RICH INTERNET PUBLICATIONS &
SERIOUS GAMES
DESIGN OF INTERACTIVE CONTENT

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ABSTRACT

When it comes to academic learning, ‘traditional’ articles seem to be the only accepted form of communication. In the last decade, serious games for educational purposes have been appearing more and more often. Interestingly though, there haven’t been any attempts to enrich scientific papers with serious games. In this paper, we analyze sub-disciplines of social sciences and try to identify indicators that should be present in a publication in order to successfully enrich it with a serious game. Furthermore, we address problems with the creation of serious games, and provide guidelines for the integration of serious games with scientific publications.

KEYWORDS: enhanced publications, rich internet publications, serious games, scientific papers, social sciences

1. INTRODUCTION

1.1. The traditional article

If we were to submit this paper to a journal, we have to take into account all kinds of guidelines and constraints. We have to use a certain layout, structure, writing style and file format. There is no room to include audio or video files, large images or flexible ways of browsing through the article. Considering the digital day and age we currently live in, this is quite peculiar. We are used to multimedia applications. We effortlessly take in information via all kinds of modalities, often even simultaneously. But when it comes to academic learning, ‘traditional’ articles seem to be the only accepted form of communication. And if we, as authors, wish to make our work known to the world, it is the number of citations in other journals that counts. In the past few years we have seen a few initiatives trying to leave the traditional article behind and focus on what is called “Enhanced Publications” or “Rich Internet Publications”. An example of such an initiative is mentioned below.

1.2. Towards the article of the future

In July 2009 Cell Press and Elsevier have launched a project called Article of the Future. In essence, the project’s goal is to take advantage of the capabilities the internet offers, using the latest advances in visualization techniques (Cell Press Content Innovation Team, 2009). Some key features of the Article of the Future are: a hierarchical presentation of text and figures, graphical abstract, research highlights,

1 PDF is the most common file format for submitting digital journal publications these days.

2 For the difference between the two, see (Breure, Voorbij, & Hoogerwerf, 2010).
detailed information on author-affiliation, clickable areas in figures, integrated audio and video, and real-time reference analysis.

So far the responses to this initiative have been largely positive in nature. The example papers have been regarded as user friendly and valuable to the scientific community, but we believe there is still significant room for improvement. A possibility we think has been overlooked, is the use of serious games.

1.3. Serious games

Serious games are designed for a primary purpose other than pure entertainment; often to train, investigate or advertise a certain matter. Examples of successful serious games used for educational purposes have been popping up more and more frequently in the last decade. And not just the education industry sees the potential of this particular type of games, but also health care, defense\(^3\), engineering, politics, emergency management, et cetera (Wikipedia, 2010).

Interestingly though, there haven’t been any attempts to enrich scientific papers with serious games; at least not to our knowledge. Just like in Rich Internet Publications (RIPs), games can combine multiple modes of communication (text, still images, video, sound), but games do so in a more engaging, and perhaps even more fun, way\(^4\). From both a social and psychological standpoint, video games have the ability to influence their players on both implicit and explicit levels (Wikipedia, 2011). Games can help build both practical and intellectual skills. As David Sheff, a journalist and author, puts it: “by playing video games children gain problem solving abilities, perseverance, pattern recognition, hypothesis testing, estimating skills, inductive skills, resources management, logistics mapping, memory, quick thinking and rational judgments” (Sheff, 1994). Van Schie and Wiegman (1997) also found a positive relationship between time spent on videogames and a child’s intelligence. There is no reason to believe this is any different for adults.

In this paper we attempt to match serious games to scientific papers in the field of social sciences. We chose to limit ourselves to just one research area and then try to generalize our findings to other application areas. The field of social sciences is very diverse (consisting of e.g. cultural anthropology, educational sciences, psychology and sociology), yet understandable to non-experts in the field. In social sciences one often tries to communicate a certain theory or concept by doing experiments. We believe this makes the papers suitable for enhancement using serious games. The question remaining is: how?

Therefore, the main question we answer in this paper is:

*How can we enhance scientific publications in the field of social sciences through the use of serious games?*

1.4. Contents

We begin by defining the concept “serious game” in chapter 2. We will look at some typical game elements, examples of successful serious games and the indicators that are of importance to our research.

