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How Serious Do We Need to Be? Improving Information Literacy Skills through Gaming and Interactive Elements

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Abstract

Catching the attention of highly technologically and visually oriented students is a challenge for libraries. The number of students entering the universities is increasing and a face-to-face learning setting is an impossible mission for the few available subject librarians. This paper demonstrates how effective the use of serious game or other web-based interactive elements can be for teaching information literacy. By means of quasi-experimental research the impact that the game *Saving Asia* on students' learning is analysed and compared to a web-based online tutorial of the Vrije Universiteit Amsterdam (Free University of Amsterdam). This research demonstrated that the game needs to be improved if it is to fit into the regular curriculum of the university, but interactive elements definitely improve learning results.

Key Words: information literacy; serious games; learning results

Introduction

Nowadays technology makes information accessible for everyone everywhere. The art of selecting the best information in a short period of time and using it correctly is called information literacy. Information literacy training provides students with the tools necessary to efficiently find and correctly use the information needed for learning purposes. Acquiring these skills is a process that takes time: during the entire academic period, learners need different types of information that require specific ways of information

seeking and processing. The Millennials, the new generation of students that now populates the universities, have a new way of processing information. They have a very short attention span and they are more critical about what, when and how they learn (Oblinger, 2005). Classical learning methods, where teachers tell students what they need to do, are considered unattractive. Students get bored quickly and do not pay attention to the lesson. How can libraries offer those lessons in such a manner that students get motivated to learn and use them every time they search for information? The challenge for academic libraries is to motivate students to acquire information skills, so that they use these skills in their academic studies and keep looking for new tips and tricks on information retrieval. Specific learning methods can be used to improve course materials on information literacy. This paper aims to contribute to the debate by presenting a research project on the effects of using a game and a web-based tutorial on students' learning which was carried out by the University Library of the Vrije University Amsterdam.

Factors Influencing Learning in Information Literacy

There are different kinds of environments in which information literacy is taught that need to be considered when a library intends to maximise students' learning, for example the kind of students libraries deal with, the learning methods and the skills of the library staff itself are all relevant factors that influence the effect of information literacy training.

The Millennials, the new generation of students who were born between 1982 and 1991, use the internet as part of their daily lives. A 24/7 approach is the best way to describe it: they use the Internet everywhere and for everything, from dawn to dusk, for learning and for pleasure — and actually mostly just for pleasure: for meeting friends, for listening to music or gaming. This digital generation knows how to use the Internet. The huge number of hits they get when using a search engine causes them to believe that they can actually find relevant information. This is a *net* generation, not only because they use the Internet for everything in their lives, but also because they interact intensively with others of the same age group, making connections very quickly whenever they need them (Boschma & Groen, 2006). These students are not intimidated by people they do not know; interactive multiplayer games on the Internet teach them to get together with others for particular purposes and forget about them when they do not need them anymore. When they

start scrolling down the first page of search engine results and they do not know where to start reading, they ask their colleagues for help and they do it immediately. Visualisation is another key word for this group. Videos and images easily get their attention. Librarians need to consider these characteristics of the new students when they decide to improve their information literacy courses. A common scenario is that students get bored quickly when the lessons do not trigger them to pay attention (Doshi, 2006; Smith, 2007). Using methods that suit students' way of thinking and acting is a powerful way to motivate students to get engaged in the course.

The number of teaching hours assigned to a librarian by a faculty is usually limited. That means that librarians have a relatively short time to teach students information literacy skills. The average time academic librarians get to spend with their students varies between 45 minutes and two-hour sessions. There are different reasons for this. An important one is the lack of library personnel that can dedicate themselves to training students in information literacy (Taylor, 2006). Another reason is the lack of interest on the part of faculty members to embed information literacy teaching by the library embedded in their academic courses (Ducas & Michaud-Oystryk, 2004; Small, Zakaria & El-Figuigui, 2004). Research shows that some faculty members do not want to involve librarians because they think librarians do not have the necessary teaching skills (Ducas & Michaud-Oystryk, 2004) or because faculty members do not have information skills themselves and thus do not see the need for them (Julien, 2000). At the Vrije Universiteit Amsterdam information literacy is not embedded in all faculty courses yet. Involvement by faculties ranges from a link in the learning environment to the course material to a full student supervision process on information literacy during different stages of the students' education. Information literacy skills help students to improve their ability to find and evaluate information. It is not, however, a kind of knowledge that students need to learn by heart. If a student is unable to type well, for example, he will spend more time typing than others, but eventually he will get there. The same is true for a student who does not have or apply information literacy skills. This is the main reason why faculty members often do not see the importance of information literacy training in their curricula. Even in those courses where information literacy training is embedded, students' ability to find and use relevant information sources is not specifically evaluated. A learning tool on information literacy needs to be an environment where students learn, practice and are evaluated simultaneously.

