Serious Games

Present and Future

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Abstract
This paper discusses the current situation regarding games as pedagogical tools, more specifically, so called serious games. Based on contemporary literature and an empirical study in the form of interviews, issues regarding the integration of video games in everyday learning and teaching situations are explored. The literature review is based both on international and Swedish research, both within the games aspect and the pedagogical aspect of this field of research. The interviews were conducted with people who are either engaged in the e-learning/game-based learning business or in education. The implications drawn from this study are used to discuss the future of serious games and game-based learning. It seems likely that serious games, just like other non-text based pedagogical tools, for example sound recordings and film material, could find their way into our classrooms. Many of the obstacles ahead will probably arise for economical and market reasons, as the development of these kinds of games will require both technical and pedagogical competences.

1 Introduction
1.1 Background
Home video games have been around for over 30 years now and a large number of children as well as adults are spending hours every week playing them (Gentile, 2004). Video games have the ability to immerse the player in compelling worlds, tell stories, portray characters and render spectacular environments and settings, and also allows the player to take on various identities (Gee, 2003), so there is really no wonder why people choose to engage in the activity of playing video games.

As video games have gained popularity and made their way into many peoples homes, concerns about their impact on the people who engage in gaming, most importantly the younger group, have been raised. The criticism has been mostly directed at video game violence and the supposed negative effect it might have on children (Cumberbatch, 2004). Another concern has been the effect video games can have on a child's social life and also how the child manages their schoolwork. Studies regarding the latter of these concerns have provided some ground for the claims about video games intruding on school work (JAMA and Archives Journals, 2007). It is, although, hardly surprising that kids would rather play video games than do their homework. Games can be extremely enticing and even grown ups can find it hard to resist playing for up to several hours, instead of dealing with more pressing matters. But why try to fight this and not see it as an opportunity that can be used to our advantage instead?

The idea of games as means of conveying knowledge has been around for quite some time and many so called serious games have been developed (Susi et al, 2007). However, games are still not generally accepted as valid tools for teaching in our educational facilities (Gros, 2007) with a few exceptions, the military being one. Game designers are hired by the military for their skills in creating compelling experiences (Squire, 2008). It makes sense, because the military often make use of simulations, and games can indeed create very accurate simulations of various real life situations. Pilots train in simulators before flying real planes.
for example. As games are capable of simulating so many different tasks and situations, this sea of possibilities is very vast indeed, and more and more serious games see the light of day.

1.2 Aim

One aim for this paper is to evaluate some of the possibilities of games as pedagogical tools and also to draw some conclusions about the means to which we can most efficiently harness the power of video games for teaching and learning purposes. Primarily, however, this study is focused on the situation today and the main question asked in this paper is, based on current implications, whether it is reasonable or not to assume that games have a place in traditional teaching environments, and if so, whether this development can be expected in a near future. This study revolves mainly around the concept of serious games.

Games are of the nature that, if well designed, players will become emerged in the game world and focus their attention at the tasks presented for them by the game. If the game is really great, the players will become unaware of their surroundings. Time disappears and so does the room around the players. The only thing the players are aware of is the computer or TV screen and the controller in their hands. At the best of times the controller becomes a natural extension of the players' bodies. Most importantly, players don't think about the fact that it is just a game they are playing. This state of focus is commonly referred to as flow (Salen, Zimmerman, 2003). This quality, the ability to capture a person's undivided attention to such a degree, isn't found in most traditional educational materials. A quality that however is found in most traditional educational tools is a pedagogical one. That, of course, kind of goes without saying. When you think about games though, pedagogy is probably not the first word that pops into your head. But as a matter of fact, games are often dependent on pedagogy. A good game gives the players the knowledge they need in order to solve the puzzles or tasks ahead of them, to beat the game. Annetta et al (2007) refers to this as stealth learning, which is learning without realizing that you are in fact learning. Video games are often about learning by doing. Trial and error. A player can fail ten times in achieving the goal set up by the game before finally succeeding, and with every failure the player has to reflect upon what went wrong and then try to correct the errors and perfect the techniques required for success. Through the same methods, knowledge that is valid outside of the game world can be conveyed to the players.

The views of educators and game developers on this matter are interesting. Can we expect to see a new paradigm of educational methods evolve in a not so distant future? While there exists a great interest for pedagogical games in the research community, in order to truly harness the potential of games as pedagogical tools, educators have to realize that there is indeed potential and game developers have to realize that it is possible to market this potential. We can distinguish three keywords here; educators, developers and market. These are main factors in this issue, and with these in mind we can phrase the main question of this paper:

*Based on current implications, is it reasonable or not to assume that games have a place in traditional teaching environments, and if so, can this development be expected in a near future?*
1.3 Scope

The main focus of this study will be aimed at serious games. It is however difficult to limit oneself to serious games only, because it is, in many ways, related to e-learning and edutainment, which will thus also become subjects for the study. This paper only presents games as pedagogical tools in a more general sense. Different school subjects, for example, will require different approaches. Of course, it is important to bear in mind the significance of identifying which types of teaching materials are better suited for presentation through the video game medium and which types of materials are not as well suited. In the latter case, methods for adapting either the material to the medium, the medium to the material, or a combination of both, should be considered. Most games teach the player to execute certain skills specific to the game, and this is something game designers are good at implementing into their games. The situation becomes quite different when the game suddenly has to teach the player about for example geography, mathematics or medicine. Still though, this is beyond the scope of this study and will therefore not be dealt with.

However, when contemplating this issue it becomes clear that there is of course a need for expertise from different types of fields. Designers of traditional entertainment games alone will not be able to tackle the challenge of creating good serious games by themselves, as their field of expertise is located mostly in the area of entertainment. Neither will people in the field of education be able to do this as their expertise lies within pedagogy and not game design. All parties involved in the process of creating pedagogical games must adopt a mutual understanding for the challenge at hand and hopefully a mutual interest for seizing the opportunity this new method of teaching presents.

This aspect of the merging of different competencies required for successful productions will be discussed in this paper. The people who are best at making great games are not the best teachers and the best teachers are not the best at making great games. This aspect has been examined through interviews with people working in positions related to game design and/or education and pedagogy.

