

Serious Games

Learning socially accepted skills by means of
computer games



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Abstract

1 Introduction

Computer games are very popular. Today you can choose between millions of games with lots of hours of fun. Through the years computer games have evolved from text based games to fully fledged 3d environment games with surround sound. The diversity of the games has also changed, nowadays there are numerous different categories which you can chose from. In this paper we will discuss a relatively new category of games, the 'Serious Games'.

A Serious Game, is a game with more than just the element of fun, it has an educational value. In this paper the term serious game will be implied as: 'computer and video games that are intended to not only entertain users, but have additional purposes such as education and training'.

Because this is a large amount of different serious games, this paper will specify to education in social skills and games that improve the physical condition and the behavior of the players. The games discussed in this paper will not only be games for the personal computer. Serious games are developed for numerous kinds of systems, for instance the gameboy® and simulators used in institutes. Though the best distributable games will be the games for the personal computer.

First this paper will describe what is meant by a serious game. After this there will be a description of the advantages of using a game to learn specific skills instead of other media. When this is discussed some disadvantages and problems with various serious games will be discussed.

2 What are Serious Games

Before we are going to describe what a serious game is, we will look what is meant by a computer game. When it is clear what a computer game is we will look into what is meant by a serious game. Further more we will describe the different sorts of serious games that are presently available or possibly under development.

2.1 *Computer Games*

When looking in the dictionary a game is defined as: ‘an activity which is relaxing with defined rules and elements like imagination, competition, dexterity, insight and chance’¹ Out of experience many games also have an element of time, where you have to complete objectives in a certain timeframe. Gredler gives another definition of a game as: “any contest (play) among adversaries (players) operating under constraints (rules) for an objective (winning)”² Gredler points out that the objective is part of the game, in a game there has to be a goal to be achieved.

When looking at these definitions they are definitions of any game, not specific to a computer game. A computer game is a game played on a computer or game console or other computer like system. The definitions given about a game also apply to computer games. Yet there is another difference in computer games, the difference between a simulation and a game.

Prensky also makes a distinction between a simulations and games. From his opinion simulations focus on a thing or process and try to copy the reality and purpose of a simulation is practice. Games focus on user experience, including fantasy and the purpose of games is entertainment. Another difference, which we can be distinguished between games and simulations, is the sort of goals you have to achieve. A simulation has no strict goal you have to achieve, they are more like personal goals, for instance to master a skill like flying. In a game the goals are more specific, you have to complete objectives to finish the game or a level of the game. However a simulation and a game can be combined, meaning that both elements are present in a game.

2.2 *Serious Games*

Now that we have defined what a computer game is, we will define a serious game. As we can read games are meant for relaxation and entertainment, but what can be serious about that? It looks like a contradiction in terms when talking about serious games, though it is not. In a Serious Game the element of fun and relaxation is combined with a serious message or an education scheme for changing behavior or learn new competences.

Serious games are not to be confused with persuasive games. Persuasive games are games developed by corporations, to promote their company or product. By implementing a message, which is positive about their company or their product in a game, people will learn this message while playing. It is a scheme of advertisement where the message is hidden in a game.

However Serious Games do have elements of persuasive games, they bring a message in the form of a game. Though serious games are not meant for advertising, but for learning new competences or change behavior in a positive way. Serious games are focused on solving problems and help people in their daily lives or to make people aware of problems. The border between persuasive games and serious games is not

¹ Definition translated from the most common dutch dictionary ‘Van Dale’

² Playing the Game: A Model for Gameness in Interactive Game Based Learning, Lesley Smith, Samuel Mann

that specific. A serious game meant to make people aware of a social problem, could also be a persuasive game, by bringing a worldview of the creator, which might not be true.

In the category of serious games are numerous kinds games, most serious games learn skills like languages and profession skills. These games are very popular, but in this paper we will discuss another kind of serious games. Games that learn to cope with health problems, improve social interaction, overcome fears, psychological training, make aware of social problems, etc.

