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LEARNING THROUGH LEVEL DESIGN

Using a learning taxonomy to map level design to pedagogy

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Abstract

Entertainment games are known for their motivational and engaging benefits when it comes to teaching the player how to play games. Still, there is little research about the connection between pedagogy and entertainment games. This knowledge could be used to develop educational games that utilize those sought after benefits of engagement and motivation**.** The purpose of this research is therefore to conduct a case study that identifies the underlying pedagogical elements in the level design components game progression and pacing in the entertainment game Space Team: Pocket Planets. The results show that by breaking down gameplay into level design components, used to teach the player how to play the game, and mapping them to a learning taxonomy, the pedagogical elements that corresponds to those components can be identified. This information can be used as a method when it comes to evaluating the pedagogy present in other games and to bridge the knowledge gap between game designers of educational and entertainment games.

Keywords: Level Design, Taxonomy, Game-Based Learning

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1 Introduction

In this thesis I am conducting a single case study where I explore learning aspects of entertainment game components by investigating what role game progression and pacing in level design play when it comes to teaching the player to play the game Space Team: Pocket planets.

In the background I present what, how and why those components are used in level design, as described by Adams (2009) and Lopez (2006). Both authors have extensive experience working in the game industry and knowledge about game design, which includes level design. I also present previous publications on game-based learning concerning both educational games and entertainment games, which reveals that there is an increased use and interest in using games developed for entertainment as educational tools, the reason being their way of engaging and motivating the player. This motivational effect is said to be rooted in the fact that the player is experiencing the learning hands-on, learning by doing, that help keeping the player interested and invested in the game for long periods of time. Entertainment games are also instructional, thus educational even if their purpose is not education. The reason for this is that they teach the player how to master the game mechanics without demanding or needing prior knowledge of how the controls or mechanics of the game works. They teach the player to reach goals and objective by keeping the feedback and rewards consistent.

This begs the question of what specific aspects of entertainment games that corresponds to specific learning methods and creates this great learning effect. The knowledge gained could be used by developers of both entertainment games as well as educational games to help them to make informed design decisions and to better understand what kinds of learning that takes place when using specific level design components. Educational game designers might be able to harness the motivational effect by integrating educational objectives with game design. Taking this into consideration, my **research aim** is to identify the underlying pedagogical elements of the level design components game progression and pacing in my case study by mapping them to Krathwohl's (2002) revision of Bloom's (1956) taxonomy. The renewed taxonomy uses two dimensions: the knowledge dimension and the cognitive process dimension where learning objectives are placed in order to see what pedagogical elements the objective has.

The method I use in order to reach my research aim is a single case study of the level design components identified by Adams (2009) and Lopez (2006) that are in the game prototype Space Team: Pocket Planets. The game was developed and designed for The European Cross Media Academy (EUCROMA), cross/trans media project. The identified components were transformed into game objectives for a smoother mapping process where the objectives are then placed into Krathwohl's (2002) revised taxonomy. The mapping was conducted following the taxonomy's main category and sub-category descriptions.

The results show that it is possible to map level design components such as game progression and pacing to the pedagogical elements that makes up Krathwohl's (2002) revised taxonomy, and what these pedagogical elements are. Space Team: Pocket planets level design uses factual, conceptual, procedural and to a lesser extent metacognitive knowledge to teach the player the concepts needed to play the game. These concepts are game content that are designed to enable the player to remember actions and concepts needed to understand the correlation between cause and effect. Knowledge that then can be used in the game by executing relevant actions, thus making the player able to analyse the results of the actions taken. This will enable them to evaluate the gameplay and their experience, that in turn make them able to create own material based on the knowledge gained.

For future research I suggest conducting more case study research to see if there is a possibility for the knowledge gained in my study to be transferred into other similar cases. This would show if the conclusions about the underlying pedagogical elements present in the level design components used in Space Team: Pocket Planets could also be found in other entertainment games. Another suggested way of going further with the research would be to follow the endorsement of integrating educational objectives with entertainment game mechanics, in order utilize the engaging and motivating effect with educational goals useful for purposes and knowledge outside of the game.

1.1 Thesis Overview

Chapter two presents the theoretical background that motivates my research aim. I also present the game design guidelines that are used to create the case and identifying the level design components that are mapped to the educational evaluation tool that is a revision of Bloom's (1956) taxonomy, also introduced in this chapter. Chapter tree explains the problem, derived from the background, and includes the research aim and objectives of the research, and I motivate the method chosen in order to reach them. The following chapter four presents the resulting case: the game Space Team: Pocket Planets and in what context that it was created. In chapter five I analyse the case according to my research aim by identifying level design components used to teach the player how to play Space Team: Pocket Planets and then mapping them to Krathwohl's (2002) revised taxonomy. Finally I present the knowledge gained and conclusions drawn from the research conducted and what the suggested next step would be to take the research further.

2 Background

In this chapter I present the theoretical background that motivates my research aim, described in chapter 3. It includes a background on what researchers of game-based learning have to say about using games as educational tools, and why there is such an interest in using games in education. In the level design section I present a general overview of my main tools when it comes to creating the case my study relies on. It focuses on two specific components of level design that delimitate my research scope, and is motivated by what the research on game-based learning find most relevant to learning, such as motivation and gradual introduction. The level design components presented in that section comes from two sources that have worked in the gaming industry for many years and thus have an understanding of how to use the presented tools in an optimal way. Their work is often referred to in game design education as a designer's handbook, and it serves as the tools for understanding what parts of level design that can be mapped to pedagogy. Finally I present an overview of Krathwohl's (2002) revision of Bloom's (1956) taxonomy that is the pedagogical evaluation tool I use to analyse the results of the case study. The use of the taxonomy is motivated by its status as an educational evaluation tool used in education, and for its hierarchal structure of learning that is used in a similar way in how researchers describe how game mechanics and gameplay is taught to the player.

2.1 Game-based Learning

The motivational effect of entertainment games is one of the most important factors for effective learning, and entertainment games are in general successful when it comes to motivating the player (Chan et al., 2011). If the game is deemed good enough, the player usually invests a lot of time playing games in order to master it. Games are designed to keep the interest of the player by sequentially introducing new challenges and concepts, like new game mechanics and/or game moves (Berg Marklund, 2013). In game design, specifically level design, this corresponds to how game designers use progression through gradually increasing content (Lopez, 2006). The potential of using this motivation in educational games is often observed, but not how to go about to ensure that they reach that potential. The games that are currently used in education are either games with entertainment as their primary purpose or serious games that are designed for some other purpose like, for example, learning. Bellotti et al. (2011) and Appelman et al. (2010) describe an increase in the use of entertainment games for educational purposes, specifically because of how they motivate the player.

Bellotti et al. (2011) point out that all games can be used as educational tools, but in those cases the learning effectiveness becomes more dependent on how, for example, a teacher uses the game, and the level of competence of teaching though the game. Berg Marklund (2013) means that it isn't as easy as just taking an entertainment game with educational values and putting it into an educational setting. This is because there is little evidence that the knowledge that is being taught in entertainment games are useful or relevant in what he refer to as the "world outside the game" (Berg Marklund, 2013, p. 2). Furthermore, it takes hardware resources and game and technology knowledge to implement the use of games as learning tools in an educational environment. In other words: the use of games in education need to fit the intended learning setting (Berg Marklund, 2013). Instead of using existing entertainment games and then adapt them for education, it's better to develop games that fit specific educational purposes, but that still manage to utilize the motivational effect that entertainment games has when teaching the game mechanics to the player (Bellotti et al., 2011). This type of motivational effect is what educational games strive for, and educators see the potential in incorporating it into educational games. The player is motivated to learn and understand the new concepts because the method of learning is by experimentation rather than mere observation (Berg Marklund, 2013).

Entertainment games can be seen as educational, since they teach the player the specific skills required to master the game. They use learning methods that are both motivating and successful in teaching how the game mechanics work (Chan et al., 2011). Games meant for entertainment are also “instructional” (Appelman et al., 2010, p. 28) and “immersive learning environments” (Appelman et al., 2010, p. 31), because they teach how to overcome and master the challenges the game presents during gameplay without demanding prior knowledge from the player. In other words: entertainment games already use methods of learning in a way that engage the player, even if the purpose of teaching has nothing to do with actual educational objectives. The player is taught new strategies and gains more skills in using the game mechanics to reach specific game objectives (Appelman et al., 2010). Thus computer games have “inherent learning features” (de Freitas & van Staalduinen, 2011, p. 31) that should be taken into consideration when designing educational games. In order for educational games to achieve the same engaging effect, the learning has to “be encapsulated *both* within the game itself *and* the game narrative” (Appelman et al., 2010, p. 31). According to Appelman et al. (2010) this is achieved by integrating the game objectives with the educational objectives, and that the game components and mechanics are relevant to that objective. Although the game objectives in educational games and entertainment games might differ, they still share game design approach by establishing rules, sub-goals and objectives and a plan on how the target audience will achieve them. Chan et al. (2011) is referencing Habgood’s (2007) dissertation on games and learning integration, and the information is along the same lines. Habgood (2007) talks about “Intrinsic Learning” (Chan et al., 2011, p. 1980), and stresses that success is dependent on the integration of the educational objectives with the game mechanics (Chan et al., 2011). Games can also be described as intrinsically motivating, since they inherently are designed to be engaging (de Freitas & van Staalduinen, 2011). Chan et al. (2011) argue that the development of games with learning purposes should emulate the development process of entertainment games, and arrives at a number of game design components that is important when doing this. Just like Appelman et al. (2011), Chan et al. (2011) mean that games have sub-goals and objectives of varying scope that requires player input to be reached, and that the input generates instant feedback. The player is gradually and individually introduced to concepts in sections, that when mastered can be used in combinations to overcome increasingly more complex challenges. Games often use reward systems as feedback on the player’s accomplishments. The conclusion is that game designers should have these components in mind when designing educational games.

Game designers need a common language for designing and evaluating educational games (Bellotti et al., 2011), and the pedagogy and game design communities needs a shared vocabulary to bring them together. De Freitas & van Staalduinen (2011) mean that in order to make the integration of game design and pedagogy possible, there needs to be a new approach to the designs that include both fields. The problem de Freitas & van Staalduinen (2011) repeatedly comes back to in their research is that: since there is no common understanding on what learning effect game design elements has inherently, it’s hard to know what learning outcomes that can be expected from a game. In order to rectify this, they present a framework derived from three other frameworks that could be used as guidelines when designing immersive educational games as well as evaluating them. One of these three frameworks is the Four-Dimensional Framework that they map identified game design element against, in order to correlate specific game components to learning outcomes. They seek to explore "the relationship between individual game elements and expected learning outcomes" (de Freitas & van Staalduinen, 2011, p. 31). They base the game design elements identification on a literature review on research about "insights, ideas, and theories on educational games" (de Freitas & van Staalduinen, 2011, p. 41). They arrive at 25 game components, chosen because of how they might support educational design and positively affect memory in primarily multiplayer games. They note that most games only use a fraction of the presented elements, and that the sheer number found in a game doesn't directly indicate how good a design is. The elements are mapped to the Four-Dimensional Framework that focuses on "learning specifics, pedagogy, representation, and context" (de Freitas & van Staalduinen, 2011, p. 41) with sub categories. The framework is a means to design or evaluate educational games.

There are of course other methods that could be used to design and evaluate educational games. Bellotti et al. (2011) means that there is a need for methods or tools that ensure that "pedagogically informed game design patterns" (Bellotti et al., 2011, p. 3) are identified in order to developing good pedagogical games. In their research they mention six categories of learning patterns that game designers should consider when developing a game. There are common game design patterns that are used in game development, independent on game content. The patterns can be identified and named, and then the relationship and consequences of chosen patterns can be described (Björk et al., 2003). I do not use pattern concept as a part of my own research, since I want to use an actual educational evaluation tool for my case study, but it goes to show that some of the presented researchers has taken a step further into looking at what kind of pedagogical tools or methods that could be intergraded or used in future game development research.

2.2 Level Design

Level design is one of the fundamentals that game design is built upon and includes a number of components that together make up a level. Adams (2009) defines the term as "a portion of a video game, usually with its own victory condition that the player must complete before moving on to the next portion" (Adams, 2009, p. 642). Level design, in general, is about conveying information to the player in the clearest way possible, by placement and pacing of different visual and game mechanic cues (Adams, 2009). As previously mentioned, educational games and entertainment games share the game design approach of establishing rules, sub-goals and objectives and a plan on how the player will achieve those (Appelman et al., 2010).

2.2.1 Level Design Components

Adams (2009) explains that level design is about creating gaming experiences, and that a level includes six different components that a level designer should include or take into consideration, since they affect the gaming experience for the player.

