Perspectives on Computer Gaming in Higher Education

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Learning Business Through Simulation Games. Survey Among Students Who Played Developed Games

Games and learning

It is not big news for educators anymore that nowadays students are increasingly audio-visual-driven learners with diverse learning styles. While educators have adopted various methods to cater to each new generation of students' needs to make learning more likeable, such efforts do not yield the same effect as playing computer games, where game players are willing to learn as they play (Wong et al., 2016: 731). The use of games in education (also called edutainment) combines education and fun, involves students in education and allows experimentation with different aspects of education (Poznań University of Economics, 2014). Rodkroh et al. wrote that "the digital games concept has been used in education since the end of the 20th century because games have the potential to promote the student' skills through problem solving" (2013: 336). This paradigm, known as game-based learning, was one in which Conati (2002) identified games utilization as a medium for conveying learning content. Computer games present an engaging experience within the virtual world where most participants are willing to spend hours being immersed and amused (Wong et al., 2016: 731). The most common game genres for educational games are simulations and role-playing games (RPGs) (Wong et al., 2016: 729). Simulations increase the level of organisational reality during training and provide the trainees with an opportunity for unstructured learning (Poznań University of Economics, 2014) and "the learner is given full control of the gameplay and can react as the hero of the game" (Wong et al., 2016: 729). There are positive and negative impacts in using games in education. According to Wong et al., computer games often have a negative impact on people because most people treat computer games as an addiction for the learner; thus, computer games have great potential to assist or replace teach-

ers and engage learners in a new and challenging way (2016: 729). Because of active participation within the gameplay and interactive storytelling, players are motivated to engage in activities within the game world (Wong et al., 2016: 731).

Learning and personality

The one aspect needed to consider in educational games is players' personality type. Students in classrooms differ in social economics, and political and cultural aspects, and so there are also different personalities. The Myers-Briggs Type indicator (MBTI) has proven to be useful for educational purposes. It is used with students ranging from junior high to college. The MBTI has become the most widely used personality measure for non-psychiatric populations (Myers, Myers, 2010: xxi). The MBTI not only identifies type in students, but also helps them to understand their various learning styles as well. Through the indicators, a student can come to know how he/she understands material most effectively, and to know what his/her learning style is. The benefits of knowing a student's learning styles are first, through an understanding of his/her learning styles, the student knows more accurately how he/she can better process and put new information to use. Second, the teacher will know how each student is most likely interpreting new information and whether or not a particular lesson or project is suitable to each student's learning style. In addition, knowledge of learning styles can help a teacher better understand each student's strong and weak points and can promote better communication in the classroom (Brownfield, 1993). So this tool could be useful to select students who can learn through simulation games better than by using other methods.

The MBTI was developed by the mother-daughter team of Katherine C. Briggs and Isabel Briggs Myers. They began developing this personality test in the summer of 1942, basing their ideas on Carl G. Jung's theory of psychological types. Despite the fact that the developers had no formal psychological or statistical training, they began developing an item pool that would test the attitudes, behaviours, perceptions, and feelings of the different psychological types, according to their understanding of them (Myers, Myers, 2010). After tryouts and research, the indicator was created. The indicator involves four preferences, each of which has two sides. They include Extrovert vs. Introvert, Sensing vs. Intuitive, Thinking vs. Feeling, and Judgment vs. Perception. There are sixteen types, each being a combination of the four preferences. Types are illustrated by four letters, such as "INFJ". The four letters indicate the preferred side of each of the dichotomous preferences, though both sides of each dichotomy are used by a person at one time or another. The MBTI is used in counselling, in business and industry, in public schools, and at colleges and universities. Some advantages of the MBTI are that it provides personal insight in a positive constructive way; it is almost completely self-administering; it has no time limits; it has several forms to accommodate various purposes; and the results are easy to interpret and understand (Briggs, Briggs-Myers, 1987). Information about an employees' personality type can inform a manager on how to manage and motivate them, and will help

to integrate new team members quickly while also developing their leaders and leadership (Bajic, 2015).