3 Why use a computer game

In this chapter we are going to look at the advantages of using a game to bring the message. What

3.1.1 Interactive

If you are using a computer game, you can make learning and your message more interactive. The person decides what to do and has a certain control over what happens on the screen. The interactivity is a part of the learning process. Most teachers use techniques to make their classes more interactive, so that the students pay more attention. When a teacher has the attention the material discussed will get more ground in the students, because the interaction makes the student more focused on the material, which results in better understanding.

When learning a person has to be motivated, this motivation is not always sufficient. There has to be a connection with the ideas and material. (prensky)

3.1.2 Addition element of fun

The element of fun is an important part of the serious games. Without this part it would not be a real game, for a game is played for fun. The additional element of fun creates an extra motivation for people to learn. If one is enjoying the material he has to learn, it will be easier for him to start learning and continue learning. If a game is fun playing people spend a lot of their available time playing the game. The nice thing about a serious game is that while playing the player is also learning.

3.1.3 Widely deployable

A computer game is made by software, with possibly some extra hardware needed to operate the game. Software is a product, which is widely deployable with the current technologies like the Internet and portable storage devices. As the internet is available every where in the world, the software can be distributed all over the world.

This means that if a serious game does not need any special hardware, the game can be used all over the world. Especially for games that are meant to make people aware of problems, or educating society, the prospect of widely deployment of the game is important. The more people who are reached, the more chance the message will have effect.

3.2 *Autonomy*

When using a game for the process of learning the player can Learn at his own time and speed. The player is not bound to time of courses but can play whenever he has time.

3.2.1 **Safe environment**

When playing a computer game, there is no risks of what is inflicted in the game, too pursue you in real life. This of course with the exception of computer inflicted diseases like RSI. The safe environment gives people the opportunity to experiment with different approaches. Simulators are based on the existence of this safe environment, this way people are allowed to make mistakes. Like when learning to fly, you start at a simulator, this way you learn the basics without jeopardizing your own or someone else his life.

By making use of the safe environment, it is possible to learn people new skills, which in real life would not be possible or to dangerous. Also people can try out new stuff when making use of the virtual world of the computer. They can try thing they normally would not do. This effect was shown at the beginning of the messaging era of the computer. People changed their normal life when they were chatting, become more risky in their exclamations. This way they can experiment with different characters, to see which is best suited with their life. The change made online also took effect in real life.

4 **Problems with serious games**

4.1 ***A game is not enough***

A common misunderstanding with all games aimed at learning, is that housing the learning material inside a game is enough to be educational. This however does not guarantee that the player will actually learn from the game. The player in this case might be entertained, though might not have gained any new skills or knowledge. To ensure that a game will be educational it is a necessity that the game is based on an educational principal or theory, which of course has been proven to work.

As teaching is a very old profession there are multiple theories people can use when designing a serious game. Which theory you choose is depended on what you want to teach. By making use of an existing and proven theory, the teaching experience of the game will be enhanced. Another advantage of using a theory is that most theories are structured and contain various models. As a game on its own is structured when programming, the structure of the game can be combined with the structure of the theory used for teaching.

Though using a scientifically proven theory is a good indication of educational success, I personally think it is not a complete prove. The game might be making use of a proven theory, but it is not guaranteed the game will meet its purpose. To prove the success of the game, you have to show that the game is effective within the target group of the game. There has to be some scientific reading with the explanation of the chosen theory and some testing to see if the game indeed is engaging and educational.

Eventually it is even important that the game is engaging as well as educational, because the game should be the element that will make the player enjoy the process of learning. A good way of testing the games, would be using a representative selection of your target group evaluate the game. Afterwards they can write down their experience and take a test to see if the players have gained the skills and knowledge the game is intended to teach.

4.2

5 The Games

5.1 *Make people aware*

[World Hunger - Food Force](#)

Food Force is a 3d game developed by the United Nations World Food Programme. In the game the player works for the World Food Programme (WFP) and has to accomplish six different missions. The missions take place in Niger and are equal to the activities the WFP performs. The player has to drop food from a plane with the best accuracy and safety for the people who have to receive the food, move a convoy to a dangerous area and make the best food package with the few substances provided.