Next we thoroughly examine the field of social sciences in chapter 3, by looking at the kind of research done in five important sub-disciplines. The goal is to get a general idea of what exactly is being researched, so that we can determine if there are any generic features of the scientific papers that would be suitable for a serious game.

We then try to list these features, or indicators, and come up with some examples of games we think would befit the papers in chapter 4. One of these examples is then developed into a working demo. We also sketch an idea of how this demo would fit within an enhanced publication.

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\(^3\) For a list of games used by the American Department of Defense, see: http://bit.ly/gHMn8Z

\(^4\) Based on our own experiences. It is difficult to find literature supporting these statements due to the nature of the keywords involved in such a search query. E.g. searching for “game” and “video” brings up articles on “video games”.

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Chapter 5 is about how authors can create serious games for their publications. We examine existing toolkits that could be used, as well as suitable programming languages.

We conclude the paper (Chapter 6) with some critical notes and recommendations for further research (Chapter 7).

2. DEFINING GAMES

In order to define a classification of serious games, it is important to define what a serious game actually is. In his 2005 article in IEEE Computer, entitled “From Visual Reality to Games”, Mike Zyda provides a logical approach to the term. His definition begins with “game” and proceeds from there.

According to Zyda (2005) a game is often defined as “a physical or mental contest, played according to specific rules, with the goal of amusing or rewarding the participant.” For the more specific term video game he proposes “a mental contest, played with a computer according to certain rules for amusement, recreation, or winning a stake” as a definition. Following this trend, a serious game can be defined as “a mental contest, played with a computer in accordance with specific rules that uses entertainment to further government or corporate training, education, health, public policy, and strategic communication objectives."

2.1. Game elements

As has been stated in Zyda’s definition of a game, it should be a contest, contain specific rules and be amusing or rewarding (Zyda, 2005). The rules define the challenges that the players must overcome to win the game. Included with the rules is the one that defines the victory condition (Rollings, & Adams, 2003, p. 35). According to Rollings and Adams this leads to multiple types of games: competitive, in which the first player to achieve the victory condition is the winner; cooperative, in which players have to work together to achieve the victory condition.

Games can also be divided by the amount of players. Most games are played by multiple players, these are multi-player games. If a game is played by one player it is a single-player game (Rollings, & Adams, 2003).

In order not to demotivate the player, the challenges in the games accompanying a publication should not be too hard; the main objective of the games is to transfer more knowledge to the player. If a player is unable to complete a game because the challenges are too difficult, this objective isn’t met.

2.2. Types of serious games

As can be seen, serious games comprise more than just storytelling, art and software. They also involve pedagogy: activities that educate or instruct, thereby imparting knowledge or skill (Zyda, 2005). In order to reach this ultimate goal, players often have to solve problems to achieve the victory condition. We argue that, depending on the game, either knowledge or skill is more present than the other. This can be illustrated by two serious games: Re-Mission and Code Red: Triage. We argue that the first type of serious games is most suitable for an enhanced publication since the goal is to transfer knowledge.

2.2.1. Re-Mission

On the one end of serious games there is Re-Mission. This is a video game for teens and young adults with cancer. In the game, the player controls a nanobot that is designed to be injected into the human body and fight particular types of cancer and related infections at a cellular level. The player must also monitor patient health and report any symptoms back to Dr. West (the in-game doctor and project leader). Each of the 20 levels is designed to inform the patient on a variety of treatments, how they function, and the importance of maintaining strict adherence to those treatments (Kato, Cole, & Bradlyn, 2008). Clearly, this game focuses more on transferring knowledge to the player.
2.2.2. **Code Red: Triage**

The serious game Code Red: Triage revolves around the training of medical first responders in a crisis situation. The player will have to make a quick assessment of the situation, call for the estimated amount of ambulances, and then proceed with the triage task. During the triages the game keeps a score of how well the player is performing. The goal of the game is to teach the player to perform triages (Van der Spek, Wouters, & Van Oostendorp, 2009). Since a player already needs to have knowledge about performing triages, this game is mainly imparting skill to the player. Of course a player certainly can learn more about performing triages by playing this game. However, we deem the game is more about applying prior knowledge in order to be successful.