Innovative teaching styles can improve learning. Active learning techniques are specifically successful in effective learning (Bonwell & Eison, 1991; Prince, 2004). Learning is an active process, where students need to get engaged in the lesson, participate in the lecture and analyse the way concepts have been created. It is important that students do not just sit and listen to what teachers explain; they need to write, ask questions and get involved in class discussions. Accordingly to Bonwel and Sutherland 'students are simply more likely to internalize, understand, and remember content learned through active engagement in the learning process (Bonwel & Sutherland, 1993, p. 3). Students are better motivated to learn when they know why they are learning and when they will need what they have learned (Smith, 2007). The new generation of students require even more attention if libraries want them to engage. These visually oriented students have trouble listening to a teacher in front of the class for two hours, but they are eager to learn in collaborative environments in which they need to work in groups rather than listen to a teacher (McGill, 2004).

There are various examples of active learning methods being used by libraries for classes on information literacy. Problem-based learning is a method commonly used to get students to participate in the lesson by solving a real-world problem. The Purdue University Libraries use newspapers and magazines to select real-life problems or situations on different topics that require a solution. Students read the article and formulate a hypothetical solution. They search for information related to the problem given (Smith Macklin, 2001). Ward describes a course where students find information to help a local business solve a problem in its organisation (Ward, 2000). At Williams College in Massachusetts first-year students need to solve the mystery of the theft of a rare book by searching the Proquest Historical Newspapers database (Doshi, 2006). These examples demonstrate how information literacy training can be embedded in a real-world context by linking information literacy skills to life's daily issues. It makes the relationship between learned content and the need for students to adopt a methodology for information seeking stronger.

Other examples illustrate how interactivity might improve online course material. As Dewald *et al*. point out: 'interactivity in online education makes the difference between an information source and a learning experience' (Dewald *et al*., 2000). If a web-based instruction tool does not have interactive elements that invite students to think about the content they are reading or listening to, the learning effect is suboptimal; such a passive learning method appeals to

people who prefer text-based learning styles, because the content looks like an online book that can be read from the screen. Even if the online course material uses video or other visual elements to show students how to use an electronic database, there is still a lack of interactiveness unless students can get some hands-on experience during or after the explanation. An example of an online tutorial with interactive elements is the Internet Scavenger Hunts, a platform where students of all ages have to locate information by using key words and various websites and search engines (Eagleton *et al.*, 2003). The online tutorial from the University of Illinois at Chicago gives directions on how to use Boolean operators. By moving the pictures of birds and other animals into the categories: Africa, birds or 'Africa AND birds', students learn the notions of the Boolean operator AND. The web-based instructions at the Vrije Universiteit of Amsterdam offer multiple choice questions during the online courses so that students can check if they understand the information given. These are good examples of interactive elements which help students to apply the lessons learned.

Institutions that use educational games have a positive attitude towards serious gaming since it fits active learning principles, it emphasises cooperation and stimulates better learning (DeKanter, 2005; Oblinger, 2005; O'Leary *et al.*, 2005; Ebner & Holzinger, 2007; Martin & Erwing, 2010). Gaming can be another way to introduce interactivity into information literacy courses. Gaming is a powerful method for teaching Millennials. It fits the learning style of this generation of gamers who prefer learning-by-doing over listening to explanations by a teacher in front of the class (Boschma & Groen, 2006; Veen & Vrakking, 2006). Digital natives (another term used to denote the Millennials) love using technology and that gives them an extra impulse to play a game and learn from it (Oblinger, 2003). A game is based on the principle of trial-and-error. If you make a mistake you can try again until you get it right and then you continue. Usually players do not read the manual before they start playing. They just start playing and see where they go. When a level turns out to be difficult, they get help from peers on the internet, for example through videos on YouTube where other players explain how they proceeded. They trust the information of other players and they do not turn to the makers of the game for instruction. A game suits the level of the player. A player that needs more time to carry out a task can stay longer at a certain level until he is ready to go on. A game stimulates people to compete with other elements: with other players or with an enemy or situation created in the game. A challenge or a competition can motivate players to stretch their capabilities and get the best out themselves.

