

“ECONOMICS IN PRACTICE” A SIMULATION GAME FOR HIGH SCHOOL STUDENTS TEACHING THE BASICS OF ECONOMICS AND ENTREPRENEURSHIP

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ABSTRACT

The Polish educational system is undergoing substantial changes. Among others, one of those changes is the introduction of innovative and technologically enhanced teaching methods. The Center for Simulation Games and Gamification at Kozminski University in cooperation with external partners proposed a teaching program based on the computer simulation game for a new subject called “Economics in practice”. This paper discusses the game project and the research conducted among Polish teachers and high school students. The research is aimed at recognizing barriers and preferences in using a simulation game as an educational tool. Teachers, (8) were selected based on previous experience with innovative teaching methods and geographic/demographic representation of north-eastern Poland, were participating in the focus group. The focus group with the teachers was aimed at identifying institutional and organizational barriers in the process of introducing a simulation game into the educational system and also served as a calibration method for the student’s questionnaire. Questionnaire studies were conducted in several cities, in which 30 to 45 students from chosen high schools were asked to fill out a questionnaire, 362 questionnaires were collected. Research among high school students was aimed at recognizing preferences in the usage of games and the preferred teaching environment. Both of those studies served as input in the design process of the simulation game for this subject.

INTRODUCTION

The Educational system in Poland is undergoing deep changes. The highest degree of change is concentrated on the Polish high school system. Until last year, the youth educational system was topic oriented (every course had a list of topics that had to be covered) - which was coming from the previous socialist education system, starting from the New Year (2013) a new system was introduced. The new system is knowledge and skill oriented and creates a new challenge for schools and teachers and is called the National Framework of Qualifications (Chmielewska at all 2010). The new approach and philosophy of learning and

teaching calls for new teaching methods as well, thus the Polish Ministry of Education together with Polish agencies within the EU, started a program for developing new and innovative teaching and learning methods for high schools. Authors in cooperation with external partners proposed a teaching program based on the computer simulation game for a new subject called “Economics in practice”. The project proposal has been accepted and the project received funding.

THE “ECONOMICS IN PRACTICE” COURSE

A series of new courses have been created and “old” courses and subjects, were recreated to match the new teaching philosophy and requirements. One of the new courses being introduced was “Economics in practice” and authors received a general syllabus for this new subject. Syllabi analysis showed the following four groups of learning objectives:

- Ability of planning and execution of the students venture
- Market analysis skills
- Organization skills – teamwork and leadership
- Evaluation skills – ability to evaluate and draw conclusions from own actions and experiences

It is clearly seen, that the course is extremely practice oriented. An interesting point needs to be made as well it seems that the syllabi does not mention any knowledge based learning goals, although a clear need for knowledge delivery next to the game content is visible. Even more doubt appears when further analysis of the course description shows that the subject can be placed at any of the three years of high school education. Moreover, in the high school curriculum there is a presence of an entrepreneurship course, which is more economic knowledge oriented. The Ministry leaves the choice of course placement up to the school. The course “Economics in Practice” can be placed as an introduction, a supplement

or replacement of the entrepreneurship course. Furthermore, the Ministry stressed the requirement of the lowest cost of introduction to the schools.

Ministry document analysis showed both; the potential for introducing the simulation game to the course and some potential threats. Skills oriented courses have high game scenario implementation potential. On the other hand, the placement frame requires a very flexible setup with a detailed course programme design. Authors decided not to propose the simulation game to the ministry but the whole teaching programme including the simulation game, classic in-class and experiential exercises, as well as, a small negotiation game. The idea behind the programme is the ability to give a teacher the potential to adapt the programme around the game. The game itself should have the following options:

- ✓ content depth customization
- ✓ played in small teams
- ✓ web based

Based on the in-depth analysis the program building proposal was issued to the Ministry of Education and it was accepted.

RESEARCH

One of the elements of the game and teaching programme was that the design process was discovering the barriers of entry and potential of the course participants. The research around the topic was splintered into two groups and two phases. The first group of interest were the teachers. A Focus group had been designed using teacher