Games and business education

One of the areas where games are used is business education. A business game is a simulation or model of either the whole or a part of a business organization. Simulations and games are experimental training activities which incorporate and utilize the various mental abilities of students. Business games are considered as a trial-and-error method, which permits a deeper insight into business management problems (Poznań University of Economics, 2014).

One of the significant aspects of educational games is the user interface (Adcock et al., 2008). This is because without the user-friendly and easy-to-understand interface, learners will grow bored and frustrated and end up leaving the game. The user interface also represents the first impression delivered to the learner about the game. A clear and simple interface will make the learner feel more comfortable (Wong et al., 2016: 730). Helme and Clarke state that "students need to have both the will (motivation) and skill (capability) to be successful learners" (2001: 136) and that "the individual brings to the learning situation numerous characteristics that influence their cognitive engagement. These include: skills, knowledge, dispositions, aspirations, expectations, perceptions, needs, values and goals" (2001: 138). Buchanan (2004; from Rodkroh et al., 2013) insisted that digital games should be designed to support the learning of cognitive, affective, and psychomotor skills and abilities, enhance problem-solving thinking skills, and promote creative exploration.

Amory and Seagram (2003) presented a model called the "Game Object Model" (GOM), which combines education theory and game design. This model consists of both pedagogical dimensions and game elements. Pedagogical elements are play, exploration, challenges, engagement, goal formation, goal competition, critical thinking, discovery, competition and practice. On the other hand, games elements that are interaction, storyline, feedback, fun, graphics, sound and technology. Therefore, there are lots of demands game constructors need to fill.

Project GAMES

Project GAMES is the follower of the project *Strategic Management Games –innovative teaching method for business education* (project number 2011-1-PL1-LEO05-19884), implemented within the Leonardo da Vinci Transfer of Innovation programme. The principal objectives of the first project were to develop and test business games scenarios, as well as to create teaching notes on the basis of strategic game engine prepared for the purposes of the project (Gaweł, Pietrzykowski, 2014). The name of the following project is *Virtual Game Method in Higher Education* (acronym GAMES) in the programme ERASMUS+ in the field of Strategic Partnerships for higher education. In the second project, education tools were created to establish and run social companies, which take care

not only of economic effectiveness, but also fulfilling social needs, so the game scenarios are service-based.

During the GAMES project, a virtual game in higher education will be developed as an innovative education method. The students as players put themselves in the position of business managers in various aspects of company management. During the game, their task is to make decisions within their area of competence, and the quality of those decisions has an impact on the performance of the virtual company. Business games force the participants to take a sequence of managerial decisions, and later on the players receive feedback regarding the consequences of those decisions. In the project were partners from four countries: Poland, Spain, Finland and Estonia. Each of the partners developed different game scenarios in the same platform. Spanish students played a coffee shop simulation game, Estonians a car wash, Finns in social care, and Poles a fitness club scenario.

Data and Methodology

After playing the simulation game, students filled a survey questionnaire conducted with the LimeSurvey application. There were different students in different countries, and it was interesting to compare results by curriculum, gender, nationality and where they had played a similar game before. The curriculum of students who played the game were classified as business studies (group A) or not, where students studying social work and tourism gathered (Group B). Respondents' data are presented in Table 1.

Table 1. Respondents by nationality. age. gender and curriculum

		Frequency*	Percent
Nationality	Spanish (ESP)	16	13.6
	Estonian (EST)	33	28.0
	Finnish (FIN)	38	32.2
	Polish (PL)	31	26.3
Age	under 18 years	6	5.0
	18–23 years	82	69.5
	24–34 years	24	20.3
	35+ years	6	5.1
Gender	Female	96	81.4
	Male	22	18.6
Curriculum speciality	Business and Administration	26	22.0
	Social Work	40	33.9
	Tourism Studies	14	11.9
	Project Management	7	5.9
	International Business	31	26.3
Previously played a similar virtual game	No	70	59.3
	Yes	48	40.7

*Same counts are presented also on figures after group name.

