee als eerste aan de groep. In je presentatie vertel je kort maar krachtig in ± 20 seconden:

- Wat is het idee?
- Hoe werkt het?
- Hoe lost het idee het probleem op?
  of
- Hoe bereikt het karakter met jouw idee zijn of haar doel?

Voorbeeld: Paula is aan de beurt om haar idee te presenteren aan de groep: "Mijn idee is de takjes-schoen. Het werkt zo: takjes uit het bos worden aan de onderkant van de kapotte schoen geplakt om het gat te dichten. Zo kan de koppige oma toch nog haar boswandeling maken."

SPELREGELS VOOR HET PRESENTEREN VAN EEN IDEE
Tijdens het presenteren gelden de volgende regels:

Het is niet toegestaan om tijdens het presenteren woorden te gebruiken zoals briljant, geniaal, simpel, eenvoudig, gek, maf, bijzonder, apart, onnozel, dom, of soortgelijke woorden die sterk lijken op de opdrachten. Het is ook niet toegestaan om deze woorden op de tekenborden te schrijven, of tekeningen te maken die direct naar deze woorden verwijzen (zoals een ezel).

Het is niet toegestaan om ideeën te presenteren of tekeningen te maken die verwijzen naar eerdere ideeën en/of opdrachten, met als doel om spelers hints te geven over je opdracht.

Het is niet toegestaan om ideeën te presenteren die niets te maken hebben met het karakter en diens doel/probleem.

Raden
Vervolgens proberen de andere spelers in het geheim te raden wat de opdracht achter het idee zou kunnen zijn. Is het een bijzonder idee? Of misschien wel onnozel? Elke radende speler kiest 1 raadkaart uit zijn of haar hand en legt deze gesloten naast het idee op tafel. Nadat deze kaarten zijn neergelegd worden ze omgedraaid. De ontwerper van het idee toont hierna zijn of haar opdrachtkaart aan de groep.

Sterren of een prijs winnen

- Elke speler die de opdracht goed heeft geraden krijgt 1 ster.
- De ontwerper van het idee krijgt voor **elke** juiste kaart 1 ster.
- Als **alle** radende spelers het goed hebben geraden krijgt de ontwerper van het idee een prijs, in plaats van sterren. De ontwerper mag zelf een prijs uitkiezen.
- Zodra een speler evenveel sterren heeft als dat er spelers in het spel zijn, dan mag dit aantal aan sterren omgewisseld worden voor een prijs naar keuze.

Voorbeeld: In een 4-speler spel hebben 3 spelers de opdracht van Paula goed geraden. Elke speler mag 1 ster pakken. Paula mag een prijs uitkiezen, want alle radende spelers hebben het goed geraden. Willem heeft nu precies 4 sterren voor zich liggen. Hij mag deze 4 sterren omwisselen voor een prijs naar keuze, omdat hij evenveel sterren heeft als dat er spelers in het spel zijn.

Vervolgens nemen de spelers de raadkaarten weer op hand en wordt er met de klok mee verder gespeeld. De volgende speler mag nu zijn of haar idee presenteren aan de groep.

Nadat alle ideeën zijn gepresenteerd en geraden (∗) start een nieuwe ronde bij fase 1: Doel/probleem bepalen, met een nieuwe karakter- en locatiekaart. De speler links van de vorige startspeler wordt de nieuwe startspeler.

∗ Deel de leukste ideeën op social media met #stardesigner.

EINDE VAN HET SPEL

Het einde van het spel nadert in een kort spel (± 30 min) zodra een speler 3 prijzen heeft verzameld, of bij 5 prijzen in een lang spel (± 45 min). Speel de ronde af zodat alle spelers evenveel beurten hebben gehad. De speler met de meeste prijzen wint het spel! Als meerdere spelers evenveel prijzen hebben, dan wint degene met de meeste sterren. Bij een gelijkspel zijn er meerdere sterontwerpers!

STRAFREGEL

Mocht een speler één of meerdere spelregels overtreden tijdens het presenteren van diens idee, dan is zijn of haar beurt direct afgelopen en wordt er niet geraden. De speler mag na zijn of haar beurt wel gewoon weer meedoen met het raden van opdrachten.