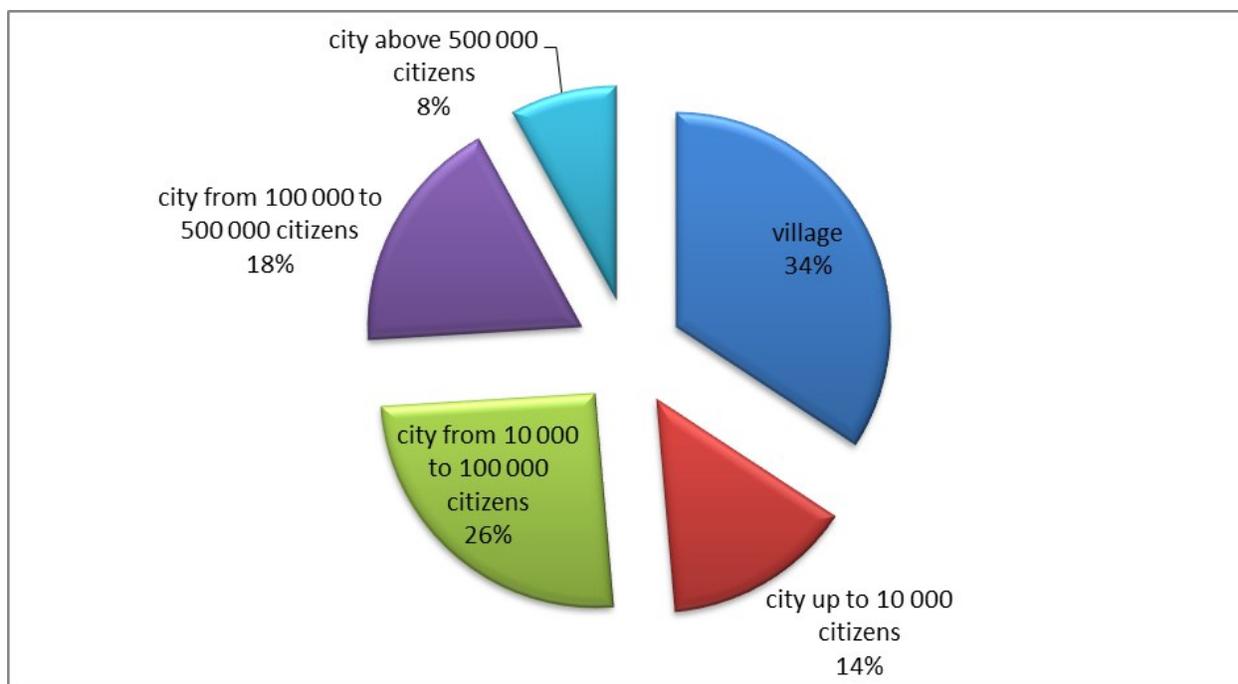
was the first phase of research. A Second group was high school students and for this group a questionnaire was designed.

TEACHERS

At the beginning of the design process an open invitation has been sent to schools as well as an advert was published on the internet. The invitation and the project were warmly welcomed by teachers and school directors and a lot of applications had been sent to the programme management team, from all of the applications 10 teachers had been selected based on their prior experience with active teaching methods and graphical spread but only 8 of them could take part in the focus group. Teachers had been invited to the university campus for the focus group research on a selected day. The Focus Group had been prepared and organized with the usual standards (Morgan 1988, Kitzinger 1995). Two tutors were selected previously and the whole focus group was video recorded and then analyzed. The focus group scenario mentioned the following topics:

- ✓ Prior experience with games and experiential learning
- ✓ Potential of applying simulation games in high schools
- ✓ Elements of the game that teachers find important
- ✓ Technical requirements for the game
- ✓ Barriers of implementation
- ✓ Desired game features
- ✓ Mode of work with a simulation game in the classroom
- ✓ Programme shape and teaching materials including in-

Figure 1.
Place of residence



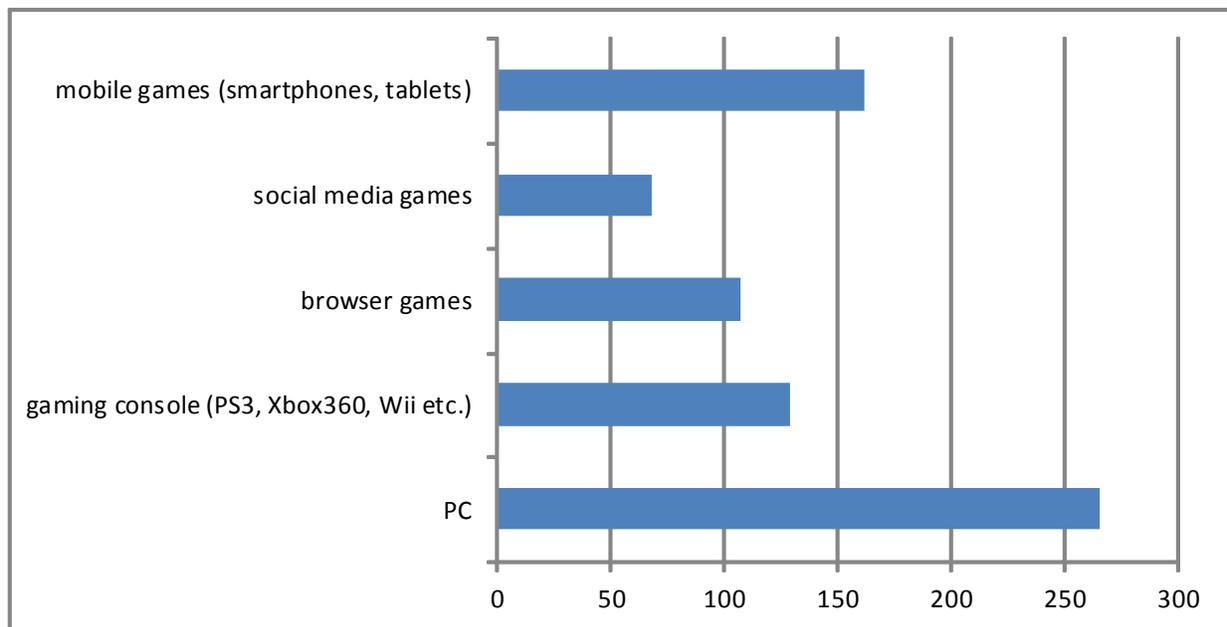
- game reporting
- ✓ Experiential gaming activities and excesses
- ✓ Grading systems with simulation games in high schools
- ✓ Motivating students
- ✓ Student profiles