The first component involves the actual place or environment that the game takes place in, since a level designer is responsible for planning, placing and implementing the game designer's vision of the levels, but also what types of game features the level will present to the player. The second component is connected with the first, and it's about the amount and placement of resources presented to the player. It also includes what initial state these resources will have and if the player is able to manipulate them. The third component is the placement and pacing of the challenges within the levels. The fourth component that affects the gaming experience is the win and loss criteria in a level. The fifth component is about how the game narrative is interconnected with the game mechanics, and the last component is about setting the right mood for the level in order to realize the game designer's vision or level plan.

Even if all the presented components have an important role to play when it comes to designing levels, I have chosen to focus my research on the chapter "Designing the pacing" (Adams, 2009, p. 373), but also an article that Adams refer to when he's talking about game progression: "Gameplay Design Fundamentals: Gameplay Progression" (Lopez, 2006, p. 1). The focus on these particular level design components and sections are chosen to narrow down my research area, but also because they in particular make up the fundament of teaching the player the game mechanics and how to play the game. Why this is, I explain in upcoming sections by exemplifying what specific game progression components that correspond with certain aspects of game-based learning previously mentioned.

2.2.2 Game Progression

Adams (2009) expands the definition of levels by describing them as sequential sections. Games that need a number of levels should be designed with the whole game in mind. If we look at levels as chapters in a book, there is still a need for connecting those chapters with the overall story arc. Adams (2009) means that the sequential levels "should exhibit progression of some kind: changes from level to level that represent growth in some form" (Adams, 2009, p. 371), and that progression could be about changes in the narrative or in the challenges presented to the player.

According to Lopez (2006) game progression includes five components: *game mechanics*, *experience duration*, *ancillary rewards*, *practical rewards* and *difficulty*. I will from now on combine and refer to ancillary and practical rewards as *rewards*. Lopez (2006) argue that a game that doesn't manage to balance these components with game progression may risk to frustrate the player, which can cause the game to become disengaging or worse, make the player stop playing.

Game mechanics is about what game moves the game allows the player to use. There are two ways of creating progression through game mechanics: instant or gradual. If the player has instant access to all game mechanics, the progression may involve designing levels that only require the use of certain game moves, to then later expand the repertoire to involve more game moves or to be replaced by new ones. When the player is gradually able to use game moves, they are introduced when the level sequences require them, as a combination of several game moves or to be used individually (Lopez, 2006). The player's interest is kept by this gradual introduction to new challenges and concepts. This method make the player motivated to learn because of how it let the player experiment instead of just merely observe, like in traditional education (Berg Marklund, 2013). Entertainment games teaches the player strategies to reach the game objectives, thus they are "immersive learning environments" (Appelman et al., 2010, p. 31). The *experience duration* should increase to indicate progression, which means that the final level sequences should take longer to complete than the first. The level designer can achieve this by increasing the difficulty level, which in turn will increase the level duration. Another example is tutorial levels, which introduce and teach the player the game mechanics while playing. According to de Freitas & van Staalduinen (2011) tutorials can be seen as instructive, but to a greater extent, the player learns to play by themselves, by experimentation. The instructional design of an educational game is important, since it "focuses on the facilitation of knowledge transition" (de Freitas & van Staalduinen, 2011, p. 49). Just like Lopez (2006), Adams (2009) means that progression should be present in each individual level. The component *reward* is mentioned in two different ways. It could be decorative changes, like new environments that reflected the narrative progression through the game world. The other type of reward has practical use for the player, since it affects the game mechanics, like new game moves. In order for rewards to be perceived as such, Lopez argue that the player must be informed about how the reward system works by, for example, letting continuous repetition of player input generate the same or similar rewards and feedback (Lopez, 2006). In game-based learning, motivation is one of the most important factors in effective learning that can be achieved by using reward systems as feedback on the player's progress, and rewards can be a motivator for continued gameplay (Chan et al., 2011). The last component presented is how the level designer can use *difficulty* as a means of progression. Lopez (2006) advocates what he calls "curved difficult progression" (Lopez, 2006, p. 5) which means that games should start with a low level of difficulty, in order to teach the player the game mechanics and to establish the reward system, to then gradually increase it throughout the sequential levels. Later on the player may need to combine several different kinds of game moves, which they gradually mastered, in order to solve new challenges. Difficulty is about creating progression though gradual introduced content (Lopez, 2006). By this gradual introduction, the player can then be introduced to more difficult challenges that might need a combination of learned concepts in order to be mastered (Chan et al., 2011).

2.2.3 Pacing

Pacing is about the frequency in which the challenges in the level are presented to the player. The pacing between the sequential levels should gradually increase (Adams, 2009), which includes two components of progression presented by Lopez (2006) in his description of how the *difficulty* and *experience duration* change as part of a "curved difficult progression" (Lopez, 2006, p. 5). Adams (2009) also advocates a varied pace in the games, which is easily doable with sequential levels. Intense periods of gameplay should be mixed with a slower pace, so that the player gets the chance to catch their breath, as well as savoring the rewards.

2.3 A Revision of Bloom's Taxonomy

Appelman et al. (2011) means that while the game industry is growing, the research, about the effectiveness of game-based learning or how learning methods are best applied to games, are not keeping up. There is a knowledge gap between game designers designing educational games and those who design entertainment games, which can result in game developers for both types of games, do not utilize their full potential by learning from each other of how to motivate the player and how to use effective learning (Appelman et al., 2011). De Freitas & van Staalduinen (2011) describe this knowledge gap as if "pedagogy and game design currently seem to be two separate worlds" (De Freitas & van Staalduinen, 2011, p. 29), since there is little research on what game components or processes that are connected to learning or how they contribute to specific learning outcomes. Squire (2011) means that research about learning effectiveness in games should focus on identifying "the aspects of games that make them good learning environments" (Squire, 2011, p. xiii), and suggest that researchers compare the pedagogy used in game-based learning with other pedagogies, since it's hard to tell the effectiveness of the methods used in game-based learning alone. In other words: "to compare the effects of the game to other curricula" (Squire, 2011, p. 228). It is difficult to combine components used in entertainment games with pedagogy and learning methods. Still, this blended approach is suggested since "simple tasks can be easily transferred to a game in a very realistic way" (Hendrix et al., 2013, p. 318) while it is also noted that more complex tasks needs to be presented in a more abstract manner (Hendrix et al., 2013). This fits into Krathwohl's (2002) revised taxonomy on how learning is hierarchal, going from simple and concrete to complex and abstract (Krathwohl, 2002), as later explained in this section.

Since my research focus on learning through level design, used in a specific entertainment game, I've chosen to evaluate the learning aspects of said game by using Krathwohl's (2002) revision of Bloom's (1956) taxonomy. It was created as a means to evaluate different kinds of educational goals and objectives, but still using the same criteria as a "common language about learning goals" (Krathwohl, 2002, p. 212). The original version of the taxonomy uses six categories with related subcategories, which are hierarchy structured, going from simple and concrete to complex and abstract. Each category must be mastered before moving on to the next (Krathwohl, 2002). This follows Lopez (2006) idea of using a "curved difficult progression" (Lopez, 2006, p. 5) where the player is gradually introduced to game content, and where the game starts out with low difficulty by teaching the player the basics to then become more complex.

In the renewed version, the educational taxonomy has been divided into two dimensions: the first being "*the Knowledge Dimension*" (Krathwohl, 2002, p. 216), the noun or object that informs about the cognitive field and the knowledge expected to be acquired. It includes four categories: *Factual*, *conceptual*, *procedural* and *metacognitive* knowledge. *A. Factual knowledge* includes the basic knowledge of different concepts required to "solve problems" (Krathwohl, 2002, p. 214) within a specific field. *B. Conceptual knowledge* is about the relationship between the basics taught in A by, for example, "classifications and categories" (Krathwohl, 2002, p. 214), and how they function together. *C. Procedural knowledge* is about knowing when and how to use different methods within a specific field, and finally: *D. Metacognitive knowledge* includes knowing about cognition in general as well as "one's own cognition" (Krathwohl, 2002, p. 214) and how the student can use that knowledge to improve.

The second dimension is: "*the Cognitive Process dimension*" (Krathwohl, 2002, p. 215), the verb or action that informs what is being done. Just like in the original version, the categories are structured by a hierarchy going from simple to complex, but their names has to some extent changed. They are: *1. Remember*, which includes remembrance and recognition (Krathwohl, 2002), which is consistent with how the progression element *game mechanics* is gradually introduced to and mastered by the player (Lopez, 2006). *2. Understand*, is about being able to understand by for example categorizing, explaining and comparing. The category also includes being able to understand instructions or other type of communication (Krathwohl, 2002). In level design, this means that the player understands how to use the available game moves, which can be communicated to the player through feedback and *rewards* (Lopez, 2006). *3. Apply*: to be able to use the gained knowledge

(Krathwohl, 2002), which is what level design and its components strive to teach the player (Adams, 2009), and *4. Analyze*: to understand and being able to explain and differentiate how the knowledge is being used or how it's linked together (Krathwohl, 2002). In level design and game progression, this happens when the player has learned how the *reward* system works, thus enabling the player to use that knowledge more effectively (Lopez, 2006). *5. Evaluate*: to be able to evaluate the effort by for example critiquing (Krathwohl, 2002), that yet again could be communicated to the player by rewards or score (Lopez, 2006). Finally, *6. Create*: producing or designing original material based on the knowledge gained (Krathwohl, 2002), which corresponds with how the element *game mechanics* might allow the player to combine mastered game moves in new ways (Lopez, 2006).

In the revised taxonomy, these two dimensions crate a taxonomy table (see Table 1) where the educational goals and objectives are placed where the two dimensions fit. This table can be used to visualize how and where the learning of specific or overall educational goals and objective happens (Krathwohl, 2002).

Table 1 Krathwohl's (2002) revised taxonomy table

	The Cognitive Process Dimension					
The Knowledge Dimension	1. ***Remember***	2. ***Understand***	3. ***Apply***	4. ***Analyze***	5. ***Evaluate***	6. ***Create***
A. ***Factual Knowledge***						
B. ***Conceptual Knowledge***						
C. ***Procedural Knowledge***						
D. ***Metacognitive Knowledge***						

2.4 Background Summary

The reoccurring theme from Appelman et al. (2010), Chan et al. (2011) as well as Berg Marklund (2013) is the emphasis on how entertainment games are effective and motivating when teaching concepts to the player in order for them to master game mechanics and reach specific game goals and objectives. This is why some entertainment games are already used for educational purposes, despite not being specifically designed for this, something that is not an optimal solution. This is why Appelman et al. (2010), Chan et al. (2011) and Habgood (2007) advocate integrating learning with game mechanics: to maintain the motivational gaming experience in entertainment games but with educational objectives. Examples on how this would work practically are absent, but Bellotti et al. (2011), for example, advocate the use of pattern recognition which they consider compatible with game design and development. If the game objectives are exchanged for educational goal and objectives, and that the game mechanics used are relevant to achieve this, then in theory, level design would be compatible with certain cognitive considerations of learning games and vice versa.

In game design a level is “a portion of a video game, usually with its own victory condition that the player must complete before moving on to the next portion” (Adams, 2009, p. 642). In short, level design is about creating game experiences by conveying information to the player in the clearest way possible (Adams, 2009). While there are several components that a level designer should take into consideration when designing a level, game progression and pacing are the components responsible for how, where and when the information is delivered, which is why my research focus on those components. This ties directly into how researchers like Appelman et al. (2010) Chan et al. (2011) and Habgood (2007) advocate integrating learning with game mechanics, since progression and pacing is directly connected with ensuring that the game mechanics are presented in a way so that the player learns how to use them.

Researchers should compare the pedagogy in game-based learning to other pedagogies in order to see the effectiveness of the learning that occurs (Squire, 2011). The original Taxonomy was created as a means to evaluate different kind of educational goals and objectives (Krathwohl, 2002). The revised taxonomy uses two dimensions with related subcategories instead of one, but keep its hierarchal structure in both dimensions that goes from simple and concrete to complex and abstract. Each category must be mastered before moving on to the next (Krathwohl, 2002). This follows the idea of the player being gradually introduced to game content, teaching the player the basics to then becoming more complex (Lopez, 2006). The two dimensions are *The Knowledge Dimension*, that inform about the cognitive field in four categories, and *The Cognitive Process Dimension* that inform about what is being taught, divided into six categories. Together they create a taxonomy table where the educator can place an educational goal or objective where they best fit (see table 1) (Krathwohl, 2002).

3 Problem

Appelman et al. (2011) see a problem in that while the gaming industry is growing, the research about how effective game-based learning is, doesn't seem to keep up, neither how different methods of learning are best applied to games. There is a gap between entertainment and education game developers that could result in games that do not utilize their full potential by learning from each other of how to motivate the player and of effective learning (Appelman et al., 2011). De Freitas & van Staalduinen (2011) means that this gap between educational and entertainment game developers is due to the little amount of research on how game components are connected to learning and learning outcomes. It is as if "pedagogy and game design currently seem to be two separate worlds" (De Freitas & van Staalduinen, 2011, p. 29). Game mechanics and the learning in games are often closely connected, which makes the identification of the underlying pedagogy difficult to pick out (Henrix et al., 2013). Based on what I presented in previous chapter about how developers of educational games should utilize the motivational effect observed in entertainment games, I focus on identifying "the aspects of games that makes them good learning environments" (Squire, 2011, p. xiii). Previous research point out that this would be of use for designers of educational games in order to harness the motivation that entertainment games has. Information that then could be used to design educational games that utilize the found learning methods in entertainment games in order to keep the motivational effect.

