

MA Games Design

Gamification in Higher Education

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Abstract

Gamification in Higher Education

The study indicates that games can offer the kinds of learning experiences and social practices that are seen as being important in the 21st Century. Recent brain-based research suggests a similarity between effective methods of engaging and activating intrinsic motivation developed by game designers, and principles being discovered on human learning. Gamification – the use of game design elements in non-game contexts to engage and motivate students - is one approach to integrating the lessons from games into designing higher education learning environments for the 21st century. It has a number of demonstrable advantages to offer, such as: a more meaningful connection to the expectations of contemporary students; an improvement in the quality of learning; a contribution to the ambitions of 21st century universities to be engines of growth and innovation; and the creation of new opportunities for educators themselves to reimagine existing practices whilst building on existing knowledge and abilities.

The conclusion is that gamification can offer significant benefits for designing higher education learning environments for the 21st century, if these are designed knowledgably and meaningfully, with an understanding of the context, goals, and motivational aspects of learning as well as a fundamental understanding of the application of the underlying game elements. Gamification in education is at the beginning of a process of widespread development and ongoing research and practice will be needed. Some contributions have been made in this study towards this end, in the form of guidelines and design documentation, to help guide the design process, both springboards for further inquiry and development.

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1. Introduction

Game designer Raph Kostner states in his book *A Theory of Fun* that games are fundamental and powerful learning tools (Kostner, 2004). He is not alone in thinking that games have much to offer to the fields of learning and education. Katie Salen, also a game designer, is of the opinion that, "There are the similarities between a good game designer and a good teacher. Each thinks deeply about ways of igniting inquiry and curiosity. Each is a master of motivation by creating challenges (momentarily) just out of reach" (Salen, 2011b, para.1). James Paul Gee, game theorist, makes the argument that games are fun because they trigger deep learning that is part and parcel of that fun (Gee, 2009).

Since the arrival of video games only a number of decades ago, the visual and intellectual language of gaming is quickly becoming an integral part of global culture, across all media (Chatfield, 2011). Games are played extensively by steadily increasing numbers of people throughout the world. Statistics from the National Gamers Survey indicate that in 2009, 83 % of the US population played games, almost half of these women; and 72 % of those above 50 played games. In the UK it was slightly less, 73 % of the population (Chatfield, 2011). Games are becoming universal; the divide between gamers and non-gamers is quickly crumbling and "soon we will all be gamers" (McGonigal, 2011, p. 6). The lessons games can teach – e.g. engagement and reward structures to visualization technologies - are being taken seriously across many sectors such as business, government, the arts and, the focus of this study, education (Chatfield, 2011).

The debate of games and learning takes place within a larger one on education. Two topics of this debate are: which skills and knowledge will future professionals need in our 21st century global knowledge economy? What are the models of learning and the educational environment (Davis, 2011) that will support the desired outcome of 21st century learning? Many of the positive qualities involved in the gaming experience, which include: engagement, commitment, collaboration, extreme effort, concentration, organization and fun are oftentimes lacking in students' present day educational experience (Prensky, 2005).

There are a number of approaches to applying the lessons learned from games to the design of learning environments that are presently being explored and developed. Amongst them is the use of serious games, also known as game-based learning – GBL -, games specially crafted for an educational purpose. Another approach is to give non-game design students the opportunity to design and construct games as part of the curriculum. There are also "game-like motivational systems" that build on the motivational power of (video) games to structure courses, otherwise expressed as gamification in education (Lieberman, 2010a, para. 3). This last approach is the focus of this paper.

The subject of this study is: what does gamification have to offer in terms of designing learning environments for the 21st century in higher education? Also, which of the elements of gamification design can be identified as effectively able to shape the guidelines of best practices for application in higher education?

2. Method

In recent years, the gap has widened between the immersive and interactive nature of today's technology and social media, and the wider trend toward the 'ludification of culture' that is fueled by the contemporary games entertainment on the one hand and the perceived lack of this by students thereof in higher education, on the other. Gamification is an example of such a trend. How to identify the ways educators and games designer embrace such a trend to create a more exciting, and engaging learning environment with higher quality learning outcomes better fitting the dynamics of the 21st century has become the general focus of this study. The ensuing focus was to analyze which ideas for future practice and research could be made in order to implement and study gamification in the researcher's practice as a lecturer at a Dutch University of Applied Science. In order to create these opportunities, the intended audience for this study were the colleagues and facilitators involved in curriculum development at the researcher's institute.

The primary method of research was a literature review as this was most suitable for the open-ended method of discovery required for the topic. The goal was to uncover and explore relevant current debates and themes concerning games and learning in general, and gamification in particular. The exploratory and emergent nature of this method of investigation was well suited to the iterative process of analysis and assessment required, i.e. the necessity of consulting available research in order to distill the exact goal of the research itself in several rounds of inquiry.

On the topics of education, learning, and learning and games there were many scientific papers available. In addition, there was much information to be found in the more informal network of blogs and websites connected to universities, organizations, as well as experts in the field of games and education. When regarding information published on university websites the context and author were examined to establish the integrity of the content. Sources were used when there was a clear academic context or established authority of the author. With organizations it was effective to look into their backgrounds, the people involved in the organization, and events such as congresses in which they had participated or initiated. In the blogosphere a different approach was taken, that of cross referencing authors by the number of links to their articles indicated through Google searches and Google charts, and comparing this with the occurrence of citations in the great number of blogs that were read as part of the initial research. The information from these sources was augmented by a number of books written by game designers that evidently played a role in the current discourse.

On the topic of gamification and particularly gamification in education, the situation was different. As this is an emergent field the scientific papers were almost non-existent and the books few. The first book on gamification and education was published well into the writing of this thesis. Thus the informal network was a primary source of information, subject to the same method of examination as above. There were a small number of case studies to be found that were also references. The last source of information was the researcher's experience as a media design lecturer and experienced instructional designer research.

In a process of iteration, a clearer picture of the precise focus of the study became apparent, as well as the main points of discussion, some contributions to its implementation, and some areas for future research.

3. Literature Review

3.1 What is a game?

The worst thing a kid can say about homework is that it is too hard. The worst thing a kid can say about a game is it's too easy.

Henry Jenkins

What makes a game? What makes a successful game? And how best to design them? are some of the questions in current discourse amongst game designers and theorists. As learning systems and games will be compared in later sections, first a working definition of a game will be established in order to create a reference point for meaningful and valid comparisons. In order to do this, a number of definitions from game designers and academics will be juxtaposed.

The game designer and scholar, Jane McGonigal, states that contemporary games come in more forms, platforms, and genres than at any other time in history. There is huge diversity in the way we play games; we can play them alone or in massively multiplayer environments, on many devices or on an old-fashioned board; we can play mini games or games that go on for months, games with or without a story, games that are physical or mental or both. Despite the variety there is something essential and unique about the way games structure experience. Stripping away the genre differences and technological complexities, McGonigal informs us, "A game has: a goal, rules, a feedback system, and voluntary participation" (McGonigal, 2011, p. 20).

In her definition, having a goal keeps players focused because it gives them a sense of purpose. Rules push players into unexplored territory as they remove or limit obvious ways of achieving those goals. Feedback systems motivate, while voluntary participation insures that all accept the rules and goals and thus share common ground, willingly accepting the effort and challenges that may be involved. Graphics, interactivity, narrative, rewards, competition, virtual environments and so on are only ways of reinforcing and enhancing these core qualities (McGonigal, 2011). She goes on to state that in video games, rules are often ambiguous and are discovered as you play, as opposed to being clear instructions understood before commencing, as occurs in more traditional games. The feedback systems are what gamers learn first, as these guide the player towards a goal. Decoding the rules and discovering what is possible are some of the most powerful motivating factors (McGonigal, 2011, p. 34).

In *The Art of Game Design* Jesse Schell, game designer, analyzes a number of definitions from other game designers. The results are in his view too complex so he looks for a simpler, more universal description. From these definitions he distills 10 key qualities.

Elliot Avedon and Brian Sutton-Smith game theorists, suggest that:

Games are an exercise of voluntary control systems in which there is a contest between powers, confined by rules in order to produce a disequilibrium outcome (as cited by Schell, p.31).

Games are entered willfully; have goals; have conflict; have rules; can be won or lost (Schell, 2010).

Greg Costikyan defines a game as:

an interactive structure of endogenous meaning that requires players to struggle towards a goal (as cited by Schell, p. 33).

Games are interactive; have challenge; create their own internal value (Schell, 2010).

The last definition Schell considers is from Tracy Fullerton, Chris Swain, and Steven Hoffman, who offer that:

A game is a closed formal system that engages players in a structured conflict, and resolves in an unequal outcome (as cited by Schell, p.33).

Games engage players; are closed formal systems (Schell, 2010).

It is his opinion that these are 10 important qualities but because they are unwieldy as a definition, he proceeds to formulate something simpler that still encompasses most of the mentioned qualities. He boils it down to the following: all games involve some kind of problem solving, and problem solving is a defining human activity. His definition therefore becomes:

A game is a problem-solving activity, approached with a playful attitude (Schell, 2010, p. 33).

The next definition to evaluate is found in *Rules of Play* (2003) by Katie Salen and Eric Zimmerman. They take a comparative look at 8 definitions - some of which we have already run into and some not - before arriving at their own. By regarding their chart below some core qualities can be compared.

The contributors are: games historian David Parlett, games scholar Clark C. Abt, anthropologist Johann Huizinga, sociologist Roger Caillois, philosopher Bernard Suits, game designer Chris Crawford, game designer Greg Costikyan, and scholars on games and play, Elliot Avedon and Brian Sutton-Smith. The definitions include what they describe as thorny issues, such as which qualities are unique to games, which define games themselves and not the act of playing a game.