The focus group started with an introduction and all participants received some basic information about the ministry project and syllabi. The topics covered during this time were quite extensive the focus group took almost the whole day to get acquainted with it. Teachers were open and enthusiastic about such a programme although they were stressed about the potential problems. The most frequent topics mentioned were covered through open discussion and storytelling, the only topic that was treated differently was the topic of barriers of implantation. In order to frame this important problem authors had applied a game storming concept (Gray, Brown, Macanuso 2010), i.e. teachers were asked to play a three simple games with a pen and paper. The first game was aimed at identifying the simulation game implementation barriers, the second was aimed at ordering identified barriers from the most important to less significant and the third and last was looking for the potential for solving and avoiding barriers. The game storming part worked well and the authors received important and well-structured data. Most of the teachers had some prior experience with games and/or experimental learning in the classroom but in most cases they were one-time events, they also said there are no major problems with introducing experiential learning in the classroom. The barriers pointed out by the focus group participants in order of importance are as follows:

1. Fear among teachers about new teaching methods and content.
2. Dealing with technical difficulties in the classroom.
3. The Game is trivial or too hard for students.
4. Misuse of the game by the students.
5. Problem of appropriate grading when using simulation games and experiential learning techniques.
6. Being not able to meet the student's expectations and needs.

One of the most interesting findings was the lack of the problem of a weak or non-existent IT infrastructure. Teachers, when asked about it, said that in a majority of schools in the region that they come from have sufficient IT infrastructure to perform classes with usage of computers with internet access. In the framing process teachers stressed the following ways to deal with these barriers. Most of the problems come from the abilities of the teacher to deal with the game and the students in the process of learning when using active teaching methods and teachers were stressing the need for extensive and attractive materials for the teachers and the students. Especially tutorials and handbook for self-instruction and a place where they can ask questions and share experiences. Some of the ideas were pointing out the need for teaching skills development and providing materials for self-learning and example syllabi and grading matrix as well. Furthermore, events and information about promoting active learning methods like simulation games should be created and distributed among teachers and high schools directors. Third area discussed by the focus group was regarding ideas addressing the issues of student engagement and motivation. Teachers stressed adaptability and topicality of the game and materials around the game. Leaving aside the need for extensive self-learning material,

Figure 2.
What kind of gaming platform do you prefer more (more than one answer was possible)?



teachers started an interesting discussion around the grading system that could work in a program based upon active and experiential learning methodology. One of the problems discussed was the issue of bankruptcy in the simulation game and how to deal with it in the classroom and in the performance grading matrix. The solution to this barrier was to be able to positively grade the team or students even, if they have bankrupted. A mandatory advisor both in the game system and the teachers/students advising team will help students until they have return into the black. Another problem that arose during the discussion and framing process was the ability to meet different student needs and expectations. The teachers concerns were in strong correlation with the problem discovered in the ministry outlines and documents, the ability to place this course for different students which could create difficulties in fulfilling the needs of students. Focus group participants reported this as a problem as well but in their opinion it was not a barrier for entry. They have correlated this with facts that students are eager to use new technologies in the classroom and are very happy to play educational games. Teachers also were stressing student's ability to discover game mechanics very fast and their ability to adapt quickly. In the discussion teachers also signalized a substantial dependency between game visual attractiveness and student's satisfaction and experience.

The last part of the focus group was designed to be an introduction to the second phase of research. Teachers also described their students as competitive and had suggested it as both a source of potential for motivation and conflict. Thus, in their opinion, competition between teams and students is welcome but it has to be limited and under the

control of the teacher in concern that they might lose control over the classroom.