Thus my **research aim** is to identify the underlying pedagogical elements of the level design components game progression and pacing in my case study by mapping them to Krathwohl's (2002) revision of Bloom's (1956) taxonomy.

3.1 The Research Process

The case created is based on the level design theory and pacing presented by Adams (2009) and the study focus on challenges and game mechanics that are relevant to game progression as described by Lopez (2006). During the design phase, after deciding on a game genre, we did research on other mobile games in the same genre to give us an idea of what had come before. The game prototype was documented into a game design document, describing all game features as well as the game mechanics and their correlation. This document was continuously updated as the game design evolved. We then went through the document and divided and identified the game design into artefacts, which are very exact descriptions of how, for example, game mechanics work individually but with references to the other mechanics or features it correlates to. Artefact descriptions are the documents that, as explained in chapter 4, are sent to the production team and communicated how the design should function, look and feel when playing. We also designed a game tutorial, but it was not implemented into the game prototype.

The level design components in the game prototype, Space Team: Pocket Planets, and associated game design documentation were identified using level design as described by Adams (2009) and Lopez (2006) and their description on what teaches the player to play an entertainment game. I also looked at de Freitas & van Staalduinen's (2011) identification of game components that support educational design and positively affect memory, derived from their literature research and how they identified the 25 elements they used in their research. Since there is previous research exploring what I want to research in my case, it strengthens the motivation of researching the correlation between the inherent underlying pedagogy and level design components in the entertainment game that is my case, since it specializes on one of their identified elements. I present the identified game components in my analysis together with commentary on how and why each individual element was chosen in correlation to the references listed above. I then proceed to drive game objectives for easier transition. The main question that is asked during the mapping process to help me define the objectives for the mapping is: 'the player will learn to...'.

The objectives are then placed in a table designed after Krathwohl's (2002) revised taxonomy table (see table 1), which serves as an evaluation tool of the identified game components in order to map them to the learning objectives. This is done in order to identify eventual pedagogical elements inherent in the level design in Space Team: Pocket Planets. The identification is based on the instructions on how the taxonomy is used and applied and on how to identify what category a pedagogical element belongs to, as explained in Krathwohl's (2002) paper. The use of Krathwol's revision of Bloom's (1956) taxonomy is further motivated with de Freitas & van Staalduinen (2011) who use Bloom's (1956) taxonomy in their research "in order to identify, arrange, and define learning objectives" (de Freitas & van Staalduinen, 2011, p. 48). I use their mapping of the 25 game components to the Four-Dimensional Framework as an additional source as to how the mapping of game components towards pedagogy works practically.

The result is an overview that shows what components of level design used in the case that corresponds to certain pedagogical elements in the taxonomy. It shows what level design components that are effective when it comes to teaching the player how to play the game. The results should be interesting for game developers of both educational and entertainment games, since it could help them to make informed design decisions by better understanding what underlying pedagogical elements that are present for specific level design choices. The result should serve as a pointer to game developers that want some indication on how effective different game design component, focusing on progression and pacing, are when it comes to teaching the player how to play games. It could also serve as a first step and a good foundation and starting point for integrating educational goals with game mechanics, as suggested by previous researchers. The research is not about what the player play-testing the case actually learns by playing, but rather what and how the player theoretically could learn by presenting the mapping. My main knowledge contribution would therefore be to fill the knowledge gap between game developers of educational and entertainment games.

3.2 Method

I use a single case study as my research methodology. This type of method is a good strategy when it comes to understanding and examining specific issues and phenomenon "by observing all of the variables and their interacting relationships" (Dooley, 2002, p. 336). A case should be based on a real-life event or situation and include certain elements: setting, individuals involved, the events, the problems and the conflicts. These elements are then observed and described in a "descriptive research document, often presented in narrative form" (Merseth, 1994, cited by Dooley, 2002, p. 336). Also, the reliability is strengthened by well documented research since a rich description of the case means that readers can draw their own conclusions and make their own interpretation of the conducted research (Flyvbjerg, 2004). This is something I try to follow by both describing the case's context and content, even if my research aim has nothing to do with cross/trans media as such. This part of the method is explored in chapter 4 where I present the context, scope and under what boundaries, in which my research was conducted. Dooley (2002) puts emphasis on that the case study should be "taken from real life" (Dooley, 2002, p. 337) and that it "rely on careful research and study" (Dooley, 2002, p. 337). This makes the EUCROMA project a good case study, since the case includes some of the game design components that are relevant for my research aim and it's also a project that I have taken part of as a participating observer. Flyvbjerg (2004) means there are different kinds of case studies that are good for different things. My case study would classify as an information-oriented selected case study "to maximize utility of information from small samples and single cases. Cases are selected on the basis of expectations about their information content" (Flyvbjerg, 2004, p. 396). This fit the description of my chosen case since I generally know what to expect and what kind of information I can expect to derive from researching the case, even if, as I explain in chapter 4, had less control of the scope of the project than first expected. Dooley (2002) then explains that the researcher can decide on what type of methodology to use when conducting research through a case study, and how the data will be collected. In my research, I use Krathwohl's (2002) revised taxonomy as a means to reach my research aim. In order to ensure that the research conducted is valid and has reliability, Dooley (2002) is suggesting that researchers consider six phases of which I present two of the most relevant for my research, but that also covers the other phases:

The first phase is: *"Determine and Define the Research Questions"* (Dooley, 2002, p. 339) that brings focus to the aim of the research. The aim and questions must be well motivated through literature reviews and previous research as it "add face validity to the project" (Dooley, 2002). In previous sections I have presented an overview of the potential and difficulty of game-based learning which motivates the research focus and research aim.

The second phase is: *"Select the Case and Determine Data-Gathering and Analysis Techniques"* (Dooley, 2002, p. 339). In order to reach my research aim, the single case study is focusing on the challenges presented and designed for the EUCROMA cross/trans media project. The level design used in the case study is based upon the insights and suggestions about level design in general as well as pacing from Adams (2009) as well as Lopez (2006) and his description of game progression, as presented in previous sections. The selection of data gathered is decided based on the relevance of the designed challenge, as well as the resulting amount of aspects of gameplay to choose from. For the analysis I use Krathwohl's (2002) revised taxonomy table (see table 1), since it is an evaluation tool of educational goals and objectives and the means to reach my research aim. Dooley (2002) suggest that the researcher relate the "findings back to the literature" since it also adds validity to the research, which is what I do in order to analyze case and to better understand the results.

3.3 Validity and Reliability

The subject of validity and reliability is something I've already mentioned in previous section, but since those two aspects are important when conducting research, I will clarify what these concepts mean in relation to my own qualitative research.

"Predictive theories and universals cannot be found in the study of human affairs. Concrete, context-dependant knowledge is therefore more valuable than the vain search for predictive theories and universals" (Flyvbjerg, 2004, p. 393). Flyvbjerg (2004) brings up the issue of how he often has been dissuaded to conduct research using the case-study method, and that the objection came from the fact that there can be no generalization drawn from a single case-study and that they are too subjective and gives too much leeway to the "researcher's own interpretations" (Flyvbjerg, 2004, p. 390). What is being questioned is the validity and reliability of the method. However, he argues that the case studies have value on their own and debunks what he sees as misunderstanding of the uses of case studies as a research method. Case studies are context dependant, but they also give intimate knowledge about the case and can be seen as a "method of learning" (Flyvbjerg, 2004, p. 391), gaining intimate knowledge about a subject or how to conduct research in a context-dependant experience.

Dooley (2002) lists what a researcher should take into consideration when conducting research, this includes: "validity, construct validity, internal validity, external validity, and reliability" (Dooley, 2002, p. 340). *Validity* is whether or not the study actually manages to achieve what it set out to achieve (Dooley, 2002). In my research I aim to gain knowledge about the underlying pedagogical elements of level design, which is more an exploration and learning approach than a measuring one. *Construct validity* is about how important it is to use the methods or tools that fit the case study (Dooley, 2002). Like described in previous section about my chosen method, I am using established game design recommendations when creating and evaluating the game that is the case study, as well as the taxonomy model presented by Krathwohl (2002), which is an established education evaluation tool.

Internal validity is about making sure that the conclusions of the observations made are credible and motivated (Dooley, 2002). Even if the tools used to identify and evaluate the pedagogical elements of the level design components in the case have guidelines to follow, the mapping between those components and Krathwohl's (2002) revised taxonomy is still based my subjective interpretation of those guidelines. Thus it is important that I thoroughly document and explain my process of getting to those conclusions, the importance which I have already stressed in previous section. De Freitas & van Staalduinen's (2011) research is to some extent be used as a guideline of how the game design element identification and mapping can be made, which remove some of the subjectivity from my own research. When it comes to being subjective, Flyvbjerg (2004) means that while case studies are in many cases more subjective than in other research, the case study is strengthened by how close the researcher comes to a real life event and that the strength lies in the intimate knowledge gained.

External validity concerns the question if you can generalize the conclusions made to include other similar situations or cases that have not been included in the specific case study conducted (Dooley, 2002). Since my research is a single case study, it's not possible to make generalizations of what the conclusions would be in other projects and studies, but it might raise the question if it could generate the same results, something that might be worth researching. Also, since the interpretations of the results are to some extent subjective, it stands to reason that other persons could interpret the data in another way. Instead of generalization Flyvbjern (2004) talks about falsification which means that if any of the observations made doesn't fit with the proposition, it is seen as non-valid, and that case studies are good to detect this, which is also known as 'black swans'. He means that case studies can be generalized, but that it is overvalued, and points out the fact that even if the results cannot be generalized, it doesn't mean it doesn't add knowledge. Thus the case then needs to be carefully chosen and relevant for what is being studied (Flyvberg, 2004). On generalisation in qualitative research, Gobo (2004) says this: "there are two kinds of generalizations: a generalization about a specific group or population (which aims at estimating the distribution in a population) and a generalization about the nature of a process" (Gobo, 2004, p. 405). The second way of generalizing is also called transferability that generalizes in terms of structures that can be noticed and transferred to other cases, something that could be possible to trace in other cases as well (Gobo, 2004). I believe that transferability is the type of generalization that fit my chosen case study the best since a single case study can't be generalized in the same way quantitative research methods can. The description of transferability also fit my research aim since I intend to gain more knowledge by identifying aspects and structures that might be found in similar research that has been conducted by de Freitas & Staalduinen (2011).

4 The Case

In this chapter I present the case I seek to study in my research in order to reach my research aim, described in chapter 3, and the relevant components involved when creating it. It includes a description of what the European Cross Media Academy (EUCROMA) is, because while the cross/trans media aspect of the project is not relevant to the research, the information is important in order to explain under what circumstances the case has been produced. In the cross/trans media project section I present an overview of the EUCROMA pipeline. The next session is dedicated to explaining the storyworld in which the case was created, based upon and part of, as well as the design team that created it and its content. Then I describe the game production part of the project, its connection to the storyworld and film and the general design process. Finally I present the resulting game and game features that is analysed in chapter 5, using Krathwohl's (2002) revised taxonomy.

4.1 EUCROMA

The European Cross Media Academy or 'EUCROMA', which is how I will refer the academy as from now on, is "an international training program in development of cross/trans media projects, which integrate digital animation and games" (EUCROMA, 2014). To be able to produce both a film and game deriving from the same storyworld, the program includes conceptual teams and a production team that fill the necessary competences needed to make the cross/trans media collaboration possible. The conceptual teams consist of the editorial teams and design teams that are responsible for developing the storyworld and plan and design a game and film derived from that storyworld while the production team is responsible for the practical execution and implementation of the components and designs, designed and defined by the conceptual teams (EUCROMA, 2014). As the Level Designer, I was a part of one of the conceptual teams. The program "revolves around the training and enhancement of the competence roles included in the blend of animation and games development" (EUCROMA, 2014). In other words, the program prepares the roles before the joined collaboration between the conceptual and production team takes place.

4.1.1 The Cross / Trans Media Project

Cross/trans media is about creating a storyworld that can stand as the foundation of several different media combined. The type of media used in cross/trans media project can wary but as previously mentioned, the EUCROMA (2014) projects are about creating games and films deriving from the same storyworld. This means that the two media types are in some shape or form connected to each other. The 2014 EUCROMA training program is divided into four phases: *Prologue*, *design*, *production* and lastly *presentation* and *evaluation*. The five week long *prologue phase* is when the design team and the production team work separated from each other as they're trained in their special fields, engaged in lectures or workshops in preparation for the upcoming collaboration. This is also when the editorial teams map out the storyworlds. During the six week long *design phase,* the conceptual teams and production teams start to get involved with each other as the game and film designs, also developed during these weeks, get into production. The two different kinds of teams learn to communicate with each other in order make the collaboration easier. This is also known as iteration one of two. The following six weeks are then dedicated to the *production phase*, iteration two of the game and film designs. This is where the conceptual teams can define and design new features into the prior game and film iteration, or change the already implemented ones that the production team once again creates and implements. Lastly the program enters the one week *presentation* and *evaluation phase* where industry representatives are invited to the final presentations of the ongoing projects (EUCROMA, 2014).