Elements of a game definition	Parlett	Abt	Huizinga	Caillios	Suits	Crawford	Codtkyan	Avedon/ Sutton Smith
Proceeds according to rules that limit player	√	√	√	√	√	√		√
Conflict or contest	√					√		√
Goal-oriented/outcome oriented	√	√			√		√	√
Activity, process, or event		√			√	√		√
Involves decision-making		√				√	√	
Not serious and absorbing			√					
Never associated with material gain			√	√				
Artificial/Safe/Outside ordinary life			√	√				
Creates special social groups			√					
Voluntary				√	√			√
Uncertain				√				
Make-believe/Representational				√		√		
Inefficient					√			
System of parts/Resources and tokens						√		
A form of art							√	

Table 1 (Salen & Zimmerman, 2003, loc. 1269)

As is seen above there are 16 qualities offered and no majority agreement on anything except that games have rules. Some elements do not apply to all games, such as being voluntary or inefficient. That games create social groups applies more to the effects of a game than the game itself. The representational or make-believe quality of games can also apply to other media or designed experiences. They have “cobbled together and whittled away” to create their own definition:

A game is a system in which players engage in artificial conflict, defined by rules, that results in a quantifiable outcome (Salen & Zimmerman, 2003, loc.1281).

Below are the concepts of the primary ideas:

System: The concept of a system is essential to their approach. They describe a system as a set of parts that interconnect to form a complex whole.

Players: A game has players, active participants that interact with the system to experience the play of the game.

Artificiality: Games maintain a boundary from “real life”.

Conflict: Conflict, a contest of powers, is central to games. It can take on many forms from competition to cooperation, solo conflict or multiplayer conflict.

Rules: Rules provide the structure out of which play emerges by delimiting what players can and cannot do.

Quantifiable outcome: Games have a quantifiable goal or outcome. A player wins or loses or has a score. This distinguishes games from less formal activities.

According to Salen and Zimmerman this definition can be applied to all kinds of games (Salen & Zimmerman, 2003, loc. 1163-1281).

A number of definitions, by contemporary game designers, scholars, and authors have been comparatively analyzed. Some are noted below. In order to find the quintessential qualities of what makes a game a game they have delved into a multitude of descriptions, all looking for something that is specific enough to describe the unique way that games structure experience but broad enough to cover all kinds of games.

Jane McGonigal: a game has a goal, rules, a feedback system, and voluntary participation.

Jesse Schell: a game is a problem-solving activity, approached with a playful attitude.

Kate Salen and Eric Zimmerman: a game is a system in which players engage in artificial conflict, defined by rules, that result in a quantifiable outcome.

Although the following is mentioned as part of Schell's research it is relevant to include it.

Tracy Fullerton, Chris Swain, and Steven Hoffman: a game is a closed formal system that engages players in a structured conflict, and resolves in an unequal outcome.

McGonigal, Salen and Zimmerman as well as Fullerton, Swain and Hoffman give definitions with a number of shared qualities. All speak of games as systems, defined by rules, having a goal or definable outcome. These are 3 qualities with a majority agreement. Only McGonigal speaks of voluntary participation and I find that Salen and Zimmerman argue successfully that even if a game is not voluntary it is still a game. Therefore, this characteristic will be excluded.

The definitions of Salen and Zimmerman as well as Fullerton Swain and Hoffman are extremely similar with some subtle differences. As mentioned, both parties and McGonigal speak of systems, rules, and goals or definable outcomes. Salen and Zimmerman and Fullerton, Swain and Hoffman bring also into play the concept of players that engage, conflict, and artificiality. The difference lies in the way they describe a system and its connection to conflict and artificiality. For Salen and Zimmerman, a system implies structure so any conflict in the game is automatically structured which enables them to connect the adjective artificial to the conflict making this quality more explicit. They speak of a quantifiable outcome as opposed to an unequal outcome, making it more inclusive of different kinds of results.

Originally theirs was the working definition of choice for further use in this study:

A game is a system in which players engage in artificial conflict, defined by rules, that results in a quantifiable outcome (Salen & Zimmerman, 2003, loc.1281).

There is however another definition very recently published in *The Gamification of Learning and Instruction* by Karl Kapp that has been modified based on the structure, terminology, and argument of

the above to make a better fit with a learning context.

A game is a system in which players – learners - engage in an abstract challenge, defined by rules, interactivity, and feedback that results in a quantifiable outcome, often eliciting an emotional reaction (2012, loc. 737).

The relevant variations are these:

Abstract: Games involve an abstraction of reality and typically take place in a narrowly defined “game space” with elements of a real situation but are not an exact replica.

Challenge: Games challenge players to achieve goals and outcomes that are not simple or straightforward.

Interactivity and Feedback have been added to Rules: Players interact with each other and with the game; feedback is the hallmark of video games.

Emotional reaction: A wide range of emotions, both positive and negative, enters into games.

Most importantly in this definition is the introduction of the concept of a game as not only a system but also an event that creates an emotional response. As this addition proves essential to the discussion on the motivating qualities of games in following sections, this will be the definition chosen for further use.

3.2 What is learning?

No compulsory learning can remain in the soul. In teaching children, train them by a kind of game, and you will be able to see more clearly the natural bent of each.

Plato, The Republic, Book VII

3.2.1 Introduction

The goal of this chapter is to place the topic of ‘gamification in higher education’ firmly in an ongoing discourse on learning and educational strategies. Some of the main learning theories are briefly outlined in the following section to create an idea of the historical context leading up to the present day.

Throughout the ages, there have been a number of paradigm shifts on the nature of knowledge and the purpose of education. Wanting to understand the mind and how it acquires knowledge has been a quest undertaken since early human history (Edgar, 2012, p.7). Until the nineteenth century, which heralded the scientific study of learning, ideas were more “intelligent guesses” developed from the perspective of philosophy and theology. In the 4th and 5th centuries BC, two Greek philosophers, Plato and Aristotle, established two major schools of thought on epistemology, the nature of knowledge, that continue to serve as points of orientation today. Plato was a rationalist who believed that truth and knowledge were innate, to be discovered through self-reflection and reasoning (Edgar, 2012, p.3). Aristotle postulated that knowledge comes through sensory perception, experience, and inquiry, creating the foundation for empiricism that is still a method in contemporary scientific practice. Additionally, education was an elitist activity, available primarily to men.

In the 19th century, a number of interrelated developments took place. The industrial revolution arrived and with it a demand for a work force with basic literacy and numeracy skills. For the first time in history, education became available to the masses and to both genders ("Shifting to 21st century thinking in education and learning: The knowledge age", n.d., para. 1-5). At the same time, the first systematic attempts were made to study the human mind through scientific methods that had, until then, been immured in the realm of philosophical study.

3.2.2 Learning theories

Behaviourism

Amongst the first theories to originate was what has become known as Behaviourism, a school of thought still in existence today. It focused on learning by observing, practicing, and receiving positive reinforcement. B.F. Skinner (1904-1990), the father of modern Behaviourism, believed that behavioral change is learning, without any influence from mental processes (Nagowah & Nagowah, 2009). In a Behaviourist classroom learning took place in a highly sequenced and structured fashion geared to acquiring facts, concepts, and skills, a system well suited to the demands of the 19th and early 20th century.

Cognitivism

Cognitivism developed after WW II in the same time frame as the advent of computer technology and the increasing demand for a more highly educated workforce. Its proponents believed that mental activities such as perception, thinking, knowledge representation, and memory activities, formerly ignored by Behaviourism, were related to learning and knowledge acquisition (Shuell, 2012).

John Anderson (1947-) introduced concepts of pattern recognition and chunking as part of a memory system that is perceived as an actively organized processor of information (Ho, n.d). According to Jean Piaget (1896-1980) children shaped their own conceptions of reality through a continuous interaction with their environment (Austin, Hammond, Orcutt, & Rosso, 2001). Bruner developed the concept of scaffolding, providing appropriate assistance to a student, giving them enough of a "boost" to achieve a learning task, and which is still widely used in our present day educational system (McLeod, 2012). Learning was understood to be an active, creative, and goal oriented process with different ways of learning for different individuals, with the possibility of different outcomes (Shuell, 1986, p. 430).

These ideas had an impact on education. In a cognitive classroom learning took place through strategies and learning opportunities that were designed for the acquisition of facts, skills and concepts, with a balance between guiding the learner and allowing for independent exploration and learning through discovery.

Constructivism

Jean Piaget, Lev Vygotsky (1896-1934) and John Dewey (1859-1952) are amongst the main contributors to this theory, one that began to be developed prior to W.W.II. According to Dewey, knowledge could only emerge from interactions in meaningful situations embedded in a social context that he called "experiential learning". Jean Piaget (1896-1980) contributed the theory of cognitive development that

proposes humans cannot be given information, instead they build their knowledge through experience. Further, experiences enable them to create schemas — mental models of the world (Thanasoulas, n.d., p. 1-3).

The Constructivist idea is: learning is best when learners are involved in authentic tasks anchored in meaningful contexts (Austin, 2001). Some key words are “learner-centred” and “problem-based”. Teachers are seen as facilitators or coaches. Learning is focused around a set of realistic, intrinsically motivating problems. Learning goals are reached through active exploration, discovery and construction (Norman & Spohrer, 2006, p. 26)

Constructionism

This is a theory of learning and a strategy for education that builds on the theories of Constructivism. It adds to Constructivism the theory that learners are particularly likely to make new ideas when they are actively engaged in making some kind of external artifact; that knowledge acquisition is not only a cognitive process but affect also plays a role; that working on meaningful activities and projects is paramount for learners to become engaged; and that learners can make connections with knowledge in many different ways (Kafai & Resnick, 1996, p. 2). It embraces social issues, the culture of the classroom, life-long learning concerned, and technology (Norman & Spohrer, p. 26). It builds on the Constructivist concept of learner-centered and problem-based approaches with a core that is focused on meaningful, authentic problem solving. Although many of the ideas have been around for almost a century, it is modern day technology that enables many of the ideas now to be implemented fully. Technology is embraced as a catalyst for change (Norman & Spohrer, p. 26).

Brain-based education

In the last 40 to 50 years, there has been groundbreaking scientific research into the brain, thinking, and learning. The emerging field of the cross-disciplinary study called neuroeducation is interesting for many reasons, one of them being its efforts to bridge theory and practice (CDSL, 2000, p. 3). There is still much work to be done; brain based does not necessarily mean evidence based educational practices (McCandliss, B. (2012)). With these qualifications in mind, there are already findings valuable for education. They highlight that brain research gives us new insights into the role of emotions, stress, threat, memory systems and motivation in learning. Below is a combination of the ideas from the cited authors.