2 Method

2.1 Method description

This study was conducted in two parts. The first part is an empirical study that consists of interviews with people involved in the e-learning business and the educational system. With this qualitative method the intention is to get an insight into how the market for teaching games could evolve. Is there any demand from clients for these types of games and are the e-learning developers willing to break new ground with this alternative teaching method? The focus of the interviews were mainly games in public schools. Questions for the interviews were prepared. The purpose of these questions was not mainly intended to induce concrete answers but rather to get a discussion going and through this discussion new and interesting questions would hopefully arise. This study is not just about finding answers, but also about finding new and hopefully important questions that can give further insights. The interviews will not, however, be presented in their entirety here. Instead, they serve as more of a catalysts for the literature review, which is the second part of the method.
The literature review consists of contemporary research made on the subject of games as pedagogical tools. The idea here is to present some of the work and progress that has been made in the field. This will also serve as to further concretize the concept of games in teaching environments and validate the concept. Because games in a pedagogical context probably feels strange and alien to a lot of people, especially those who consider games to be something existing purely for entertainment purposes, it is important to show that the whole idea behind this is valid. Further, the literature review is necessary to define some of the underlying concepts related to games and serious games.

With the combination of the interviews and the literature review, some insights regarding the main question of this paper which is; Based on current implications, is it reasonable or not to assume that games have a place in traditional teaching environments, and if so, can this development be expected in a near future? will hopefully present themselves.

2.2 Interviews

2.2.1 People

The people that were interviewed were all working in fields related to the subject of games as pedagogical tools. It felt necessary to get the point of view from people with expertise in the different areas that most directly relates to the subject, and to our main question. The process of finding these people was pretty straight forward. By going back to the main questions and those three keywords; educators, developers and market, identifying people whose experiences would be valuable to the study was made much simpler.

The first person who agreed to an interview was a development manager for pedagogical IT usage at a gymnasial administration. This person was approached after a personal tip and is, besides a visionary, very competent in her field with a background as both a teacher and an IT pedagogue. With her focus on implementing technology into classrooms and making it part of teaching, she became a valuable asset for the study and a good representative of the educational system.

The second interview was with an employee at the e-learning company Accoll. Accoll is responsible for the development of Bonniers Trafikskola, an interactive production meant to help driving students improve their theoretical knowledge. They have also developed a serious game for the Swedish Crime Victim Compensation and Support Authority. Their experience with game-based learning made them highly interesting for this study, and one experienced employee kindly agreed to share her views on the present and future of games as pedagogical tools.

The third interview was with a person working in marketing at Data Ductus, an IT company and developer of serious games, among other things. They have been responsible for designing serious games in cooperation with the Swedish National Defence College with the aim to help educate people involved in peace support operations. Like Accoll, Data Ductus has much experience with game-based learning, and to get a marketers point of view on the matter was very interesting indeed, as there is of course a business aspect to the development of serious games as well.
2.2.2 Interview sessions
The interviews gave a good hint on how different actors in the businesses affiliated with games as pedagogical tools think about different aspects regarding the subject. This was indeed a great chance to hear their insights and learn more about the possibilities they see in this particular field of teaching materials, and also what they think could become problematic. The interviews lasted approximately 20 minutes and were conducted face to face, with the exception of one (Data Ductus) that had to be done remotely using Skype. The interviews were recorded, instead of scribbled notes, to cause minimal distraction. The recordings were later used for revisiting the discussions.

2.2.3 Interview questions
Uwe Flick (2009) writes in his book An Introduction to Qualitative Research that the person being interviewed should be given room to express his or her views. At the same time there must exist a structure around which the things they talk about should be based. Thus, the interview questions were devised to encourage a discussion rather than simply generating direct answers. Through this method, the interviews became more reflective and gave some very interesting insights, and also clarified some of the issues regarding the subject, issues that perhaps never would have come up, had the interview questions been devised simply for shorter more direct answers.

The questions were mainly intended to focus the discussion around the issues regarding the main question and of course the keywords (educators, developers and market), though some of the questions were centered more around basic concepts regarding serious games and e-learning.

2.3 Literature
Most of the literature used in this study is quite contemporary, as the subject of games as pedagogical tools is still relatively fresh. The literature that has been studied has mostly been in the form of scientific papers and shorter articles and almost all of the material is from 21st century.

Step one in the literature review was to find research defining the underlying concepts of serious games, with gaming being the most fundamental. It was important that the literature used in the study reflected both the basic concepts of gaming and games, but also the inherent pedagogical qualities of video games. Fortunately, plenty of research has been conducted on this particular aspect of gaming, and a visit to the library provided useful printed work on the subject, as well as literature on pedagogy and teaching in a more general sense, which was of course also very useful for the study.

When it came to finding research on serious games however, the library didn't cut it and instead most of this literature (mainly articles and shorter research papers) was acquired using Google Scholar and Google Books. Search strings with keywords related to the subject gave very useful results and after studying many articles it became more clear which researchers were leading in their field and most relevant to this study. It then became more efficient to simply search using the names of these people in order to find more of their research.
2.4 Method review

The empirical study that is an important part of this method, is of a qualitative nature, due to one main reason; the time for this study wouldn't really allow the collection of any relevant quantitative research data. Relevant data in this case could be testing of a few games on a group of people, and though this would certainly be interesting enough, the analysis of the data would be time consuming and the tests themselves would require a lot of preparations. A more quantitative approach could probably have provided very interesting results but the qualitative approach has hopefully provided just as interesting ones.

In order to find the answers to the questions posed within this paper the obvious solution was to turn to other peoples research. The literature that has been studied is quite up to date as most of it has been written in the 21st century. One might argue that the development of video games is progressing so fast that any observations made regarding today's video games will be outdated in a couple of years. This is true if one chooses to look only at the technology behind video games. Graphics improve at a very high rate. Gameplay and the core mechanics of video games however, do not evolve as rapidly. Good gameplay means pretty much the same thing today as it did 30 years ago when Super Mario saw the light of day. The literature should thus be satisfactory regarding it's relevance.