2.3. **Indicators in games**

Most studies focussing on videogame analysis make general classifications in terms of their technical or thematic features (López, & Cáceres, 2010). The study by López and Cáceres, in contrary, is centered on social science education and learning processes. They propose a classification in line with the subjects of this discipline. López and Cáceres define five different groups of games that fit within social sciences: games of an economic, social, geographic, artistic and historic nature. López and Cáceres divided each of these groups into three different variables, depending on the features of the different types of contents that can be approached: conceptual (information and data on processes and phenomena), procedural (development of techniques and skills) and attitudinal (values and attitudes related to the subject of the game).

In the case of a serious game that is supposed to complement a publication, we argue that the conceptual and procedural indicators are the most important. After all, the goal of the game is to elucidate the concepts or processes defined in the publication. To achieve this, conceptual and/or procedural indicators have to be present in the game. Some examples of these games are given in chapter 4.

3. **RESEARCH IN SOCIAL SCIENCES**

While the framework provided by López and Cáceres (2010) provides us with a starting point, it is our opinion that it provides a rather broad definition of the social sciences. Therefore, in the remainder of this paper we will narrow our scope down to the fields of cultural anthropology, sociology, educational theory, pedagogy, and psychology. All of these fields within the social sciences are related to one subject: the (social) behavior of humans. We will now describe each of these research fields to get a feeling for the type of research done, and possibly some first ideas on how to use serious games to enhance the research being done.

3.1. **Cultural anthropology**

Anthropology, in short, is the study of humanity. It has origins in multiple disciplines such as the natural sciences, the humanities, and the social sciences (Wolf, 1994). Within the field of anthropology, one of the basic concerns is how humans behave. As such, anthropology is a rather diverse area of research: in the United States, it is traditionally divided into four sub-fields, each with their own branches. These sub-fields are biological/physical anthropology, social/cultural anthropology, archaeology, and anthropological linguistics (American Anthropological Association, n.d.). In Europe on the other hand, these sub-fields are often seen as distinct disciplines (Layton, 1998). While the different fields frequently overlap, they tend to use different methodologies and techniques.

In our research, we focus on the discipline of cultural, or social, anthropology. Cultural anthropology is the branch of anthropology that examines culture as a scientifically meaningful concept. This concept reflects in part a reaction against earlier discourses based on an opposition between "culture" and "nature", according to which some human beings lived in a "state of nature". However, anthropologists have argued that culture is "human nature", and that all people are able to classify experiences, encode classifications by means of symbols (i.e. in language), and teach such abstractions to others (Spiro, 1994, p.24).

Much of anthropological theory has originated in an appreciation of, and interest in, the tension between particular cultures and a universal human nature.
3.2. **Sociology**

Sociology is the study of society (Comte, 2005). In this social science various methods of empirical investigation and critical analysis are utilized to develop a body of knowledge about human social activity (Asley, & Orenstein, 2005, pp.32-40). The most important question in the area of sociology is which factor(s) determine the behavior of an individual (Giddens, 1996, pp.14-19): do social structures determine an individual's behavior or does human agency? In this context “agency” relates to the capacity of an individual to make free choices, and thus act independently. This is the opposite of the “structure”, which refers to factors which limit or affect the choices and actions of an individual (e.g. social class, religion, gender, ethnicity et cetera).

As all aspects of human activity are sculpted by social structure and individual agency, sociology is topically a broad discipline. Its topics include: criminality, deviance, economy, environment, education, health, politics, ethnicity, religion, and stratification. As can be seen, sociology overlaps with a variety of disciplines.

The research done in sociology consists of both quantitative and qualitative methodologies. It should be noted that qualitative methodologies are nowadays more prevalent in journals. On the other hand, text books tend to be of quantitative nature (Hanson, pp.104-106).

3.3. **Educational theory**

Educational theory is concerned with how people learn in educational settings, which methods of learning best correspond with this, how education is organized, and how policy can be used to improve the education (Universiteit van Amsterdam, n.d.). Educational theory is closely related with some of the other subjects in the social sciences, such as psychology and sociology. It both draws from and contributes to cognitive science and the learning sciences.