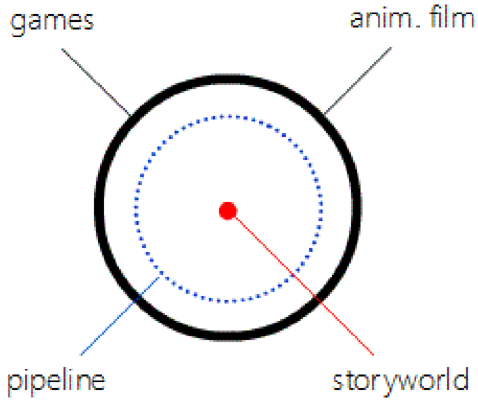

Figure 1 Image explains the correlation between the media types included in the EUCROMA 2014 cross/trans media project, also how the pipeline of work is integrated and the storyworld that connects them.

4.2 Space Team

There are three cross/trans media projects in the 2014 EUCROMA program. I was a part of conceptual team three, Space Team. As previously mentioned, the projects conceptual teams include an editorial team, whose primary purpose is to develop the team's storyworld, what the game and film will be about, and the design team that conceptualise and plan the ideas so that it can go into production (EUCROMA). Adams (2009) describes how the game director and the level designer work together where the level designer "take the essential components of the game provided by the other designers ... and use those components to design and construct the individual levels" (Adams, 2009, p. 52). This relationship is very similar to how the two teams as a whole collaborate. The editorial team provide background information in the form of the storyworld bible containing the rules and overall design, while the design team act within those rules and guidelines, filling the world with content.

In Space Team the editorial team consist of: producer Frederik Denning, storyworld director Arran Topalian, game director Lee Gillespie and film director Mads Gulborg Bøge. The design team consist of: production designer Touraj Haji Khosravi, sound designer Frederik Boye Hansen, level designer Helena Ekholm, concept artist Xin Ding and concept artist Pip Snaith.

4.2.1 The Storyworld

"Storyworlds provide a core from which, dramatic conflicts, engaging experiences and immersive settings can be derived" (EUCROMA, 2014). The Space Team's storyworld is described in the Space Team storyworld bible, written and edited by Topalian (2014) where the overarching concept is stated as: "What if the new girl at school turned out to be an over-adventurous, intergalactic Alien Princess?" (Topalian, 2014, p. 4). EUCROMA (2014) asked of the storyworld directors to describe the world in a document that during the development process was in constant expansion as the design board added their designed content for the

Space Team storyworld. Space Team's target audience is children age six to eleven, which set the overall tone of the world and its derived film and game.

Space Team is about Alex, a human boy whose best friend turns out to be the princess of the wondrous Marmor galaxy. Ali, the princess, was sent to earth when her scheming aunt framed her for something she didn't do in order to prevent her from warning her parents of the plans to seize the throne of the Marmor Galaxy. It is up to Alex and Ali to stop her evil plans and to set things right (Topalian, 2014). The storyworld is very character driven, and the summary of the world is also the basic premise of the film part. But the Marmor galaxy and its strange planets and inhabitants gives a lot of opportunities to create unique stories within that world, which is what a cross/trans media product need to be able to do; derive more content. In the storyworld bible (Topalian, 2014) the galaxy itself came to have a great importance when it comes to the game part. In the background story Marmor was created by mysterious aliens called the Council of Creation. This council built the galaxy in eight star system zones, containing different planets that are often flamboyant and otherworldly in design (Topalian, 2014). In the next section I describe how the game fits into the storyworld and how it came to be.

4.2.2 The Game Design Process

The game design process was a collaborative effort between game director Lee Gillespie and me as a level designer, but the game director had the first and last say on the general direction of the game and the design decisions taken. One of the major aspects of the cross/trans media project was that the film and game would share production team and production time for both projects, meaning that both projects scope needed to be realistically proportioned to the resources available. This limited the game, especially in terms of how many artefacts we could add. EUCROMA (2014) describe an artefact as an element of the film and game, such as a player avatar, that will move or behave in a specific way in the product. The conceptual team needs to list and describe all of the artefacts that are present in the game and film in the clearest way possible, so that when they hand it over to the production team, they will be able to create the film and game from that information. By writing an artefact list, the production team will be able to give feedback on how probable the execution of the film and game parts are in relation to the amount of specialist available and the time they have to create and deliver said artefacts.

As previous mentioned, cross/trans media doesn't necessarily mean that the products derived from the same storyworld have to be directly connected. In the beginning, the game concept documents initially produced had a similar approach to the storyworld as the film had, with Alex and Ali as the main protagonists and with the objective of defeating evil aunt Malum. After feedback on project scope we realised that our initial ideas for the game was too resource heavy, considering that the film would demand a great amount of resources. The information of how many artefacts we could use had been established half way through the design phase when the production team had made test run of their productivity. We as designers had been more focused on gameplay and player experience than how the game would fit from a cross/trans media experience, but the feedback made us think of other possible approaches to the storyworld that still would satisfy that aspect of the project. Instead of focusing on a character driven game we took a closer look at the universe that Ali lives in, the Marmor galaxy. The concept artist had by this point started to draw images of what the planets and inhabitants in the galaxy would look like, and what they created was interesting enough to spawn the idea of a virtual pet game. Virtual or digital pets are simple pet simulations that you have to take care of in order to keep it healthy and alive. Our game would focus on the planets themselves, but also its inhabitants. The idea still needed an anchor point in the storyworld and the Council of Creation was a result of that effort, and was added to the bible. Other efforts to connect the film and game were also made by featuring the film planets in the game and vice versa.

4.3 Space Team: Pocket Planets

In this section I present the resulting game and case called 'Space Team: Pocket Planets'. In the game, the player takes on the role as one of the council members of the Council of Creation, the mystical creators of the Marmor galaxy. The game objective is to nurture planets and its inhabitants, keeping them happy in order for the planet to prosper and generate rewards. The game is what game designers would call a virtual or digital pet on a mobile platform, a pastime activity game where the player revisits the game in short periods of time in order to keep the planet and its inhabitants happy. In the following sections I break down the game into several components in order to explain the game system, its core mechanics and the design process behind it. Some of the features presented were never implemented into the game due to scope and resource management, but all of the features are fully designed and meant to be a part of the gameplay.

4.3.1 Game Tutorial

The first thing that is supposed to greet the player when starting up a new game is a learn-by-playing tutorial level. This feature only exists as finished design and is meant to be implemented, but due to time and resource restrictions it was not possible. Adams (2009) explains how early versions of game tutorials often were long manuals because of memory limitations. Nowadays the manuals are used as reminders rather than meant to teach the player to play the game; the tutorial levels have replaced them. A tutorial level is "early levels that teach the player how to play" (Adams, 2009, p. 375) and while they are more time consuming to design than the old manual way, they are seen as better since they teach the player how to play by actually playing a version of the game (Adams, 2009). This way of teaching the player concepts by participation rather than by observation is what makes the player motivated to learn and understand the new concept (Berg Marklund, 2013). The way the game challenges is taught during actual gameplay without demanding prior knowledge (Appelman et al., 2010).

We took our target audience into consideration when designing the game introduction. The game is designed with as little text as possible so to not overwhelm our target audience and to keep the main game screen clean, making the tutorial level even more important. The tutorial level is both interactive and text based, where the text is instructional and the practical application is what makes the player progress through the tutorial. During the first playthrough, the player has to complete every sequential part of the tutorial in order to move on to the actual gameplay and to progress in the tutorial itself. The player starts out with one concept taught at a time, information on how they have act in order to be able to take care of the planet and its inhabitants. The game's pacing, as described by Adams (2009) is therefore adapted to each individual player, since they control how fast the challenges in the game are introduced to the player. This gradual introduction is also mentioned by Lopez (2006) as progression through gradually introduced game mechanics, meaning that they are introduced when the player requires them. The player has to master the game mechanic before being able to move on to the next section of the tutorial. It is also connected to the progression difficulty, since it's about creating progression through gradual introduced content (Lopez, 2006). In our game, the players can also go back and replay the tutorial level whenever they wish to refresh their memory. It will also be available in a traditional text-based manual from a settings menu as well.

The game tutorial for Space Team: Pocket Planets is a ten step tutorial and includes: *1. Introduction to Narrative Objectives*, where the player is informed about the game objective in its narrative context. *2. Planet Core*, *3. Happiness*, *4. Sun*, *5. Housing*, *6. Food*, *7. Stardust Production and Collection*, *8. Asteroid & Fire Event*, *9. Buying and Placing Items* and *10. Planet Maturing*. The player is asked to follow through all the game moves available in gameplay by written and animated imagery of how said actions are to be executed. In the end of the tutorial level, the player receives a planet core. Every planet in the Marmor galaxy starts out as a planet core, and once the new core has become a planet, the tutorial ends and the player can start using their newly honed skills in real-time gameplay. In the following section I will explain these game features and mechanics in more detail.

4.3.2 Main Gameplay and Core Mechanics

The main game objective is to keep the planet and its inhabitants happy in order to get rewarded. The *Happiness* level of the planet is determined by three major interactive game mechanics the player has to keep up to date. These are *Sun*, *Housing* and *Food* levels, displayed to the player on the main game screen as icons together with numbers that show the current number of, for example, houses and the optimal level or bars. These are located beside on the main user interface and that gives the player feedback on game progression. The three major mechanics are time dependant, meaning that over a certain amount of time, some of the bars or numbers will deplete to zero, which in turn will affect the happiness level as well. This is very usual for mobile platform games and especially virtual or digital pets because it causes the player to come back to the game to check on their pet to see if it's alright.

The three main mechanics share some features, besides being time dependent, in order to keep the gameplay as simple as possible. They are shown as similarly designed graphical icons that are intended to communicate how they affect in gameplay. The icons that the player cannot click to directly interact with gameplay, are shown on the top of the screen with numbers beside them to indicate the current number of, for example, houses and the number of the optimal amount of houses the player should place to increase the happiness level. The icons that can be interacted with are displayed at the bottom of the screen, close to where the players would rest their thumbs. The sun, housing and food mechanics have five states that affect the happiness level and each mechanic affects a third of the happiness level bar each. The happiness icon has 15 levels, which is the combined number of the three main game mechanics levels that affect it. The happiness icon is designed as an abstraction of a face, or what is called a smiley. The icon has three visual states that communicate progression to the player: sad, neutral and happy. These states are also colour coded as red for sad, yellow for neutral and green for happy. That means that a small amount of overall mechanic progression will be represented to the player as a sad face and a moderate overall mechanic progression will result in a neutral smiley. Once the player has a high level of overall mechanic progression, the happiness icon will show a happy face, communicating to the player that the overall happiness level of the planet and its inhabitants is optimal. The player will also receive feedback for each time they gain or lose one of the 15 levels of happiness the bar is built upon, but not directly visually displayed to the player. This feedback is shown by either green pluses or red minus signs that burst out from the icon in time with the gain or loss, to communicate that certain actions, or lack thereof, has resulted in a change in happiness. It was a conscious decision to not show all of the 15 levels of happiness to the player, simplifying the display to fit the intended target audience.

Most of the game mechanic icons are displayed in a similar way, divided after if the player can interact directly with the game by clicking them or not. The population, housing and food are displayed with a visual representation of what game mechanic they represent together with a numbers that indicate how many there currently are of a value and what the optimal value is, i.e. what the player should strive for. These icons are also colour coded, thus will change colour from red to yellow to green as the player get closer to the optimal value, just like the happiness icon changes colour to show progression. This way the player get direct feedback on how well they are doing with each mechanic and the number will give more detailed information on that progress. The other icons present on screen are placed apart from the rest and the player can interact with them to affect gameplay in some way, this includes the sun icon which instead of changing colour will use a bar to indicate progression and the icon colour will thus not change to show progression.

The sun mechanic is displayed on the user interface as a sun icon with an incorporated bar that that is raised when filled. The player has to provide the planet with sun in order to raise the sun bar, which in turn will raise the happiness. The player has to click the sun icon in order to activate its powers and then either hold that icon or click the planet to use the power. The sun feedback of using the sun power is displayed to the player as rays of sunlight emitting from behind the planet. As long as the player holds down the finger, the sun bar will slowly fill. If the player removes the finger, the player will stop affecting the sun mechanic and the rays of sunlight will disappear automatically.