At the beginning of each mission the player will get explanation of the mission. The difficulties are pointed out and then the player will have to complete the task. As a reward the player gets points awarded for fast and accurate play and good decision-making.

At the end of each mission a short video is shown explaining how the aid agency would have dealt with the situation. This way you know what problems an organization like the WFP has and how they handle it. You will become aware of the difficult decisions the WFP has to make and become aware of the importance of the activities they perform.

The game has some nice 3d effects, which make the game fun to play. It not just a simple flash game with limited playability, but still the game is free of charge. By making effort to let the game look good, people are more motivated to play the game.

[Carabella Goes to College](#)

Carabella Goes to Collage is a simple flash game, where the player has to guide Carabella to make good decisions. Carabella is a girl who is finished with high school and goes to the university. Carabella has to enroll in a university and open a bank account. The object of the game is to give as little as private information away while performing different actions. Also the player has to take in account what will be done with the private information, for instance if it can be given to a third person. Like every other student Carabella wants to go to a student parties where she has to show her student ID and fill out a form, she has to manage to get in without giving to much personal information.

The game has a fixed set of activities that have to be performed. For making the right choices the player will get points awarded. If the player makes a wrong decisions and private information is possibly unsafe, the points will subtracted. After every activity, which can consist of multiple actions, a summary is given of the collected points. The game will give the reasons for the giving the points and give advise how you can keep your private information safe.

The game is as said a simple flash game and playable online. The possibilities are not that extensive and the game play is some times a little awkward. You navigate trough the game with a next button, where next to are buttons which lead you to the game site. When you have to fill in a form you do not get a lot of options. The simplicity of the game does not make it very appealing. Also the advises sometimes seem a little paranoid, but it will keep your private information safe.

[Life Simulation - Real Lives 2004](#)

Real lives 2004 is a simulation game where you are born on this world as a character male or female. Your character is born based on real world statistics. This means that you have a very good chance of being born in China or India, and a high chance of being born poor. You might also be born into a rich family in a rich country. The game will give information about the chance of being born in the situation which you will play.

In the game the player will get numerous statistics about the country where the character is living. The player will get information about the fictive family of the character. When playing the game you can manage the income of the family and where the income is spend on. The player can choose to let the character get older or younger. When getting older different events occur, for instance a relative gets married or dies.

The game has not much graphics and mainly consists of pictures and tables with statistics. It gives a notice of what is going on in this world, but is not a real game, more like a simulation. There is no goal to achieve or points to earn, this makes it less attractive to play. By using mainly tables and figures it is hard to start the game and really enjoy playing it. It takes a lot of fantasy to make this game real to yourself.

[Escape from Woomera](#)

Escape from Woomera is a 3d action/adventure game where you crawl into the life of a refugee who has escaped from his/her country by boat and gets locked away by the UN laws. The people who locked you away are acting illegally, but you are the one who is treated as a criminal.

In the game you are in a detention centre in Australia called Woomera, which exists in reality. You have to manage a way to get out of the detention centre by asking asylum where you meet all the bureaucracy that goes with it. When asking for asylum fails you have to find a way to escape. What makes the game more difficult is that you have to do this in a specific amount of time.

Inside the detention centre you will have to find out more about your situation and environment. By doing this you can solve the puzzle to get away from Woomera. Rewards are based on unlocking new sections of the game, and a variety of outcomes will become available to the player. Inside the detention centre you will also meet other refugees and hear their stories. In the end there are multiple outcomes for this game, which should encourage people to play the game more than once.

The game is based on stories from refugees and media archives. The goal of this game is to make people aware what goes on in different detention centres. By making people aware of the activities the game designers hope to bring change in the situation by putting people to action.