To understand the characteristics of learners of all ages, educational theory develops and applies theories of human development and learning theories (especially cognitively oriented ones) which are drawn largely from psychology (Wood, Wood, & Boyd, 2006). Important factors herein are: social, moral and cognitive development; individual differences and disabilities; learning and cognition; and motivation. Each of which is approached from several viewpoints (Woolfolk, Winne, & Perry, 2006).

3.4. **Pedagogy**

Closely related to educational theory is pedagogy. This is the science that studies how adults raise their children. Pedagogy is concerned with how a child develops from infancy to adulthood. To study this, special attention is paid to how the child is raised by its family, the relationship of the child with its environment, et cetera. Within pedagogy, there are different specializations: social pedagogy, educational pedagogy, clinical pedagogy, theoretical pedagogy, and orthopedagogy.

While closely related to educational theory, pedagogy is often seen as a form of applied psychology. This is probably related to the fact that it isn’t recognized as a distinct science in many countries. However, in the Netherlands and Belgium it is.

3.5. **Psychology**

The last area we focus on is psychology. Psychology is the science of mind and behavior (Gray, 2010). Its goal is to understand humanities by discovering general principles and by exploring specific cases (Fernald, 2008, pp.12-15). What psychologists attempt to understand is the role of mental functions, such as perception, cognition, attention, emotion, motivation, and personality, in social and individual behavior. While psychological knowledge is typically applied to the assessment and treatment of mental health problems, it is also applied to understanding and solving problems in many different spheres of human activity.

3.5.1. **Sub-disciplines**

Since psychology is such a wide discipline, there are a lot of sub-disciplines. The most influential of these are: behaviorism, psychoanalysis, humanistic psychology, and cognitive psychology.
Behaviorism is a sub-discipline of psychology based on the proposition that all things that organisms do, and should, be regarded as behaviors (Skinner, 1984). It tries to explain human behavior in terms of external physical stimuli, responses, learning histories, and reinforcements (Graham, 2010a).

Psychoanalysis is primarily devoted to the study of human psychological functioning and behavior. It defines three main components: a method of investigation of the mind and the way one thinks; a systematized set of theories about human behavior; and a method of treatment of psychological or emotional illness (Moore, & Fine, 1968, p.78).

Humanistic psychology adopts a holistic approach to human existence through investigation of meaning, personal responsibility, spirituality, human potential, and self-actualization (Aanstoos, Serlin, & Greening, 2000). Much of the subject matter of psychology lends itself to qualitative approaches.

Cognitive psychology explores internal mental processes; it is the study of how people perceive, remember, think, speak, and solve problems (Feist, & Rosenberg, 2009). Compared to the other sub-disciplines it is radically different: it accepts the use of the scientific methods, and generally rejects introspection as a valid method of investigation (Schunk, 2008, pp.14, 28).

3.5.2. Research methods

One of the key methods used in the field of psychology is introspection, or the self-observation and reporting of conscious inner thoughts, desires and sensations (Graham, 2010b). Just like in sociology, the research done in psychology consists of both quantitative and qualitative methodologies. Qualitative researchers aim to gather an in-depth understanding of human behavior and the reasons that govern such behavior. Qualitative methods produce information only on the particular cases studied, and any more general conclusions are only hypotheses. In order to verify whether or not these hypotheses are true, quantitative methods can be used.

4. POSSIBILITIES FOR SERIOUS GAMES

As the research by López and Cáceres (2010) has shown, games often contain conceptual and procedural indicators. This means that these games draw upon theories which are based on research done in a particular field of the social sciences. This raises the question whether or not it is possible to identify indicators that should be present in a publication in order to successfully enrich it with a serious game.

4.1. Indicators in research

An important aspect that returns in all games is problem solving. According to the definition of Zyda (2005) without challenges there wouldn’t be games. One way to incorporate a challenge in a game is by means of problem solving. Therefore we argue that, in order to successfully incorporate a serious game in a publication, the concepts or processes defined in the publication should have a clear problem solving aspect. An area of research in which this returns is cognitive psychology.