Each inhabitant on the planet needs a house to live in, in order to raise the happiness. The player can get a house to place on the planet by visiting the game shop. The house item is free, but is displayed in the shop in order to keep the consistency of displaying and making all items the player can place on the planet accessed from the same game interface. The player is instructed that the house placement affect happiness in the item description as well as informed of what the house do with a small version of the housing icon together with an up arrow to indicate that this item increase the house number. The house 'bought' is placed in the player's inventory, making the player able to place it on the planet. The player can have a maximum of 20 houses in their inventory, which is the inhabitant cap of each planet. By clicking the house in the shop or inventory, they player is moved to the main game screen where they can click any space not occupied on the planet to place a house at that position. The houses placed have to match the number of inhabitants living on the planet or the player won't receive the maximum amount of happiness. The player keeps track of progression by looking at the numbers displayed beside the housing icon where a number of the current house is displayed out of the desired amount. The desired amount of housing is always the current number of inhabitants living on the planet, and the housing information will change in time with the population growth, which is also displayed on the user interface. Once in a while a house will deteriorate, meaning that the player has to refresh the house to make it inhabitable again. A deteriorated house will not count or add to the overall happiness. The more happy a planet is, the more inhabitants are going to show up, which will keep the player coming back to build or refresh the houses built. Houses will also deteriorate if they are caught up in a fire during the fire event and the player has to extinguish the fire before they can refresh the deteriorated house.

The inhabitants also need food to stay happy. The food mechanic is the most advanced game mechanic in Space Team: Pocket Planets, since it uses a couple more interactions than the sun and housing mechanics do. The food mechanic is displayed to the player as an apple since we decided to associate it with food. The current food level is displayed together with the optimal amount of food the player should strive for in order to increase happiness. The food growth is controlled from the planet's farm, which is always present on the planet. The player clicks the farm to decide upon how much food to grow and how much time the growth will take. If there is already food growing beside the farm, it will inform the player on the remaining time before the food grow. Once the food is grown, the player clicks the farm to harvest it. The harvest is visually presented as it moving towards the food icon before disappearing, raising the numbers displayed by the food icon. If the player doesn't harvest the food, it will eventually spoil and even if the player will be able to collect it, the collecting will not add food, nor will it affect the happiness level. The farm is identical on every planet for easy recognition and fairly large so that it doesn't blend into other planet items. The player can make the food grow faster by adding rain to the farm. This mechanic is displayed as a rain cloud orbiting the planet that can be dragged to the planet's farm in order to be used. However, the rain will increase the rate in which the sun icon bar depletes. The rain cloud will rain over the farm until the player click it and flicks it away and will otherwise not affect gameplay unless used to put out fires in the fire event.

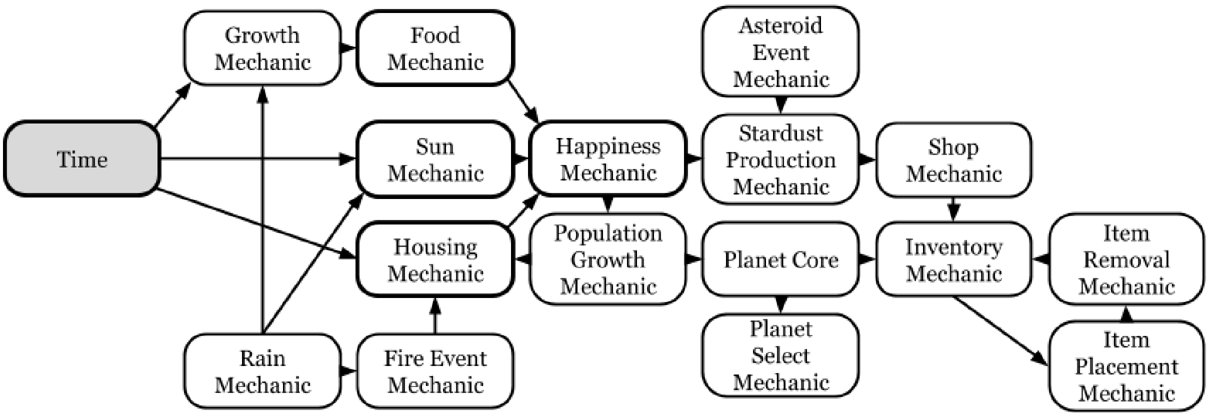

Figure 2 Image shows the game cycle containing all of the mechanics present in Space Team: Pocket Planets and how they correlate to each other.

There are other ways that the game communicates progression besides the bars, numbers and icons. The music as well as the inhabitant animations and sounds are happiness mechanic dependent, having three stages of feedback, just like the happiness icon. This means that when the happiness level bar is at 0-5, the music reflects this, and the sad version of the inhabitants animation cycles will trigger. The inhabitants will cheer, walk or idle in an unenthusiastic manner as well as, when clicked, speaking in a way that fit the mood. If the happiness level is at 6-11, the music will turn mood neutral, as will the inhabitant animations and sounds. Respectively, when the bar is at 12-15, the music and inhabitant animations turn enthusiastic to communicate the new game state.

Figure 3 Space Team: Pocket Planets work in progress gameplay screenshots.

Figure 3 shows two images of some aspects of the gameplay in Space Team: Pocket Planets. Note that in these screenshots the user interface does not represent the final design. The left image show the newest version of the user interface, even if the 'out of' information of the population, house and food icons is not implemented. The image shows how there is currently one (out of 20) inhabitants living on the planet and that the house number does not match that amount, turning the icon red to indicate that the player has to place or refresh a house. The planet has 100 stardust/game currency collected and has yet to decorate the planet with items bought from the shop. The current food collected can be seen by the number displayed beside the apple icon. The image also shows that the planet and its inhabitants have a happiness level of 12-15, which is visually displayed and communicated to the player as a happy smiley face. The sun icon ability is also activated, communicated to the player by the sunrays coming from behind the planet and how the sun mechanic cause the sun bar is rise. The player can make a distinction between the interactive parts of the user interface and the non-interactive ones by the way the interactive icons have an incorporated box. The right image shows that the player has two other planets in their star system, since some of the items placed are rewards for gaining a pirate and a tropical core. The image also shows the rain mechanic is in use, as the player has placed the rain cloud above the farm. This will decrease the sun bar (see left image, Figure 3) as it speeds up the growth mechanic.

4.3.3 Game Rewards and Objective

As previously mentioned, the main game objective is to keep the planet and its inhabitants happy in order to get rewarded, while the sub-goals would be to increase the happiness level by using the core game mechanics. Lopez (2006) mentions practical and decorative rewards as a way of creating game progression for the player. Decorative rewards are purely visual changes that are connected to the game narrative (Lopez, 2006), and it's the type of rewards that Space Team: Pocket Planets uses since it fits the game genre of digital or virtual pets and because our target audience are children six to eleven. Another reason was the limitations in resources, which affected the game scope, making us unable to add more game mechanics for the first iteration.

The player can gain in-game currency, Stardust, by keeping the planet and its inhabitants happy. The higher the happiness level, the more stardust is being produced by the planet. Another way of earning stardust is to destroy asteroids or put out fires that now and then will erupt surrounding or on the planet, and just like the planet's own production of stardust, the higher the happiness level, the more stardust the player gain from a destroyed asteroid or from putting out a fire. The fire event will in a timed interval set a house on the planet on fire, making the player use the rain cloud to put it out. A house that has been raged by fire has to be refreshed, therefore the fire event has direct impact on the housing mechanic and thus overall happiness. The currency can then be used when visiting the game shop where the player can buy special items that they can use to decorate the planet's surface. The items bought can be directly placed on the planet or stored in the player inventory, which is a feature incorporated in the store where they also can sell items they no longer want. The player can also move around the already placed objects, changing the look on their planet. The player keep track on the collected amount of stardust by displaying the numbers on the main game screen and shop screen. The items that can be bought with stardust have no practical impact on to the game, but if a player has many different themed items in the shop that they can buy, it means that they have taken good care of their planet, since keeping the happiness level full will result in more inhabitants moving in.

When the player reaches 20 inhabitants, the planet has matured and will spawn a new planet core. Each new planet comes with a new themed item set that the player can then buy in the store with stardust. Since each planet has a cap on how much stardust they can store, the more planets the player earn the more stardust they can store, meaning they can buy more expensive items than the players with only one planet. Game progression-wise, this also increases the difficulty level, since there are more game moves, even if they are the same, to execute to be able to keep both planets happy. Keeping the gameplay the same for all of the player's planets, means that we inform the player of how the reward system works, which Lopez (2006) sees as very important, by letting similar actions generate the same results. Chan et al. (2011) means that using rewards systems as a way of feedback on player progression will motivates the player to learn the game moves that generates that feedback.

The player collects and keeps their planets in their own star system, tying the game narrative of expanding the Marmor galaxy to the game objective.

4.4 Case Summary

EUCROMA is an international training program in cross/ trans media where the students in teams produce a film and game deriving from the same storyworld. The students participating in the program are divided into a conceptual team, consisting of the editorial team, and design team that design and visualize the storyworld, and a production team that create the planned and designed content. The EUCROMA program is structured with four phases that start with the *prologue* where the design team and production team attends lectures and workshops in preparation for the upcoming collaboration. The next phase is the design phase and first iteration of the cross/trans media projects as the production team takes on the storyworld designs. Iteration two or the *production phase* is used to make changes on created content or add new features to the projects. The last phase is dedicated to the *presentation and evaluation* of the projects (EUCROMA 2014).

The Space Team cross/trans media project was from a conceptual team standpoint a collaboration effort where the editorial team developed the storyworld and the background material, like the storyworld bible, that the design team then used to design the content of for the film and game. It is a universe with its own rules and logic from which different stories and experiences can be derived. The Space Team's storyworld is targeted towards children age six to eleven and is about the human boy Alex and the alien princess Ali and their adventure together in the Marmor galaxy, ruled by Ali's parents, to stop her evil aunt Malum from seizing the throne by debunking her plans (Topalian, 2014). The game does not focus on the main characters of the storyworld, but takes a slightly different approach by focusing on the Marmor galaxy and its weird and wondrous planets instead. The player takes on the role of a councilor of the Council of Creation, the makers of Marmor, whose primary objective is to expand the galaxy by creating new star systems.

The resulting game is a time dependent virtual or digital pet: a planet and its inhabitants that the player has to take care of in order to keep them happy. There are three main game mechanics that the player has to manage, each affecting the happiness level a third each. These are the sun, housing and food mechanic. The happier the planet and the inhabitants are the larger amount of stardust, the game currency, is being produced that the player can use to buy decorative items to place on their planet. The happiness level also affects the number of inhabitants that live on the player's planet. Once the planet has 20 inhabitants, the planet has matured, and will spawn a planet core. Every planet start out as a planet core, which means that the player has gained yet another planet that will be added to their star system. More planets means that more stardust can be collected and stored, which in turn means that the player can buy the rarer, more expensive items from the shop. The player is mainly taught the gameplay by an optional game tutorial that the player can revisit whenever they want, but also through keeping player actions and feedback consistent throughout the game.

5 Analysis

In this chapter I present the analysis of the case, Space Team: Pocket Planets, whose design process is presented in previous chapter. I use Adams (2009) and Lopez (2006) design guides to identify the game and level design components that are fundamental in teaching the player to play the game. I also present a more in-depth analysis of how game progression and pacing correlates to Space Team: Pocket Planets. This is done by describing how I made the identification of the level design components and what game objective I derive from them. The objectives are then placed and categorized in a table constructed after Krathwohl's (2002) taxonomy revision and its guidelines of how the objectives are placed. The taxonomy is a way to explore the underlying pedagogical elements that in theory are responsible for teaching the player to play entertainment games, but specifically teaching the player to play Space Team: Pocket Planets. I will then discuss and compare the similarities and differences in my game component identification and mapping to de Freitas & van Staalduinen's (2011) identification and mapping to the Four-Dimensional Framework.

5.1 Identifying Game Components

In this section I present the identification of the level design components that is used when it comes to teaching players how to specifically play Space Team: Pocket Planets. The game components chosen are either implemented into the game prototype or exist conceptually in the design document, ready for implementation, but that was set aside because of scope and resource limitations. I take a look what Lopez (2006) and Adams (2009) say about game progression and pacing when it comes to teaching the player how to play the game and then present my arguments for the identification made, and what learning objectives that can be derived from them. Lopez (2006) presents five components, and by identifying how game progression and pacing has taken shape in the case, the components that is used to teach the player how to play Space Team: Pocket Planets can be revealed.