Regarding the interviews, one downside is possibly the inconsistency that might have emerged due to the fact that one of them had to be done over Skype and not face to face. A face to face interview could have generated a deeper dialogue and thus provided more interesting insights. Another downside to the interviews were the fact that the audio recordings were not of the best quality, making it a bit harder to catch every word that was spoken even though the main points that were made were preserved and are presented in the paper. Full transcriptions of each of the interviews would have been very useful but regrettably poor preparations with the recording equipment made this virtually impossible. The major disadvantage in this part of the method is that not as many people were interviewed as was initially intended. While the interviews gave some really interesting results there is no guarantee that these results are generally representative even though it is likely that the main points that were made are consistent with the general view of people in similar positions. Nevertheless, the main points of this paper and the results presented here are based on the literature review.

3 Games and pedagogy

3.1 Games

There exists a great number of definitions of what a game really is. As a result, defining a game can be really hard. David Parlett even went so far as to say, in The Oxford History of Board Games, that:

*The word [game] is used for so many different activities that it is not worth insisting on any proposed definition.*

(Parlett, 1999, p. 1)
Parlett has a point in the sense that it is probably very hard to find a definition that covers every aspect of the word game. However, just because a definition isn’t adequate in every sense doesn’t mean it has to be wrong. Depending on the type of game or the purpose of the game, the definition could be changed, thus remaining true, although perhaps not spanning every facet of the game’s nature. Consequently, with this in mind, it is possible to find a definition that is suited for this study in particular – games as pedagogical tools.

In the case of games as tools for teaching there are of course certain qualities, true for games, that should be contained within the definition. One quality that is very interesting and relevant to serious games, is the ability to capture the player’s interest. In the book *Homo Ludens: A Study of the Play Element in Culture* by Johann Huizinga a reference to this quality can be found. Part of Huizinga’s definition of, what he refers to as play, states that:

*Play is* a free activity standing quite consciously outside “ordinary” life as being “not serious,” but at the same time absorbing the player intensely and utterly.

(Huizinga, 1955, p. 13)

Play in this case represents the activity that people engage in when using a game. Huizinga’s definition is however also contradictory to the subject of this study because it talks about games as something somewhat unrelated to reality and something that is “not serious”. This is of course the opposite of the whole idea behind games as pedagogical tools. On a side note, the term *serious games*, which was taken into wide use through the Serious Games Initiative in 2002 (Susi et al, 2007), is rather clearly manifested as to refrain from the “not serious” aspect of games.

Another quality of games that is relevant to this subject is presented by Chris Crawford in his book *The Art of Computer Game Design*. The quality in question is safety and Crawford describes it as follows:

Conflict implies danger; danger means risk of harm; harm is undesirable. Therefore, a game is an artifice for providing the psychological experiences of conflict and danger while excluding their physical realizations. In short, a game is a safe way to experience reality. More accurately, the results of a game are always less harsh than the situations the game models.

(Crawford, 1982, p. 14)

This of course directly relates to games in the form of simulations, commonly used by the military (Squire, 2008). This is a very important quality because with a flight simulator, for instance, the outcome of a crash is a lot less severe to the pilot than had it been a real plane they were maneuvering. Crawford’s definition of safety does of course assume that there is in fact a conflict present to begin with. This is fortunately true for all games in some sense (Salen, Zimmerman, 2003), although the given conflict may not be of life threatening nature.

The teaching aspect of course also has to be included in the definition of games for the purpose of this paper. In *Serious Games – An overview* (Susi et al, 2007, p. 10) it is argued that:
One of the reasons why games are effective is that learning takes place within a context that is meaningful to the game; learning in a meaningful and relevant context is more effective than outside that context [...] 

3.2 Games and classrooms

Games have been under heavy criticism ever since they saw the light of day, whether it has been about games making people stupid or violent (Cumberbatch, 2004). It is hardly surprising that the idea of games in classrooms is something that perhaps doesn't rhyme very well with everybody's idea of healthy education. In Serious Games – An overview by Susi et al (2007), one of the more critical voices is presented. Stoll (1999) is of the opinion that computers:

...direct students away from reading, away from writing, away from scholarship. They dull questioning minds with graphical games where quick answers take the place of understanding, and the trivial is promoted as educational. They substitute quick answers and fast action for reflection and critical thinking [...] Turning learning into fun denigrates the most important things we can do in life: to learn and to teach. It cheapens both process and product: Dedicated teachers try to entertain, students expect to learn without working, and scholarship becomes a computer game.

(Stoll, 1999, pp. 13-14)

While Stoll is probably right in the sense that hard work can indeed build character and prepare a person for upcoming challenges, he is missing the point of pedagogical games and also the use of computers in classrooms. One of the things Stoll believes students are being directed away from, through the use of computers, is reading. Reading is traditionally viewed as the decoding of symbols in order to derive meaning (Wikipedia). But the concept of reading can go beyond this definition. This is shown in the book Mellan Dante och Big Brother by Christina Olin-Scheller (2006). In this thesis Olin-Scheller talks about an expanded text concept. The idea of the expanded text concept is even included in the Swedish schools' curriculum. Loosely translated into English it states that:

To absorb and process text does not always have to imply reading but can also come through listening, film, video etc. An expanded text concept, besides written and spoken texts, also includes images.

(Olin-Scheller, 2006, p. 21)

Written fiction and other literature is therefore not really favored but is rather one medium that falls under the expanded text concept. This new definition of text in the syllabus is,
according to Olin-Scheller, a way for the schools to relate to the ever growing and evolving media society.

The word text stems from the Latin word textus which means woven cloth (Olin-Scheller, 2006) and reading is indeed the act of weaving together letters into words and words into sentences and ultimately the sentences form some sort of meaning. Olin-Scheller also talks about the word read that stems from the Latin word legere, which basically means that one merges different elements into a whole. This act, to merge elements, is according to Olin-Scheller, not necessarily limited to letters and figures but can also be applied to sound and images. Further, she argues that in doing this, merging elements, interpreting and absorbing the contents, the reader becomes an active co-creator of the meaning a text have to offer. Games as a form of literacy is also discussed by Gee (2003) in chapter 2 of the book What Video Games Have to Teach Us About Learning and Literacy where he claims that there are many ways of reading and writing and that literacy is multiple.