Escape from Woomera is actually a modification on Half-Life and requires a registered version of Half-Life. This is a disadvantage because not all people have a registered version of Half-Life. However the use of the Half-Life engine makes it a nice 3d game, which looks good to play and it is free of charge.

[<Eye Witness>](#)

<Eye Witness> is an Interactive Situation Simulation Software (ISSS). It is a high resolution 3d game in the form of a first person shooting game, except the only weapon you carry is a camera. In this game you will experience the Nanjing Massacre in person, with no censure. The Japanese soldiers killed refugees in various brutal ways. For example, cutting of head, stabbing, running over with tank, shooting, lopping, bombing.

The goal of this game is to make good pictures of the things that happen around you during the massacre. The photographs will be used for convicting people of war crimes. The score of the photos are based on 5 characteristics: Viewing Direction, Object Distance, Golden Time, Sharpness and Focus.

By using a game you can really become part of the massacre and see the horror, which goes further than the books. The game makes you aware of the Nanjing history in order that this will not be forgotten. It is a bit of horrifying game, with a lot of cruelty, but makes its point. The game is free of charge and not recommended for children to play.

[Virtual U](#)

Virtual U is a game, which looks like a Sim City environment where you can see university campus. When playing this game you take up the role of president of a university or a college. You have to run the University by controlling the cash flow and define rules and regulations.

While playing this game, the player becomes aware of the political choices that a president of a college has to make. The goal is to make people aware (and especially students) of the trade offs their have to be made. The game will teach more respect for such a position.

[Darfur is Dying](#)

[Media Blackout](#)

[Ditto's Keep Safe Adventure](#)

http://www.wiredwithwisdom.org/our_software.asp (internet safety)

[Nano Swarm: Invasion from Inner Space and Escape from Diab](#)

'Nano Swarm: Invasion from Inner Space' and 'Escape from Diab' are adventure games for children, which stimulate healthy eating and exercise. The game blends sci-fi action and adventure with evidence-based behavior modification theories. The theories used behind the games are not placed on the Internet.

The games have two aspects what it wants the player to learn:

- To recognize the role that diet and physical activity play in the development obesity
- To adopt healthy diet and exercise behaviors (specifically, increasing their intake of fruit and vegetables and increasing physical activity)

Momentarily the games is in development the estimated release date is somewhere in 2008. There is not much published about the game, a few short trailers are present. What the games will look like is unknown, the only thing is that both games will be 3d adventure games.

5.2 *Psychological health*

[Personal Investigator](#)

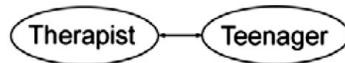
Personal Investigator is a therapeutic 3D game for teenagers. The game acts as a intermediate between the therapist and the teenager and implements the Brief Solution Focused Therapy (BSFT), which is a goal-oriented therapy.

In the game teenagers play the role of a detective and move around a Detective Academy. As they journey through the academy they meet several characters and

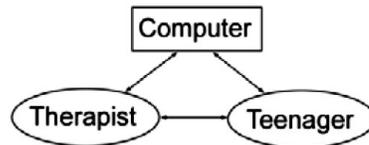
must carry out series of tasks. Rewards are given as each task is achieved and if the teenager succeeds at all the tasks he or she is able to graduate from the academy and become a Master Detective.

Because BSFT is a goal oriented therapy it is easy to implement in a game which is also goal oriented. In the game players must achieve minor goals (e.g. fight a beast, vault a wall) to achieve the major goals (e.g. finish the game). The game interacts with the player in a way that problems can be communicated to the therapist. The game acts as an intermediate between the therapist and teenager.

Traditional model: Direct communication



New model: Computer aided communication



[The Journey to wild divine](#)

The Journey to Wild Divine is a collection of games developed by the Wild Divine Project. The games are unique in the way the interface works to play the games. With the game you have to get a new kind of controller, which you can plug in to an usb port. The controller consists of three finger sensors. The sensors measure skin conductance level (SCL) and heart rate variability, which is monitored and translated in the biofeedback hardware platform called the light stone(see figure..).