There are primary two strategies of creating progression through *game mechanics*: with them being instant or gradually introduced to the player (Lopez, 2006). In Space Team: Pocket Planets, the player is instantly introduced to most the game mechanics available in the form of game moves/player actions, all visible to the player. Using game actions are the player's way of interacting or affecting the often hidden game mechanics, triggered by player actions. Even if most of the game mechanics and player actions are available at once for the player to use, Lopez (2006) describes that some of them will not affect gameplay until they are needed. An example of this from the case is how the player can use the sun and rain mechanic whenever they want, but if the sun bar is full or there is no food in production or fire event triggered, the effects of these mechanics will not affect gameplay in any way. There are also examples of gradually introduced game mechanics. According to Chan et al. (2011) a gradual introduction is meant to introduce concepts to the player one at a time and to then, when mastered, be able to use the actions or mechanics in combinations with each other (Chan et al., 2011). This is also possible with the player having instant access to actions because of, like previously explained, the way certain events or parts of gameplay require only a few actions used at a time. An example of gradual introduction is the housing mechanic. The player can't place as many houses as they want on the planet, but has to match its number to the current population, meaning that since the population is gradually increasing and the player has to keep up with the growing demand of the population, and the amount of houses that needs to be placed on the planet will gradually increase as well. This is of course connected to what Lopez (2006) refers to as a “curved difficult progression” (Lopez, 2006, p. 5) which is about how the *difficulty* level should increase as the game progresses. This means that the player will learn to **‘identify the actions needed to play the game’**, and since the actions are tied to icons or items that the player is able to interact with, it will help the player to **‘distinguish between interactive and non-interactive icons’** where the non-interactive ones featured on the user interface still communicate information to the player. This helps the player to **‘classify the user interface icons by use’** and **‘identify what the icons on the user interface represent’** as the information is communicated to the player by graphics and numbers on the user interface. By doing this, the player will learn to **‘interpret game progression’**. They will learn as they play the game and according to Berg Marklund (2013) and Appelman et al. (2010), this learn-by-experimenting is one reason to why the player feels motivated to learn how to play the game.

A more obvious example of game progression through gradually introduced game mechanics is the game tutorial level which is its own ecosystem within the game where the player will learn to **‘follow tutorial instructions’**. Another instance where the player gets text-based instructions, present in the game tutorial as well as in the main gameplay state, is in the in-game shop where the item description of the houses tells the player that placing a house will keep the inhabitants happy. It will also result in the player learning how to **‘use actions’** and how to **‘recall how to use actions’** which also will happen as the player uses the instantly or gradually introduced actions available repeatedly. Every action taken is introduced sequentially, with instructions, in order for the player to master each individual game mechanic to then be told how they correlate with each other. This will teach the player to **‘identify how actions affect one another’**, like how the rain mechanic affect the sun mechanic, as well as the player will learn to **‘recognize how actions affect gameplay’** as they will directly see the feedback on screen while going through the tutorial steps or trying out the actions available. The player will be able to see the sun bar go down as they use the rain cloud to speed up the growth process of the food at the farm. This ability to see how the actions and mechanics work together includes, for example, teaching the player to **‘identify actions that affect happiness’**. The player doesn’t have to understand the hidden game mechanics to be able to understand the correlation because of the information displayed on the user interface and the feedback it gives**.** Once the player understands how their actions affect gameplay, they will be able to **‘respond to a game event by taking the appropriate action’**. This could range from filling up an icon bar to using the cloud to put out fires in the fire mechanic event. This way of teaching the player how to play the game and how the game mechanics work is what makes the game motivating (Chan et al., 2011). An example of the action and mechanic correlation is how the player will be introduced to the growth mechanic, as well as the sun mechanic individually, to then be introduced to the rain mechanic that affects both of the sun and growth mechanics, in addition to having a function in its own (by putting out fires in the fire event). The game tutorial level in itself goes from introducing basic concepts to the more complex, which creates the difficulty curve Lopez (2006) talks about, within the level.

The next game progression component Lopez (2006) addresses is the *experience duration* and how it should increase from level to level to indicate progression. Space Team: Pocket Planets doesn’t make use of levels in the traditionally sequential way, as described by Adams (2009), but there are still ways experience duration has been used in the game design. In a way the population growth mechanic is a level system, since it takes longer to reach the next level of population, which also, like the game mechanic progression, is tied into the difficult level, since the player has to keep the planet and its inhabitants happy for an increasingly longer amount of time in order for the population to grow from one to 20. A larger population also means a greater pressure on the player to provide them with houses and to refresh deteriorated ones, which has to do with *pacing*, the frequency of challenge that according to Adams (2009) should increase over time. The time duration also affect the three main game mechanics (see figure 2). The growth mechanic, for example, is connected to the planet's farm where the player can decide upon how many crops to grow and get information on how long time it will take to grow them. The housing, sun and food mechanic has bars or numbers that will deplete over time. Beyond that, the events has inbuilt triggers that are time dependent as well, which decides the pacing of the challenge the event presents. This will become apparent to the player as they either play the game tutorial or learn by experimenting as Berg Marklund (2013) means is what motivates the player to learn. In other words, the player will learn to '**identify how time affects gameplay**'.

Rewards come in the form of practical ones, which directly affects gameplay, like new game mechanics, or decorative ones that show player progression through environment changes that in turn show the narrative progression (Lopes, 2006). Both types of rewards are present in Space Team: Pocket Planets and they are both connected to the main gameplay and game objective. The condition for gaining rewards is to keep a high level of happiness and the rewards are designed to motivate the players to take care of their planet and its inhabitants. Since the decorative rewards are bought with in-game currency in the game shop, the stardust production mechanic is what the player wants to keep at an all-time high. The higher the happiness level is the more in-game currency is being produced, which means that rewards and main game objectives go hand in hand as the player is rewarded for taking care of the planet. The player will be able to **'design a uniquely looking planet'** where they have artistic freedom to use the item placement and removal mechanic to control the look of the planet. Practical rewards are connected to the population growth mechanic that says that the planet needs to keep a certain amount of happiness for a certain amount of time for a new inhabitant to move in. The reward of keeping the happiness level high and gaining the maximum of inhabitants is a planet core: a new planet that directly affects game progression by increased difficulty level, since they player now has two planets to take care of. This practical reward also comes with a decorative reward package as the new planet has a different theme, thus the shop provides the player with new decorative rewards they can place on their new and old planet. Also, the two planets combine their stardust cap, which means that they together can produce and store more stardust, meaning that more expensive items, otherwise unavailable for a player with only one planet, can be bought. This opens up new opportunities for the player to **'create a star system that match personal play-style'** as the player gain more stardust with the condition that they take care of both planets. The player can stop adding planets whenever they want and will still be able to access the new items in the shop even if they stop taking care of their new planet. This is one of the reasons the player will also be able to **'match play-style to personal strengths'**. Where the player can chose to take care of all planets at the same time, thus upping the difficult level, or play more casually. Another reason is how the player can use the rain mechanic to shorten the timer on the growth mechanic, but at the same time will reduce the sun mechanic bar. Lopez (2006) means that this continuous repetition, where the same action generates the same results is a way of communicating the reward system to the player. The player will therefore be able to **'interpret game progression',** looking at either the stardust collected or the information displayed by the user interface which in turn will teach the player to **'predict outcome of play-style'** by making the player **'check for consistency in the user interface feedback'** where they get direct feedback on an action taken. This could be happiness level changes or the use of colours for bad/sad, mediocre/neutral and good/ happy or game currency rewards, and thus they will learn to **'determine the success of action taken'**. According to Chan et al. (2011) this is a way of giving the player feedback on progression and a motivation for continued gameplay.

I recognise that consistency in the game design is important when conveying information as the player learns to play the game. A game designer can help the player understand how to execute game moves and how they correlate to each other by letting similar game moves generate the same feedback, just like Lopez (2006) means that the player needs to be informed about the reward system in order to be able to use their gained knowledge in new ways. In Space Team: Pocket Planets, the similar feedback and design to icons and their interaction helps the player to draw conclusions about the underlying game mechanics of the other game moves. This means that the game designer can instruct the player less than if every action available, and how it affects the game, is inconsistent. With this taken into consideration, it is clear that Adams (2009) and Lopez (2006) description of game progression and pacing is what structurally is what teaches the player to play Space Team: Pocket planets. This could have to do with how their work to an extent was used as a guideline when creating the case, but also that they are writing from experience as game designers in the game industry. Each identified component can be further broken down into sub-components and relate or many or few game-moves or actions available to the player, mechanics or ways of instruction, but they end up relating back to the same collective components. These 20 level design components already answer the question of what the player will learn from specific game content in Space Team: Pocket Planets in form of game objectives, which will ease the integration of placing them into Krathwohl's (2002) revised taxonomy.

5.2 The Mapping

In order to see what underlying pedagogy the previously identified game components and their derived objectives contain, I use Krathwohl's (2002) revised taxonomy. Unlike the Four-Dimensional Framework that de Freitas & van Staalduinen (2011) use in their mapping, Krathwohl's (2002) taxonomy revision has a lot more complexity by its sheer number of categories and sub-categories, as well as by its two dimensions: the cognitive process dimension and the knowledge dimension, that correlate with each other. This makes any attempt of mapping a quite precise process, which removes some of the subjective estimation from my part, since I have to adapt the categorizing to the instructions. It is yet again worth noting that it is the learning objective, not activity that is mapped, thus I present the categorization as if answering the question of what the player will learn.

Table 2 The resulting mapping of the identified level design components in Space Team: Pocket Planets that focuses on game progression and pacing.

The Knowledge Dimension	The Cognitive Process Dimension					
	1. Remember	**2. Understand**	**3. Apply**	**4. Analyse**	**5. Evaluate**	**6. Create**
A. Factual	Identify actions needed to play the game	Identify what the icons on the user interface represent	Follow tutorial instructions	Identify actions that affect happiness	Check for consistency in the user interface feedback	
B. Conceptual	Recognize how actions affect gameplay	Classify the user interface icons by use	Respond to a game event by taking the appropriate action	Identify how actions affect one another	Determine the sucess of action taken	
C. Procedural	Recall how to use actions	Distinguish between interactive and non-interactive icons	Use actions	Identify how time affect gameplay		Design a uniquely looking planet
D. Metacognitive		Interpret game progression	Match play-style to personal strengths	Predict outcome of play-syle	Interpret game progression	Create a star system that match personal play-style

Table 2 shows how the case Space Team: Pocket Planets, according to Krathwohl's (2002) revised taxonomy, uses the simple and concrete types of learning objectives to a greater extent than the more complex ones like evaluate and create in the cognitive process dimension, and more concrete than the abstract ones, like metacognitive knowledge in the knowledge dimension. The reason for this could be that the game genre of virtual pets to a great extent is designed to be repetitive and mundane in order to make them casual. It's the type of game that is meant to be a pastime activity. This entertainment game doesn't need the player to be able to evaluate their gaming experience in the same way as educational games in an educational setting does, where transferability of knowledge gain is important. The purpose of the objectives is to teach the player to play the game, not learning a skill that can be transferred into 'real life'. The game still provide the player with feedback that the player can use to change their approach to playing the game, just as described in the identification. The metacognitive knowledge is the category that the player will be in contact with during gameplay when the player adapts their play-style after their own pace, but the knowledge about knowledge is not a requirement to play the game well.

5.2.1 The Mapping Process

I will now to a greater extent explain the mapping process as to why the different game components and their respective objectives ended up in the categories they're placed by giving examples from the taxonomy. Each of the elements presented in the knowledge dimension as well as the cognitive process dimension are categories with sub-categories that more precisely explain what type of learning objectives that is included in said category. Any learning objective that is placed in the taxonomy table has to fit both of the categories. Together they inform about the expected knowledge the student, or in this case player, is expected to learn, specified by the knowledge dimension and what will be done, specified by the cognitive process dimension. Table 3 is a breakdown of the mapping process and explains how the objectives where fitted to the categories by looking at the element descriptions that Krathwohl's (2002) revised taxonomy uses as placement guide. It's worth noting that the objectives at the least match the general description of the categories and in most cases they also fit one sub-category or more. Table 3 gives a more precise look at the mapping process:

Table 3 Mapping process breakdown.

