# Serious Games Education for Working Life Needs – a Pilot Study

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**Abstract:** Serious games possess huge market opportunities and offer possible solutions for various real-life challenges in different fields of businesses. Although the potential of serious games is well recognized, the educational and training possibilities in the field are scarce. Through cooperation and multiform learning solutions, the lack of education particularly around serious games could be filled in to answer the requirements of the future job descriptions. This paper presents results of student feedback (n=27) around a pilot study of a serious games course that bases on the survey of actual working life needs (company interviews) and was designed to bring closer the substance experts and the game development experts.

**Keywords:** Gamification, Learning, Serious Game

## 1. Background

Digitalization is one of the most promising ways to increase productivity in the society (e.g. Brynjolfsson & McAfee 2011; Mokyr et al. 2015). In addition, digitalization has been perceived as a reformator of the economy, also substantially affecting the transformation of working life. The educational system is an essential nexus of digitalization process since digitalization has influenced almost all work tasks and it creates completely new jobs requiring competence to utilise computers and other digital devices (e.g. Frey & Osborne 2013; Niemi et al. 2014; Michaels et al. 2014; Bessen 2015). Media and game industry is an example of a recently widely recognised area. Based on the report of Finnish game education executed by University of Jyväskylä (2014), digital game industry in Finland has grown tremendously and is becoming one of the largest sectors of cultural industries worldwide. (Hiltunen, Latva & Kaleva 2013; Mononen, Neittaanmäki & Vähäkainu 2014.) This growth naturally requires development in education in this field. Only in recent years, learning institutions have started to invest in education that prepares for the future positions. (Mononen, Neittaanmäki & Vähäkainu 2014, 4; Pohjola 2014.) Digital games, including simulations and virtual worlds, have the potential in teaching providing with interactive, engaging and immersive activities and tools (Gee 2008; Shaffer 2005; Smith 2007: Kiili et al. 2015; Clark et al. 2015). Learning has been somewhat gamified. Studying of gamification is popular topic nowadays among the academic research (Hamari et al., 2014). Gamification can be seen as an umbrella term for the use of game design elements in non-gaming contexts to improve user experience and user engagement (Deterding et al., 2011). During the recent years, gamification of both online and more traditional courses has been researched and benefits of using gamified solutions as a part of teaching have been suggested (Camilleri, Busuttil, & Montebello, 2011; Muntean, 2011). Gamification is generally theorised to affect the process of learning by altering the behaviour of the student, affecting the relationship between the instructional content and the learning outcomes (Landers, 2014). Research on gamification in a learning context often measures student perspectives on a gamified module using such a metric as: enjoyment, engagement and impact of learning. (Tao et al., 2012). For this reason, some gamification elements were applied in the pilot course to be discussed later: a bird watcher's table and division of the course content into levels.

The interest in digital games designed for learning is not restricted only to formal educational practice. Serious games possess huge market opportunities and solutions for learning already deployed in domains as diverse as military, commerce, health and informal learning. Benefits of gamified solutions have been acknowledged also in healthcare education (e.g., Koivisto, Haavisto, Niemi, Katajisto, & Multisilta, 2016). For example, serious games in the health sector is a growing domain. This is an area where challenges may occur when the topic, content and practises in serious games development differ a lot from the very gaming business. That is why, it is of crucial importance to have the knowledge of the area of expertise serious game operates on in order to generate appropriate and user-friendly serious games for therapeutic use (Bellotti et al. 2010; Sirkka & Koivisto 2015).

Although the potential of serious games is well recognised, the educational and training possibilities are scarce. The actual need for cooperation is also acknowledged in the report where all the Finnish game education was studied and listed. It is evident that there are lots of possibilities to study and research games in different educational levels. (Mononen, Neittaanmäki & Vähäkainu 2014, 7-24.) Since the educational operators have all their own areas of emphasis in their game-related curricula, it would be beneficial to generate new patterns and models for cross-sectoral collaboration between various educational levels, industries and organisations in order to create and tailor-make new educational opportunities on serious game technology that could make the most of that time and place independence that digitalisation offers. Through cooperation and multiform learning solutions, the lack of education around serious games in particular could be filled in order to answer the requirements of the future job descriptions. It is evident that both the actual development process of the game and mastering the content serious game is developed for are equally important. This paper presents results around the study of a serious games course that bases on the survey of actual working life needs and was designed to bring closer the substance experts and the game development experts.

## 2. Survey on Working Life Needs

Serious Games Platform for Business and Education (SeGaBu) is an EU funded cooperation project targeted on generating virtual online studies (30 ECTS) on serious games based on identified working life needs. SeGaBu actors interviewed seven (n=7) of game developer companies and two other large-scale companies (n=2) in Kajaani and Oulu regions in Finland interested in implementing gamified solutions into their businesses. The interviews were semi-structured, and the questions addressed to company representatives were based on possible educational solutions implemented as a part of the course. Interviews took approximately one hour each.