ZANDLOPER

Sommige spelers hebben behoefte aan een zandloper. Als spelers te lang doen over het bedenken en/of tekenen van ideeën, mogen de andere spelers de zandloper inzetten. Ook als spelers het lastig vinden om ideeën te bedenken kan de zandloper soms wonderen doen... Sommige spelers presteren onder druk het best!

TEAM VARIANT

Deze variant is geschikt voor 3 tot 6 spelers. De teamvariant is met name geschikt voor jonge kinderen (8+) die graag samen willen spelen met een vader/moeder of broer/zus. De spelregels van het basisspel zijn van kracht. Pas de volgende wijzigingen toe:

- Verdeel de spelers in teams van 2 spelers. In een spel met 3 of 5 spelers speelt één iemand alleen, het liefst de meest ervaren speler.
- Tijdens het bedenken van ideeën mogen de spelers binnen een team op fluistertoon met elkaar overleggen, om elkaar een beetje op weg te helpen.
- Spelers in een team mogen elkaar ook helpen met tekenen, schrijven en het presenteren van ideeën.
- **Belangrijk:** het is niet de bedoeling dat de spelers in een team de geheime opdracht van elkaar te weten komen.

COOPERATIEVE VARIANT

Deze variant is geschikt voor 3 tot 6 spelers. In de coöperatieve variant zullen de spelers als groep gezamenlijk winnen of verliezen. De spelregels van het basisspel zijn van kracht. Pas de volgende wijzigingen toe:

- Leg 5 verschillende prijzen en 5 sterren in een rijtje op tafel. Doe de resterende prijzen en sterren terug in de doos. Deze zijn in de coöperatieve variant niet nodig.
- Als **alle** radende spelers de opdracht van een ontwerper goed hebben geraden, dan mag de jongste speler namens de hele groep een prijs uitkiezen.
- Er worden **maximaal** 5 ronden gespeeld. Gebruik de 5 sterren om af te tellen. Als het de spelers lukt om binnen 5 ronden alle 5 de prijzen te winnen, dan heeft de groep gewonnen. Lukt dit niet, dan heeft de groep verloren.
- **Voor gevorderden:** de groep verliest een prijs als er in een ronde helemaal geen prijzen gewonnen worden. De prijs kan in een volgende ronde weer terug gewonnen worden.

5 sterren

5 prijzen

karakterkaart

Koppige Oma
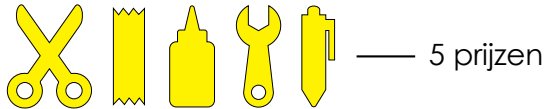
locatiekaart

Doel / Probleem

Oma heeft kapotte schoenen.

doel-/probleembord

INSPIRATIELIJST DOELEN/PROBLEMEN

|	
Meer groente eten...	Altijd te laat...
Snel rijk worden...	Bang voor honden...
Een nieuwe hobby...	Last van verveling...
Efficiënter werken...	Kan geen Engels...
Een verstopplek...	Vergeetachtigheid...
Nieuwe vrienden maken...	Snoepverslaving...
Een nieuwe bijbaan...	Hekel aan afval...
Een betere wereld...	Nare geurtjes...
Tijd nuttig besteden...	Heeft het altijd koud...
Een nieuwe sport...	Nat fietszadel...
Een nieuw avontuur...	Altijd honger...
Manier om hulp te vragen...	Moeite met opstaan...
Een nieuwe outfit...	Last van hoogtevrees...
Creatief bezig zijn...	Verzamelzucht...
Duurzaam leven...	Geen gevoel voor humor...
Een nieuw spel...	Last van luiheid...
Nieuwe trend creëren...	Geluidsoverlast...
Een nieuw hulpmiddel...	Klimaatverandering...
Stoppen met nagelbijten...	Traag internet...
Meer bewegen...	Last van smetvrees...
Complimentjes geven...	Moeite met keuzes maken...