Now, with Olin-Scheller's words in mind, it suddenly becomes easier to justify video games in the classroom. Video games easily falls under the expanded text concept with their rich story lines and compelling sounds and visuals, and as the expanded text concept is already in the school's curriculum, video games most certainly have a place there too, just like film, for example, have been part of our education for some time now.

### 3.3 From edutainment to serious games

With the expansion of the home PC market during the early 1990s, edutainment products became increasingly popular. This is sometimes referred to as the edutainment era. Edutainment, or educational entertainment, means any kind of educational activity or tool that is also entertaining in some way. Edutainment can be anything from music to movies and games. When we speak of edutainment however, we usually mean some sort of digital material, very often based on play. The primary target group during the edutainment era was preschool- and young children. (Susi et al, 2007)

The term edutainment was coined by Walt Disney in 1948 to describe Disney's movie productions that were supposed to be educational as well as entertaining (Van Riper, 2011), and games with purposes other than just entertainment were developed long before the edutainment era (Susi et al, 2007). First to use the edutainment label for video games was Electronic Arts in 1984, when marketing their game Seven Cities of Gold (Egenfeldt-Nielsen, 2006). While edutainment games became relatively popular during the early 1990s, they were also under heavy criticism, the foundation of which was laid by Thomas Malone in the 1980s. He identified a lack of intrinsic motivation and bad integration of learning and games (Egenfeldt-Nielsen, 2011). Further, the criticism was aimed towards the fact that these games often put a heavy emphasis on repetitive tasks, assuming that learning is benefited when the student gets to practice a skill enough times (Gros, 2007). Egenfeldt-Nielsen (2011) points out that while the principles of learning through skill-and-drill are valid, they limit the areas in which we can use learning games, since they are often only applicable on simple information.

In the end, the concept of edutainment was in many ways a failed one. The products simply weren't profitable. However, with the technological advancements in computer
graphics and the development of multiplayer gaming during the late 1990s, the failure of edutainment ultimately led to the evaluation of the possibilities of serious games. (Susi et al, 2007)

3.4 Serious games

What are serious games then? Answering that question can be somewhat tricky, as there are many different definitions to be found, some wider and some more narrow. However, two important aspects of serious games are their ability to add value, both when it comes to education and entertainment. These two aspects, education and entertainment, are reflected in the term serious games, which in itself is an oxymoron, as games would imply something that is traditionally fun, and not at all serious (Ritterfeld et al, 2009). One could consequently argue that education is not entertaining, but on the other hand serious. This is where serious games come in. Of course, lots of people are probably already of the opinion that “just” learning can be a lot of fun, but then again, the idea behind serious games is not primarily about making learning into fun. That is another discussion, but so far we can see that both edutainment and serious games share the same basic ideas.

To better understand what a serious game is we also need to define the concept of e-learning, as it is important that we recognize serious games as a more specific concept. E-learning has been an expanding business ever since the late 90s and it has been responsible for the development and distribution of digital learning materials (Squire, 2008). Wikipedia’s definition of e-learning is that it comprises of all electronically supported teaching and learning. This definition is of course very wide. E-learning material can comprise of virtually anything from text to images, sounds and video. What makes it into e-learning is the fact that it is distributed digitally. Most of this material uses the internet as its medium.

Closely related to e-learning are therefore serious games and also game-based learning. Some consider game-based learning a branch of serious games and others consider the two terms to have more or less the same meaning (Susi et al, 2007). Serious games can in many ways be viewed as a sub category to e-learning, but with the risk of reducing serious games to something similar to edutainment, which, in the light of the early 90s, can trigger some negative associations. Indeed, serious games are digitally distributed tools for teaching but while e-learning is all about the content, serious games are also about the packaging of the content (Squire, 2005). Games are powerful in the sense that they are designed experiences that let the player participate in an ideological world that is designed to support particular kinds of feelings and at times thoughts and identities which can be used in education and training (Squire, 2008). The point is that serious games should share this quality as well. Serious games are games, but with the addition of educational content.

The Serious Games Initiative was founded in 2002 by the Woodrow Wilson Center in Washington D.C. (Susi et al, 2007) and it was through this initiative that the term serious games was made more widely acknowledged. The description found on the homepage for the Serious Games Initiative (www.seriousgames.org, 2014) reads as follows:

*The Serious Games Initiative is focused on uses for games in exploring management and leadership challenges facing the public sector. Part of its overall
charter is to help forge productive links between the electronic game industry and projects involving the use of games in education, training, health, and public policy.

In other words, the idea of merging different competencies is one that is well alive within the Serious Games Initiative. This description also presents some fields in which games can be used. It is however perhaps too much of a mouthful and an even more specific definition of what qualifies as a serious game could be useful. If one were to look up serious games on the internet they would find that a common definition of the term is that a serious game is a game with another purpose than entertainment, or something to that affect (Susi et al, 2007). Michael and Chen (2006) presents a definition which is very much in line with this description. According to them, serious games are:

...games that do not have entertainment, enjoyment, or fun as their primary purpose. That isn’t to say that the games under the serious games umbrella aren’t entertaining, enjoyable, or fun. It’s just that there is another purpose, an ulterior motive in a very real sense.

(Michael, Chen 2006, p. 21)

This description, while perhaps not being a very in depth definition, gives a general idea of the concept and serves as a good base for understanding what serious games are.