Several of the requirements named in the interview data introduced a category of game technology. Another category essential in serious games studies is business related topics such as budgeting, sales and marketing, and service design. The game companies highlighted the understanding of the nature of game development as utmost important even over mastering the technology since game development is always a multidisciplinary teamwork. Finding a mutual language in the team is important in order to understand each other. A serious game development team should consist of actual game developers, but also of substance experts. The course "Basics of Serious Games" ("Hyötypelien perusteet") was constructed on the results of game company interviews incorporating both expertise in substance and game development. A main goal of this course was to share the required knowledge base and thus eliminate misunderstandings and unnecessary delays due to miscommunication.

## 3. Piloting Online Course Basics of Serious Games

The pilot online course "Basics of Serious Games" was implemented on the DIGMA learning platform (http://digma.fi) administered by Tampere University of Applied Sciences (TAMK). DIGMA is a Moodle-based learning management system (LMS) designed specially to serve open education and cross-institutional studies and projects. The course content was created by Kajaani University of Applied Sciences (KAMK), and the pedagogical design and gamification implemented by KAMK and TAMK.

The course was realised in November 2016 to January 2017. The aim of the course was to offer online studies regardless of time and space. The course was targeted to persons interested in expanding their expertise in serious games. The course objectives were (based on the interview results):

1) understanding of the concept of serious games and also the role and significance of serious games in the field of the actor's own industry;
2) getting familiar with the game development process, and acquiring the skills to act in the product owner's role in a serious games development project;
3) understanding the technology perspective, acquiring a variety of innovation methods and learning to apply a chosen method for generating and developing game ideas; and
4) learning to present own game ideas, including any relevant market research information.

The learning material consisted of videos, PowerPoint presentations, web pages, games and scientific and popular articles. The studies were mainly carried out as independent studies with some extent of collaboration with peer students. The assignments consisted of group discussions, playing games, a competence test, a game evaluation and an assignment where the students accomplished brainstorming of their own serious games.

To start the course, students were assigned to describe their experience in games and motivation to join the course. In the end, the students were asked for an optional feedback of the overall course by filling in a semi-structured e-questionnaire. The feedback was analysed by conventional contents analysis, and the main findings are presented in this paper.

Unfortunately, at the time when the pilot course "Basics of Serious Games" first started, none of the add-ins supporting gamification had been installed on the LMS yet. However, there were roundabouts and other ways to gamify courses. "Basics of Serious Games" made use of levels. The higher levels stayed closed for the students, until they had passed the assignments required on the lower levels. The levels were created by enabling the standard Moodle course completion tracking, and then adjusting the conditions for opening the next course section ("level"). At the moment, *Level Up!* and *Level Availability* blocks (Level Up 2017) are installed on the DIGMA platform for controlling the students' access from level to level.

On the pilot course, the Moodle *Progress bar* tool was deployed to create a Bird watcher's table. The idea was to scatter little bluebird icons around the course material to be searched. From pedagogical view, the bird watching was installed to encourage students to browse through all the course material in the course area. Currently the *Stash* and *Stash Availability* blocks (Stash 2017) are installed on the DIGMA platform mainly to serve the same purpose: picking up objects into a repository inside the course. The Moodle G*rid* layout was applied in order to create a slightly game-like visual look and feel to the course (see Fig. 1).
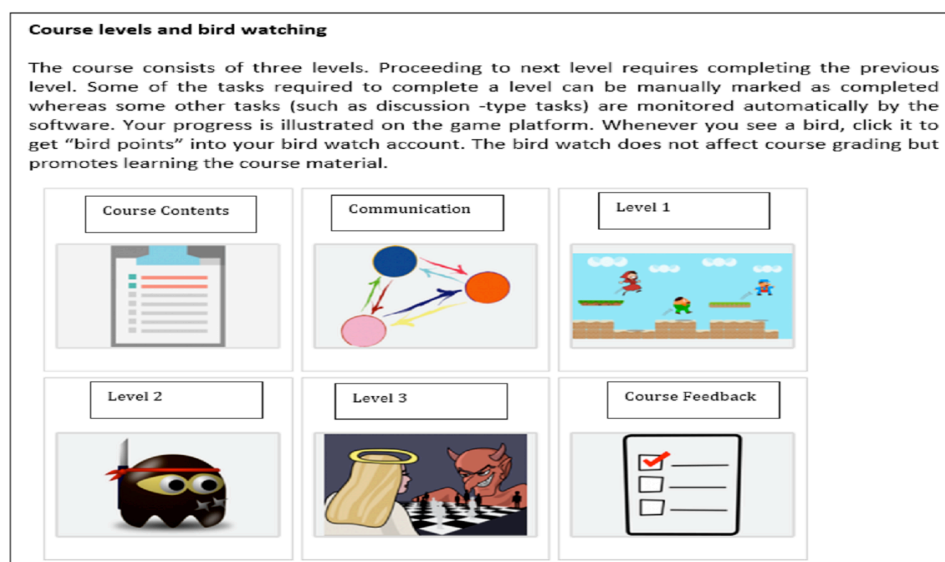