There are different kinds of games that have been used to explain elements of information literacy. Some of them are easy to make and can help to reinforce lectures in the classroom. Crossword puzzles on Boolean operators and the *Copyright Tic Tac Toe* (which pinpoints issues like plagiarism and academic integrity), are games used by the University of Nortre Dame to test the information skills of students. They bring variety to classroom sessions (Smith, 2007). These games are printed and distributed during the lecture to give the students a moment to think about the subjects learned (Smith, 2007). Various libraries in the United States[1] have developed a Jeopardy-style game and have used it at the beginning or at end of lectures (Ury & King, 1995; Krajewski & Piroli, 2002; Leach & Sugarman, 2006; Walker, 2008). *Library Jeopardy* consists of questions on information skills and library concepts (Walker, 2008). When the librarian starts the course with the *Jeopardy* game, he can test the information skills of the students (Walker, 2008). Used at the end of the class, the game becomes a review of the content explained by the librarian (Walker, 2008). The students can answer the questions during class by raising their hands (Walker, 2008). One negative aspect of this method is that not all the students need to answer the questions, making the assessment only partial to those that are actively involved in the lesson. Students that do not want to participate are not triggered to do so and they learn less than the students that are involved in answering the questions. In Germany, various university libraries make the game *Letterheinz* available through their library websites. *Letterheinz* is a jump'n'run flash game where the worm Heinz needs to make his way through different obstacles and eat the letters shown on the bookshelves. At the end of each level the gamer gets some information or tips on using the library. This game has not been integrated into lessons on library skills. Students are free to play it outside their study hours. Again at Williams College, students need to solve a macabre mystery: they must discover what happened to the skull of the university founder Ephraim Willem which is missing from his grave. To introduce the mystery, the library produced a video with the plot. To solve the problem, students in groups need to search in archival content and online resources. According to a news item on the Willem College website, the responses have been very positive. Students like this way of getting introduced to library resources while meeting other students and having fun.

Though various libraries are using interactive elements and games to improve the attractiveness of their course material, and the first reactions have been positive, there has been very little evidence to prove that gaming actually

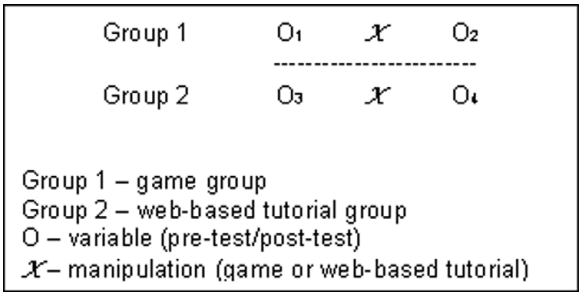
improves learning by students. Therefore the Vrije Universiteit developed a research project to test the effectiveness of a web-based tutorial and an online game.

Methodology

The research project aimed to measure learning effects on students using the web-based tutorial *Information Literacy* and to compare the results with students using the online game *Saving Asia*. Methodologically the research is based on a quasi-experimental design that measures the causes and effects between variables. In a quasi-experimental design is it not possible to select students on the basis of criteria such as background or experience; the groups were chosen randomly. Students were able to decide themselves in which group they wanted to take the test. The research was carried out in a test environment, which means that students were not been tested in their real study environment. First-year students from different faculties were invited to take part in the test and were paid a small amount of money for their efforts.

The quasi-experimental design measures the students' knowledge at the beginning and after the experiment with a pre- and a post-test. A pre-test shows what the students already know about information literacy before they start the game or the web-based course. By comparing the results of the pre- and post-test that is taken after the student completes the game or attends the tutorial, it is possible to measure learning effects. By comparing the results of the two groups it is possible to distinguish the group that achieves a better learning result. The research model is illustrated in Figure 1.

Fig. 1: Diagram of a quasi-experimental design.