Objective	The Knowledge Dimension	The Cognitive Process Dimension
A1. Identify actions needed to play the game	**A. Factual** - The basic elements that students must know to be acquaintedw ith a discipline or solve problems in it. **Ab.** Knowledge of specific details and elements	**1. Remember** - Retrieving relevant knowledge from long-term memory. **1.1** Recognizing & **1.2** Recalling
B1. Regonize how actions affect gameplay	**B. Conceptual** - The interrelationships among the basic elements within a larger structure that enable them to function together. **Bc.** Knowledge of theories, models, and structures	**1. Remember** - Retrieving relevant knowledge from long-term memory. **1.1** Recognizing
C1. Recall how to use actions	**C. Procedural** - How to do something; methods of inquiry, and criteria for usings kills, algorithms, technique, and methods. **Ca.** Knowledge of subject-specific skills and algorithms	**1. Remember** - Retrieving relevant knowledge from long-term memory. **1.2** Recalling
A2. Identify what the icons on the user interface represent	**A. Factual** - The basic elements that students must know to be acquaintedw ith a discipline or solve problems in it. **Ab.** Knowledge of specific details and elements	**2. Understand** - Determining the meaning of instructional messages, including oral, written, and graphic communication. **2.1** Interpreting
B2. Classify the user interface icons by use	**B. Conceptual** - The interrelationships among the basic elements within a larger structure that enable them to function together. **Ba.** Knowledge about classification and categories	**2. Understand** - Determining the meaning of instructional messages, including oral, written, and graphic communication. **2.3** Classifying & **2.6** Comparing
C2. Distinguish between interactive and non-interactive icons	**C. Procedural** - How to do something; methods of inquiry, and criteria for usings kills, algorithms, technique, and methods. **Cc.** Knowledge of criteria for determining when to use appropriate procedure	**2. Understand** - Determining the meaning of instructional messages, including oral, written, and graphic communication. **2.3** Classifying & **2.6** Comparing
D2. Interpret game progression	**D. Metacognitive** - Knowledge of cognition in general as well as awareness and knowledge of one's own cognition. **Db.** Knowledge about cognitive tasks, including appropriate contextual and conditional knowledge	**2. Understand** - Determining the meaning of instructional messages, including oral, written, and graphic communication. **2.1** Interpreting & **2.4** Summarizing
A3. Follow tutorial instructions	**A. Factual** - The basic elements that students must know to be acquainted with a discipline or solve problems in it. **Ab.** Knowledge of specific details and elements	**3. Apply** - Carrying out or using a procedure in a given situation. **3.1** Executing
B3. Respond to a game event by taking the appropriate action	**B. Conceptual** - The interrelationships among the basic elements within a larger structure that enable them to function together. **Ba.** Knowledge about classification and categories	**3. Apply** - Carrying out or using a procedure in a given situation. **3.1** Executing
C3. Use actions	**C. Procedural** - How to do something; methods of inquiry, and criteria for usings kills, algorithms, technique, and methods. **Ca.** Subject-specific skills and algorithms	**3. Apply** - Carrying out or using a procedure in a given situation. **3.1** Executing
D3. Match play-stule to personal strengths	**D. Metacognitive** - Knowledge of cognition in general as well as awareness and knowledge of one's own cognition. **Da.** Strategic knowledge & **Dc.** Self-knowledge	**3. Apply** - Carrying out or using a procedure in a given situation. **3.2** Implementing
A4. Identify actions that affect happiness	**A. Factual** - The basic elements that students must know to be acquainted with a discipline or solve problems in it. **Ab.** Knowledge of specific details and elements	**4. Analyse** - Breaking material into its constituent parts and detecting how the parts relate to one another and to an overall structure or purpose. **4.1** Differentiatiating
B4. Identify how actions affect one another	**B. Conceptual** - The interrelationships among the basic elements within a larger structure that enable them to function together. **Bc.** Knowledge of theories, models, and structures	**4. Analyse** - Breaking material into its constituent parts and detecting how the parts relate to one another and to an overall structure or purpose **4.2** Organizing
C4. Identify how time affect gameplay	**C. Procedural** - How to do something; methods of inquiry, and criteria for usings kills, algorithms, technique, and methods. **Cc.** Knowledge of criteria for determining when to use appropriate procedures	**4. Analyse** - Breaking material into its constituent parts and detecting how the parts relate to one another and to an overall structure or purpose **4.1** Differentiatiating
D4. Predict outcome of play-style	**D. Metacognitive** - Knowledge of cognition in general as well as awareness and knowledge of one's own cognition. **Da.** Strategic knowledge & **Db.** Knowledge about cognitive tasks, including appropriate contextual and conditional knowledge	**4. Analyse** - Breaking material into its constituent parts and detecting how the parts relate to one another and to an overall structure or purpose.
A5. Check for consistency in the uder interface feedback	**A. Factual** - The basic elements that students must know to be acquainted with a discipline or solve problems in it. **Ab.** Knowledge of specific details and elements	**5. Evaluate** - Making judgements based on criteria and standards. **5.1** Checking
B5. Determine the sucess of action taken	**B. Conceptual** - The interrelationships among the basic elements within a larger structure that enable them to function together.	**5. Evaluate** - Making judgements based on criteria and standards. **5.1** Checking
D5. Interpret game progression	**D. Metagognitive** - Db. Knowledge about cognitive tasks, including appropriate contextual and conditional knowledge	**5. Evaluate** - Making judgements based on criteria and standards.

C6. Design a uniquely looking planet	**C. Procedural** - How to do something; methods of inquiry, and criteria for usings kills, algorithms, technique, and methods. **Ca.** Subject-specific skills and algorithms	**6. Create** - Putting elements together to form a novel, coherent whole or make an original product. **6.1** Generating
D6. Create a star system that match personal play-style	**D. Metacognitive** - Knowledge of cognition in general as well as awareness and knowledge of one's own cognition. **Da.** Strategic knowledge & **Db.** Knowledge about cognitive tasks, including appropriate contextual and conditional knowledge	**6. Create** - Putting elements together to form a novel, coherent whole or make an original product. **6.2** Planning

A few of the mapped objectives are entirely based on the main category descriptions (see table 3). The first example is *'B5. Determine the success of action taken'* which only has *'B. Conceptual Knowledge'* as its major category and a description to explain the expected knowledge gain. The category is explained as: "*The interrelationships among the basic elements within a larger structure that enable them to function together"* (Krathwohl, 2002, p. 214). In the cognitive process dimension, which talks about what will be done, the objective is both matched to the general category description of *"5. Evaluate – Making judgements based on criteria"* (Krathwohl, 2002, p. 215), as well as the sub-category: *'5.1 Checking'*. The objective action the player has to take in order to reach the objective would be to make the judgement if an action was a success by checking if the action affects the right corresponding mechanics, shown by the feedback on the user interface that conveys that information. This fit the description of the *'B. Conceptual Knowledge'* category.

Another example of the same situation where an objective fit the general description of a category, but not necessary a sub-category for both dimensions is: *'D4 Predict outcome of play-style'* that is matched to the general category description of "D. Metacognitive Knowledge – Knowledge of cognitive in general as well as awareness and knowledge of one's own cognition" (Krathwohl, 2002, p. 214), as well as the sub-category *'Da. Strategic Knowledge'* as well *as 'Db. Knowledge about cognitive tasks, including appropriate contextual and conditional knowledge'* to explain the expected knowledge gain. The cognitive process dimension on the other hand only has the "4. Analyse – Breaking material into its constituent parts and detecting how the parts relate to one another and to an overall structure or purpose" (Krathwohl, 2002, p. 215) which is the main category description to explain what will be done. The objective action that the player has to take in order to reach the objective would be to know the gameplay well enough to know how the game mechanics or visible actions relate to one another when executing game actions, knowing the context and conditions, so that they have developed their own way of playing within the small freedom of adaptation the game provides.

Lastly, there is one situation in the mapped taxonomy where two of the objectives are the same, but fit into two different major categories in the taxonomy (see table 2). The objective is *'D2. Interpret game progression'* that also appears in the *'D5'* cell. First we take a look at the knowledge dimension category that these two objectives have in common: *'D. Metacognitive Knowledge'* and they share sub-category: *'Db. Knowledge about cognitive tasks, including appropriate contextual and conditional knowledge'* to explain the expected knowledge gain. The real reason for their difference is in the cognitive process dimension. The *'D2'* objective is mapped to: "2. Understand – Determining the meaning of instructional messages, including oral, written and graphic communication" (Krathwohl, 2002, p. 215) as well as the sub-category of *'2.1 Interpreting'* and *'2.4 Summarizing'* that explains what will be done. *'D5'*, on the other hand, is mapped to the main category description of *'5. Evaluate'*. The objective action of *'D2'* that the player has to take in order to reach the objective would be to looking at the instructional feedback in form of the user interface and interpret what the bars and numbers say about their progression for individual components or as a whole.

The user interface is part of the reward system that tells the player how well they are doing, and that interpretation is a condition to understand progression in its context. You could say that the objective has to do with being able to read the graphical feedback. For the 'D5' objective, the action would be to understand how well they are doing by judging their progression based on the knowledge of that the condition is a high happiness level. It is a focus on the whole progression, but with knowledge of what part the condition of individual components plays.

5.2.2 Identification and Mapping Comparison

De Freitas & van Staalduinen (2011) present 25 elements, identified by a literature review, that were chosen for their research because they might "support educational design" (de Freitas & van Staalduinen, 2011, p. 41) with a focus on multiplayer games. The identification of the elements is presented in a table containing the game element together with a description of the connection to learning. The elements are connected to educational games for an educational setting, and they are broad and general by including components that range from the game's theme, in order to explain the context of the game, to the problem-learner-link, which is about the relationship between the game and player and how they relate to each other (de Freitas & van Staalduinen, 2011). This means that most of them in theory could be found in both entertainment games as well as educational games. They are also broad in the sense that they present components like 'progression' which in my research is broken down into several components. This means that my identification is more specialized and less inclusive compared to de Freitas & van Staalduinen's (2011) research. Also it is directly tied to the case and is not derived from a larger number of sources that gives them the ability to generalize their findings, which I can't do because of the nature of single case studies being very context restricted. I present my identification in a similar way where I explain what I base the identification on and how I explain the correlation of the level design components with the game actions that support them. The correlation is however imbedded in the text rather than displayed as more precise list over components and its description. I motivate my identification by referring back to what Adams (2009) and Lopez (2006) has to say about what teaches the player to play the game according to the game and level design used in entertainment games, with a focus on game progression and pacing, which delves deeper into the more general approach that de Freitas & van Staalduinen (2011) has. I also base it on what previous research has to say about motivation and what is important when it comes to learning in educational as well as entertainment games. In my research, the components are specific to the case which results in them being less general and inclusive in its description, but I will generalize similar components into game objectives in order to ease the mapping process. De Freitas & van Staalduinen's (2011) identification serve an inspiration for my own research, as well as it is interesting to compare the results of my own identification and mapping with theirs. Even if the focus of the objectives in my research is different, there is still value in looking into similar research to find the underlying pedagogical elements present in game design.

When it comes to the mapping, de Freitas & van Staalduinen (2011) use different means to evaluate the elements they found relevant of supporting educational design. While they also placed their identified elements in an evaluation model, they were not presented as objectives, but kept their function as elements that they identified important to take into consideration when creating educational games. They use the Four-Dimensional Framework to evaluate the identified game elements. The first dimension is *context*, which includes where the learning takes place as well as how factors like access to equipment looks like (de Freitas & Oliver, 2006). An example of a game element that is mapped to this dimension is 'rules' that inform the player of the game limitations and possibilities (de Fraitas & van Staalduinen, 2011). The second dimension is *learner specifics* that include aspects like learning styles, learning preferences and age of the learner (de Freitas & Oliver, 2006). Game elements such as 'challenge' are mapped to this dimension, where obstacles are put in the way of the goals and how the difficult level changes as the learner progresses (de Freitas & van Staalduinen, 2011). The third dimension is *representation* that includes aspects such as interactivity and immersion (de Freitas & Oliver, 2006). Game elements mapped to that dimension is, for example, 'control' which is about manipulating the game by making decisions (de Freitas & van Staalduinen, 2011). The fourth and last dimension is *pedagogy*, focusing on methods and such that support learning practice (de Freitas & Oliver, 2006). A game element that has been mapped to this dimension is 'debriefing/evaluation' which is about being able to reflect on the outcomes of the actions taken and gameplay results (de Freitas & van Staalduinen, 2011).

5.3 Analysis Summary

Game progression and pacing are two of the level design elements that teach the player how to play games. The level design components in the case were game design either implemented in the game or fully designed in a design document. They were identified using the design guidelines of how to use game progression and pacing in entertainment game as described by Adams (2009) and Lopez (2006).

Space Team: Pocket Planets use all of the game progression concepts in order to convey information of different kind to the player, like how to use an action or how certain game mechanics affect gameplay, but it still uses some of them more than others. It can be argued that the gameplay can be taught to the player by only using the game tutorial, but there are other ways that the game has been designed to ease the learning and shorten the time it takes to teach the player to play the game. The game relies on the player to experiment with the actions available to them to see how they affect gameplay and how the user interface responds to the input. This has to do with feedback of the numbers, bars and colours on the user interface that informs the player of game progression. Rewards also has a big part in giving the player a sense of progression though the game world, and is a way of showing that their input, through actions, affects gameplay and generates rewards, which will motivate the player to play. The same actions always change the game mechanics in the same way, making the player familiar with the actions and rewards and give them a chance to plan their gameplay and understand how the actions correlates to each other. Chan et al. (2011) mean that the reward system is a way of giving feedback on the player's accomplishments. Lopez (2006) means that the same actions should generate the same feedback and rewards to inform the player of this reward cycle.

The identification resulted in 20 level design objectives, based on descriptions of level design components and examples on how they are used in the case. These objectives where then mapped against Krathwohl's (2002) revised taxonomy, meaning the objectives were placed in the taxonomy based on how the category descriptions fitted the objectives and the underlying level design components that they are derived from. The precise process is displayed in table 3, where information of what categories the objectives where mapped to as well as sub-categories. The comparison to previously conducted research by de Freitas & van

Staalduinen (2011) shows that many of the elements they found relevant when it comes to supporting educational design is what Adams (2009) and Lopez (2006) refers to as game progression and pacing. My research can also be seen as complementary to their own since it specialise on one of their identified game design component, game progression, that I break down further into more precise components.