However, as we noted before, the sub-discipline of cognitive psychology is radically different from the rest of psychology. Essentially this means that for the bigger part of psychology clear indicators are hard to determine. Notwithstanding this, problem solving isn’t the only way to create challenges (i.e. challenges aren’t necessarily based on cognition), they can also be based on moral choices. The problem with this kind of challenges, however, is that it is difficult to define when it actually is a challenge: there are no clear boundaries.

Most of the disciplines within the social sciences, as we define them, are based on, or closely related to, psychology. Therefore it is equally difficult to come up with generic indicators for these areas as it is for psychology. As a result, general indicators can’t be determined and we propose publications will have to be addressed individually in order to enhance it with a serious game. In the next sub-chapter we show a few publications that could have benefitted from enhancement through a serious game, and how these games would possibly look like had they been used.
4.2. **Examples of games**

4.2.1. **Hobbits and orcs problem**

This problem is presented in John Anderson’s book on Cognitive Psychology, and is described as follows (Anderson, 2005):

On one side of a river are three hobbits and three orcs. They have a boat on their side that is capable of carrying two creatures at a time across the river. The goal is to transport all six creatures across to the other side of the river. At no point on either side of the river can orcs outnumber hobbits (or the orcs would eat the outnumbered hobbits). The problem, then, is to find a method of transporting all six creatures across the river without the hobbits ever being outnumbered. (p. 257)

Anderson represented this problem using just letters, lines and arrows; and then asks the reader to “[s]top reading and try to solve this problem”. Instead of writing it out by hand as the author suggests, this problem lends itself particularly well for a game. In the image below we attempted to sketch such a game. The reader can use his keyboard to select the orcs or hobbits to move across the river. The colors were arbitrarily chosen; blue represents the ‘driver’ of the boat, red represents the ‘passengers’.

![Figure 1: A sketch of what a problem solving game could look like.](image_url)

The reader comes to a better understanding of why the hobbits and orcs problem poses difficulties for people by trying it himself in an entertaining way. Some of the difficulties are studies by Jeffries, Polson, Razran, and Atwood (1977). Of course, this paper could have benefitted from this game. However, at the time the paper was written, the computers needed to play the game weren’t as widespread as they are nowadays.

4.2.2. **Jug problem**

This particular problem is provided by Atwood and Polson (1976), but has been adapted by Anderson (2005):

You have three jugs, which we will call A, B, and C. Jug A can hold exactly 8 cups of water, B can hold exactly 5 cups, and C can hold exactly 3 cups. Jug A is filled to capacity with 8 cups of water. B and C are empty. We want you to divide the contents of A equally between A and B so that both have 4 cups. You are allowed to pour water from jug to jug. (p. 258)

This problem illustrates how people experience difficulty in solving a problem at points where the correct solution involves increasing the differences between the current state and the goal state.

Anderson uses a simple graph with the states and transitions between the states. It would be easy to turn this problem into a game where you can interactively pour the water from one jug to another.
Figure 2: A sketch of the jug problem.

In this example, the user simply clicks the jugs and watches as the water pours from one jug into another until he has reached his ultimate goal. Two paths of solution for the jug problem are posed in Atwood and Polson (1976). Therefore, this paper could have benefitted from this game. Just as is the case with the hobbits and orcs problem however, computers weren’t widely available in that time.

4.2.3. Memory confusion

Our ability to make inferences from information and to elaborate on it, both while the information is being studied and when our recall is being tested, is essential to using our memory. Inferences made allow us to extrapolate from what we heard and saw to what is probably true. In some circumstances, however, we need to be able to separate what we actually heard and saw from our inferences. One of these situations is in eyewitness testimonies.

In a study conducted by Loftus, participants who witnessed a traffic accident were asked what speed the car had when it passed a Yield sign. Even though there was no such sign, many participants remembered having seen one (Loftus, 1996). Another case of memory confusion is the false memory syndrome. This involves memories that appear to be recovered by the use of psychotherapeutic techniques. There is evidence that some of these memories were created by the strong suggestions made by the therapist (Loftus, & Pickerall, 1995).