Figure 1 shows that business students and students from Spain and Poland are played similar games before and others not. In the figure numbers on the coloured areas indicate the number of respondents and length of the coloured areas indicate groups' distribution by percentage

When using a computer-based game for teaching students, it is important to know how students assess their digital skills. There were a few respondents who said that they hate info technology (IT) and they rather feel confused using new electronic devices and usually have problems adapting to new electronic environments.

Based on Figure 2, it can be concluded that most students do not afraid computers and are willing to play simulation games. Students not studying business, especially students from Estonia and from Finland, and those who not played similar games before, found that the way that this virtual game deals with market dilemmas was interesting. Half of the business students, 58% of students who played similar games before, 65% of Polish and 75% of Spanish students, disagreed with this.

The same apportionment was among different groups of respondent's answers' for the questions "The scenario of the virtual game captures important issues", "Problems provided in this virtual game are diversified" (see Fig. 3) and "The structure of the virtual game is consistent".

65% of Estonian respondents agreed that they can draw conclusions relevant to real market situations; in other groups, respondents agreed with this less than 50%, but 23% of the Spanish students, in addition to students who had played similar games before, totally agreed with this. Up to 20% of respondents agreed that information in the instruction is sufficient for making decisions in the virtual game and that the story provided in this game scenario was coherent and clear. So it can be concluded that after once playing the game, it is not easy to understand

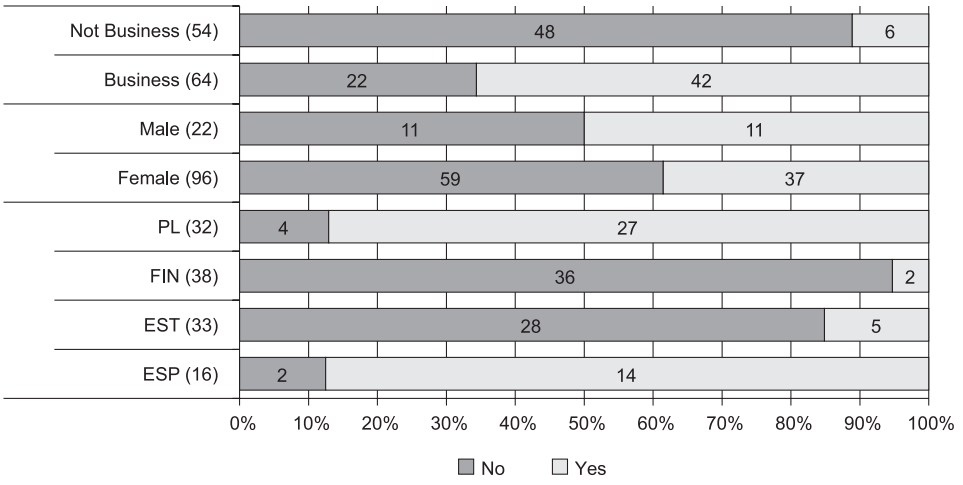

Fig. 1. Have you played similar games before?

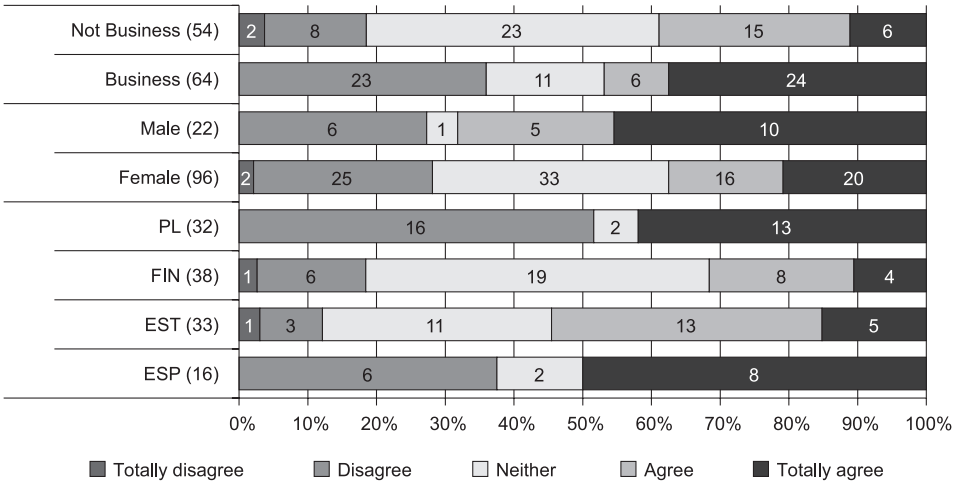

Fig. 2. I love IT and feel comfortable in using different media formats in everyday life, study and at work