Variable O (the test) is the same for both groups, before and after manipulation takes place. Manipulation *X* is the knowledge that students absorb while playing the game or attending the tutorial. Measuring the students' achievement is an excellent way to discover if the learning method used achieves the expected results. Is the approach used to explain the topic effective? How can libraries know that the way they explain the *content* is getting through? Do the students understand the explanation that has been given? For students' achievements are not only affected by the attention they give to the explanation and to the efforts they make to learn, but also by the way the explanation has been formulated and presented. For academic libraries and faculties, measuring the learning effect is the ultimate way of evaluating learning materials and teacher performance.

In the pre-test and post-test the students answered identical questions. The test was divided into four subjects that were both part of the game and the web-based tutorial. For each subject the students needed to answer five questions. The subjects that were measured are:

- Formulating a research question
- Identifying key words, synonyms and key phrases
- Combining key words (Boolean operators)
- Quality criteria of information: evaluating the information found.

Students were invited to get involved in this research project. They could choose if they preferred the game or the web-based tutorial. Students chose one of the groups based on various individual aspects: time schedule, number of hours, fee, etc. Students chose moments that did not interfere with their schedule. Some students preferred the web-based tutorial because they did not want to spend many hours doing research. Some students chose the game instead of the web-based tutorial because the game test was planned for eight hours, which meant a higher fee. The web-based tutorial takes three hours. Students were not allowed to do both tests, because the content gained in one test could influence the learning effect of the other test.

In this project only the influence of cognitive aspects on learning was measured. The effect that emotional aspects can have on learning is much more difficult to determine. An emotional aspect that is known to influence the quality of learning is, for example, social activity within the group. In our case the test groups spent time together for only a couple of hours. Only the

students that already knew each other had intense social interaction during the time they were attending the tutorial or playing the game. Social activity is part of the game because students compete with each other, but we did not compare this social activity with the activity of the group using the web-based tutorial. Another aspect that was not measured is the attractiveness of the course content. This aspect is already part of the yearly student evaluation of the information literacy course.

The Learning Methods

The web-based tutorials on information literacy were developed by subject librarians of the University Library of the Vrije Universiteit Amsterdam in 2006. Ever since they have been kept up to date. There are web-based tutorials for various levels, academic disciplines and languages.[2] A web-based tutorial contains four to seven sections. At the end of each section a number of multiple choice questions is presented to the students in order to test if they understand that particular section. Students receive instant feedback on their answers. The web-based tutorials have three different levels of complexity: beginners or A-level, intermediate or B-level and advanced or C-level. Level A is for the bachelor freshmen and provides them with practical knowledge on the library and teaches them how to work with academic information. Level B is for students who need to write their first essay. Students learn how to do a systematic literature search, how to evaluate the information found and how to incorporate it in their essay. Level C is meant for master students who need to write a master's thesis. Students learn how to keep track of scientific developments in their field, manage the information found and keep it up-to-date using rss-feeds, email alerts and discussion groups. Each web-based tutorial lasts about two hours.

The tutorials are given to students in cooperation with faculty teachers. Faculty teachers can choose to remove some sections or add content from other course levels so that the tutorial exactly fits into the faculty educational programme. For individual academic disciplines specific sections are available.

The web-based tutorials can be followed individually. Guidance by a teacher or library staff is not necessary. The tutorial is freely available on the internet and students can follow it from their homes if they want. Most faculties

choose to schedule a computer room to make sure that students follow the tutorial during class hours. Students' results can be assessed by having them write an essay, or by having them do a test or an exercise which gives them points related to the course programme they are following. Students' acquisition of information literacy skills depends quite strongly on the way faculty teachers embed the tutorial in the faculty course. If there is a direct connection between the tutorial and an exercise that needs to be made or a test that students need to pass, student motivation for acquiring information literacy skills increases.

The library evaluates the tutorials every year with students and teachers by using an evaluation form for the students and short interviews with the teachers. Every year the library staff considers whether changes need to be made so that the tutorial is always up to date. A remark often made by students is that they find the web-based tutorial very useful and very boring at the same time. Interviews with teachers indicated that at the end of their studies students still do not know how to cite well or identify a reliable source, topics that are part of the web-based tutorial. These comments inspired the library to look for learning methods that help students to absorb the content more effectively.