Meaning: The search for meaning is an innate human quality; curiosity is engaged by meaningful activities.

Memory: Meaning facilitates memory; memory is actively organized through a process of pattern recognition and chunking.

Emotions: Challenging situations that motivate enhance learning rather than those that cause uncertainty and anxiety.

Process: The learning process engages the entire physiology and is enhanced by the experience of a rich, complex and multisensory environment. It takes place in different environments and through different processes. Knowledge is acquired in a spiraling, progressive manner connecting and building on existing knowledge to create new knowledge. The brain is a self-organizing system that is affected by our experiences, expectations and needs.

Social: The brain is a social brain and people learn effectively through collaborating with others.

Lifelong learning: Experience changes the brain as it develops with use throughout our lifetime making life-long learning a possibility (Davis, 2011; CDSL, 2000; Caine &Caine, 1990; Jensen 2010 as cited in Davis, 2011; McCandliss,2012; Sullo, n.d.)

There are a variety of research approaches and techniques, and evidence from different branches of science that are beginning to converge, promising to evolve dramatically in the next generation (CDSL, 2000).

3.2.3 The 21st century

The 21st century is an information society, a society that is globalized, interconnected and, often termed a knowledge economy. The students presently in universities are known as digital natives: raised with digital technologies; born well after the advent of video games. The ATC21S, an international educational research organization, states that we need future professionals that are capable of higher order thinking skills that enable them to apply new understandings to uncharted contexts. Creative problem solving, critical thinking, systems thinking, collaboration in cross-disciplinary teams, and integrating multiple sources of knowledge are the capabilities needed by proactive learners to negotiate the demands of the 21st century, as are the skills that foster media literacy and life-long learning (Binkley et al., 2010). Education and professional development should be aligned to produce a support system that produces 21st century outcomes for today's students (Binkley et al., 2010).

At present, a number of education applications relating to the learning theories outlined above are based on creating learning environments where learning is a creative, active, experiential process, a process in which knowledge is built in a social context through meaningful, intrinsically motivating interactions in a multisensory environment. The focus is learner-centered; teachers are seen as facilitators or coaches. There are a significant number of educators that support such an approach, stating that that new models of learning with a more holistic approach are needed (Brown, 2006; Squire, 2007). These models need to be connected more firmly to the emerging research from neuroscience, in order to equip future professionals for the fast changing society they (will) live in (Davis, 2011). Another idea supports the reconceptualization of the role of the educator "from sage on the stage to guide on the side", from providers of knowledge to designers of learning. Emerging technologies are leading to the development of many new opportunities to guide and enhance learning that were unimagined even a few years ago, of which gamification in education is one (Norman & Spohrer, p. 27).

3.3 Games, Learning, and Education

Tell me and I'll forget; show me and I may remember; involve me and I'll understand.

Ancient Chinese proverb

3.3.1 What makes games so intrinsically motivating?

Games are played by hundreds of millions of people across a wide international demographic. The time spent on games is significant - above 13 hours a week on average in the USA (Sharkey, 2012). Which qualities of games make them so captivating? What makes gamers willingly dedicate time and effort to the learning of new skills and the tackling of steep challenges? Since the arrival of video games more than 30 years ago educators, scientists and game designers have directed their attention to this question, delivering a number of ideas that account for this.

One is that games tie in deeply with fundamental human needs. The core mechanic of games is learning (Gee & Levine, 2009, p. 1) and, under the right conditions, learning is biologically motivating and pleasurable for humans. Games are about learning fundamental life skills. Additionally, 'fun', which is at the core of gameplay, is a key evolutionary advantage in our survival because it means we enjoy learning new things (Koster, 2004, p. 56). Recent brain-based research shows a similarity between good methods of motivating people to learn, as developed by game designers, and cutting-edge principles being discovered on human learning (Gee, 2005).

As people, we are hard-wired to learn by recognizing patterns in the world around us. We group patterns semantically in a process called chunking and store them in memory. Games, that are iconic, abstracted depictions of patterns in the world, tap into our innate need to solve problems through pattern recognition (Koster, 2004, p. 206).

Games are designed for success otherwise they wouldn't be played. They activate intrinsic motivation by offering clear (compelling, uncertain, desirable, worthwhile) goals combined with an intense and varied feedback system (McGonigal, 2011, p. 45). Challenges need uncertain yet potentially attainable goals. The attainment of a goal can be made uncertain through variable difficulty levels, multiple levels, unlocking (hidden) information, and randomness (Malone 1980, pp. 49-55). Video games stimulate the development of mastery through leveling up, having challenges and tasks that adapt (adaptivity) to the players skills and abilities, and staying in the narrow zone called the Flow Channel. A true 'flow' experience is remaining in a narrow zone between things being too hard ("I give up") and things being too easy ("I'm not challenged at all."). As long as the game remains constantly in the Flow Channel, people will want to continue playing (Prensky, 2005). The role of decision-making and the so-called 'learning loop' of decision-action-feedback-reflection are crucial to both learning and engagement (Prensky, 2008).

Games insert players at their achievable challenge level and reward player effort and practice with acknowledgement of incremental goal progress as has been shown in research (Willis, 2011). When learners have opportunities to participate in learning challenges at an individualized achievable challenge level, their brains invest more effort in the task and are more responsive to feedback. Students working toward clear, desirable goals within their range of perceived achievable challenges, reach levels of engagement much like the focus and perseverance we see when they play video games (Willis, 2011).

Dopamine release, which triggers the intrinsic reward system, is sparked through risk and new chal-

lenges such as those experienced during gameplay. The motivation to persevere in risk taking is the brain seeking another surge of dopamine, and is called the fuel of intrinsic reinforcement (Willis, 2011). Although there is research that indicates that dopamine can play a role in addiction (Bell, 2013) the survival benefit of the intrinsic dopamine-reward system lies in building skills and adaptive responses. Intrinsic rewards are the most powerful motivators that we have apart from our basic survival needs. Gameplay could be described as the quintessential autotelic - self-motivated, self-rewarding- activity (McGonigal, 2011).

'Fun' is notoriously hard to define but a crucial element in the engagement mix, and it is very clear (to gamers) when fun is missing (Prensky, 2005). The 'fun process' - when the emotional experience connects to the motivating ability of a game - is how interaction with a game system can lead to pleasurable and/or rewarding experiences for the player. Fun can be involved in the act or process of mastering or solving a problem; solving these puzzles is what acquaints games with learning (Koster, 2004, p. 85). It would appear from psychological research that for many people, what is called 'relaxing', fun, watching TV, window-shopping, eating chocolate, doesn't actually make us feel better (McGonigal, 2011, pp. 27-34). It is 'hard fun' that provides the opportunity for challenge, mastery and feelings of accomplishment by focusing on goals, constraints, and strategy (Lazarro, 2004).

Engagement occurs when the brain is rewarded, and for something to be perceived as rewarding, it must evoke positive emotions. There is a range of powerful emotions evoked by games, wonder, curiosity, frustration, or joy that rivets players' attention and unleashes powerful neurochemicals that facilitate learning (Lazarro, 2004). Crucially, these also help players persist through negative emotional experiences and even transform them into positive ones. The most dramatic example of emotional transformation in a game is around the issue of failure. Games offer the promise of resilience in the face of failure, by reframing failure as a necessary part of learning (Hammer & Lee, 2012).

And lastly, game designers create rich multi sensory worlds where people can have meaningful new experiences (Gee, 2005) and where the mind's natural curiosity is engaged by complex and meaningful challenges.

3.3.2 What are the educational properties of games?

How can learning and education benefit from the learning mechanisms developed by game designers? And which educational theories and strategies based on these ideas are being developed at the present time? There are a number of main topics for discussion, extracted from the discourse and research on this topic, set out below.

Games offer the kind of learning experiences and social practices that are seen as being important in the 21st Century: collaboration; team-building; problem-solving in all kinds of complex spaces; the ability to take on identities, to explore and to try out different roles and different ways of tackling things (Salen, 2009a). The play emerging from video games also supports the development of disciplinary knowledge, systemic thinking, and the production of complex multimodal digital artifacts that should be found in twenty-first-century classrooms (DeVane, Durga & Squire, 2010, p. 3).

Games create a meaningful and relevant context, thus providing a springboard for inquiry and knowledge gathering fuelled by intrinsic and extrinsic motivation in an immersive environment (Lin, 2008). Participation in the rich virtual worlds of gaming makes it possible to simulate future professional practice through learning by experience and doing (situated understanding; developing a set of effective social practices, experimenting with new and powerful identities, and developing shared values through communities, (Shaffer, Halverson, Squire, & Gee, 2004)). Such professional thinking in the 21st century is called an epistemic frame: a community of practice composed of interconnected knowledge, skills, values, and identity linked by a particular professional epistemology (Shaffer, 2006). In what are known as epistemic games, students can use experiences found in video games, and other interactive learning environments, to help them deal more effectively with situations outside the original context of learning (Shaffer, 2006)

Another train of thought is that there should be a rethinking of our pedagogical practices and learning environments in an age marked by the power of new technologies, one based on the 'good principles of learning' that are built into successful games. In *Learning by Design* a number of the learning principles found in games are mapped onto an educational application, showing that this is a viable strategy. Some of these principles are familiar from the discussions discussed above such as intense feedback, experimentation with identities, systemic thinking, and mastery through a leveling in a growing cycle of expertise. Others are new approaches to the concepts such as well-ordered problems, skill development as a strategy to accomplish goals, the provision of safe environments with a sense of authenticity, and the advantage of a simplified, abstracted version of reality that is found in games (Gee, 2005).

On a more detailed level, classroom instruction that provides opportunities for incremental progress feedback at an achievable challenge level pays off with increased focus, resilience, and willingness to persevere toward the achievement of goals that can positively affect students far beyond the classroom walls (Willis, 2011).

In recognition that there is no unified vision of learning and teaching in the 21st century, the point is brought forward that the learning principles of games are neither conservative, liberal, traditional, nor progressive. According to Gee: the situated embodied experience offered by games is crucial, but learners cannot be left to their own devices, they need smart tools and, most importantly, they need good designers who guide and scaffold their learning (Gee, 2005).