the game properly. Less than 30% of respondents from all groups agreed or totally agreed that the duration of the game was properly predicted.

Respondents who had the most convenience in playing the game were male (32% totally agreed, 23% agreed), Polish students (40% totally agreed), studying business (27% totally agreed, 7% agreed), and students who had played before (31% totally agreed, 1% agreed). Also, 33% of the Estonians and 29% of the students who had not played similar games liked to play the game. For them, it was a new learning method, and so it was interesting. The game demands lots of business knowledge, so it is convenient for students who are more experienced

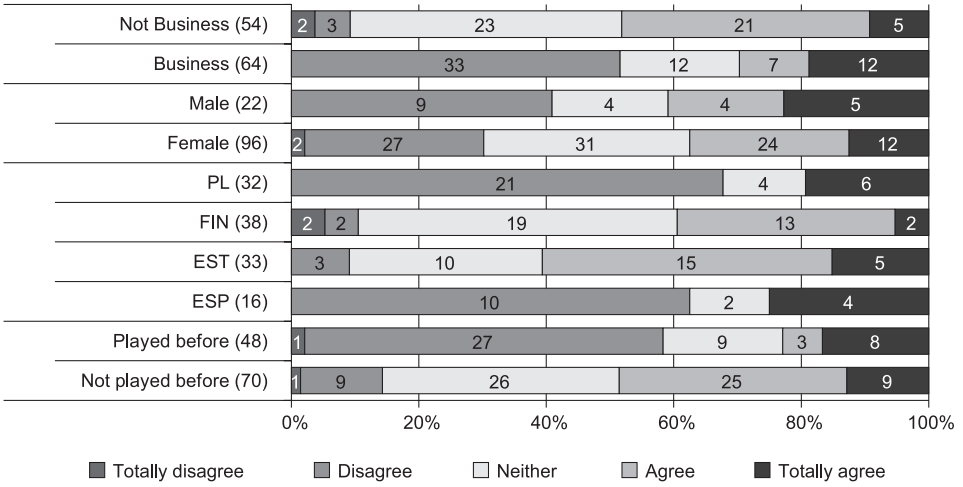

Fig. 3. Problems provided in this virtual game are diversified

in business and simulation games. None of the Estonian students disagreed with wanting to participate in similar classes, but approximately 55% of Polish and Spanish students do not want to do this again (see Fig. 4).

60% of the students wanted to change some game elements. They made the following suggestions:

"It took too much time to wait other players to move to next round" (EST 3, FIN 5 players)

"If we would have read the manual, everything would perhaps have been understandable, but while playing the game the so-called pop-up windows could appear on to draw attention to what you can do with the new round" (EST)

"More clear instruction, feedback from the last turn (tips, what should be improved), different professionals should be able to work in the same office" (FIN, 5 players)

"The game might say, as a kind of important thing is not checked (such as pricing)" (EST, 3 players)

"Specify the need for different workers for different services" (FIN 4 players)

"Adapt taxes also into the game" (EST)

"Would be nice if the software were somehow easier to use and navigate" (FIN)

Respondents were asked to assess how important some factors were while playing this specific game. The first factor was "To receive an achievement within the game-context". For 55% of Polish students, it was not important; on the other hand it was very important for 39% of them, as it also was for most of the other groups' respondents. Less than 18% of those not studying business, as well as Finnish students, considered receiving an achievement very important, and 60% marked it as important. So, achievement is important for students.