CREDITS

Spelontwerp: Wouter van Strien
Illustraties: Cheerted Keo

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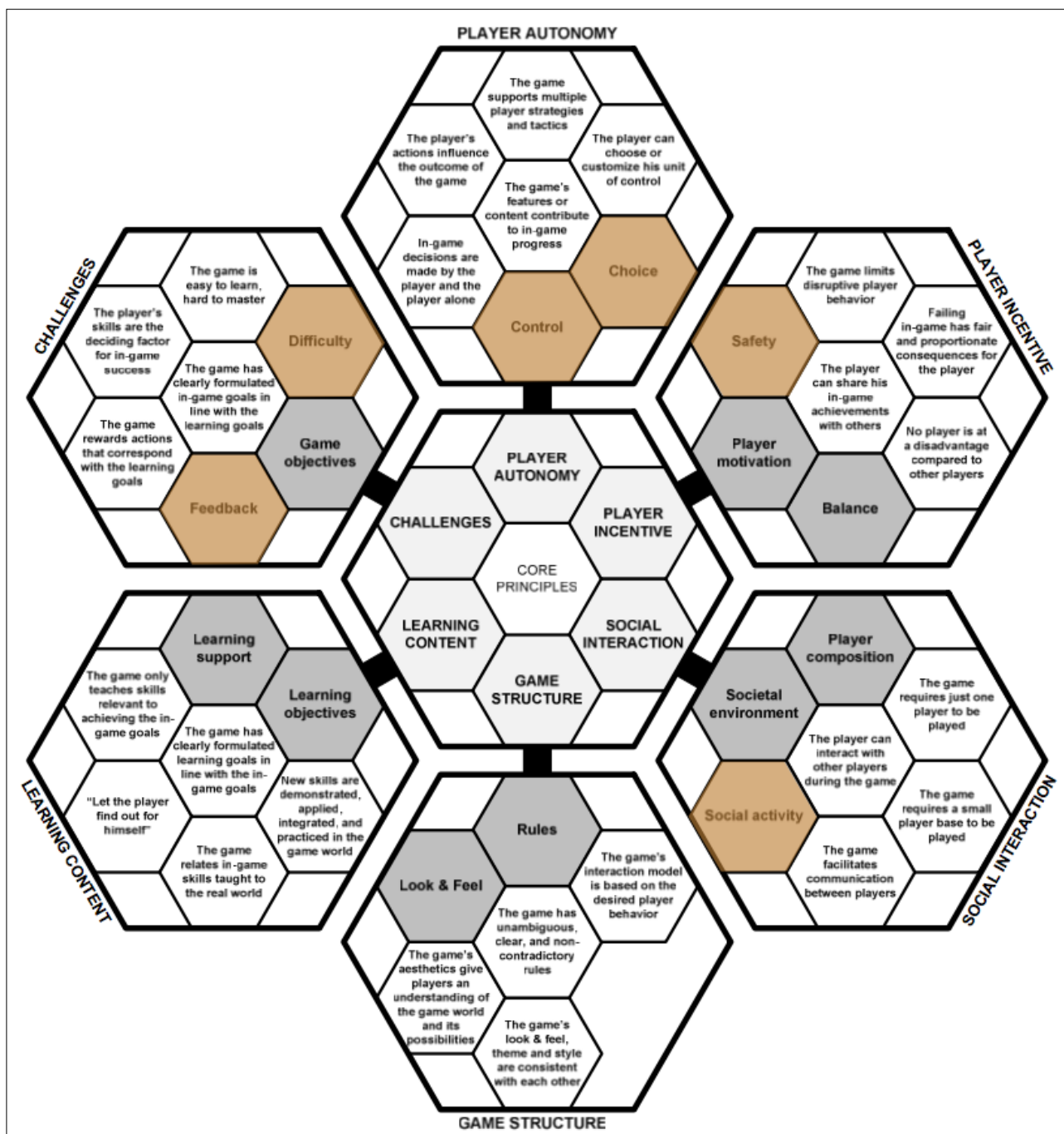
Framework for educational game design (Adapted from: Van Staalduinen, 2012)