3.3.3 Summary

To summarize, there is research that shows that games are engaging because they tap into innate human needs and desires that we are biologically hard-wired to undertake and enjoy doing. Games activate our intrinsic reward system by offering clear (compelling, uncertain, desirable, worthwhile) goals combined with an intense and varied feedback system (loop) that allows for incremental progress and skills mastery through leveling.

The principles that motivate players to dedicate time and effort to the required learning process have much to offer 21st century education. Harnessing the potential of games for learning is a means of embracing and implementing the digital tools available and building on new research into how we learn. Games in education are new tools that offer many interesting possibilities to reshape learning in this century; however, they are not the solution to all problems, or the only way to be innovative, nor are motivated teachers no longer necessary (Gee, 2005).

3.4 What is Gamification?

In every job that must be done, there is an element of fun. You find the fun, and - SNAP - the job's a game!

Mary Poppins

3.4.1 Approaches to integrating games into education

Interest in educational uses for games has risen greatly over the last couple of years (Lieberman, 2010a, para.1). There is a lively and wide-spread debate amongst game designers, game researchers, and educators on what games are, what can learnt from them in education, and in which way the lessons can be applied. In this section, gamification in education will be examined: What does it mean? What is the theory behind it? What are the benefits and pitfalls? What are some examples of practice?

Research and theory within the emerging field of games in education cover a wide range of promising approaches to games in education and these are presently being explored and developed. Three of the most widely used are mentioned here. First amongst them is the use of serious games, also known as game-based learning - GBL -, games specially crafted for an educational purpose. Although very similar and therefore somewhat confusing there is also what are called Games for Learning, which describe a range of products, off the shelf commercial games that are used for educational purposes, although they were not necessarily created with that purpose in mind (Miller, 2012). Oftentimes these two terms are used interchangeably to describe any use of full-fledged games in education. Deterding, Dixon, Khaled and Nacke define a full-fledged game as an instance of fulfilling all necessary and sufficient conditions for being a game (Deterding, Dixon, Khaled & Nacke, 2012).

Another approach is to give non-game design students the opportunity to design and construct games as part of the curriculum, which comes from Constructionist theory on learning, i.e., in constructing games students create new relationships with knowledge. Also behind this method is the idea that the greatest learning benefits are for those involved in the design process (Kafai, 2006).

3.4.2 Gamification

Lastly there is the use of "game-like systems" (Lieberman, 2010a, para. 3) that builds on the motivational power and principles found in well-designed games, as discussed earlier, in order to design learning environments, structure courses, and even whole curricula (Keramidas, 2010). As Paul Gee has

out (Gee, 2005), the lessons distilled from video game design can be applied more widely to designing learning environments and experiences. Although all the above-mentioned approaches to connecting games to learning are of potential interest, the focus in this paper is on the last one, the use of the principles and elements of game design as a model for developing new modes of pedagogical practice, and for designing learning environments. The distinction between serious games and GBL is that in this third option, the principles and some of the elements of games are used without creating a full-fledged game.

Creating game-like solutions for real life situations is not new: children of all times have made chores less boring by making them a game, military training has always used games to make it more real, and in the last century, games have been increasingly used in education and business (Deterding, Dixon, Khaled & Nacke, 2011). Teachers and corporate trainers have been using game-like techniques for a long time as well. Instructors, trainers, and professors embed stories in the form of case studies to wrap up experiences for learners, create challenges to engage them, and set goals and provide feedback on progress while providing a safe environment in which learners may practice their skills (Kapp, 2012). In the business world there was Chuck Coonradt, often called "...the grandfather of gamification" (Krogues, 2012, para.1) who in 1984 wrote *The Game of Work, how to enjoy work as much as play*, in which he developed 5 key principles for workplace application: clearly defined goals, better scorekeeping, more frequent feedback, a higher degree of personal choice of methods, and consistent coaching.

What has changed over the last 4 decades is, as stated earlier, that video games have become ubiquitous, with an increasing majority of the population in most Western countries playing them. The demographics of gamers is spread across all ages, and there is a growing appreciation that games demonstrably motivate users to engage with them using unparalleled intensity and duration; therefore, game elements should be able to make other, non-game products and services more enjoyable and engaging (Zichermann 2010 as cited by Deterding, Dixon, Khaled, & Nacke, 2011, p. 2). In more recent years the application of game-based elements to engage people, motivate action, promote learning, and solve problems has acquired its own buzzword, 'gamification'. The concept of gamification has become part of a broader, emergent, and rapidly expanding field that has found its way into domains like marketing, politics, health and fitness, and education.

The term gamification needs further examination for it to have validity in education as at present it has an evolving and contested terminology. As gamification takes on different directions in different contexts, people are using the term without an agreed-upon understanding of what it is (Lagrow, 2011, para. 1), resulting in confusion and misunderstanding. To make it even more confusing, parallel terms continue being used and new ones are still being introduced, such as "productivity games" "surveillance entertainment", "funware", "playful design", "behavioral games", "game layer", "applied gaming", or "gameful design" (Deterding, Dixon, Khaled & Nacke, 2011, p.3). Yet 'gamification' is the one that has seemingly managed to institutionalize itself as the common household term. If the term 'gamification' is to be used fruitfully in education it is important to come to meaningful definition. There are voices that say that learning and development professionals need to 'take the word back' from its perceived appropriation for marketing goals and embrace gamification as a method of enhancing

relevance, motivation, and engagement in learning (Kapp, 2011).

Computer programmer Nick Pelling arguably coined the term gamification in 2002, but it wasn't until 2010 that the use of this term exploded as a result of widespread use of badges, leaderboards, and point systems, mainly by new location-based services such as Foursquare, Gowalla, or Booya (Rempe, 2013). In the same year, at the DICE 2010 conference, Jesse Schell forecasted a gamepocalypse, a hypothetical future in which everything in daily life becomes 'gamified', from brushing one's teeth to going to work (Schell, 2010). The response in the blogosphere was mighty and varied, ranging from enthusiasm to horror at what some perceived as an 'Orwellian' prospect. In 2011, the term made its way onto the Gartner Hype Cycle, a graphic representation of the maturity and adoption of technologies and applications, where it is still positioned to become a highly significant trend over the next 5-10 years. Gartner, a renowned information technology research and advisory company, further forecasts that by 2015, more than 50 percent of organizations that manage innovation processes will gamify those processes (Petty, 2011a; Petty, 2011b; Zichermann, 2011a).

Gartner Hype Cycle 2012



Successful business examples are the Nike + community, where you can monitor and improve your progress, sign up for challenges with friends and find new running routes, to name a few of the possibilities. Or the social networking site, Foursquare, where you can check in to recommend places that you are visiting, gather points and badges, and possibly attain 'mayor ship' of a location.

Table 2 Gartner Hype Cycle

There are also examples of its use with real-world problems that are solved using the power of games. An example is the Rock Health initiative that uses gamification to empower sufferers from illnesses, or Chore Wars where families can make household chores fun. Another is Foldl that utilizes a game-like puzzle interface that allows people from all over the world to 'play' and compete in figuring out various protein structures used to decipher a crystal structure for one of the AIDS-causing viruses fitting a researcher's criteria (Zichermann, 2011b).

In education, a pioneer is Quest2Learn, a school in NYC where the entire structure of learning over the course of the unit, and year, is gamified. From boss levels and quests to avatars and incentives, the entire learning process is a game (Miller, 2012). There is also the Khan Academy, a non-profit project providing free materials and resources with the goal of a better education for all. The project's platform includes several game mechanics like achievement badges, points, "skill-growth trees", and multiple paths of learning. It also provides students with ongoing feedback on their progress.

3.4.3 A definition

There are many definitions to be found on gamification and it would not be fruitful to attempt to list them all. Instead there is a selection of terms used by professionals from the world of game design, gamification, academia, and marketing that offers a wide range of backgrounds and some important variations.

Rajat Paharia of Bunchball, creator of enterprise applications for gamification describes gamification as using game mechanics to help drive any kind of user participation, consumer engagement and loyalty, or to motivate employees, a strategic competitive weapon that can be used in any industry to encourage repeat user and visitor behavior, and to promote deeper engagement (n.d., para. 1-4). The key focus seems to be on the corporate benefits.

In her 2011 Google Tech Talk, Amy Jo Kim, author and social game designer, advocates cutting through the hype cycle to the meaningful concept masked by the trendy term. She speaks of “smart gamification” and gives it the following simple definition: using game techniques to make activities more engaging and fun (2011a, slide 4).

Jessica Hammer and Joey Lee, educational technology researchers, define gamification as the use of game mechanics, dynamics, and frameworks to promote desired behaviors, and to harness the motivational power of games and apply it to real-world problems and to shape learners’ behavior and solve the problems with motivation and engagement in schools (2011, p. 1-3).

For Kevin Werbach, gamification professor, the definition is the use of game elements and game design techniques in non-game contexts (2012, video 1.3)

Kapp states it is the careful and considered application of game thinking to solving problems as well as the encouragement of learning by using all elements of games that are appropriate. In addition to game mechanics and aesthetics, game characteristics can be used as building blocks to create powerful learning experiences with powerful outcomes (2012, loc.1012).

A number of the authors suggest a modification to the term to give it proper focus and depth: Kim speaks of smart gamification, Kapp of it being well-designed. UX designer Scott Nicholson, proposes that we speak of meaningful gamification, which has a focus on the user experience that puts the needs and goals of the user before those of the organization (2012).

In one of the first academic papers focused on defining gamification *From Game Design Elements to Gamefulness: Defining Gamification* (Deterding, Dixon, Khaled & Nacke, 2011) the proposed definition is:

The use of game design elements in non-game contexts (Deterding et al., 2011, p.1).

On the surface, this is a seemingly mundane definition. However, in the process of creating nuance, as well as providing historical and theoretical contexts for this definition, several key insights emerge (Blayon, 2012) that also give context and meaning to the diverse definitions found above.

Gamification is placed within a larger frame, 'the ludification of culture' where mindsets and practices from video games increasingly suffuse society with playful identities and playful media practices (Deterding et al., p.2). It is connected firmly to games, as has been earlier defined, as opposed to play. The distinction is made between ludus (games with goals and rule-systems) and paida (the open-ended concept of play) as defined by Caillois (as cited by Deterding et al., p. 3). They also speak of the term gamefulness, following its introduction by McGonigal, which describes the coherent set of phenomena as: experiential and behavioral quality, artifacts affording gameful interaction, and designing for gamefulness. This is typically expressed by using elements of game design.