The game *Saving Asia* was developed mainly as a trial to investigate if a game is a better tool to teach information literacy skills. The game was not designed to replace the existing web-based tutorial, but it was designed with a specific group of students in mind: exchange students. Some of these come from developing countries where they do not have access to the expensive electronic databases that Western universities can afford. After a short period of time in the Netherlands, these students usually go back to their countries and only to realise that access to scholarly information is much more limited. By learning how to find freely available scholarly information on the Internet they can fill the information gap to some extent. The game was developed in collaboration with the International Institute of Social Studies in the Netherlands which works mainly with foreign students from developing countries. In 2009 the game was tested and improved.

The game *Saving Asia* is a multiplayer game that uses the Cyberdam platform.[3] Students compete with each other to achieve the position of Junior Advisor in a country in Asia that has been hit by a tsunami. As Junior Advisor, the student is allowed to help this country recover. The students need to choose a

subject, write a research question, find key words, look for scholarly information on the Internet and evaluate the information found according to several quality criteria. For each task students get points. The points are updated by the teacher or information librarian after each assignment and the students can do extra tasks to improve their scores. The student that gets the highest score wins.

Because the game was developed by two different educational institutions, it is quite general and can be used by other institutions as well. The game takes five hours to play. The first two hours of gaming are coordinated by the teacher or librarian. He or she explains the aim of the game and helps the students take their first steps. The students do their first assignment in the presence of the teacher. After that they need to complete three more tasks that can be done at home. The teacher gives the deadlines for the assignments. Each task is assessed by the teacher, who also updates the student scorecards. The teacher is able to communicate with the students through the game platform, both with the group as a whole and with individual students. It allows the teacher to give individual feedback. The last hour of the game is coordinated by the teacher who answers questions and announces the winner.

Measurement of Learning Effect

Thirty-four students participated in the project. All of them were first-year bachelor students. The social sciences students were already familiar with the web-based tutorial level A (for the test the web-based tutorial level B was used). Students from other faculties were not familiar with any information literacy courses at this university, but they might have had some instruction in high school. The pre-test was designed to measure the starting level of the students, so that we could take those and their possible influence on the test results into account.

Both the web-based tutorial and the game were presented to the students in a test environment. It is possible that students would have attained higher scores if participation had been obligatory for their studies and/or if they had to pass the test with good grades, but it was not possible to include this 'motivation'-factor in the test environment. Students were aware of the fact that they did not need to pass the test.

The students were between 17 and 30 years old. Most of them were 18 or 19 years old. Twelve men and twenty two women participated. In total eight groups completed the test. The first four groups did the test in October 2009 and the other groups followed at the end of November and the beginning of December 2009. The group size fluctuated between 2 and 10 participants. For the test with the web-based tutorial the number of participants did not make any difference, but for the groups that played the game it was very important to have at least four participants in a group.

The Results

All students did a pre-test consisting of twenty multiple-choice questions. The questions were divided into four sub-categories related to the four topics analysed in this test: (1) writing a research question, (2) identifying key words and finding synonyms, (3) combining key words in a search query and (4) analysing quality criteria for scholarly information. On each topic the students had to answer five questions. In the post-test the same questions were used. The tests were done anonymously, making it impossible to trace individual learning developments. One question on the topic 'formulating a research question' was ignored in the final results of the test because the pre-test showed that 90% of the population answered this question correctly. It seemed that this question did not make enough of a distinction, and therefore it was not included in the final results.

Fig. 2: Average overall scores.

Group	Average score
Game pre-test	4.2
Game post-test	7.0
Web tutorial pre-test	4.6
Web tutorial post-test	6.1