Both of these theories are published on text only. Instead, it could be demonstrated by showing a video of, for instance, an accident and some statements form eyewitnesses. When the reader has watched this video, some questions can be asked and the right answer should be selected. When explaining the theory to readers, still images could be shown with both the correct answer and the answer of the reader displayed underneath.

Question 4:
What was the speed of the car when it passed the Yield sign?
If you have no idea, please select the last option.
A) around 30 mph
B) around 30 mph (your answer)
C) around 30 mph
D) I'm not sure (the correct answer)

You answered B, the correct answer is D: there was no yield sign.

Figure 3: A sketch of a memory game.
In this example, the “See explanation” button would take the player to the relevant section of the paper explaining why s/he could have thought there was a Yield sign. The original paper (Loftus, 1996) could have been enhanced through the use of this game.

4.2.4. Personal gain

Just like the “hobbits and orcs problem” and the “jug problem” can be used to clarify certain difficulties, the Prisoner’s Dilemma, or any other game that focuses on personal gain, can be used to illustrate concepts about human behavior. This could either be used in research related to sociology or to the behaviorism sub-discipline of psychology. The most important aspect of this kind of games is that they are a non-zero-sum game. Zero-sum means ‘if one gains, another loses’. Non-zero-sum games are therefore games in which there is no ‘winner takes it all’ situation. Situations comparing to this are frequently seen in real life.

Often when publications refer to these games, the name of the game is used and the reader is supposed to know what the game encompasses. If a reader doesn’t know this, he is out of luck and the understanding of the paper might suffer. The least an author could do is include a link to a working example of the game. One step further might be that the author assumes that the reader has actually played the game, and take him/her as a specific case and relate this to general principles.

In this particular example, the button provides the player with a part of the publication explaining the motivation as to why most people choose to stay silent instead of betraying the other prisoner. As such, the player (a specific case) is related to the general population.

5. USING SERIOUS GAMES IN PUBLICATIONS

As has been demonstrated, it is possible to use games to accompany an enhanced publication. The question whether or not this is more effective than a publication without a game, remains to be tested. Not only that, but multiple questions regarding the creation of these games arise as well. Are authors able to create a game in a simple manner or do they need to seek the assistance of a professional? And not only the creation deserves attention, the integration of the game within the publication is an important aspect as well.

5.1. The creation of games

In the most ideal of cases, the authors of a publication would be able to create a game themselves. This would require a simplistic toolkit since not everybody has experience with programming languages. However, the availability of a toolkit isn’t the only problem: another problem is that the games should be playable in a browser on a multitude of systems. In order to accomplish such a thing, the games should preferably be made in a Flash, Java or another language that is widely available on computers. As an alternative, the games could be made using JavaScript but this requires more programming knowledge since there are no toolkits available for this language.
The availability of toolkits that adhere to the above two guidelines is not widespread, but there are some toolkits on the market. These are Greenfoot\(^5\) for Java, and Stencyl\(^6\) for Flash. Both toolkits try to abstract the programming logic away from the end-user. To do so, Stencyl utilizes the MIT Scratch project\(^7\) which focused on getting children to create games. With Scratch, programming is based on a collection of graphical programming blocks which can be snapped together. There is no obscure syntax to learn, as is the case with traditional programming languages, and as a result the floor is low (Resnick et al., 2009).

While Scratch abstracts the syntax of the programming language away from the user, everything remains possible. Therefore, it is theoretically possible to create whatever game is needed for the enhanced publication in a basic environment without programming skills.

5.1.1. A working example

One of the game examples provided was the so called “hobbits and orcs problem”. As a proof-of concept, we converted this example to a fully functional game\(^8\). This demo is created using JavaScript, HTML, and CSS; all of which are basic languages used on the internet. As a result, it can be run in virtually all browsers without any plugins. We think this is an important aspect for the accessibility of the games, and therefore for the understanding of the enhanced publication as a whole.

![Demo - Hobbits and Orcs Problem](image.png)

5.2. Integrating games in publications

The first step to integrate games within papers is to make sure these papers have already been hosted online in the form of enhanced publications. Working with enhanced publications ensures that digital material can be attached or integrated within the publication, just like one would normally add a video to the project.