The authors propose restricting the term game elements to the components characteristic to most games. Suggested elements that they have structured in order of mounting abstraction levels are:

- Game interface design patterns (i.e. badges and leaderboards)
- Game design patterns and mechanics (i.e. time constraints, limited resources, turns)
- Game design principles and heuristics (i.e. enduring play, clear goals, variety of game styles)
- Game models (i.e. MDA model, game design atoms)
- Game design methods (i.e. play testing, play centric)

Important to their definition is that gamification uses these elements as building blocks for a system that includes elements from games, but is not a full game proper. Although the designer may be using only building blocks from the user perspective such systems can then be enacted and experienced as games proper, gameful, playful, or otherwise. This instability or openness is sets gamification apart from games proper. The term gameful design is suggested as an alternative term with less baggage, preferable for further academic discourse. Lastly it is the opinion of Deterding et al., that gamification is not limited by specific usage intentions, rather, it is trans-medial, and can be applied widely in all non-game contexts (Deterding et al., 2011).

A second issue is context and related usage. Deterding et al. (2011) are of the opinion that the term can be applied widely in all non-game contexts, and no usage specific intentions are necessary. Although it is possible and useful to give a wide and inclusive definition of gamification, when gamification is used in a specific context such as education, it seems to be appropriate to give it a more focused and precise context and usage target.

The definition by Deterding et al. is inclusive yet exact. It gives a solid framework for further use and includes the systemic and experiential components typical of games. It also gives a useful lens through which to look at the other definitions: game thinking, game-based design, mechanics, dynamics and aesthetics all being possible ingredients. As the elements include game design principles, smart, considered or meaningful gamification requires applying these principles to its design.

3.4.4 Promises and pitfalls for education

Pitfalls

A number of potential pitfalls for gamification are:

1. Pointsification

Some of key points of the not inconsiderable criticism from game researchers, game designers and educators refer specifically to this issue. It has been said that the proponents of gamification don't actually understand the substance of games and in their enthusiastic fervor have mistaken some of the least essential elements of games – things like leaderboards, points, and badges – as the essence of games (Pihil, 2012). Or, that gamification would better be called pointsification for this reason. Points, badges, and leaderboards (PBLs), it is argued, have no closer a relationship to games than they do to websites and fitness apps and loyalty cards (Robertson, 2010). Author and games designer Ian Bogost calls it exploitationware: whereby people are led to believe that in order to meet commercial objectives, points, badges, levels, leader boards, and rewards are “key game mechanics” (2011, para. 2-6). Key game mechanics are, in his opinion, the operational parts of games that produce an experience of interest, enlightenment, terror, fascination, hope, or any number of other sensations. Points and levels and the like are mere gestures that provide structure and measure progress within such a system (2011, *ibid*). Jon Radhof, (2011, para.2) game designer and blogger, speaks up against reducing what is so important to creating successful game experiences, the problems of immersion, cooperation, and competition to Skinner boxes (“push-button, get cookie”), a part of behaviorist psychology.

2. Not easy

Informed by 5 years of university teaching and instructional design, the researcher states that applying gamification to education needs, like any design process, is complex. It requires an understanding of the design elements, which ones map best to the learners' needs and goals, the educational context, disciplinary knowledge and a design method. It is not magic pixie dust that can be sprinkled on existing structures to make them work (Kim, 2011a).

3. Not a panacea

Many voices in education (Gee, 2005) stress that games in education are new tools that offer many possibilities to reshape learning in this century but they are not the solution to all problems, nor applicable in all situations (Lagrow, 2012). If not carefully designed it will be in danger of “overhyping and backlashing” thus not reaching its potential (Hammer & Lee, 2012, p.3).

4. Only extrinsic rewards

Game designer Kathy Sierra points out in a talk given at the SXSW conference that gamification often replaces intrinsic motivators important for sustainable experiences like mastery of a task, or solving meaningful problems with extrinsic motivation like points and badges (as cited by Kilner, 2011). Martin Lagrow links this issue to education, stating that external motivation can “prime the pump” but internal motivation is what fosters life-long learning (Lagrow, 2012, para.4). In a meta-analysis on motivational studies extrinsic rewards and intrinsic motivation in education (Deci, Koestner, Ryan, 2001), it was found that tangible rewards, like badges, gold stars and such, in in certain situations can undermine

intrinsic motivation that is linked to high-quality learning. Verbal rewards, such as feedback were found to enhance intrinsic motivation. Research indicates that for a successful application of gamification in education it is essential to focus on how to facilitate intrinsic motivation rather than focusing only on external rewards for motivating students' learning (Kapp, 2012).

5. Drain on resources

When designing within the university system there may be the training of lecturers, course development, and the development of meaningful assessments that may drain existing facilities and time (Hammer & Lee, 2011, p. 4) There is also the issue of developing meaningful and practical assessments that decide whether students are achieving their aims.

Benefits

A number of potential benefits of gamification are:

1. Connects better to student expectations

Gamification will engage and motivate students more powerfully as it connects better to the expectations of digital native students of the 21st century (Keramidas, 2010). Applying the learning principles in games to designing learning environments (Gee, 2005), not only makes the learning experience more beneficial to students, and more fun, it meets more closely the expectations of these at this point in time.

2. Connects to 21st century skills

Systems thinking, collaboration, and disciplinary knowledge, media literacy, solid epistemic frameworks, higher order thinking skills have all been mentioned as important skills that can give students the capabilities needed to negotiate the demands of the 21st century (Binkley et al., 2010). Using games and game elements connects firmly to these skills and can play an important role in producing an educational system that supports 21st century outcomes for today's students (Binkley et al., 2010).

3. Uses existing skills of learning professionals

An advantage for educators is that it offers the opportunity to append existing skill sets rather than retrain as a game designer, to re-imagine preexisting materials (courses, programs) rather than begin entirely anew, with a shallower learning curve than needed in designing fully developed games for the classroom (Keramidas, 2010). Gamification can be used to promote learning because many of the elements of gamification are based on educational psychology and are techniques that designers of instruction, teachers, and professors have been using for years. Items such as assigning points to activities, presenting corrective feedback, and encouraging collaboration on projects have long been the staples of many educational practitioners. The difference is that gamification provides another layer of interest and a new way of weaving together those elements into an engaging game space that both motivates and educates learners (Kapp, 2012). It can also give teachers better tools - more engaging and goal oriented- to guide and reward students (Hammer & Lee, 2011). Learning professionals have many of the skills, knowledge and abilities to take a leadership position in the gamification of learning and instruction (Kapp, loc. 954).

4. Engages and motivates

The expectations to deliver in the area of increased engagement, motivation and learning outcomes are high. If using only external rewards with a lack of insight can be a pitfall, harnessing all the motivational - intrinsic and extrinsic - qualities in a knowledgeable way games can be of great benefit. Games are designed for success, and according to Zichermann (as cited by Deterding, Dixon, Khaled, & Nacke, 2011, p. 2), they can demonstrably motivate users (learners) with unparalleled intensity and duration, When games are well-designed they tap into our deeply rooted, intrinsically motivated, biologically programmed love of learning (Gee, 2009). Gamification can motivate students to engage in the classroom and to bring their full selves to the pursuit of learning. It can create effective, interactive experiences that motivate students and engage them in the learning process, practicing behaviors and thought processes that can easily transfer from the classroom environment to real life (Trybus, 2012) and eventually translate to a career of lifelong learning (Hammer & Lee, 2011).

The large majority of traditionally designed instructions contain course objectives - not challenges, bulleted lists - not interactivity and end-of-lesson quizzes - not continual corrective feedback. Interactivity challenges and continual feedback are what makes gamification so effective as a perspective for designing and delivering instruction (Kapp, 2012, para.4).

5. Incremental application

Designing a full-fledged game is a long and complicated, often expensive process. Gamification has the advantage that it can be applied in incremental steps, making it less complicated, more manageable, and less expensive. There are smaller adaptations to be made to parts of courses that can be improved and added to over time. Gamifying a whole course can also be done in various steps allowing for improvements and additions.

3.4.5 Projects

It is not within the scope of this paper to do exhaustive research into the projects that have been documented. For those who will undertake gamification projects it is good design practice to start by doing some 'competitive research'; that is the moment that best practices can inform and inspire most meaningfully that design process.

In education there are, in any case, 2 possible approaches to gamification. One is gamefully designing the learning process whilst leaving the course content unchanged (Kapp, 2013). The second option alters the course content, making it feel more game-like as in an Alternate Reality Game (ARG) such as given in the first example below.

In 2011, freshmen at the USC School of Cinematic Arts were offered a unique way of getting to know each other. They could play Reality Ends Here, a trans-medial ARG card and web-based game that enabled them to create collaborative media projects such as films, games, events, or other artwork. Once students were lured into the game via a series of mysterious communications they received a pack of 10 cards with challenges and prompts. By connecting to other players' cards they could form

multifaceted deals. Active participants and high scores offered interesting rewards such as mentorship opportunities, meet ups and encounters with alumni, artists, and other industry professionals that were not connected to gathering study points.

The overwhelming majority of students participated in the voluntary game, giving the faculty reason to play it again in 2012. This game is a useful example of how a simple core mechanic- exchanging cards - can create a complex game with multiple possibilities for creating projects and interacting with fellow students (Guilmour, 2011).

Janna Jackson created a game-like structure for an educational technology course that she called game-based learning in 2009, before gamification was a 'household name' Her approach is an example of gamifying course structure, inspired by James Paul Gee's earlier mentioned principles of learning such as leveling, well-ordered problems, immediate feedback, resubmission, and discovery learning. Using these principles, she restructured her class as a game around a series of design assignments (Jackson, 2009). Students could submit these assignments multiple times, a hit among students because it changed mistakes to learning opportunities gave students more opportunities to practice based on feedback, and allowed students to take more risks. Students also had to 'level up' by earning a certain number of points before moving on to the next assignment. Each assignment built skills for the next, thus providing 'well-ordered problems'. Offering 3 levels of expertise: Proficient, Expert, or Guru, added the element of 'adaptivity' allowing students to learn at the edge of their 'regime competence' and use their 'self knowledge' (Jackson, 2009).

