The Use of Virtual Worlds and Serious Gaming in Education

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Abstract The use of virtual worlds and serious gaming in education is growing. Data are limited on the efficacy and mechanism of action of these learning platforms. Therefore, we focus our research and development activities on this field. In our first study, we explored 12 educational initiatives in the virtual world Second Life (SL). There we found seven learning activities in SL with added didactic value: exercising skills, demonstrating learning topics, building, organizing events, organizing exhibitions, meeting people in order to learn and supervision of students. All these activities included aspects of social interaction and collaboration between students. Based on the experiences in these initiatives, we constructed a checklist for teachers considering the use of virtual worlds in education. With this checklist, we developed the serious game 3D-Trivial Pursuit in Second Life. In this game, students exercise exam questions for their education. In our second (pilot) study we found that the Trivial Pursuit game triggered the intrinsic motivation to learning in students, resulting in increased well-being and decreased drop-out of students. The results suggest that the synchronous communication between students during the game triggers social interaction, which is prerequisite for the observed intrinsic motivation. These examples show how our institute uses the results of our research for the development of new learning tools.

Keywords Serious gaming · Virtual worlds · Education

1 Introduction

The use of virtual worlds and serious gaming in education is growing. Data are limited on the efficacy and mechanism of action of these learning platforms. Therefore, we focus our research on this field. Using the virtual world Second Life

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we explore for which learning activities virtual worlds can be used with added value, and show how, with a checklist from our research, Serious Games (here Trivial Pursuit) can be designed.
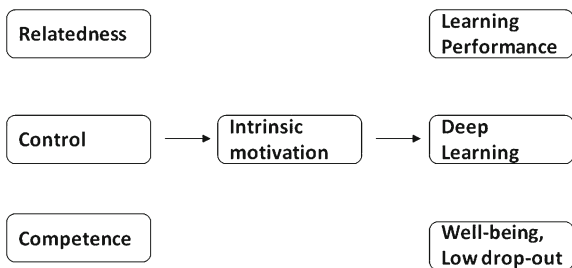
Based on our research we consult teachers how to implement serious games and virtual worlds in their curricula, and train and help them to develop new learning tools of good quality. Finally, we study the use of these new learning tools in education in collaboration with our partners. In this paper we describe our activities.

2 Virtual World

In their (self) determination theory, Ryan and Deci (2000; see Fig. 1) indicate that in education intrinsic motivation of students is crucial for good learning results, well-being, and low drop-out of students. Prerequisite for this intrinsic motivation are three student-related factors: social interaction (student–student and student–teacher: "relatedness," "presence"), control of students on their learning process and competence to do the assignments.
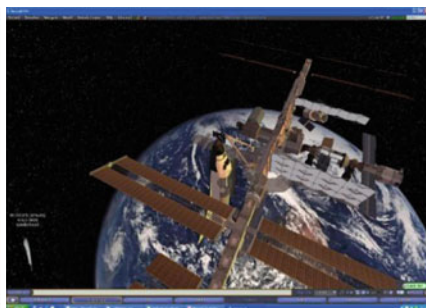
Three platforms may trigger this intrinsic motivation: virtual worlds, serious games, and simulations. Simulations and serious games can be developed in virtual worlds. Therefore in the first study, we explored which learning activities in the virtual world Second Life (SL) have added didactic value for education. Using questionnaires we described 12 initiatives in higher education and secondary vocational education. Analysis of the data resulted in a list of seven learning activities in SL with added value: exercising skills, demonstrating learning topics, building, organizing events, organizing exhibitions, meeting people in order to learn, and supervision of students (see Fig. 2). All seven learning activities included aspects of social interaction and collaboration between students. In most SL-initiatives teachers reported better grades in comparison to traditional education. Those teachers reported increased intrinsic motivation in their students, and indicated as underlying student-factors social interaction and control on the learning process.

Fig. 1 The (self) determination theory by Ryan and Deci (2000)

Relatedness

Control → Intrinsic motivation → Deep Learning

Competence

Learning Performance

Well-being, Low drop-out

Exercising skills

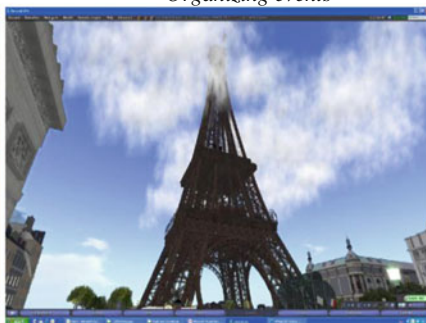*Demonstrating learning topics*

Building

Organizing events

Organizing exhibitions

Meeting people in order to learn

Supervision of students

Fig. 2 Seven learning activities in SL with added value

Based on the experiences in these initiatives, we constructed a checklist for teachers considering the use of virtual worlds in education (see Table 1).