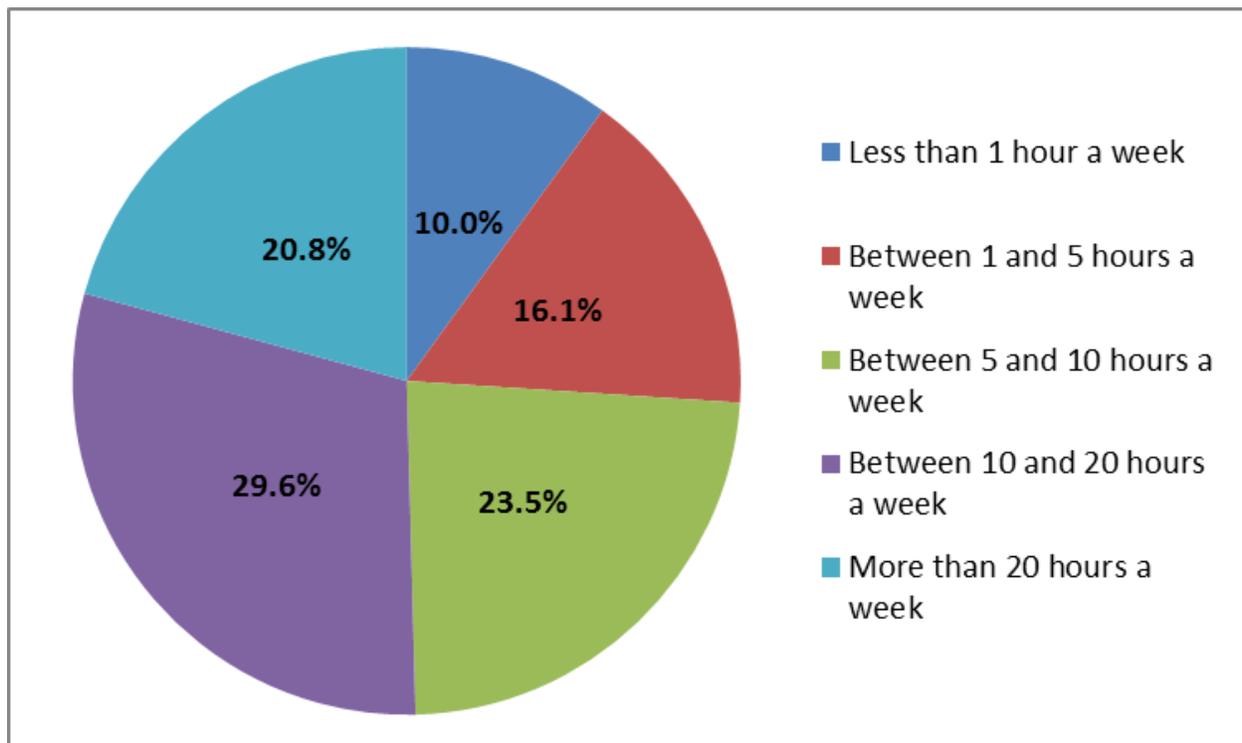
The questions about students profile was the closing part of the focus group and the main reason for them was to frame the questionnaire addressed to students which was the second phase of the research conducted.

STUDENTS

In the next step of the research and programme design process was discovering the user pattern and habits of students. Based on similar research and focus group conclusions a questionnaire was composed and sent to selected schools with a request of distribution along with instructions. The selection of schools was based upon their geographical and demographical representation. After several weeks the questionnaires were returned to the authors via mail.

The questionnaire was separated into a few sections addressing different areas of interest, the main idea behind the study was to discover the preferences of students and implement that knowledge into the game design process in order to increase the game's attractiveness. The questionnaire was anonymous but the metrics were built with quite narrow fields (Churchill, 1999). The aim of such a set-up was to get a high response rate and be able to build a precise profile of the student. The number of students that took part in the survey is 362. 55% of the responders were males and 45% were females and all of them were between 16 and 18 years old, the biggest age group was 16 (54%) and 17 (24%) years old. This distribution was intended,

Figure 3.
How many hours a week you spend playing video games?



because it is very likely that the course will be placed in the first or second year of high school. In the Polish high school system all classes have a predetermined specialization profile. All class specialization profiles can be grouped into two areas: human science oriented (languages, history and social sciences) and exact science oriented (math, physics, biology, chemistry, informatics, economics). Specializations are quite important and have a strong influence on the choice of courses for a particular class and because the ministry did not specify, which of the existing specializations should have this course, authors were interested in receiving data from a large variety of specializations. In the survey there are more than 15 class specializations present after grouping the human science oriented classes which represented 61% of the students and exact sciences oriented classes were 39% of total responders. This distribution is representative for the most high schools in Poland. Geographically the group of schools that were chosen represents middle sized and smaller towns in north-eastern Poland.

It can be observed that the largest group of responders is living in villages or middle sized cities, this distribution was also intended. Moreover, it is also a trend in the Polish educational system, with lowering numbers of children and youth in the schooling age, schools are concentrated in the bigger cities and thus forcing students to travel longer distances.

One important factor from the point of view of simulation game design is internet access, to the authors surprise 98% students reported to have easy access to internet apart from the schools, mostly at home. The authors surprise comes from the fact that north-eastern Poland is reported in official statistical and economic development reports to be the least developed in the country in the area of household's IT infrastructure.

The second section of the questionnaire was devoted to students' game playing habits. The aim of this section was

to build a profile of the student as a game user and thus receive the picture of a student as the gamer.

Playing games on the PC is still the most favorite way to play games, second comes mobile gaming, which is also correlated with the usage of smartphones and tablet PC's as they become more affordable. Surprisingly social media gaming is not very popular in this group. Gaming consoles are not strongly represented as well, mostly because their cost is still very high for the average Polish household.

High schools students spend quite a lot of time playing video games. More than a half of the surveyed group devotes more than 10 hours per week playing (waged average was 8 hours). A strong trend can be observed that video games have become major entertainment in this group. This observation is also supported by results on reasons for playing video games.

Observation showed games being a time killer and stress relief valve. Although 78% of students reported to be playing multiplayer games do not seek new friendships through gaming, maybe it is the main reason why social gaming is not as popular in this group as was expected..