Jackson compared this class with an earlier traditional one and the results were positive. Qualitative data from course evaluations, focus groups, and unsolicited student comments supported the conclusion that game-based teaching outscored direct instruction in cognitive motivational and emotional processes. Some points for improvement were: creating a storyline to make it more compelling and adding elements of immersion and agency, rethinking the points system as the students said although they liked the use of Experience Points, this added little to their motivation (Jackson, 2009).

In *The Multiplayer Classroom, Designing Course work as a Game* by Lee Sheldon, game designer and writer, game design professor, and a pioneer in gamifying university courses, we are offered a skeleton for rethinking classroom content delivery, and bringing game mechanics into the structure of a course (Sheldon, 2012, p. 84) using his examples from real-life applications. The mechanisms games use to engage and entertain the player are explained and there are suggestions on how to use those same mechanisms to facilitate learning. He modeled his classes on MMOs with the classroom as a real-time environment. The first level (chapter) is titled "Good morning. You all have an F." He goes into detail on restructuring the grading system by creating Experience Points – XPs - that you gain as you fight monsters - quizzes, exams, etc., complete quests - presentation of games, research, etc., or craft - analysis, concept and design documents (Sheldon, 2012).

This illustrates another of his ideas, that gaming terminology should overlay the usual class terminology. Students work in Guilds and take on roles, they create personal Avatars, the teacher becomes a Game Master. He explains how to create an underlying theme and story line. Using 12 levels, students can progress from an F to an A. To boost their grade they can do assignments for extra credits such as early completion of assignments, gaining positive peer reviews, or taking on extra assignments

(Sheldon, 2012). The book also covers systems for tracking progress in what is called a LMS (Learning Management System), a game dashboard where students and teachers can see the accumulation of skills, points, levels, possibly a leaderboard and such (Sheldon, 2012).

His first courses in 2010 were voluntary and quickly filled. They are now in their third year of iteration having gone through cycles of improvement based on student response surveys that offered a number of points for improvement. The enthusiasm has spilled over to other courses at his university that have also adapted the gamification approach. Although it is not a manual offering ready-made strategies that can be incorporated into lesson plans, the ideas in the book can be fruitful building blocks for designing gamified courses. An additional aspect of this book is the multitude of case studies on offer.

4. Discussion and Results

4.1 Discussion

The first object of study was an investigation into what gamification has to offer for designing higher education learning environments for the 21st century. In order to answer this, an extensive review of relevant literature was undertaken on this and a number of underlying and related topics. In this section several pertinent points that came to light will be discussed.

As the application of gamification in education was being examined, an important topic emerged: that of learning and education. What is learning? How have ideas developed over time? What are some relevant current theories? How have educational strategies evolved? What are some of the present day educational ideas and strategies?

Also a subject of review became the connection of games and gamification to learning and education, specifically, what are the qualities of games that are so intrinsically motivating and in which way can these qualities be applied to education?

Fundamental was also the examination of views on the meaning of the term gamification, which in turn involved understanding the word at its core, namely, "game". What are the ideas on the essential and defining properties of games? Which elements of games, and in which manner, play a significant role in gamification?

4.1.1 Learning

Throughout the ages there have been significant paradigm shifts on the nature of knowledge and learning; evidence indicates these shifts will continue as we understand more. The study of knowledge and learning took place in the realms of philosophy and religion until the mid 19th century when the first systematic attempts were made to study the human mind through scientific methods. Since then much has been learned. Recent brain-based research indicates that:

- Learning engages the complete physiology, not only the cognitive processes, and it derives essential information from experience
- Multisensory environments enhance learning
- The search for meaning is innate
- Meaning facilitates learning and memory
- Memory is actively organized through a process of pattern recognition and chunking
- Emotions have a positive or negative effect on learning
- Humans learn effectively through collaborating in social contexts
- New knowledge builds on existing knowledge
- And, the brain is formed by experience and can develop throughout our lifetime.

(Davis, 2011; CDSL, 2000; Caine &Caine, 1990; Jensen 2010 as cited in Davis, 2011; McCandliss,2012; Sullo, n.d.)

Currently there is a variety of research approaches and techniques for understanding learning, and evidence from different branches of science are beginning to converge, promising to evolve dramatically in the next generation (CDSL, 2000).

4.1.2 Games and learning

Recent brain-based research also suggests a similarity between effective methods of motivating people to learn developed by game designers, and cutting-edge principles being discovered on human learning (Gee, 2004). Games have a unique way of structuring experience (McGonigal, 2011) that ties in deeply with fundamental human needs. At the core of games is the mechanic of learning; we are biologically programmed to enjoy learning, especially under certain circumstances such as those experienced in gameplay (Gee, 2005). Games are about learning fundamental life skills, and fun, which is at the core of gameplay, is a key evolutionary advantage in our survival because it means we enjoy learning new things (Koster, 2004). Games are iconic, abstracted depictions of patterns in the world that tap into our innate need to solve problems through pattern recognition (Koster, 2004).

Another way in which games engage players and activate intrinsic motivation is through presenting clear, desirable yet uncertain goals, in combination with an intense and juicy feedback system (McGonigal, 2011). Challenges need uncertain yet potentially attainable goals (Malone, 1980). The uncertain goals and challenges in games trigger the release of the neurochemical dopamine. This mechanism also has a survival benefit called the fuel of intrinsic reinforcement, that plays a role in developing skills and adaptive responses. Intrinsic rewards are the most powerful motivators that we have apart from our basic survival needs (Willis, 2011).

Video games stimulate the development of mastery through leveling up; challenges and tasks adapt (adaptively) to the players' skills and abilities, the system of immediate and intense feedback keeps them in the narrow zone between 'too hard' and 'boring' called the Flow Channel. The role of decision-making and the so-called 'learning loop' of decision-action-feedback-reflection are crucial to both learning and engagement (Prensky, 2008).

4.1.3 Gamification

The term gamification is a neologism with a contested terminology and much ensuing confusion and misunderstanding (Lagrow, 2011, para. 1). For the purpose of this study the chosen definition has become one proposed in the 2011 study by Deterding, Dixon, Khaled & Nacke, 2011, The use of game design elements in non-game contexts (Deterding et al., 2011). In this study, historical and theoretical contexts have been provided with several key insights (Blayon, 2012), presenting a useful lens through which to look at the ingredients found in other definitions such as game thinking, game-based design, mechanics, dynamics and aesthetics.

Amongst the findings was the firm connection of the term gamification with the word at its origin, namely 'game'. In the definition that was used earlier, a game is an event that is larger than the disparate elements:

A game is a system in which players –learners– engage in an abstract challenge, defined by rules, interactivity, and feedback that results in a quantifiable outcome, often eliciting an emotional reaction (Kapp, 2012, loc. 737).

This incorporates two important components typical of games: the systemic and the experiential. The gamification designer uses game elements characteristic for games as building blocks, as distinguished from a full-fledged game defined as “an instance of fulfilling all necessary and sufficient conditions for being a game” (Deterding, Dixon, Khaled & Nacke, 2011, p. 2). From the user perspective, such systems can then be enacted and experienced as ‘games proper’, gameful, playful, or otherwise. Amongst the characteristics suggested are game design principles, heuristics and methods, game interface patterns, and game patterns and mechanics. Gamification is transmedial and generally deployable in a wide number of contexts and usages (Deterding et al., 2011). When used in an educational setting it is useful to be more precise: players become learners or students and the usage is to solve problems, engage and motivate students, and encourage and improve learning.

Within the emerging field of games in education, gamification is one of a number of approaches. Also used is game-based learning - GBL -, games specially crafted for an educational purpose, often known as serious games, and Games for Learning, which describes a range of products, off the shelf commercial games, that are used for educational purposes although they were not necessarily created with that purpose in mind (Miller, 2012). Another approach is to give non-game design students the opportunity to design and construct games as part of the curriculum, the idea being that the greatest learning benefits are for those involved in the design process (Kafai & Resnick, 2006). Lastly, there is the use of ‘game-like systems’ increasingly known as gamification in which the lessons distilled from video game design are applied to designing learning environments and experiences (Keramidas, 2010).

4.1.4 Gamification in Higher Education

Building on the insights into the nature of knowledge and learning, the intrinsically motivating capabilities of games, the nature of games and gamification, and their significance for learning revealed in the literature review, a clearer picture has emerged on the potential of applying gamification in designing higher education learning environments for the 21st century.

Student expectations

Today’s university students have grown up with video games and other digital technologies such as mobile phones, the Internet, and social media, that seem to stimulate playful attitudes, identities, and goals, and are seen as part of a wider trend in the ludification of culture (Deterding et al., 2011). In recent years, the gap has only widened between the immersive and interactive nature of contemporary games entertainment and the perceived lack thereof in education (Gamification, 2012). Applying gameful design to learning environments could make the learning experience more relevant, engaging, beneficial, and fun for students (Gee, 2005), relating more deeply to their expectations and experience. Redesigning the learning process, by stimulating students to acquire skills as part of their process of mastery, encouraging them to embrace failure as an opportunity to succeed and engage

through story-telling, as well as enabling them to approach learning through the process of leveling up in a cycle of expertise, has the potential to involve students more deeply and proactively in their own learning process.

21st century learning

Having a proactive attitude is one of the important qualities in the development of '21st century learning' - the term that describes some of the ways of thinking about the skills and mind sets that will be needed by future professionals. Contemporary students will need to be lifelong learners to sustain the multiple careers they will undertake throughout their lifetimes. Games and gamification trigger intrinsic and extrinsic motivation that can fuel these processes with unparalleled intensity and duration (Zichermann as cited by Deterding et al., 2011).

Professional thinking in the 21st century is called an epistemic frame: a community of practice composed of interconnected knowledge, skills, values, and identity linked by a particular professional epistemology (Shaffer, 2006, p.227). Gamification can create immersive, effective, interactive experiences that allow students to simulate future professional thinking through learning by experience, developing a set of effective social practices, experimenting with new and powerful identities, and developing shared values through communities (Shaffer, Halverson, Squire, & Gee, 2004, pp. 1-15). These behaviors and thought processes can later be transferred from the classroom environment to their future practice (Trybus, 2012).