The second factor was "To explore the game and its environment", and this was important for all the Estonian students to whom the game was introduced

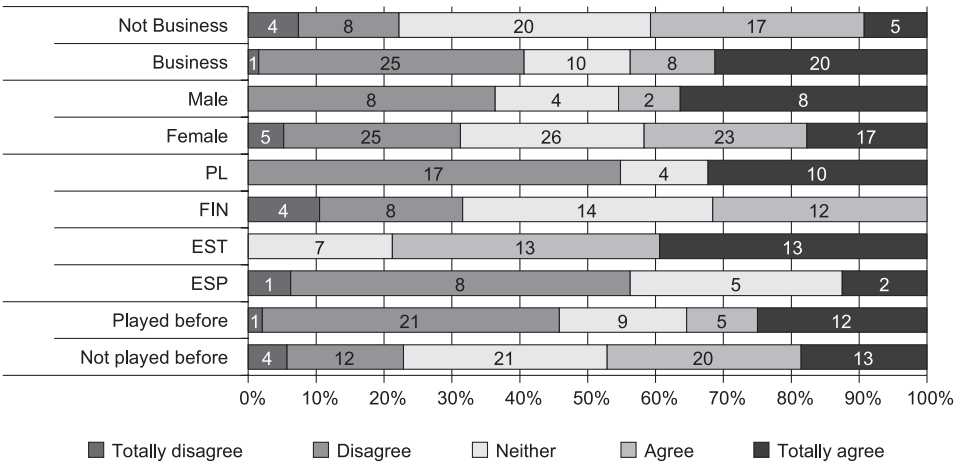

Fig. 4. I would like to participate in similar classes

as a prototype they needed to test. This factor was also important or very much important for students not studying business and those who had not played a similar game before. 55% of Spanish and 41% of Polish students marked this factor not important, despite that in conformity, 22% and 54% of students of the same countries marked it very important. Approximately the same proportions were among business studying and students who had played before.

The third factor was cultural, and the question in the questionnaire was, "To socialize with other team members or players" (see Fig. 5). For 88% of Spanish students, 65% of the students who had played a similar game before, and 61% of Polish students, it was not important. 94% of Estonian students considered this factor important or very much important (42%). Less than 30% of the respondents of other groups considered it as a very important factor.

The last factor was "To impose upon others (to dominate/ win the game) by any necessary tools", and almost same proportion (30–45%) of students from every group considered it important or very important.

Students also assessed the learning process with the virtual game. 81% of Spanish and 68% of Polish students disagreed that learners use their previous knowledge in building new knowledge; half of the business students and those who had played similar game before also disagreed. Approximately half of the students agreed or totally agreed with this statement; only Estonian and students who had not played similar games before agreed more than others, with a conformity of 96% and 70%. Similar results were also obtained for the statement "Authentic tasks in a meaningful context are encouraged". 69% of Spanish and 49% of Polish students disagreed that virtual games encourage reflection on prior knowledge and the task. 81% of Estonian students agreed or totally agreed with it, and Finnish students preferred answer "Neither".