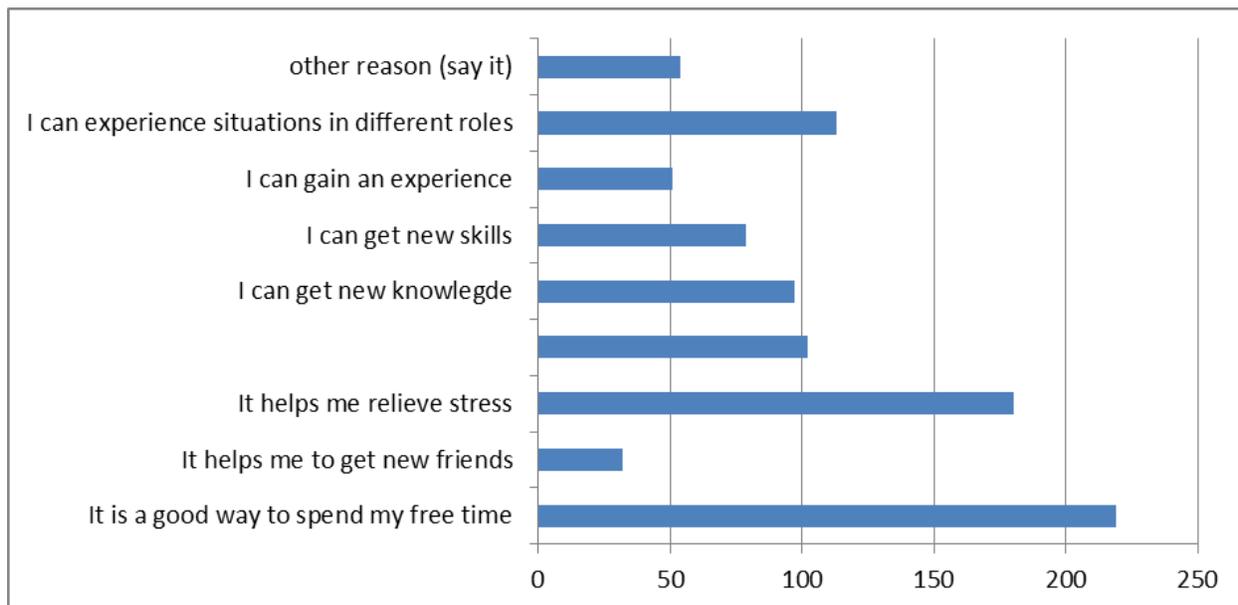
The last question from this section of the survey was aimed at the most favorite game types among the high schools students.

The most popular multiplayer type games are strategy and First Person Perspective games, classic board games and card games are also quite popular among high schools students.

The third part of the survey was aimed at getting student opinions about learning and teaching with games and simulations.

Authors wanted also to check the awareness of students on the topic of a games ability to transfer learning. Data clearly show that a large majority of the responders have a clear and positive opinion about learning through games. The authors could about not ask specifically of business simulation games because of a high possibility

Figure 4
Why do you play video games (more than one answer is possible)?



that high students never encountered such a game.

One of the most valuable sets of data received, from the game design point of view, has been received from the responder's opinion about the game features that they find important. A user friendly interface and ability to compete with others received the highest attention and tutorials and hints had the lowest scores. This data supported the teacher's opinion of Polish high school students liking competition and challenges, which are rare in the existing schooling system. Other data also supports teacher suggestions about the need for a visually attractive and interactive game environment is highly appreciated by potential users.

The next question was devoted to the ideal type of business that should be represented in the game. Students gave a lot of answers including starship workshop and unicorn breeding farm, but 90% of the answers were concentrating on the service type business like restaurants, workshops, banks, hotels, skate parks etc.

The last section of the questionnaire was aimed at the experimental learning part of the programme. The first question from this section concentrated on the desired work space with the simulation game. A majority of the students 67% still chose to work with the simulation game in the classroom, the least popular 14% work type was e-learning and working with the simulation game at home. The middle segment was a mixed solution of classroom and e-learning which gathered 19% of answers. This was quite surprising, because authors assumed that students will be more willing to work at home instead of the classroom.

The last two questions concentrated on the activities going on outside of the classroom.

In both of cases a majority of students found the ideas of meeting people, who are from the business world as valuable asset to their experience and knowledge base. They were although less enthusiastic about contests based on video games.

Structure analysis was also performed from the point of gender and class specialization. The entire data collected through the questionnaire was both analyzed with F, Chi² statistic and Pearson statistics in separation for gender and class specialization. The Group, although it is large enough for analysis, occurred to be very homogenous. Very few elements were statistically significant which have been found e.g. females valued more tutorials than males. None of the found differences were substantial and influential.

SUMMARY

The analysis consisted of two parts; both of them brought a lot of criteria meant for the teaching programme and the game development process. According to ministry standards a detailed syllabi was created. The Syllabi concentrated on a list of learning goals and the teaching methods of delivery. Learning goals have been created in line with revised Bloom's teaching and learning methodology (Anderson, Kathwohl at all 2001) in three categories knowledge, skills and social competences. The Syllabi was the first point of action, which was aimed to satisfy teachers. Afterwards, a strategic decision can be made based on the all three party's requirements and favorites.

Figure 5
What is your favorite multiplayer genre (more than one answer possible)?