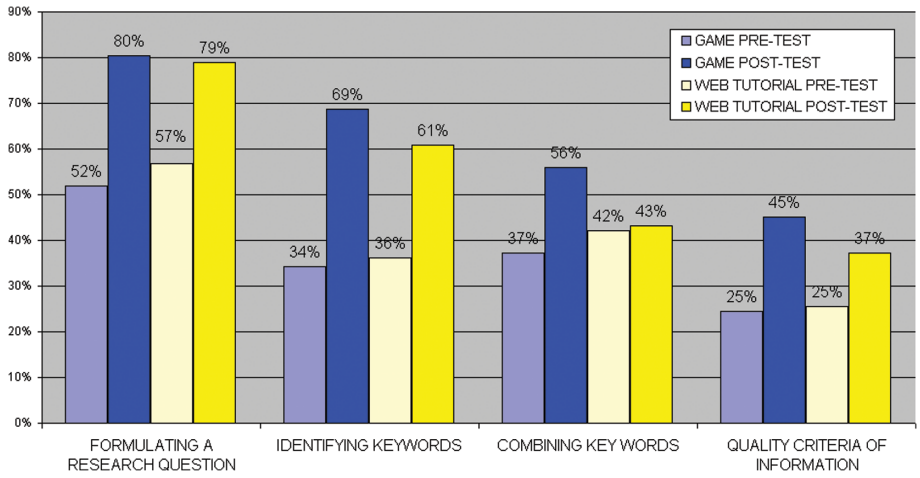
The average scores of the different groups give us a good idea of the learning achievement of the average student per group before and after using the instructional material. The end score shows that the game group scored 0.9 points higher than the web-based group. When comparing the pre-test and post-test scores, the difference is bigger: the game group acquired 2.8 points

and the web-based group 1.5 points, a difference of 1.3 points. With these results we can conclude that the game group learned more than the web-based course group (Figure 2).

To measure the learning effect, the difference between the pre-test and post-test of each group was taken as a parameter. The difference between the starting level of knowledge and the knowledge they acquired during the test programme was measured. The results are shown in Figure 3.

In Figure 3 the percentage of correctly answered questions for each topic is shown. The four pillars of each topic symbolise the groups and the tests taken. The first two columns represent the game groups. The first column shows the results of the pre-test and the second column the results of the post-test. The third and fourth columns display pre- and post-test results for the group that followed the web-based course.

Fig. 3: Table results pre-tests and post-tests per topic.



When we analyse each individual topic, we see that for the topic 'formulating a research question' both groups answered about 80% of the questions correctly, indicating that for this topic both groups did equally wel. But in comparison with the pre-test results, we see that the game group showed slightly more progress than the web-based course group. The main reason for this is that they had a lower starting level when they started the test than

the other group. At the same time we can conclude that for this topic both groups learned about the same, which could be explained by several factors. The game and the web-based course do not explain the content in so much detail that students can get a 100% score. Another explanation might be that they are unable to process so much information at once, and thus miss some information in the final test. Also the students, knowing that this test was not going to influence their study results, just might not make an effort to think properly about the answer. Perhaps if the students had had time to organise the information and study for the post-test, they would have achieved better results. It was difficult to find out why students did not get a 100% score for the test, as we could not include all possible variables.

Students of both groups learned the most about 'identifying key words'. We saw an increase of more than 30% for the game group and more than 25% for the web-based course group. On the topic 'combining key words' the web-based group learned hardly anything from the explanation given in the course, although this group knew most about this subject at the pre-test results. The explanation in the web-based course on this topic will be improved.

As regards 'criteria for quality of information' we see the largest learning difference between the two groups: the game group learned 20% and the web-based tutorial group 12%, a difference of 8%. In the web-based tutorial this topic is explained in a three-page text, where you can read why it is important to analyse the quality of information and which criteria you need for the analysis. In the game there is a short explanation of the 'why' and an exercise asking students to evaluate the articles found by other students using the quality criteria. In light of these results we can conclude that exercising with the information to be learned helps to improve the outcomes. But as we see from Figure 3, students of the game groups learned only 45% in this topic, which means that they did not learn enough to get an average grade. There are a number of factors that might explain why these results were not so spectacular. Firstly we see that the students knew very little about this subject before they played the game or read the web-based course and the improvement they made in their learning was less than in other topics (with the exception of the web-based group on 'combining words'). Perhaps they did not understand the relevance of the topic because they were not acquainted with it. When a subject is considered to be not in the students' interest, they are not motivated to learn and the results are disappointing. Secondly, com-

pared to the other topics, this one is more abstract and requires more critical thinking. Students were already familiar with 'writing a research question', they just improved their knowledge on the topic. The other two topics were subjects that you can use on a daily basis when searching for any kind of information with the help of a search engine. The practical utilisation of the learned subject can be a good motivation for learning. Generally students are unaware of quality criteria when searching for information on the Internet. Although in both courses the importance of being critical of the information found is explained, students still did not get the point sufficiently.