There are several ways to attach a game to an enhanced publication. The article of the future (image below) has attached an image to the right side of the text, like one would commonly insert an image into a paper article. This image could easily be replaced with a game applet, so that when the reader is reading a

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\(^5\) Available from http://www.greenfoot.org/index.html

\(^6\) Currently in private beta. For more information see: http://www.stencyl.com/create.php

\(^7\) For more information see: http://scratch.mit.edu/

\(^8\) The demo game can be found online at http://koen.ekelschot.eu/dic/
particular paragraph, the game illustrating this text would be right next to it. Optionally the game can remain hidden until the reader has clicked a particular word or button.

Another way to tackle this problem is to attach the game much like one would attach an image or video to an e-mail. A reference or hyperlink in the text could point to the link to download or stream the game. E.g. Play the Hobbits & Orcs game.

The game could also be posted under a separate tab, e.g. a “media” tab (see the example tabs used by Cell in the image above). Again, a reference in the text could point to the tab with the game. Once the user is done playing, s/he can navigate back to the full text tab.

We prefer the first method, as this keeps the reader focused. Having to navigate to another window or waiting to download a game can be very distracting. Instead of enriching or enhancing the article, it could potentially damage it. Readers are much more used to finding images integrated in texts, and as long as the game does not have blinking graphics or other distracting elements, it should do fine as well.

6. CONCLUSIONS

Our research started out with the question “how can we enhance scientific publications in the field of social sciences through the use of serious games?” In order to answer this, we first of all turned to the definition of serious games. Furthermore, we defined the field of social sciences, and analyzed the research in this field. Based on these topics, multiple aspects have been defined in this paper.

The most important aspect to keep in mind when adding a serious game to a publication is that the game should be used to elucidate the contents of the paper; it should impart some knowledge to the reader of the publication. In order to do so, the challenges in the game shouldn’t be too hard to pass: the player has to be able to solve it, otherwise knowledge isn’t imparted.

The challenges in games are mainly based on problem solving. Problem solving therefore can be seen as an indicator of publications that can be enhanced through a serious game. This means that publications from cognitive psychology can be enhanced. However as we found out, this sub-discipline is quite different from the rest in that it generally rejects introspection as a valid method of investigation. As a result it proved to be impossible to come up with more indicators. But this doesn’t mean that other publications aren’t suitable for enhancement. They should be analyzed individually in order to determine the suitability.

Another aspect of enhancement would be that the authors of a publication will have to be able to create a game without the help of an expert. Meanwhile, the game should be accessible on a plethora of computers with different software configurations. To overcome this obstacle, a simple toolkit could be used. While
the availability of toolkits isn’t widespread, a few suitable examples have been found, namely Greenfoot and Stencyl.

Furthermore, we identified multiple ways to integrate a serious game with a publication. These are: within the text, as a reference or hyperlink, and in a separate tab. Last but not least, we indicated what we think is the preferable option, namely within the text. But exactly how the integration should be done is up to the author of the publication.

7. DISCUSSION

Based on the results this preliminary paper provided, we can say that it is possible to enrich a publication through the use of a serious game. However, this doesn’t necessarily mean all publications can be enhanced in this way. As has been noted, it proved to be difficult to identify indicators in research in the social sciences. However, what we do not know is whether or not the result would have been the same if we chose to analyze a different research area. It is not unlikely that it is possible to identify indicators in, for instance, biology or physics. This would be an interesting subject for future research.

Another point that should be taken into consideration is that we did a superficial analysis of the social sciences, which is still a rather broad scope. It might be the case that more aspects of research would have emerged when a more in-depth literature research was done or when we focused on a specific discipline within the social sciences. As such it remains something worth investigating.

In this research we have focused on integrating serious games and publications. What we don’t want to do however, is integrating the two regardless of the effectiveness of the game. Or, as Van Eck (2006) puts it: “If we […] preach only that games can be effective, we run the risk of creating the impression that all games are good for all learners and for all learning outcomes, which is categorically not the case.”

8. REFERENCES