**Figure 1.** Instructions for bird watching, and the grid view with levels in our pilot course.

Several different gamification add-ins have been installed by now on our learning platform. The *Game* activity module (Moodle Game 2017) builds on Moodle's standard questions, quizzes and glossaries and can be applied to create interactive games, such as *Hangman, Crossword, Cryptex, Snakes and*

*ladders, Hidden picture, Millionaire* and *Sudoku*. Students play these games independently. In order to meet the learning context and objectives of the course, the games need to be designed in a pedagogically meaningful way.

## 4. Student Feedback of the Course Implementation

The student feedback was collected and analysed in order to get the insight of students' opinions on this type of online multidisciplinary course. Total number of 27 (N=27) answered the online questionnaire regarding their motivation to join the course but only 12 (n=12; 44%) gave requested feedback at the end of the course by the time of data collection. The main reasons named of joining this course were: enhancement of one's personal skills in gamification (n=15; 56%), general interest in gamification (n=9; 33%), and increased gamification skills required at work (n=3; 11%).

Most of the respondents learned about the course by email (n=19; 70%), informed by teachers of some other course (n=2; 7%), by a friend (n=1; 4%), or accidentally by surfing in the net while searching any online courses (n=1; 4%). Four (n=4; 15%) did not indicate the source of information regarding the course attendance.

The course contents and objectives were clearly presented (n=12; 44%) in the beginning of the course, and they were estimated to match the implementation excellently (n=6; 22%) or well (n=6; 22%). The course was assessed to work as an online course excellently (n=9; 33%) or well (n=3; 11%) by the students, and the assignments supported excellently (n=4; 15%), well (n=7; 26%) or satisfactorily (n=1; 4%) the set course objectives. Total amount of 15 students did not respond to these questions (n=15; 56%).

The students assessed their own input in attainment of the course objectives good (n=6; 22%) or very good (n=3; 11%), and satisfactory (n=2; 7%) or poor (n=1; 4%). Seven of the participants reported having worked more than 70 hours to accomplish the course (n=7; 26%), while the rest (n=5; 19%) used less than 50 hours for the studies of this 5-credit entity (total of 135 study hours). Reported study time was used to get oriented into teaching material (n=6; 22%), accomplishing the assignments (n=6; 22%), commenting other students' assignments (n=2; 7%) or developing one's own game concept (n=1;4%). Four (n=4; 15%) of the respondents assessed the course too easy one as a 5credit course. Total amount of 15 students did not respond to these questions at all (n=15; 56%). (Table 1.)

**Table 1.** Time used over the studies.

| Assignments complied with my learning objectives N=27; 100% | Assessment of one's own input in the course, scale 1-4 N=27; 100% | Obtained information about this course? N=27; 100% | Time used for studies in this course (5 cr = 135 hrs of studies) N=27; 100% | The time was used for… N=27; 100% |
|---|---|---|---|---|
| Excellently (n=4; 15%) | poor (n=1; 4%) | by email (n=19; 70%) | <50 hrs (n=5; 19%) | getting oriented to course material (n=6; 29%) |
| Well (n=7; 26%) | satisfactory (n=2; 7%) | from a teacher (n=2; 7%) | >70 hrs (n= 7; 26%) | developing one's own game concept (n=1; 4%) |
| Satisfactorily (n=1; 4%) | good (n=6; 22%) | from a friend (n=1; 4%) | no reply (n=15; 55%) | commenting other students' assignments (n=2; 9%) |
| no reply (n=15; 55%) | excellent (n=3; 11%) | accidentally when searching online courses in the internet (n=1; 4%) | | working on the assignments (n=6; 29%) |
| | | | | difficult to estimate (n=2; 9%) |
| | no reply (n=15; 55%) | no reply (n=4; 15%) | | course to easy for 5 crs (n=4; 20%) |
| | | | | no reply (n=6; 22%) |

The workload was generally experienced reasonable compared with the course guidelines, or the guidelines being even overestimated. Some of the students described their starting level skills to be quite high which made performing the course easy and quick. On the other hand, the study hours also depended on the students' motivation. Some of the answers indicate very thorough reading and studying of the provided materials, which naturally takes more time.