Gamification can create activities that are personally meaningful, experiential, social, and epistemological all at the same time: that can support the development of systemic thinking, creative problem-solving, the ability to take on identities, to collaborate in (trans-disciplinary) teams, to explore and to try out different roles, (Salen, 2009a), and, additionally, to produce the complex multimodal digital artefacts that should be found in 21st century classrooms (DeVane, Durga, & Squire, 2010).

This potential connects well to some of the ambitions formulated for higher education in the Netherlands, i.e. to stimulate professional practice by creating a disciplinary knowledge base, relevant skills and competencies and critical thinking, through situated, problem-based learning, and synergizing the use of media and technology (Standaarden voor onderwijs, 2011).

Innovate to innovate

Universities, including those of the Netherlands, often see themselves as engines for growth in a globalized economy where future professionals are fostered to be capable of creating innovative practices in the complex systems of the fast changing world they will encounter (Bonhoff, 2012). It would appear contradictory to use pedagogical methods to achieve these goals with methods that were developed for the classrooms of the 19th and 20th centuries. The large majority of traditionally designed instruction contains course objectives—not challenges, bulleted lists—not interactivity and end-of-lesson quizzes—not continual corrective feedback that makes gamification so effective as a perspective for designing and delivering instruction (Kapp, 2012, para. 4). An innovative, gameful approach that meets modernity with modern methods of learning (Liebermann, 2010a, para.1), deeply grounded within a theory of learning appropriate for an age marked by the power of new technologies (Gee,

and the demand for innovative and creative professionals, can play a role of significance.

In addition, the application of gameful design to classroom instruction can pay off with increased focus, resilience, and willingness to persevere towards the achievement of goals far beyond the classroom walls (Willis, 2011), a valuable attitude for a future practice in a global economy where innovative products and practices will play an important part.

Learning professionals

Gamification not only provides a new way of creating an engaging game space that motivates and educates learners (Kapp, 2012) it also creates exciting new opportunities for educators themselves. It is a means of embracing and implementing available cutting edge digital tools and building on new research into how we learn. It creates new roles, i.e. that of gamification designer and active builder of learning experiences. New identities also become possible, for example, the Game Master, one who coordinates, guides, and rewards students in the gamified classroom. It puts forward new ways of engaging with students and seeing course content in a fresh way (Kapp, 2012). The learning curve is less steep for learning professionals than it would be if designing a full-fledged game; many of the elements of gamification are based on educational psychology and are techniques that designers of instruction, teachers, and professors have been using for years. Learning professionals already have many of the skills, knowledge and abilities to take a leadership position in the gamification of learning and instruction as it gains momentum and acceptance in more and more fields (Kapp, 2012).

Incremental application

Designing a full-fledged game is a long and complicated, often expensive process. Gamification has the advantage that it can be applied in incremental steps, making it a less complicated and more manageable process. There are smaller adaptations to be made to parts of courses that can be improved and added to over time. Gamifying a whole course can also be done in various steps, allowing for improvements and additions (Werbach, 2012).

Successful application

As was defined earlier, gamification in education has the goal of engaging and motivating students (learners); encouraging and improving learning; and solving problems. However, there are a number of issues that are potential impediments to its successful implementation that should be anticipated and resolved.

1. Gamification has been compared to snake oil (Bogost, 2011), one of the criticisms, sometimes called 'pointsification' (Robertson, 2010), being that people are led to believe that some of the least essential elements of games – things like leaderboards, points, and badges – are indeed their essence (Pihil, 2012). Or that gamification trivializes learning (Kapp, 2012). Gamification is however a serious approach to accelerating the experience curve of learning, and teaching complex subjects (Kapp, 2012, loc. 856). It is an approach that does, however, require a fundamental understanding of the application of underlying game elements in order to avoid creating superficial gameful applications that will not achieve their goals. The entire user experience of the learner must be constructed knowledgeably, intelligently, and meaningfully, with an understanding of the context, goals, and motivational aspects

intelligently, and meaningfully, with an understanding of the context, goals, and motivational aspects of learning. It is the interplay of different elements all adding up to more than the sum of the parts that makes an experience worthwhile (Kapp, loc. 1596).

2. At the other end of the spectrum, gamification is sometimes promoted as, the 'best thing since sliced bread', a solution to all learning problems. There should be the awareness that gamification is not a panacea but a new tool that offers many possibilities to reshape learning at a time where there is no unified approach (Lagrow, 2012, para.7). Many of the learning principles underlying gamification can encompass 'traditional' ideas - whereby learners cannot be left to their own devices - as well as more 'progressive' ones - like situated learning (Gee, 2005) and constructing digital artefacts.

3. Another key point of criticism is that gamification only uses an approach focused on driving a behavior with a reward system fuelled by extrinsic motivation (using points and badges etc.) (Kilner as cited by Kapp, 2012) that replaces the intrinsic motivation that is linked to high-quality learning like the mastery of a task, or solving meaningful problems, and which fosters life-long learning (Lagrow, 2012). Research indicates that for a successful application of gamification in education it is essential to understand and facilitate intrinsic motivation rather than focusing only on external rewards for motivating students' learning (Kapp, 2012), although extrinsic rewards can play a supporting role in the learning process (Deci, Koestner, & Ryan, 2001).

4. Designing and implementing new teaching methods is never easy and applying gamification is complex, like all design processes. There is also the administrative context that can be complicated and frustrating. Establishing the learning objectives and content, the game themes and types, feedback loops and the implementation of a rewards and scoring system requires careful planning by a team with the right mix of expertise. In a subsequent section we will go into these issues in more detail.

5. Sufficient resources should be made available in advance to counter a possible drain on existing facilities and time (Hammer & Lee, 2011).

4.1.5 Summary

To summarize, it would seem that there is much argument to support the suggestion that gamification has merit and potential as an innovative approach to designing learning environments appropriate to the expectations, mind set, and possibilities for 21st century higher education. It has the capacity to connect more meaningfully to student expectations to make their learning experience more relevant, engaging, beneficial, and fun. It offers methods of education and learning that are in keeping in with the role that universities, in any case in the Netherlands, see for themselves within a wider context, i.e. engines of growth for the global economy, a hotbed where creative problem solvers capable of the highest order of thinking that is demanded in addressing the complex problems of the fast changing world they will encounter, are cultivated. For learning professionals it offers exciting new possibilities whilst building on existing skills, knowledge and abilities. It runs the gamut of approaches from game-

fully designing whole courses to a micro application, or using incremental steps, making it extremely flexible.

To be successfully applied, the entire user experience of the learner must be constructed knowledgeably, intelligently, and meaningfully, with an understanding of the context, goals, and motivational aspects of learning and a fundamental understanding of the application of the underlying game elements. It requires a careful and considered design process with sufficient resources made available. Lastly, it should be seen as one approach within a diversified educational context that can be adapted to fit different educational strategies.

4.2 Results

In the following sub-sections are documents of a more practical nature for designing educational gamification projects. The guidelines are intended to give general direction; the design document can serve as road map to start up the actual design process and guide the necessary research at the beginning.

4.2.1 Guidelines for meaningful gamification

There are a number of authors from varying disciplinary backgrounds offering principles on how best to apply gamification. It has become apparent that most of the principles can be grouped under 3 key concepts: Meaning, Mastery, and Autonomy (Deterding, 2011). These three principles are adopted from the self-determination theory from Deci and Ryan (as cited by Groh, 2012) and describe three innate needs for intrinsic motivation. Meaning comes from Relatedness, the universal need to interact, to be connected, and to tap into personal and shared goals, interests, and a meaningful story. Mastery comes from Competence, the need to be effective and master a problem in a given environment. The third is Autonomy, defined as the universal need to control one's own life. Intelligent gamification for any situation should be built on these concepts (Deterding, 2011; Groh, 2012). The ensuing substructure has been adapted and extended based on Groh's research (Groh, 2012).

Meaning

Connect to personal goals and interests

Strong engagement can be accomplished if there are attainable, personal, motivating short-term goals such as developing a particular skill, a personal quality, social recognition, or academic excellence (Kapp, 2012).

Connect to shared goals

The goal of 'preparing for the future' can be abstract and distant for students. Establishing (exciting and aspirational) long-term goals while relating to short-term tasks creates growth with a purpose (McGonigal, 2011).

Mastery

Provide interesting challenges

Present compelling and meaningful challenges in order to trigger intrinsic motivation (Groh, 2012) and the mind's natural curiosity (Malone, 1981). To keep the pleasure of intrinsic satisfaction going, the brain needs an increasing level of challenge and complexity (Willis, 2011).

Students are motivated by challenges that are just out of reach but attainable (Gee, 2005).

Creating an experience of Flow requires remaining in a narrow zone between things being too hard and things being too easy (Prensky, 2005).

Scaffold challenges

Make the onboarding process easy by scaffolding the challenges and reducing scaffolding as students progress through the game (Kim, 2011), making it 'Easy to learn, difficult to master'.

Make challenges incrementally attainable through leveling

Break longer mastery arcs into smaller nested skill-chains (van Diggelen, 2012). Mission based levels help structure the progression of learning and motivate learners by developing mastery as the levels become more difficult and learners must recall, use, and improve their skills and knowledge to advance (Kapp, 2012). Replayability will allow for failure as a strategy for a fruitful learning process (Kapp, 2012).

Provide clear, visual, varying, well-structured goals

Goals create purpose, focus, and measurable outcome. In order for an environment to be challenging, it needs adaptive goals perceived as worthwhile for the learner and, goals whose attainment is uncertain. Goals can be made uncertain through designing for variable difficulty levels, multiple level goals, hidden information, and randomness (Malone, 1981).

Provide juicy feedback

Juicy feedback means feedback that is effective, exciting, and engaging because it is balanced, coherent, continuous, emergent and fresh (Hunicke as cited by Kapp, 2012). Intrinsic motivation is activated by offering clear goals combined with an intense and varied performance feedback system (McGonigal, 2011; Prensky 2005). Feedback can give information or guide the gameplay.