3.5 Games and pedagogy

With games we can achieve different types of learning. Just as with the case of edutainment, games can be used for skill-and-drill learning, where the user repeats and memorizes information. But if serious games are designed in this way, in essence they’re nothing more than edutainment. We can however take the learning further and use games to create a deeper understanding for concepts and problem solving, applicable in real world situations. In other words, deep learning. We don’t even have to change the way we design games, just add content. Games, not just serious games but commercial ones as well, have intrinsic features that make them very suitable learning tools. One such feature is the way in which games allow the player to understand the rules of the game simply by playing it. (Gee, 2009)

The same means, through which commercial games imbue learning, can be applied on serious games. James Paul Gee (2009) describes six properties in entertainment digital games that functions as a basis for deep learning, not just skill-and-drill practice. These properties, that are found in good entertainment games are, according to Gee, essential for the production of successful serious games. Gee (2009) refers to these as properties of gaming.

The first of Gee’s properties of gaming is (gaming) as a way of figuring out how to use the rules of the game to achieve goals that are of personal and emotional interest to the player. In this case, the term rules both refers to rules set up by the game’s designers and rule like properties, referred to by Gee as emergent properties. These properties are discovered by the player themselves. Working out how the rules of a game can be used to the player’s advantage
is fundamental to gaming, and because of this, gaming is at its core always about problem solving. The personal interest in solving problems and achieving the goals is of great importance, as deep learning occurs when we care and feel that something is at stake (Damasio, 1999). Gee points out that one can argue that the goals of digital games are set by the game designers, not the player, and are therefore not of personal or emotional interest to the player. He argues however that the player first accepts the goals of the game, simply by choosing to play it, but then adapts and changes the goals, by choosing their own way of accomplishing them, for example as quickly as possible, or as skillfully, or perhaps not without finding every last coin or treasure. The goal doesn’t have to be just winning. Good games offer multiple ways of solving problems and gives the player the opportunity to design their own experience.

The second property is gaming as microcontrol that leads to embodied intimacy or an extension of the player’s power and vision. Microcontrol means that the player can control aspects of the game at a very detailed level. Many games feature avatars, often human characters, and the player are given the means to control these and other elements of the game. This microcontrol gives the player the sensation of their embodied power extending. Embodied power refers to the space in which we humans feel we have direct microcontrol (i.e. our immediate area of reach). Through this extension of the player’s embodied power, they can become intimately involved in the digital world. The player uses microcontrol and vision to extend their body, through the avatar and into the digital world in order to interact with it. In this way, thinking and problem solving in the game becomes intimately embodied, and as embodied beings in the world we tend to learn best.

The third property is gaming as experiential learning and supply of all the right conditions for learning from experience. Studies show that people primarily learn through experiences in their past. We use these experiences to simulate and calculate how to act in new situations. Because games offer the player experiences in simulated worlds, they have a huge advantage as learning tools. However, for experiential learning to be efficient, the experiences have to meet some conditions. First, they need to revolve around specific goals, as the human brain tends to learn through evaluating the outcomes of attempts in achieving goals. Second, the experiences need to be interpreted by the player. The player has to analyze patterns and rules to form strategies in order to succeed in the game. In other words, the player has to think. Third, learning becomes more efficient when people get immediate feedback during an experience, and can evaluate their errors and rethink their strategies. Games are generally good at giving direct feedback and if the player is engaged in multiplayer gaming, discussions with other players will provide deeper analysis of tactics. Fourth, games need to allow the player to apply their previous experiences in new situations. Gradually the experience will become separate from one specific situation and thus applicable more generally. Many digital games are designed in this way. Skills for the player to master are introduced and later put to the test, traditionally in a boss fight. Fifth and last, players, or learners, have to learn from other people. Interaction, discussion, sharing and mentoring are important aspects in experiential learning. This is not possible in a game. It is however possible through a gaming community.
The fourth property is gaming as finding and matching effectivities and affordances between bodies or tools and the worlds they are in, and then using these effectivity-affordance matches. An affordance is what Gee calls a feature of a world, real or virtual, that allows someone interacting with the world to take an action, but only if they have the ability, or effectivity, to do so. For example, in the game Minecraft, a stone block is an affordance for mining stone, but only for players who have the right effectivity, in this case the right tool (a pickaxe). The effectivity can also be the body of an avatar in a game. For example the main character in the Uncharted-series (these are adventure based action games), Nathan Drake. In these games Drake uses his strength and agility for climbing walls and swinging on ropes in order to make progress. With Drake's body as a tool for the player, the world's many ledges, ladders and ropes become affordances for moving forward in the game. The property of gaming as effectivity-affordance matches, is a good way of viewing worlds from different perspectives. If Nathan Drake didn’t have his climbing abilities, the world in the Uncharted games would have appeared very different to the player. The affordances that matched Drakes usual effectivities, would now become obstacles instead and the player would have a completely different perception of the game world.

Fifth is gaming as modeling and using models in order to make learning from experience more general and abstract. This means that because experiential learning can be too specific, or rather, too tied to a given situation, modeling is needed in order to make concepts more abstract. Models and modeling are natural parts of games. Games can model items, places, creatures, vehicles and so on, but also systems, like weather or traffic. A model is just a depiction of the real thing, and is always simplified in some way. A model can be a toy car, which resembles a real car very much, but of course can't be driven. A model can also be a blueprint of the same real-life car. The blueprint itself doesn't resemble the car at all, but is still a depiction of it. Both of these models gives us understanding of the real-life equivalent on a general plane. According to Gee, modeling is important because while experiential learning is effective, modeling allows for aspects of experiential learning to be used in problem solving on an abstract plane.

The sixth and last property of gaming is as player-enacted stories or trajectories. Games are very often based on a story, just like a movie or a book. Gee refers to this as the designer's story. The designer's story is of course always the same for all players (with some exceptions where the player gets to choose between different pre-set trajectories) and based on events that move the narrative forward. But then there's the other story. The story the players write as they progress through the game. This story is unique to all players and each play through of the game. The player-enacted story plays out based on the players choices (how to solve problems, in which order to do things, items the player find and when they find them), their development (mastering the play control, learning new skills) and their own experience of the game. The player-enacted story is important because it engages the player emotionally and therefore contributes to deep learning within the game.

These six properties of gaming, described by James Paul Gee (2009), could be used as a check list in the production of serious games. As they can already be found in commercial games today, it's all a matter of applying them to educational content instead of entertainment. If this is done successfully, they can be used to create the exact same
compelling experiences that video games provide a wide audience with today, but with a deeper, more meaningful purpose.