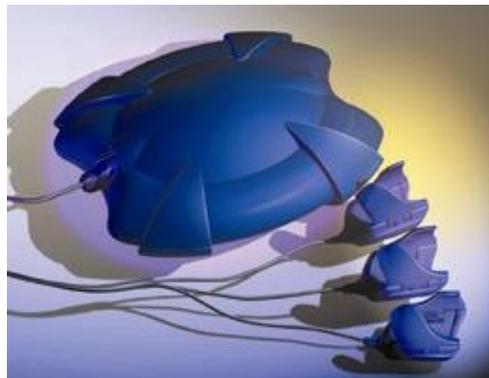


Figure 1: biofeedback hardware platform

Biofeedback is scientifically proven to have a powerful, positive effect on your emotional and physical well being by teaching you to alter your brain activity, blood pressure, muscle tension, heart rate and other critical bodily functions.

By increasing, decreasing or synchronizing body rhythms, through various levels of breathing, relaxation, and meditation techniques you control the game. In the game you get explanation of the various techniques you have to use to play the game. Eventually you will learn different meditation techniques, which you can use in your normal life. By playing the game you learn how you can reduce stress, which in turn is good for your health

The game environment is very relaxing, which stimulates the relaxation. The levels consist mainly of fixed backgrounds where you are guided to and have to learn

another technique to move further. When moving to another level you are guided through a 3d environment with relaxing element like temples and sunrises. By providing the controller with different games the player can learn more and will also have lots of ours of playtime. In the games there is no scoring, you manage yourself through different levels where the reward is the unlocking of a new level.

Earthquake in Ziiland

Earthquake in Ziiland is a game developed by Ziiland Interactive for children with divorced parents. The game is made in cooperation with two psychologist who have years experience with divorce therapy.

The game is about a little moose who lives on an island. The islands where two islands who zipped together. After a period of time the island splits again. The little moose is upset en does not understand why it happen. In the game the moose goes to different parts of the island an talk to different figures. In his room there is a diary where the little moose describes his emotions, for the player there is the option to start his own diary, which is encrypted by a password.

The game has sort of a 3d environment where you navigate through by clicking on object, there is no free movement by the use of mouse or keyboard The character will have to collect different items and use them for different. There are different characters in the game where you can talk to. The player can choose what he/she wants to say, the player even has the choice to act unreasonable and mad.

The game is provided with a parents guide. The parent(s) can open a dialog with the child when playing the game. By using the guide the parents get advise how they can talk about certain aspects of the game. Earthquake in Ziiland can enable parents to:

- To talk about painful issues ,which the child is usually reluctant to express
- To broaden their knowledge and understanding of the impact of separation on their child
- To play alongside their child and (nonverbally) address personal family issues
- To deal with the issues of separation and divorce in an indirect way

5.3 *Express Emotions*

Ben's Game

Ben's Game is a game developed by an employee from Lucas Arts in cooperation with make-a-wish foundation and a boy Ben. Ben is a boy who suffers from leukemia and had a wish to make a game for kids with cancer. The object of de game is that de player gets the feeling he or she can fight against cancer.

The game is a platform game where you play as a boy or girl (you can design your character yourself) who is in a body fighting against cancer cells and the symptoms that come with them. The goal is to collect seven shields, each protecting against a symptom related to cancer and the therapy that goes with it. To obtain the shield you have to complete a level by killing all the cancer cells and the monster protecting the shield. Each monster is designed in a way they have similarity with the symptoms.

In the game children with cancer can express their emotions, which in turn relieves little pain. The game is designed in cooperation with Ben who brought his own experience with his disease in the game.

Remission

Remission is a game developed by HopeLabs made for children/adolescents with cancer. The game has the same idea as Ben's game except the game makes use of a

full 3d environment. Another difference is that Remission gives information about cancer and the different medicine. This element makes the game more educative for the person who is playing.