Create a reward system for intrinsic and extrinsic motivation

For more information on rewards systems refer to the design document.

Design for fun

Fun must be created. Collecting, sharing, customizing, exploring, collaborating, competing, role-playing and problem solving, are all activities learners can perceive as being fun (Werbach, 2012).

Autonomy

Empower the player and create a feeling of agency by allowing for decisions and choices that influence the outcome (Kapp, 2012).

Analysis gamification guidelines

In the results indicated in Table 1 there is a detailed analysis of the attributes in the gamification guidelines examined for this paper. Kim speaks of 7 core concepts in which she advocates understanding the needs, motivations, and shared or personal goals of the audience (Kim, 2011b). That could mean understanding the social style involved such as being competitive, collaborative self-expressive (Kapp, 2012) or the Player Type as classified by Bartle - an Explorer, Socializer, Achiever, or Killer (Werbach, 2012). This understanding can be called user-centered (Nicholson, 2012), human-focused (Chou, 2012), or learner-centered (Sheldon, 2012). Others speak of designing for mastery by defining the core activity, establishing feedback loops, creating clear goals, establishing challenges and tasks, designing levels and balancing the process and outcome (van Diggelen, 2012; Deterding, 2011; Simeos et al., 2012; Hannify, 2012; Chou, 2012; Werbach, 2012). Those involved in educational gamification advise establishing clear learning objectives and content (Mieure, 2012; Kapp; Sheldon, 2012). A number of the authors analyzed advocate creating a story layer or at least a game theme, and choosing a game type (Sheldon, 2012; Kapp, 2012; Chou, 2012).

	Chou	Deterding	van Diggelen	Groh	Hammer & Lee	Hannify/MIT	Kapp	Kim	Mieure	Sheldon	Simeos et al.	Werbach
MEANING												
Personal goals	*	*	*	*			*	*		*		*
Meaningful community		*	*	*			*	*	*	*		*
Meaningful story		*	*	*			*			*		*
Emotional experience	*	*	*		*	*	*	*		*	*	*
MASTERY												
Challenges		*	*	*		*	*	*		*	*	*
Goals		*	*	*			*	*		*		*
Rules		*					*	*		*	*	*
Incremental progress	*	*			*		*	*		*	*	*
Skills, levels		*			*	*	*	*		*	*	*
Scaffolding		*					*			*	*	*
Juicy feedback	*	*	*	*			*	*		*	*	*
Flow			*				*	*		*		*
AUTONOMY												
Agency, value activity	*	*		*	*		*					
OTHER												
Social styles			*				*	*	*			
Player types	*		*				*	*		*		
Player styles							*			*		*

Table 1 Analysis of Gamification Principles

(van Diggelen, 2012; Deterding, 2011; Chou, 2012; Kapp, 2012; Kim, 2011b; Hammer & Lee, 2011; Mieure, 2012; Werbach, 2012; Hannify/MIT, 2012; Sheldon, 2012; Simeos et al., 2012)

4.2.2 Gamification Design Document

The design document below is based on multiple sources that have been synthesized in combination with the researcher's extensive design practice and educational experience (Werbach, 2012; van Diggelen, 2012; Chou, 2012; Kapp, 2012; Sheldon, 2012; Liebermann, 2010b). It is intended as a springboard for further inquiry and project development.

1. Establish the educational goals.

Educational goals are often high level concepts that are connected to the institute or department in question. A gamification project should be aware of and support these goals.

2. Understand the student audience.

Depending on the situation, the students could be analyzed demographically or psychographically to gain an understanding of their needs, motivation, and personal goals. Other items of importance could be establishing their game literacy or their relevant present and future skill levels. Students could formulate their personal goals at the beginning so that they are aware of them and evaluate them at the end to see if they have been accomplished (Liebermann, 2010b).

3. Establish specific (learning) objectives and content.

Once the learning objectives have been established for a course, the content can be created in a way that will seem familiar to an experienced instructional designer. If a complete course in video production is taken as an example, the final deliverables could be: a video, a script, and storyboards. Next, these could be broken down into more granular sets of the skills and knowledge students will need to build in order to acquire the mastery necessary to create the final project. These could be film analyses, smaller practice videos, learning to storyboard, location scouting, tutorials for using equipment and editing software, and so on. Next, these should be structured so that they build on each other, that the building can proceed along different pathways, and skills slowly but surely being forged together in the final challenge (van Diggelen, 2012).

4. Choose a game theme, game story, game type, game environment.

In *The Multiplayer Classroom*, it is suggested that a theme comes first as this drives following elements forward (Sheldon, 2012). A theme for the fictive course above could be:

"The camera work, the lighting, the effects, the sound, the mise en scène must enhance and reinforce the story".

Although a gamefully designed course will not have the narrative of a full-blown video game such as say, "Lord of the Rings", a story can play a valuable role in creating meaning and context. In teaching higher order skills a RPG -role playing game- or ARG -Alternate Reality Game- can strengthen the learning experience, if it has an authenticity connected to the subject (Kapp, 2012). In the example sketched above students could take on the role of a production company which is creating a video for a client, assuming different avatars for different professional functions, thus viewing things from different perspectives. To give the course a gameful experience, Sheldon proposes that gaming terminology overlays the usual class terminology. Students work in Guilds and take on roles, they create personal Avatars, the teacher becomes a Game Master, etc. (2012). Learning activities can be linked to possible,

relevant game styles that must be integrated with, and reinforce, the learning outcomes.

5. Develop a scoring system.

One of the characteristics of a gamified course is the revamping of the grading system to a more game-like approach that will be familiar to most students. There are different models and variations but the idea is that everyone starts the class as a level one learner and they work their way up to mastery. Experience Points, or XPs, are awarded for the completion of quests (tasks and assignments); as they progress through levels they gain XPs that represent the final grade. The XPs can have a performance and a quality assessment. There can be additional bonus quests that have a different focus, perhaps more closely linked to personal goals, developing special skills, or excelling, giving the students control over the path and level of their achievement (Liebermann, 2010b). This can become visible through a leaderboard.

6. Develop a rewards system.

The designing of a successful reward system is complex. One of the most important issues is understanding the different roles played by intrinsic and extrinsic motivation. There are measurement achievements that have an evaluative function to create a perception of competency which in turn feeds intrinsic motivation. Completion achievements for performance or non-performance create extrinsic motivation and should be used sparingly as their overuse can reduce intrinsic motivation. Make achievements challenging for the greatest returns in player performance and enjoyment. Phrase achievements and design interactions to increase player self-efficacy (Blair as cited by Kapp, 2012).

7. Design for mastery

Establish the core activities. These can be writing, problem solving, designing, presenting, and so on. How is the overarching challenge divided into smaller goal tasks in progression loops? Which mechanics are used to “light the way” (Kim, 2011, slide 27)? What is the connection between learning mechanics and game mechanics? What are the rules? Where is the feedback and which form does it take? Where is the choice? Where is the fun? Will they play alone or in teams, against or with each other? How is the process balanced with the outcome?

In closing: the design team must be thoughtfully put together creating the right mix of expertise. In theory it can contain an instructional designer, a content expert, a game or gamification designer, a visual designer, a programmer, a student representative, an institutional representative, a sound engineer, and a project manager (Kapp, 2012) but, in the educational reality, teams will likely be smaller: functions will be combined; some team members will be only sporadically present; other functions may not be deemed necessary. Especially in an educational project, the involvement of the student population in the design, prototyping, and testing process is another factor that can contribute to the project's success. This document doesn't have the intent to be complete but instead to function as a springboard for further inquiry and development.

4.3 Future Research

There are many opportunities for such further inquiry and development in the emergent world of gamification in the context of Dutch higher education. One example is further experimentation in the gameful design of existing courses in a controlled manner using quantitative and qualitative research methods for assessment. 'Mini- gamification' is another area with smaller games for specific situations, i.e. parts of courses like presentations, research, or assessments. Other ideas are gamifying social events like the induction process at the beginning of the school year. More detailed research is needed on the development of specific game mechanics that support learning, the use of feedback systems and rewards systems that stimulate intrinsic motivation, as well as the role of narrative and design, and which game types are best suited for which kind of learning. Lastly, in order to improve the quality and efficiency of the design of gamification, tools and resources will need further development.

5. Conclusions

In order to answer what gamification has to offer for designing higher education learning environments for the 21st century, the pertinent areas of learning, education, and games and learning were reviewed.

Creative problem solving, systems thinking and collaboration are a number of what are known as '21st century skills', skills that can give students the capabilities to negotiate the demands of this century. New models of learning fueled by new neuroscientific insights into the nature of learning, and the opportunities offered by emerging technologies can be of importance in producing an educational system that supports 21st century outcomes for today's (university) students. Recent brain-based research suggests a similarity between effective methods of engaging and activating intrinsic motivation to learn as developed by game designers, and cutting-edge principles being discovered on human learning. Games, that are quickly becoming an integral part of global culture and, it is argued, "soon we will all be gamers" (McGonigal, 2011, p.6), can offer the kinds of learning experiences and social practices that are seen as being important in the 21th century.

Gamification - the use of game design elements in non-game contexts to engage and motivate learning - is one approach for integrating the lessons from games into education. The literature review indicates that it has a number of demonstrable benefits to offer in designing higher education learning environments for the 21st century. By connecting more closely to the experience and expectations of today's students, it has the potential to involve and motivate them more deeply and proactively in their own learning process, and to improve the quality of learning. Using innovative, gameful pedagogical methods of the 21st century can play a role in the ambitions of Dutch universities that see themselves as engines for growth in a globalized economy, and where future professionals are fostered to be capable of creating collaborative, innovative practices. In addition, it also creates exciting new opportunities for educators themselves, allowing them to reimagine existing practices in which they can build on their existing skills, knowledge and abilities.

For the successful, non-trivial application of gamification in education, the entire user experience of the learner must be constructed knowledgably, intelligently, and meaningfully, with an understanding of the context, goals, and motivational aspects of learning as well as a fundamental understanding of the application of the underlying game elements.

Concerning best practices for implementing gamification, there have been some valuable steps made in the form of guidelines that can give direction, and a structural design document that can guide the design process and function as a springboard for further inquiry and development.

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