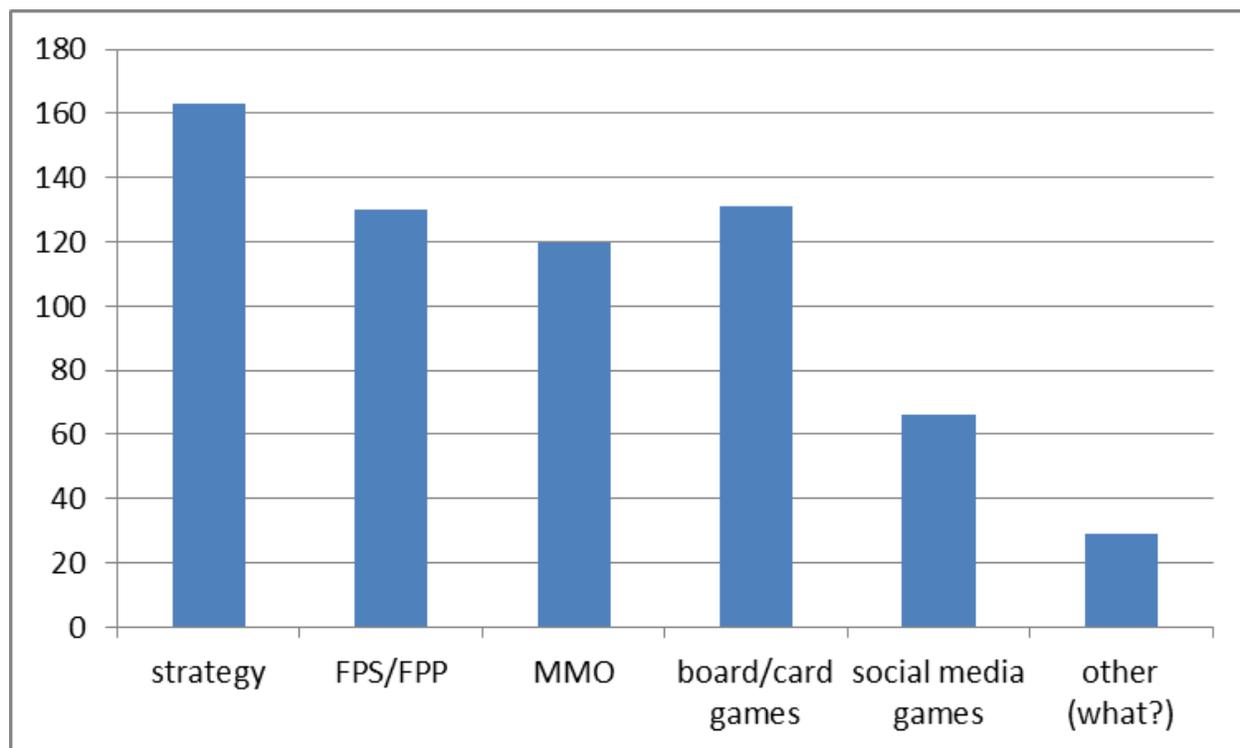


Figure 6
Do you think that games can develop your knowledge and/or skills?