The game consists of 20 missions where you fight against the different types of cancer cells. Each mission has a goal, you have to monitor someone that he takes his antibiotics in time help someone relax who is nervous for an MRI scan. All these actions take place inside of the body. You play a nanobot inside a persons body fighting against cancer. By using painkillers an antibiotics you can fight against cancer.

The game does more than just let the player express his or her emotions. It gives the player notice what goes on in the body when using antibiotics and painkillers. The use of a full 3d environments makes the playing very enjoyable.

5.4

Learn skills

Team-Up

Team-up is a game developed by an American nonprofit youth organization dedicated to inspiring all girls to be strong, smart, and bold. The object of the game is to learn the importance of cooperation.

Team-up is a puzzle solving game where you have to move collect items in a on a small platform. The platform consist of various obstacles which have to be overcome in order to collect all items. To solve the puzzles you need the skill of different girls. The skills of the different girls are jumping, moving boxes and throwing another girl. By making use of the different skills the player will learn the importance of cooperation.

The game is challenging because you have to try to solve to puzzles in as less moves as possible. The gameplay is simple, there are no high graphical requirements. A disadvantage of the serious game is that is developed for girls and the characters are all girls, this makes it less attractive for males to play.

Bronkie The Bronchiasaurus

Bronkie The Bronchiasaurus is a game designed for children with asthma. In the game you play a dinosaur who has asthma. You have to play the levels and make sure the dinosaur keeps his breath. Players make decisions about their health throughout the game and see how the decisions affect Bronkie.

The game is a 2 dimensional game in the style of duke nukem. To complete the game you have to go through different levels, where you have to avoid dust and cigarette smoke. The goal is to collect peace of a machine that fix the machine to clean the air.

The game helps people to learn important asthma management skills and gain the confidence to manage asthma effectively in their own lives. Skills that are learned are the following skills:

- taking daily medication
- using an inhaler and spacer
- avoiding asthma triggers
- monitoring peak flow
- responding to changes in peak flow
- using a sick day plan appropriately
- reviewing the asthma record (create a record of personal triggers for asthma)
- basics of asthma management

Because the dinosaur in the game has asthma the player can identify with the character. This makes the game more fun to play.

[Re-mission from HopeLab learn to cope with cancer](#)

[Heart Awareness – know when someone has a heart attack and what to do](#)

Heart Sense is game developed by the university of Pennsylvania for lay people to give understanding of heart attacks and the symptoms that go with it.

The game is a Macromedia Shockwave game where you play the character Jack who recently lost his mother because of a heart attack. Jack starts in the hospital where he is offered to become a doctor. His decision about this is not sure, because of his loss. When the doctor offering him this job gets kidnapped he finds a clue leading to one of his patients. Jack now will go with a nurse called Wanda to two of the doctors patients who show symptoms of heart attacks. Jack will have to make the right choices to prevent further complications.

The game is very simple, you choose the lines which you want to say. While playing you become aware of the different symptoms of heart attacks and the actions which you have to take.

[Glucoboy – learn to control your sugar level](#)

Glucoboy is a game for the gameboy advance®. The game consist of a gamecartridge with a glucometer. When you plug in the cardtrigde you can play a game on your game boy. Like every game you can finish it after you completed the objectives. The glucoboy however consist of a number of games, where the player has to earn a new game. The player can earn a new game, not by completing a game, but by checking his sugarlevel on time and keeping the level between healthy borders.

This way the game is a stimulus for a child to learn to cope with his or her **decease**. In stead of letting the parents check if the child is

5.5 *Virtual reality (overcome fears)*

[School Phobia \(Avoidance/Refusal\)](#)

[Social Phobia \(offered in San Diego & Palo Alto only\)](#)

[Attention Deficit Hyperactivity Disorder \(ADHD\)](#)

[Fear of Needles and Blood](#)

[Panic Disorder](#)

[Fear of Flying](#)

[Fear of Driving](#)

[Fear of Public Speaking](#)

[Fear of Heights](#)

[Fear of Thunderstorms](#)

[Flying Anticipatory Anxiety](#)

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