### 3.6 A Force More Powerful

Breakaway's 2006 game *A Force More Powerful* is a good example of how a serious game can work in order to educate the player in a particular subject, in this case using non-violent actions in order to achieve social change.

Inspired by the 2000 documentary with the same name, *A Force More Powerful* is a turn-based strategy game in which the player engages in different scenarios, or missions, designed around the subject of non-violent conflict, and based on historical events (Squire, 2008). The game's system can be described as “subject-verb-object”, where the player picks one of several available agents, picks an action for the agent to carry out and finally picks a target for this action. The action can for example be fund raising. The player can have multiple ongoing actions during every scenario. Throughout the game the player deals both with individuals and factions. Individuals in the game have different characteristics, e.g. public influence, ambition and will, while factions can have different standings towards society, for example their view on the current regime. Other important variables can be fear, enthusiasm or religious and ethnic affiliations. These are used by the player to determine how people or factions in the game may respond to the player's actions. The game also uses a simple color-coding system, with green representing positive values, yellow for neutral and red for negative values. (DeMaria, 2005)

As players engage in these scenarios, they acquire not only a factual and descriptive knowledge of the principles of non-violent actions, such as protests, strikes, leafletting, civil disobedience and non-cooperation, but they also get to see the effects of these actions in simulated real world situations, and learn to understand when these actions are used and for which purposes. Squire (2008, p. 21) said that:

> As players encounter different scenarios, they practice routine skills, develop a mastery level understanding of game basics, and develop more flexible understandings of game content.

In addition to the in-game scenarios, A Force More Powerful comes with a level editor, which allows students to apply their knowledge and extend it further. (Squire, 2008)

### 4 Possibilities and challenges

#### 4.1 Publishers of educational materials

The largest players in the field, or perhaps the business, of pedagogy are of course the publishers of traditional educational materials, mainly textbooks. Their experience in pedagogy and the implementation of it in educational facilities should be a great asset in the development of serious games, but is it likely that these companies will actually turn to this new branch of educational materials?
When looking at different established publishers of educational materials in Sweden it seems that all of them, with a few exceptions, are completely focused on books and other printed material. Many of the publishers do however provide additional material through their websites. This material though, is directly related to the printed material which is still in main focus. Instances of this can be found at the websites of Gleerups, Liber and Studentlitteratur respectively. Some of these, e.g. Natur & Kultur publishers distribute other forms of digital material, such as movies and e-learning products. Any references to serious games are however not to be found.

One example of a publisher of educational material that focused solely on pedagogical games was Levande Böcker. Today, Levande Böcker is merged with four other companies which form Pan Vision, who mainly distributes traditional entertainment games but also some pedagogical games and films. In the late 90s and early 00s Levande Böcker published quite a few pedagogical games, including the popular Mulle Meck-series. The games Levande Böcker published were however only children's games and no games for teenagers or adults were developed. On the other hand, the games easily qualifies as serious games as there is more to them than just entertainment. This shows that it is clearly possible to run a successful business based on pedagogical games.

4.2 Games and schools

The interviews that were part of this study were focused on games in today's school system and thus the questions were designed to lift issues in relation to this. From the discussions and answers that were generated through these sessions, it seems that games as pedagogical tools are of interest to both developers and schools. However, with all the possibilities that lie ahead comes many challenges to overcome as well.

From the interview with the development manager working at the gymnasial administration it became clear that there is a great interest for serious games as well as e-learning within the public schools. However, according to this person, it is important that the use of games is motivated. The student has to understand why the game is being used and be able to critically approach the game. There has to be a clear purpose and the student must understand why their actions generate a certain outcome. Further it is important that somebody, most likely a teacher, can coach the students and provide feedback. The teacher should also be able to analyze the results from the use of the game. The role of the teacher is of course already presented in the curriculum for the Swedish schools (www.skolverket.se), if not word for word, the same ideas are there, only they don't currently apply to video games. However, this doesn't mean that they're not applicable. It has already been argued that games can fall under an expanded text concept and the idea of an expanded text concept is already in the curriculum (Olin-Scheller, 2006). It seems that the curriculum is indeed ready for game-based learning. The question is if the teachers are ready. Not all people teaching are familiar with video games, and teachers who are unfamiliar with games are reluctant to use them (Gros, 2007). The development manager made a point of this in the discussion and explained that further education of the teaching staff would of course be required.

Elizabeth Simpson and Susan Stansberry (2007) focuses on this issue in Video Games and Teacher Development: Bridging the Gap in the Classroom. In the text the authors talk about
Digital Native students and their Digital Immigrant teachers (Simpson, Stansberry, 2007), a digital native being someone born in the time of digital technology and thus being used to it, whereas a digital immigrant is somebody born before the breakthrough of digital technology, who has had to adapt to the change (Wikipedia). The gap in knowledge regarding digital technology between the students and the teachers are the root of many problems in the classrooms according to the authors. Experiences with digital technology of the majority of teachers, are limited to word processing, databases, presentation software and some multimedia (Simpson, Stansberry, 2007). According to Simpson and Stansberry (2007) the use of, for instance, a video is a step in the right direction but it is probably still not engaging enough for the students who are used to non-linear and more interactive materials.

The text discusses what is required in order to integrate the video game into the classroom. One of these things, and the most important one, is teacher preparedness. Many of the teachers in our schools today are not gamers and therefore many of the teachers will have a hard time adjusting to this new way of teaching. The question here is of course how to best prepare teachers and if it is even possible. Of course, newly educated teachers starts their careers every year and, as time goes by, it becomes more and more likely that this new teacher is a digital native and perhaps even a gamer.

Just as the development manager at the gymnasial administration, both the interviewee at Accoll and at Data Ductus thought that games are very potent teaching tools. Between the two of them they have lots of experience in both e-learning productions and serious games, however, none of these productions have been made for clients representing the public schools. The problem lies in the financing of the productions. A serious games production have to involve so many different competencies. The interviewee at Data Ductus had previously worked on a project which involved an external game studio in addition to the competencies at the company and also people with knowledge in pedagogy. This can’t be financed by the schools and on this point all three persons interviewed were in agreement. This is sad in a way as both persons from Accoll and Data Ductus said that there is a great interest to work with projects for schools. However, both Accoll and Data Ductus are running businesses and can hardly be expected to engage in charity work.