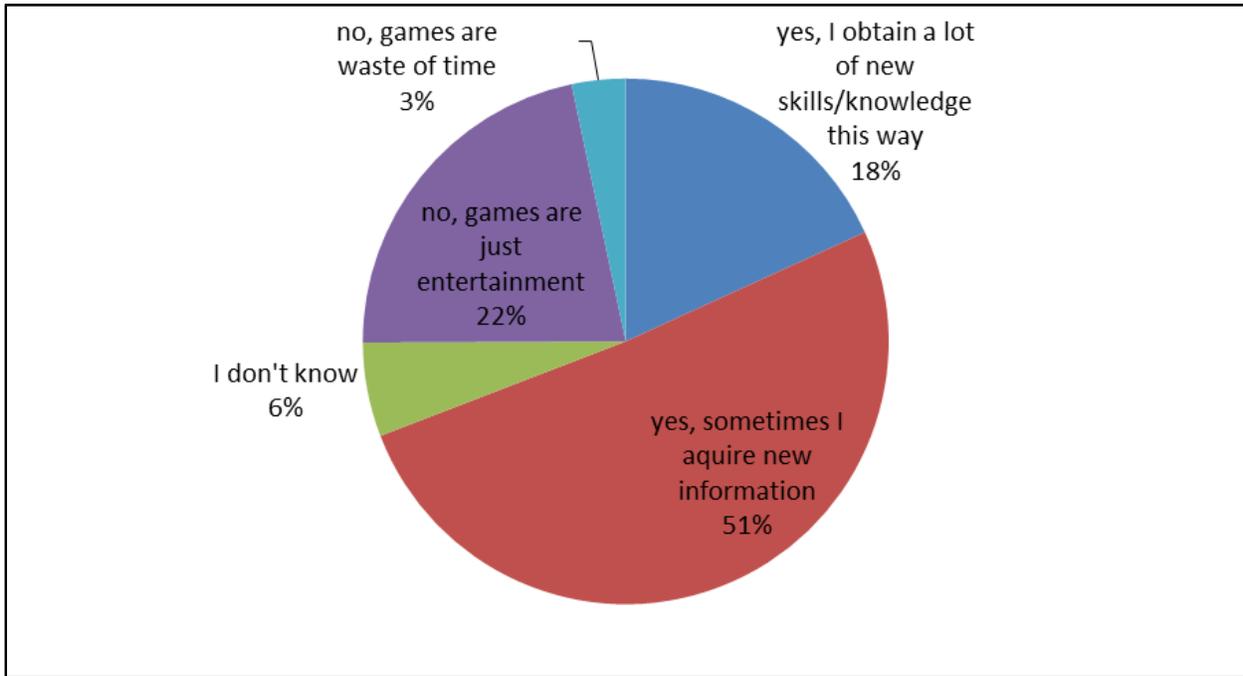
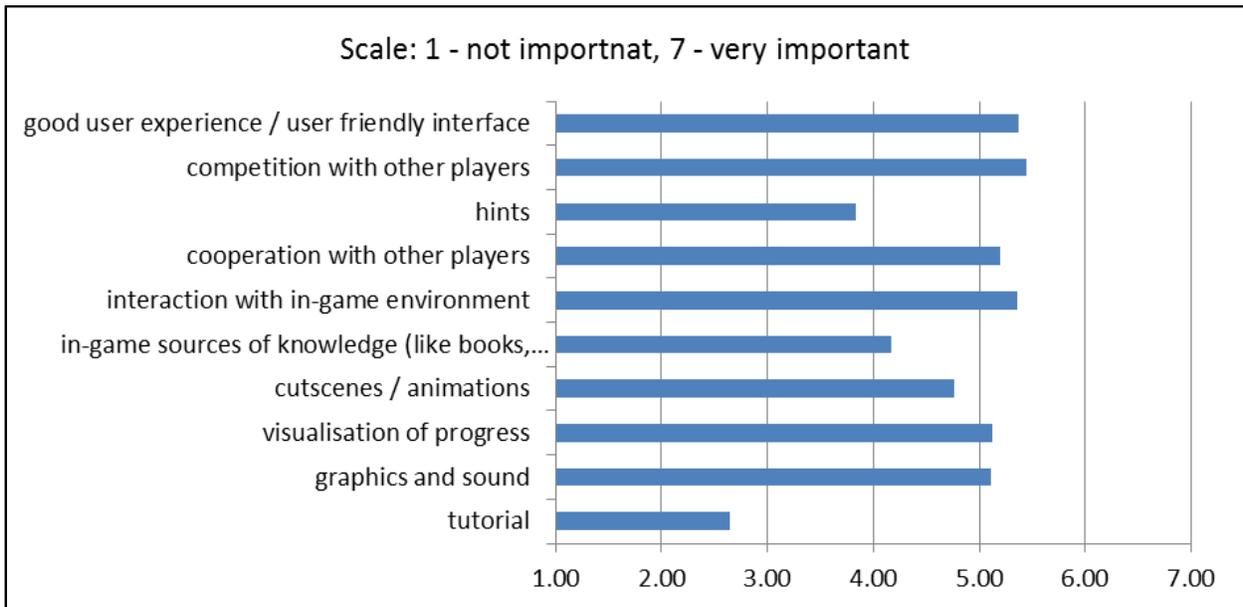


Figure 7
What is the most important thing for you in a game?



The core of the programme is a business simulation game played in small teams of 2-4 people. Students will not be directly competing against each other; they will be competing through a ranking based upon balanced scorecard type metrics. Authors decided not to increase the already very competitive posture of the students and the ranking system will be a sufficient tool to drive and motivate them (Kapp 2011). Balanced score metrics will consist of long and short term economic results, satisfaction indexes of stake holders and a sustainable management index. Game outcome measurement is also supported by the ministry, who insisted on incorporating sustainable management elements into the game and the teaching programme. In the game, in some point of time, a computer generated competition will appear. Competition will follow predetermined generic strategies like low cost/low price or high quality/high price etc. Competitions strategies will be the same for all teams in the particular class.