When looking at the overall picture, the game *Saving Asia* proves to be a more effective instrument to teach students on the four topics studied. This is a promising result, but there is room for improvement. The game *Saving Asia* did not produce any students with excellent (90–100%) results. Perhaps getting excellent results without additional time to absorb the content is a dream that will never come true, because in general we need some more time to learn something than a few hours in a course setting. Today's reality is that librarians are confronted with the problem that there is not much time available for teaching information literacy in the faculty curricula. That is why it is so important to provide students with the most compact and effective information literacy programmes possible. Students need to learn how to improve their information skills in a couple of hours. Getting the information and putting it into practice must take place at the same time. Librarians are challenged to integrate the explanation and the understanding of what has been explained — the learning as such — in one single moment. Therefore the explanation and the exercises need to be integrated as much as possible.

In this case the use of active learning techniques is not only an effective way of improving student achievement; it might even be the only way of teaching information literacy in this context. In both learning settings — the web-based tutorial and the game — techniques of active learning were applied. A game is a learning tool by which students start acting right away and explanations are only given when needed. The web-based tutorial includes multiple choice questions that test how much students absorb of the content they read. Feedback on these questions is given immediately, which might cause students not to think very hard about an answer. Since answering these questions is not obligatory, students can skip them if they want to. When we analyse both learning methods, we can conclude that students participating actively in the game setting influenced their learning achievement positively. This con-

clusion does not mean that a game is the only solution for a better learning achievement, but using active learning methods properly can improve learning achievements in different situations, even in a classical setting.

In this test possible emotional factors where not measured. We cannot tell whether the competition component embedded in the game influenced the students' motivation. If it did, then a game should result in an better learning achievement than other active learning techniques. Our experience with the game test groups is that two of the four small groups that played the game really competed. After each task a game score was shown and students could see their status. In two of the groups, students started to do extra tasks to get better scores. When this happened, other students started to do the same and then the competition really got off. In two other groups this did not happen. As the tests were performed anonymously, unfortunately there was no way of measuring whether the groups that started competing and performing extra tasks got better results.

Conclusion

Especially nowadays, in the information age, academic students need to have information literacy skills and utilise them when retrieving information. Libraries are using different active learning methods to get better learning achievements in their information literacy courses. The Vrije Universiteit Amsterdam has developed a web-based tutorial with interactive elements and a game on information literacy. To measure the effect of both learning methods, quasi-experimental design research was used. Students that played the game got higher scores than students that followed the web-based tutorial. This conclusion does not mean that games in general are better than web-based tutorial; rather the features of both learning methods need to be investigated more thoroughly to get a good understanding of what makes one method more powerful than the other. In the game *Saving Asia* students are actively engaged from the beginning until the end: they are involved in the game plot as they are a candidate for the position of Junior Advisor in a country in Asia that has been severely hit by a tsunami. To get to the end of the game, students need to fulfill several tasks that teach them how to find freely available scholarly information on the internet. The web-based tutorial makes students follow a course on information literacy on the Internet. The tutorial offers students multiple choice questions so that they can check their understanding of

the subject. These questions are not obligatory and they require less critical thinking than the tasks the game students need to accomplish.

A better learning achievement can be obtained when students get more involved in their learning, when they experience and understand the content better. The more active students get, the faster they will learn and the better their skills will be. Interactive elements can help to improve this process. A game is a way of introducing interactivity, but it is not the only one. Visual elements, for example, catch the attention of the Net Generation better than text-based components. Active learning techniques can be used in different settings, also in a web-based tutorial. When a web-based tutorial is enriched with different interactive elements that have been richly visualised, it might obtain the same results as a game. The clue is to engage students in their learning, to get them to actively participate and understand the content within the short period of time libraries have to teach information literacy.

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Website Referred to in the Text

International Institute for Social Studies, Rotterdam, www.iss.nl.

Notes

[1] As known: Georgia State University Library, Pennsylvania State Berks, the Northwest Missouri State University and the Simmons College.

[2] See the list of web-based tutorials on our course website http://webcursus.ubvu.vu.nl.

[3] http://games.cyberdam.nl.