4.3 Production values

One thing that came up during the interview with the employee at Data Ductus was the quality of the visuals and gameplay in video games. It was in this persons opinion that for a serious game to truly be a serious game it had to meet the quality of commercial games in terms of graphics and gameplay, though the person did emphasize that the gameplay can’t take over from the learning experience while still being good enough to keep up the interest. The interviewee also believed that almost any kid today has a very fine taste in games and can easily distinguish between a high quality production and one of poorer quality. This opinion is also shared by Squire et al (2005, p. 34) who ask the question:

How will educational technologists respond to a generation of students who, raised on interactive games, expect the same kinds of interactive experiences from their educational media?
This of course suggests that the involvement of experienced game designers will be a necessity in order to achieve success with serious games productions in classrooms.

4.4 Games and gender

Women are a minority within the gaming community (Lippe, 2007). This is no doubt a huge issue when it comes to educational games as well. If the intended user feels that they have no relation to the educational tool what so ever, it might be more difficult to find the use of it meaningful. This of course goes beyond gender. It could just as well be related to age, social background, culture etc. but with gender, things seem more black and white. Our current patriarchal social structures simply dictates that boys play video games and girls don’t. As this affects half of the population it is not to be taken lightly.

There are many reasons for the under-representation of females engaging themselves in gaming. Lippe (2007) describes reasons for why we choose to engage in different activities. These include cultural acceptance based on gender roles, socialization and education, peer-pressure and of course personal preferences (that on the other hand often are a result of aforementioned reasons). According to Lippe the act of playing video games often lead to a wish to create video games. This of course means that a majority of video game creators are male and thus most video games are created from a male perspective. It wouldn’t be a total over-exaggeration to say that video games are often made by men for men. This is of course based on the crass assumption that men and women are automatically drawn to different kinds of games. Personal preferences naturally plays a role here too and we can of course not assume that all girls like one type of games and all boys like another type of games.

Another reason for the lower number of females playing video games might be stereotype threat, presented in the paper Gender Differences in Technological Sciences as Self-Fulfilling Prophecies: Stereotype Threat in E-Learning by Appel, Kronberger, Wiesner and Batinic (2007). In this paper the authors claim that people who are made aware that they belong to a stereotyped group who, according to the stereotype, are expected to under-perform in a certain activity or task will indeed show poorer results in said activity. The stereotype that women are not supposed to be as good as men at playing video games could thus lead to women not performing as well in a game and this will of course not work as encouragement in pursuing further video gaming activities.

Lippe (2007) states that it takes a lot of energy, courage and motivation for a woman to enter a domain that is traditionally a male one, like video gaming. However, women who do engage themselves in gaming show both skill and knowledge and furthermore a will to enter the industry. There seems to exist a contradiction in this matter because while the stereotype threat (Appel et al, 2007) might suggest that the usage of video games in classrooms would mean poorer results from the female students, Lippe (2007) shows that women, not very surprisingly, can perform just as well as men in video gaming. This would of course mean that none of the sexes would have any advantages or disadvantages in using a video game for learning purposes.

To further emphasize this point; a study made on text-based learning vs. learning with computer simulations, and whether if you are male or female matters, confirms Lippe’s case. The study is presented in the paper Text-Based Learning vs. Learning with Computer
Simulations: Does Gender Matter? (Kickmeier-Rust, Holzinger, Wassertheurer, Hessinger, Albert, 2007) and in this study it was found that there were no significant differences between the female and male students. Regardless of whether they were using the text-based material or the computer simulation no significant differences were found. The performances of both sexes were equal. However, the question whether the educational games will feel relevant to both sexes still remains. It’s easy to assume, based on social expectations and stereotypes, that boys will be thrilled about playing video games in school and girls will be more reluctant. The fact that the gaming community has an extremely big problem with sexism makes it even more unwelcoming to women. This is a reflection of social structures that serious games will hopefully help to change.

5. Discussion and conclusion

5.1 Present
The purpose of this paper has been to investigate the current situation regarding games as pedagogical tools and to answer the question:

*Based on current implications, is it reasonable or not to assume that games have a place in traditional teaching environments, and if so, can this development be expected in a near future?*

So, what are the current implications? In this paper we have discussed possibilities and challenges for the serious games movement. It seems clear that the possibilities for using video games in learning situations are vast. Many studies show the pedagogical potential of video games and a lot has happened since the early days of edutainment and e-learning. So, let’s focus on some of the challenges at hand, and what they’re implying. Let’s start on a more practical note regarding the actual development of serious games. Who will take the initiative and gather the competencies required for high quality productions that meets both the expectations of the users and the pedagogical requirements? A few plausible alternatives would be either that the e-learning developers start creating actual serious games, that the commercial game developers take some of their productions in a pedagogical direction or that publishers of traditional educational materials, such as textbooks for instance, starts hiring game developers and pour their pedagogical expertize into game making. It seems that on a practical level, it simply comes down to supply and demand. Was there a demand for serious games there would no doubt be a huge supply coming from all kinds of different developers, because in the end, it comes down to business. But, while there is no real demand for serious games right now, there is a great interest for them, as shown in this paper. As the empirical study shows, both developers within e-learning as well as educators see the potential of games as pedagogical tools. Studies on the subject are not hard to come by and with the increasing use of computer and video games, gaming as an activity is more widely accepted now than ever.