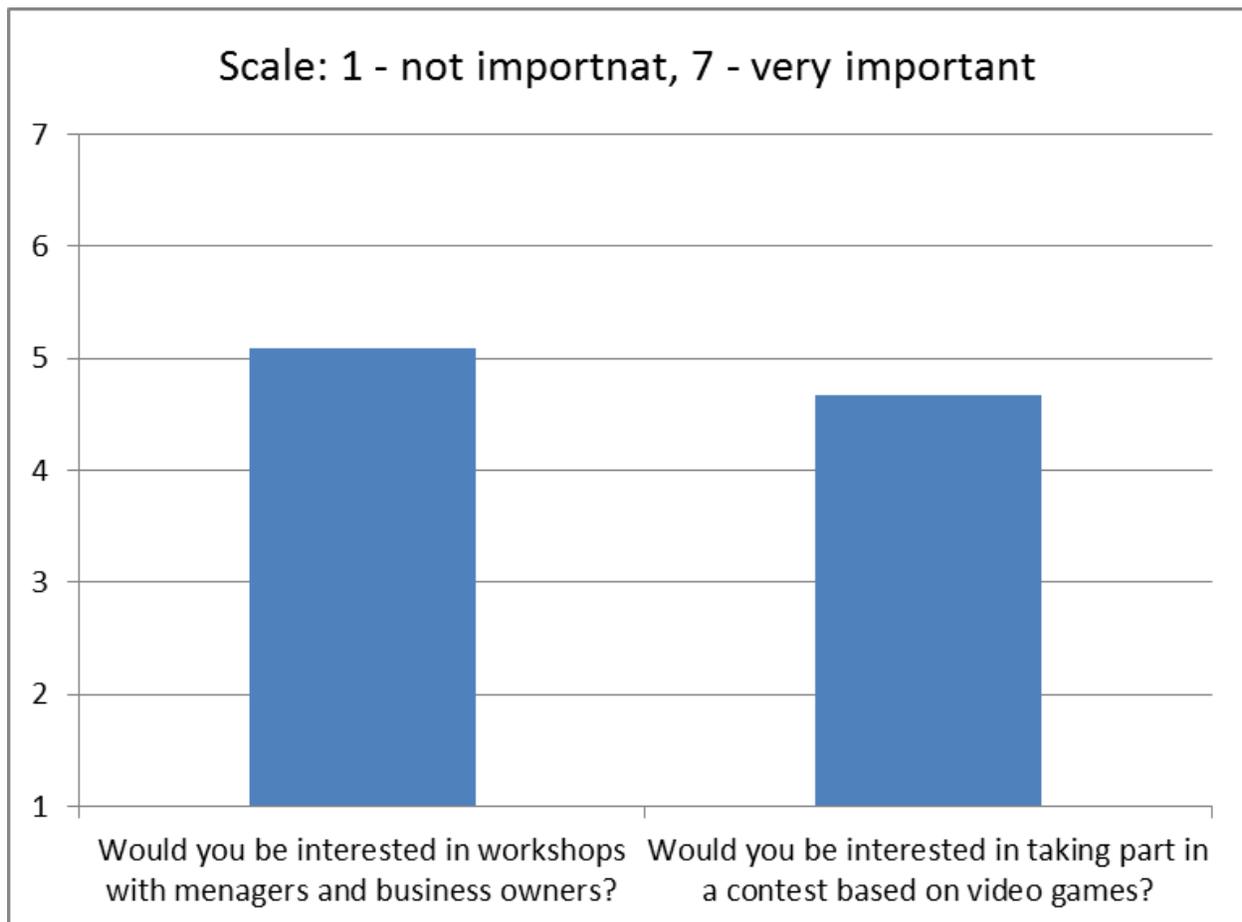
The game will be designed to be played through web browser in the HTML 5.0 language, which allows it to be played in class without software installation and it can be also played at home and through portable PC tablets and smartphones. In order to secure an interactive environment and visual attractiveness the game will be played in the

form of isometric and interactive game map (Koster 2005, Schell 2008).

The game will be played in quarters and years. The full game version will consist of virtual 16 quarters and 4 years. The game will develop as the students will gain knowledge and experience. It will start very small with just a few decisions and a full game version will consist of 22 major decision groups covering all business decisions areas. Changes are going to be introduced every full year according to the game experience development (Kriz, 2003). All major changes will be supported by introductory tutorials in the form of comics and in-game animations. New entities will appear on the interactive game map like banks, an advertisement agency, city hall, an employment office etc. They all will be interactive and in some of them part of decisions that need to be made will be made e.g. loans, deposits and investment credits will be placed at the bank building.

The game scenario will follow a start-up company in the service business, after long discussion the authors have decided upon the hotel industry. This decision is followed by idea that every potential game participant can imagine how to run such a business and can place themselves in the shoes of a small hotel manager. The game scenario will be based upon a demand function that is designed as a local

Figure 8
Experiential questions



and global optimization and trade-off paradigm which is built around the production capacity growth path (Gold & Pray 1990, Teach 1990, Murff & Teach & Schwartz 2006) and cost functions will be based upon a classic diminishing returns paradigm. Additionally, options of 14 events have been created to make the game scenario more dynamic and unpredictable. Events have three categories based on which game function they influence: demand events, supply (cost) events and sustainable management events. The teacher can decide on including them into the scenario or not and can adapt this way the difficulty and dynamics of the game environment.

The teaching programme, which is designed around the game and supports the appearance of game options and decisions. A series of in-class lectures and exercises have been designed and placed in the syllabi at the moment when those options appear in the game. Additionally, three experimental exercises and one simple negotiations game have been designed as optional content that can be replaced as classic in-class exercises. The exercises are scenarios and outlines for both students and teachers on performing them e.g. when the bank appears in the game the teacher has two options. The first option is a classic in-class lecture and exercises on calculating interest rates, loans and deposits. The second option is an experimental exercise in which students have to go to the nearest bank branches and gather information and then present them in the class. The

scenario of a simple negotiation game will also be offered to the teachers, this will be a cooperation/competition negotiation game based on the modified prisoner dilemma (Harrington 2009). If the teacher will choose to introduce it to the classroom this option will also appear in the game and game participants will be able to cooperate or not on the level of building cooperation networks (it will influence the cost but not the demand because they do not compete directly). Flexible design of the programme and ability to customize, to some extent, game scenarios are an essential part of the design. The challenge of creating a game that can be attractive to different groups of students and simple to manage for the teachers is quite extensive and still calls for budget discipline. However, research among teachers and students was one of the key elements of the game design process and although it required additional work and involved cost authors believe that in the alpha and beta testing process it will pay-off. The impact of this research was so extensive that authors decided to implement teachers and students in the next phases of the production process as well and after every major milestone of this project. Focus groups and queries will be conducted in order to bring this simulation closer to the needs of students and teachers.

Figure 9

Example of interactive isometric map of the game design. Copyright by Strangefruit Graphics.



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