6 Conclusions

In this chapter I go through what has been learned from the research conducted by summarising the knowledge gain and the results and providing answers to the research aim. I also present an overview of the similarities and differences in the identification and mapping I conducted to that of de Freitas & van Staalduinen (2011). I end the chapter with looking at what the next step for continued research might be, based on what previous research say about entertainment games and motivation. Also how additional research could further validate the use of the level design in entertainment games as a means of teaching the player to play games

6.1 Summary

My **research aim** was to identify the underlying pedagogical elements of the level design components game progression and pacing in my case study by mapping them to Krathwohl's (2002) revision of Bloom's (1956) taxonomy.

Table 4 An overview of what level design component and game objectives that corresponds to specific pedagogical elements and categories in the resulting mapping.

Level Design Component(s)	Game objective(s)	Pedagogical Element: The Knowledge Dimension	Pedagogical Element: The Cognitive Process Dimension
Game mechanics & diffuculty	A1, A2, A3, A4, B1, B2, B3, B4, C1, C2, C3 & D2	A. Factual (4/5), B. Conceptual (4/5), C. Procedural (3/5) & D. Metacognitive (1/5)	1. Remember (3/3), 2. Understand (all) 3. Apply (3/4) 4. Analyse (1/4)
Experience duration & pacing	C4	C. Procedural (1/5)	4. Analyse (1/4)
Rewards	A5, B5, C6, D6, D3, D5 & D4	A. Factual (1/5), B. Conceptual (1/5), C. Procedural (1/5) & D. Metacognitive (4/5)	3. Apply (1/4) 4. Analyse (1/4) 5. Evaluate (all) 6. Create (all)

Table 4 shows how the level design components game progression and pacing relates to pedagogical elements presented in Krathwohl's (2002) revised taxonomy. *Game mechanics*, including instant and gradual access to game actions and mechanics as well as the game tutorial, corresponds mostly to the simple categories in the cognitive process dimension and to a greater extent to the more concrete categories in the knowledge dimension with one exception to the inclusion of a metacognitive game objective (D2). This has to do with that the game mechanics and how they and player actions work and are used is a requirement to understand their relationship. The identification ended up with there being only one game objective that directly corresponds to the game progression component *experience duration* as well as *pacing*, but these components, similar to *difficulty*, still works together with other game progression components, thus are hard to separate. Finally *reward*, corresponds to a greater extent to the more complex categories in the cognitive process dimension and to the majority the abstract category of the metacognitive category in the knowledge dimension. This has to do with that the reward system is a way of communicating the player's progression and a way of assessing it. This is only possible if the player know the building blocks of the game beforehand, such as understanding the user interface or knowing what the player actions are and how to use them, such as the objectives connected to game mechanics.

The results (see table 2, 3 and 4) show that it is possible to map the objectives derived from the level design components, in turn identified by the descriptions of game progression from Lopez (2006) and pacing from Adams (2009), to Krathwohl's (2002) revise taxonomy. Once the identification was turned into game objectives of what the player will learn while playing the game, and matched to the categories in the taxonomy, it was easier to see what underlying pedagogical elements that are present in the level design in Space Team: Pocket Planets. Also that the level design in the game uses factual, conceptual, procedural and to a lesser extent metacognitive knowledge to teach the player the concepts needed to play the game. As well as that the game will teach the player these concepts by a design that includes that the player remembers, understand, can apply, analyse, evaluate the game and to some extent create own material based on the knowledge gained. The use of level design, particularly game progression and pacing was motivated by previous research whose explanations as to why entertainment games are motivational reflect the way Adams (2009) and Lopez (2006) explain how these game components are meant to function within a game.

6.2 Discussion

The main knowledge contribution that my research provides goes back to what both Appelman et al. (2010) and de Freitas & van Staalduinen (2011) point out as a problem when it comes to game design. That is, that there is a gap in knowledge in ways of communicating between educational and entertainment game designers on how learning methods and ways of engaging and motivating the player are effectively applied to games. Also how game components are connected to learning and learning outcomes. According to Bellotti et al. (2011) there is a need for a common language that includes both fields in order to bring the two communities together and for integrating the knowledge. Hendrix et al. (2013) means that this combination is hard to combine, but still advocates it. Squire (2011) suggest that researchers focus on identifying "the aspects of games that makes them good learning environments" (Squire, 2011, p. xiii).

My research helps closing the knowledge gap between learning and game design by combining tools from both of these worlds. This was done using level design components used in entertainment games and then evaluating them as if they were educational objectives. This gives the game designers and educators the sought out common language and understanding needed to draw conclusions about the expected learning outcome of a game and it's components, while still keeping the engaging and motivating effect that entertainment games has. This also means that another knowledge contribution my research provides is the method of identifying game components after common game design guidelines and then map to a known educational and pedagogical evaluation tool.

6.2.1 Identifying and Mapping

The biggest difference in de Freitas & van Staalduinen's (2011) mapping compared to mine is how their identified elements are less specialized and broader, and the resulting mapping follows the same trend. They are still not presented as game objectives, but rather stay as elements they have found relevant when it comes to educational game design. The Four-

Dimensional Framework has some similarities in how the different dimensions handle different parts of the pedagogy, but they do not create a taxonomy where the dimensions relate to each other. The Four-Dimensional Framework also doesn't make a direct difference in the simple and concrete to complex and abstract hierarchy. These factors can still be mapped to the relevant dimensions, but will have to be explained within the element when they are placed in the dimension, rather than being directly placed in a hierarchical structure to begin with. Otherwise many of the elements they found relevant is very similar to the components in level design Adams (2009) and Lopez (2006) describe. If anything, de Freitas & Staalduinen's (2011) similar research approach and subject legitimize my research aim, and my research can in some ways be seen as a continuation, showing that it is a field of research that is worth looking into in order to better understand what role game design components in general, especially entertainment games, can play when it comes teaching the player how to play a game and how game elements correspond to learning outcomes.

Table 5 An overview of the similarities and differences found between my research and de Freitas & van Staalduinen's (2011) identification and mapping process and results.

	de Freitas & van Staalduinen's research	My research
Goal	"Exploring the relationship between individual game elements and expected learning outcomes" (de Freitas & van Staalduinen, 2011, p. 31)	Exploring the underlying pedagogical elements of level design components in Space Team: Pocket Planets
Identification	Identification of 25 game elements based on a literature review	Identification of 20 level design components with focus on game progression and pacing
	Elements chosen based on how they support educational design and contribute to learning and positively affect memory	Components chosen based on how they support teaching the player how to play entertainment games
	Identified elements range from game theme to problem-learner-link	Identified components specialize on game components present in game progression and pacing
	Elements are listed in a table together with an explanation of why they were picked out and/or motivated with a reference from the literature review	The components are imbedded into the analysis and explained with case scenarios and game design references, summarized into game objectives reflecting what the player will learn
Mapping	The identified elements are mapped to the Four-dimensional framework. An educational game evaluation and design tool	The identified objectives are mapped to Krathwohl's (2002) revised taxonomy. An evaluation tool of educational goals and objectives
	The components are placed were their function matched the dimension categories and descriptions	The objectives are placed in the grid that the two dimensions make up, based on how well the components and the derived game objective fit the main category and sub-category descriptions.

The goals presented in table 4 are the desired outcome of the identification and mapping process and in my case, also the research goal. De Freitas & van Staalduinen's (2011) goal is only part of their research's main goal, which is to use the knowledge gained to create a framework that can be used to create better educational games or evaluate existing ones.

I came to realize that I in some cases found it easier to first identify the learning objectives in the game according to the instructions and model of Krathwohl's (2002) revised taxonomy then to identify what level design components that is necessary for that learning to happen. It felt more natural to directly come to the conclusion that the player will learn to, for example, predict that the fire event will happen and then look at what level design components that contributes to that knowledge gain. This is because since the game design document had been written as well as the game tutorial, the game director and I knew what game mechanics the player had to learn to use in order to reach goals and sub-goals. This doesn't change the fact that Krathwohl's (2002) revised taxonomy on its own doesn't help me reach the research aim, which focus on the game components identification, where the taxonomy is a tool to better understand the learning inherent in level design in entertainment games. The identification was for most of the time made before the mapping took place, but it was rather helpful to think in reverse or from yet another angle for some of the more complex components.

6.2.2 Validity and Reliability in Retrospect

My research aim gives the expectation that I managed to identify all of the underlying pedagogical elements of the level design components game progression and pacing in Space Team: Pocket Planets. While that was my aim, it is difficult to say if that was the case. In response to this, I tried keeping the research process transparent. According to Flyvbjerg (2004) a detailed description of the case study and the research process, allows the reader to draw their own conclusions from the research (Flyvbjerg, 2004). This very important since the research to an extent rely on my subjectivity, that might have affected the process, interpretation and the results.

On the notion of research validity, I refer back to what Flyvbjerg (2004) said about that the case needs to be carefully chosen and relevant for what is being studied. The question is: was Space Team: Pocket Planets a case study most fitted for the research? I was a level designer and part of developing the case where my position in theory meant that I could design challenges after the guidelines presented by Adams (2009) and Lopez (2006) as well as a case that is an entertainment game. However, while I could influence the game by coming with suggestions and ideas, it was a collaborative effort and I had little control of the final design decision since my place in the project's hierarchy put me in a position where I couldn't make any final design decisions. Firstly, the game design we ended up making did not use traditional levels, which is a big part of how the level designer can build progression according to Adams (2009) and Lopez (2006). The game was still designed using game progression and pacing, as described in previous chapters, which meant that I still could use the intended methods and was still able to identify components and execute the mapping. It is also important to remember the fact that our intended target group was children, which also was a deciding factor on what type of game we decided to produce. Secondly, the scope of the case was very restricted due to the few programmers and other specialist we had to work with that could execute our game design. This was partly due to us having to share specialists with other conceptual teams, but also sharing them between the two derived media, the film and movie, from the Space Team storyworld itself. That meant that we had to restrict the content going into production. This, however, did not stop us from designing a game that went beyond the implemented content. One of these major features that had a big role in the identification and mapping process, but was not prioritized, was the game tutorial, but it is still fully designed and ready for implementation. With this in mind, I think that our game, despite these issues, was suited the research I conducted, but it is hard to say what the result would have been if the case was a game that uses traditional levels. Keeping in mind that the same level design used would have been used in a similar, but extended way, in a level-based game as well. Even if there were many factors that me and my co-worker could not control, I still think we made good with the direction we took and the resources we had to work with.

6.3 Future Work

I look at my case study as a first step in gaining knowledge on the subject of what it is that teaches the player to play entertainment games, and about how learning games can be designed to keep the motivation that entertainment games have by using the components that are inherently instructive. The knowledge gained from my research cannot be generalized in the same way as quantitative studies can, thus the results cannot be said to reflect what the results would be if the process were to be used to identify pedagogical elements in other entertainment games. This is because of the qualitative method that the use of a single case study is. However, according to Gobo (2004) it is possible that another type of generalization, transferability, can be applied to single case studies. The generalization that occurs is about structures that could be traced in other cases (Gobo, 2004). This has to an extent already been proven true due to the similarities to the identification and mapping conducted by de Freitas & van Staalduinen (2011). The objectives stay relevant to the specific case, but the level design that I base the components found in Space Team: Pocket Planets come from industry sources, likewise researchers like Chan et al. (2011) mentions similar game elements important when it comes to designing educational games. This means that other cases can be evaluated on the same conditions and while the resulting objectives might differ, the design would still be based on the same criteria. My research result would suggest that it is possible to find similar results in entertainment games that use level design in a similar way to how it is used in Space Team: Pocket Planets. Conducting an more in-depth single case study or looking at a couple of case studies, and then evaluate what underlying pedagogical elements there are by using the same methods used in my case study, would show if that transferability is possible.

Another way of taking the research further would be to use the knowledge of what underlying pedagogical elements there are in entertainment game's level design in designing educational games. According to Appelman et al. (2010) the way of keeping the engaging effect that entertainment games has is to integrate educational objectives with the entertainment game objectives. Chan et al. (2011) think much in the same lines of how educational objectives needs to be integrated with game mechanics for this to be a success and argues that the game development of games with learning purposes should emulate that of entertainment games. The problem as Appelman et al. (2011) describe is that there is little information of how different methods of learning is best applied to games that hinder both types of developers to utilize the games full potentials of making better educational games as well as entertainment games. By doing a bigger study and mapping of the inherent pedagogical elements in entertainment game design as a whole, not only specific to level design, the knowledge could be used as guidelines as to what aspects of entertainment games that is useful when it comes to motivate and engage the player as well as being inherently instructional. Those identified components would make a good foundation for the integration of educational objectives as it would utilize the engaging and motivating gameplay researchers endorse.

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