Another challenge, discussed earlier, is the issue regarding games and gender. As previously mentioned, for games to work as good learning tools, they have to feel relevant to
the user. Sadly, video games can feel very much \textit{irrelevant} to a lot of people, many of which are women. Due to sexist attitudes in male gamers and game developers, female characters in video games are often portrayed as subordinate to men, and are almost always objectified in some way, and thus, games are marketed mainly towards a male audience. However, while this is indeed a huge problem for the gaming industry, it might actually be an opportunity for the serious games movement. Indeed, the gaming community is in the beginning of a transitional phase, where awareness regarding gender stereotypes is growing every day, mostly thanks to the efforts and initiatives of female gamers, notably Anita Sarkeesian (www.feministfrequency.com ). By learning from the mistakes of the gaming industry, and by drawing from the experiences of female gamers, every new serious game can be everything that most commercial video games are not; an experience that is including and welcoming of people regardless of gender, social background and ethnicity.

Finally, when looking at our educational institutions, it seems that they are welcoming towards alternative teaching methods. As discussed earlier, serious games could easily fit the expanded text concept that is already in the curriculum. There are of course a lot of practical issues connected to the implementation of video games in classrooms, but there is really nothing that suggests that this would be impossible. With school children, and people in general, getting more and more access to computers and technology, it seems only natural that we will want to explore more ways in which we can be put this to use.

To summarize; the current situation regarding serious games implies that while there are challenges to overcome, there are also great opportunities. It seems that we understand the pedagogical aspects of games better and view gaming in general as a worthwhile activity. Even the portrayal of video games in other media, with movies such as \textit{Ender's Game}, is slowly getting us used to the idea of video games as something more than just an act of play.

\textbf{5.2 Future}

One could argue that where e-learning failed, serious games will too. Game-based learning will never be acknowledged as a realistic alternative to traditional teaching methods, and the failure of e-learning is proof of this. Is it though? It seems that the ideas from which e-learning sprung were the results of an overconfidence in IT technology rather than an actual analysis of the pedagogical possibilities that present themselves when technology is viewed as a platform or tool for learning, which is what the serious games movement is about. Without the e-learning business however, we probably wouldn’t have gotten to where we are today. In a way, this has been a process of evolution. We could perhaps say that the relationship between e-learning and serious games goes like this; e-learning is serious games’ past, and serious games was the future of e-learning. The question we’re trying to answer however is, what is the future of serious games? Do games have a place in traditional teaching environments?

Based on the current implications the future for serious games does indeed look bright. As shown in this paper, games have the right prerequisites for deep learning, which is of course fundamental, but the findings presented in this study also implies that there is a great interest for serious games. We are slowly realizing the potential of learning through play. If a serious breakthrough for serious games can be expected in a near future is however harder to
say. If indeed the video game industry see the potential in game based learning, and think that serious games could broaden their market, a major publisher could launch a title within a year. If successful, more titles would follow. It wouldn't be hard for companies such as EA, Activision or Ubisoft to find the expertise required for an actual educational production. Based on the findings in this paper however, there is as little evidence of this happening within one year, or ten years for that matter, as there is of it not happening within one year, or ten. It seems unlikely that we’re going to let this opportunity slip away though, and with new technical advancements every day, this alternative use of gaming will surely not be left untried. For now, let's just say that the future is ahead, and the implications tell us that serious games are a part of it.

5.3 Concluding remarks

Whether it will be all about business or a will to change the educational landscape, huge million dollar productions or small, independently developed games, an entire paradigm shift for our school systems or additional teaching methods based on today's curriculum, serious games seem to have a role to play in the education of future generations. Exactly what that role will be is yet to be seen, but it's safe to say that video games aren't just about play anymore.

6. Games and reality

On the 5th of April 2010, WikiLeaks released a classified US military video from Iraq depicting the attack on several people, including two journalists and two children, from a US military helicopter (WikiLeaks, 2010). The video is shot from the helicopter's on board camera and shows the point of view of the attackers. The sound in the video is the radio communication between the helicopter crew and ground personnel. This footage is very disturbing in many senses. One being how detached from the situation the attackers in the helicopter seem to be. Julian Assange, spokesman for WikiLeaks, acknowledged this in a press conference. The following is from an article regarding the incident and the press conference:

“I believe that if those killings were lawful under the rules of engagement, then the rules of engagement are wrong, deeply wrong,” he said. The fliers in the video act like they are playing a computer game and their desire is they want to get high scores” by killing opponents, he said. (Reuters, 2010)

The keyword here is of course computer game. If we assume that the people in that helicopter were in fact trained in a simulator, is that simulator the reason for their actions? The purpose of a simulation is of course to create a situation which resembles reality as closely as possible. The game should feel real. But what if the effect is reversed and reality suddenly feels like the game?
One of these images is from the video provided by WikiLeaks and one is from the video game *Call of Duty 4: Modern Warfare*. But which is which? Most people who were challenged to guess got it wrong.

1. Reality?

2. Game?

**References**


Appendix

Interview questions

These are all the interview questions translated. Not all questions were used in all interviews, because some weren't relevant to all interview persons.

1) Is the concept of serious games referred within the e-learning business? What does e-learning mean to your company?

2) What types of clients do you get and which are usually the target groups for your productions?

3) In your opinion, is there any real interest for e-learning/serious games in schools?

4) Lek & Lär-spel (Play and learn games) are not unusual in schools, but are used mostly in elementary school. Why do you think this is? The way in which younger children perceive information and learn is probably different to older kids, but why aren't we seeing similar games designed for them? Is it a matter of psychology or is it just that games are considered childish?

5) Do you think games could serve as a basis for education, with traditional teaching materials as a complement, or will games always be the complement?

6) In Umeå municipality for example, the gymnasial schools supply their students with computers. This of course means a lot of new opportunities, beyond traditional teaching methods. How do you think we should take advantage of this?

7) Would co-operation with an out-and-out entertainment video game developer be of interest to you? Could both parties gain from such and experience and could it generate a good production?

8) Learning and school is a lot about interacting and socializing with other people. Gaming can also be a highly social activity, whether it's about competition or co-operation. Can e-learning be a social activity in the same way and can this contribute in making it an even more effective tool for learning? If so, in what ways?

9) Is there a demand for new educational methods? People take in knowledge in different ways. For instance, some people can easily acquire lots of information from texts, while others struggle with reading. Are today's methods versatile enough, or do we need to rethink? Could video games be a tool which makes learning a easier task for more people?