3 Serious Game

Using the checklist (Table 1) we developed the serious game 3D-Trivial Pursuit with exam questions (see Fig. 3). The objective of the game was to stimulate students to spend more time gaining knowledge that remains instantly available. The game has the same game rules as the original board game. Extra is the option to add sets of exam questions. With these educational questions, groups of students practice for their exams. During the game, students have the option to discuss about the exam questions using a synchronous communication function (chat) in the game. In our second (pilot) study, students in the control group individually used books gaining knowledge on the Dutch language. In the experimental group students for extra played the game with exam questions on the Dutch language, in groups of minimally two students. The results of this study show that students playing the game spent more time gaining knowledge. This is an indication that the game triggered the intrinsic motivation to learning in students. The results indicate that the game triggered social interaction between students (through synchronous communication), which is prerequisite for the observed intrinsic motivation. Beside increased intrinsic motivation, the students reported increased well-being and decreased drop-out. Likewise, the synchronous communication in the game could help to decrease the significant drop-out of students observed in distance

Table 1 Checklist for teachers considering the use of virtual worlds in education

Didactic factors

(1) Choose those learning activities for which the virtual world has added value compared to other media (e.g., the seven selected learning activities in this study)

(2) Make investments in adequate didactics:

    a. Define and pursue the educational objectives of the course

    b. Design adequate assignments

    c. Organize adequate feedback and examination

    d. Formulate transparent rules of conduct

    e. Invest in adequate preparation for and teaching of the course

(3) Build/monitor/adjust the initiative in the virtual world

Organizational factors

(1) Create commitment (of teachers, students, and management (e.g., PR))

(2) Make connection to the policies of the institution

(3) Choose subgroups of students capable of working with the virtual world

(4) Minimize risks foreseen with the use of the virtual world

(5) Reduce fear that working with the virtual world is time-consuming

(6) Make investments in the development of expertise in the use of the virtual world

(7) Design protocols for the use of the learning activity in the virtual world

(8) Ensure support on IT

Fig. 3 The serious game 3D-trivial pursuit with exam questions

education, where traditionally communication is asynchronous. The number of students included in this study was to small ($n = 16$) to report on grades.

4 Recirculation of Knowledge From Research

With the knowledge from our research we consult teachers how to implement serious games and virtual worlds in their curricula, and train and help them to develop new learning tools of good quality. This way we helped to develop examples of all seven learning activities mentioned in the virtual world study, including more 3D-virtual boardgames and role-play games for education.

Finally, we plan to study the efficacy of these new learning tools in education.

5 Partners

Our institute collaborates with other institutes in the field of serious gaming to exchange techniques, didactics, and research facilities. In our role-play games we used primitive artificial intelligence to program nonhuman players. The interaction

of students with these "bots" was not natural. Therefore we started a collaboration with the institute TNO (Soesterberg, The Netherlands). With TNO we explored the use of their smart interface with high-tech artificial intelligence (Ashley) in our role-play-games. Furthermore, we collaborate with TNO in a study to explore the efficacy of five serious games in education.

With the Technical University of Twente (Enschede, The Netherlands) we collaborate in a Post-Master curriculum on the use of IT in Education. Serious Gaming is one of the topics in this curriculum.

Currently, we are in the midst of setting up a *Center on Serious Gaming in Education* at Windesheim University. In this center teachers and students are inspired (with seminars, consultancy, workshops) to use serious gaming in education. To facilitate that new learning materials are constructed, teachers with game concepts are matched with partners that can develop those games for them (internal partners (e.g., students), or external partners). Consultancy is provided to ensure that the products are didactically adequate learning materials. Research in this center is aimed at the efficacy of the developed learning materials and at the development of IT-competences of teachers

We are open to new partners interested in joining in on our Research & Development activities by exchanging techniques, didactics, and research facilities in order to optimize serious gaming in education.

6 Conclusion

In this chapter we described the merits of our research: we explored for which learning activities virtual worlds can be used with added value, and showed how with the checklist from our research Serious Games can be designed.

The limitation of the present study is that we used one virtual world (Second Life), and designed one Serious Game (Trivial Pursuit). In future work, we will expand our research to more virtual worlds and serious games.

References

1. Ryan RM, Deci EL (2000) Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. Am Psychol 55(1):68–78