As to the identified learning outcomes, two main categories emerged: 1) meanings and application possibilities of serious gaming and gamification, and serious games terminology; and 2) understanding of the processes in serious games development. This result indicates the experienced main learning outcomes being in line with the set course goals. More in details, the main learning achievements attained in the course were an overview of requirements and processes in generating games (n=8;

30%), to realize the potential in serious games (n=6; 22%), to get an overview of existing serious games (n=3; 11%), or attaining other personal learning objectives (n=9; 33%). One student did not reply (n=1; 4%). As most rewarding parts in the course were named course materials (n=3; 19%), assignments (n=3; 19%), activating approach in the course (n=3; 19%), interaction with other students (n=3; 19%), achieving own learning objectives (n=3; 19%) and positive changes in attitudes (n=1; 5%). The course gained overall grade as very good (n=5; 19%), good (n=5; 19%) or satisfactory (n=2; 7%). 15 students did not assess the course at all (n=15; 56%). (Table 2.)

**Table 2.** Most rewarding elements and development need of the course.

| Rewarding elements and achievements (N=27; 100%) | The most important learning experience in the course N=27; 100% | Overall grades given to this course, scale 1-4 (N=27; 100%) | Development needs |
|---|---|---|---|
| course material (n=3; 11%) | overview of serious games n=2; 7% | poor (n=0; 0%) | more material in Finnish |
| assignments (n=3; 11%) | motivation into gaming n=2; 7% | satisfactory (n=2; 7%) | more entertainment game elements |
| achieving one's own learning objectives (n=3; 11%) | basics in serious games designing and development processes n=4; 15% | good (n=5; 19%) | audibility issues |
| attitude change (n=1; 4%) | realising the potential in serious games n=6; 22% | very good (n=5; 19%) | chat for peer communication |
| interaction with peer students (n=3; 11%) | serious games requirements n=4; 15% | no reply (n=15; 55%) | more contact teaching |
| activating approach in the course (n=3; 11%) | gamification terminology n=2; 7% | | better instructions in required forms |
| no reply (n=11; 41%) | assessment and research of games n=2; 7% | | timetabling the assignments better |
| | refreshing the basics n=1; 4% | | technical issues in exams |
| | refining one's own game concept n=2; 7% | | |
| | team working n=1; 4% | | |
| | no reply (n=1; 4%) | | |

The suggestions concerning course improvement (n=9) in the future were mainly technical details rather than anything to do with the course content: more material in Finnish, clearer instructions in filling the required forms, better timetabling of assignments, chat for peer communication, and removal of technical problems still existed in audibility and exams. One of the students (n=1) expected more contents of entertainment games, too, even if the course was particularly on serious games.

## 5. Discussion

This paper presented results of student feedback (N=27) around a pilot study of a serious games course that bases on the survey of actual working life needs (company interviews). It was designed to bring together the substance experts and the game development experts. The main areas categorized from the interview data concerning the education of serious games development were: category of game technology, business related topics, and substance expertise. These factors were implemented as parts of the course "Basics of Serious Games". Main objectives of the course were: 1) understanding of the concept of serious games and the role and significance of serious games in the field of the actor's own industry, 2) getting familiar with the game development process, and acquiring the skills to act in the product owner's role in a serious games development project, 3) understanding the technology perspective, acquiring a variety of innovation methods and learning to apply a chosen method for generating and developing game ideas and 4) learning to present own game ideas, including any relevant market research information. At the end of the course, students were asked for an optional feedback of the overall course by filling a semi-structured e-questionnaire. The feedback was analysed by conventional contents analysis. The two main learning outcomes were: 1) meanings and application possibilities of serious gaming and gamification, and serious games terminology; and 2) understanding of the processes in serious games development.

Since giving feedback of the course was optional, the responses varied somewhat depending on the questions. However, the data is indicative for the future development of serious games education regarding both content and implementation. Only one of the answers related to learning outcomes was dealing the evaluation and judgement of serious games. Further emphasis may be needed in the studies to discuss what factors make the game a serious game and how the utility of the game is measured and analysed. Games in general provide a lot of data which could be used in many ways. The application to

this data could also be a topic for further studies. Lack of communication with course members was mentioned in the course feedback. In general, the challenge in online courses is to enable discussion, collaboration and teaming. One of our developmental goals is to use new, gamified, teaching methods and technical tools to enhance the communication and active role of the students. Gamification of the course platform is one of the approaches to be focused on in our future studies.

Especially the gamification elements, such as "Bird watch", ranking tables, levels, collecting treasures or coins in a Stash, adapting gamified interface on the standard LMS test tools must be further studied in our future pilot courses. A few of gamification elements were already implemented in this course but the research will continue during the other courses running on the platform. The objective is to learn how students perceive and adapt gamified approach in their online learning context. This study, however, as a pilot study offers orientation and reflects the actual needs of the game industry, working life, and student experience. The results well indicate that within our modestly gamified environment, the experienced learning outcomes were mainly in line with the course goals.

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