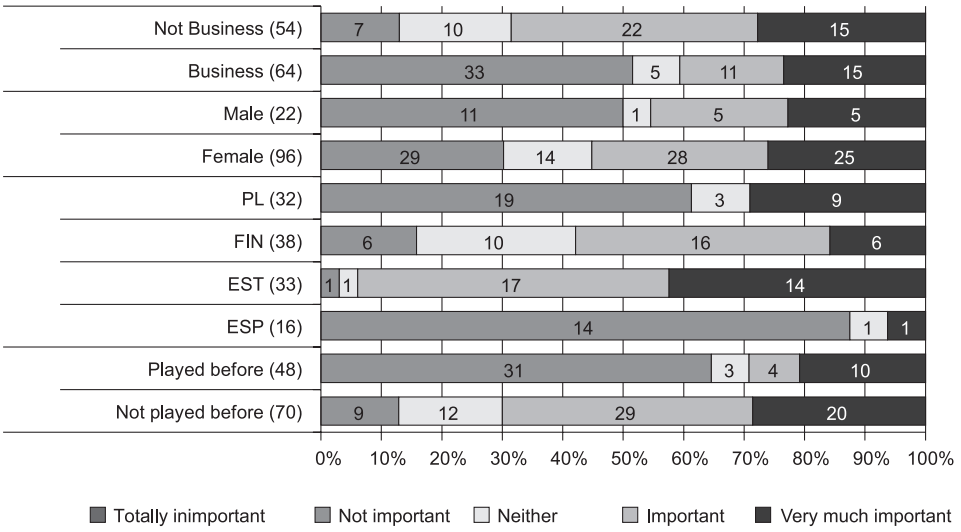

Fig. 5. To socialize with other team members or players

Almost 60% of Polish and Spanish students marked that collaborative work was not encouraged, but 91% of the Estonians, 69% of students not studying business and who had not played similar games before, and 58% of Finnish students declared that it encouraged collaboration. Similar trends were also seen in regards to the opinion that learners experience new situations and explore them in finding the right solutions (Fig. 6).

40% of students agreed that learners get feedback on their activity.

Students assessed in the five point Likert scale which skills are necessary to successfully progress with this specific game, and which skills are developed while playing the game. The mean scores (Mean) and standard deviation (SD) by different groups are shown in Table 2.

Not one of the named skills received a total average score below "3", so every skill was counted as necessary and developed. Students indicated that the three less necessary skills for success with this specific game were independence, computer and time management skills, and less developed skills were rated the same. The most needed skill was the decision-making skill and this was also most the developed skill by students. Differences between students' groups are shown in Table 2.

There was a question about feelings during the game. Students were asked to mark just one feeling of eight (see Fig. 7) and these feelings were coded on an 8-point-scale (feelings presented in a different order than in the questionnaire): 8 – "Self-confident and challenged"; 7 – "Cheerful and in good spirits"; 6 – "Amused"; 5 – "Neutral"; 4 – "Cannot tell"; 3 – "Disoriented"; 2 – "Bored"; 1 – "Irritated because things did not go as I wanted". Coding the variable like that allows the researchers to use parametric tests, like independent samples t-Test

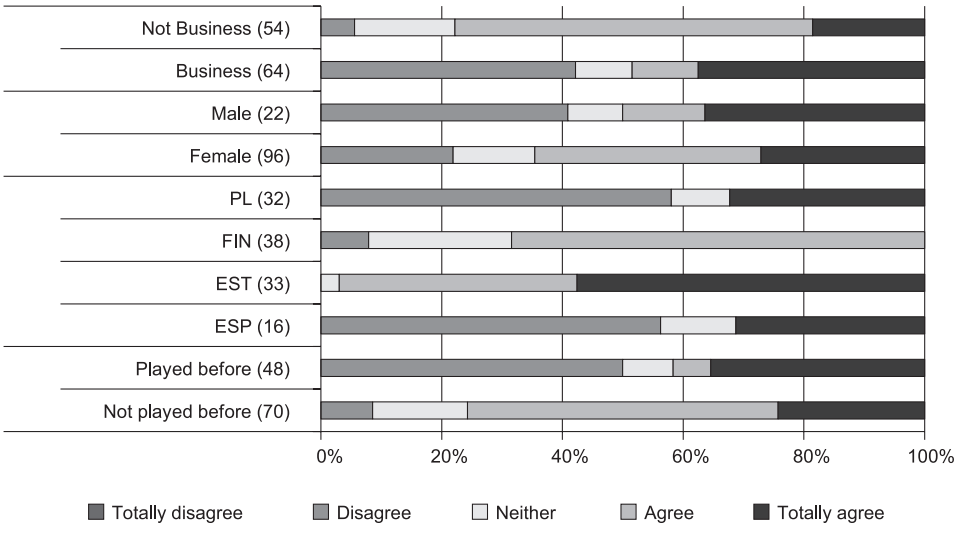

Fig. 6. Collaborative work was not encouraged

Table 2. Necessary and developed skills by students (n=118)

	Skills	Played a similar game		Gender		Nationality				Business Curriculum		Total	
		No	Yes	F	M	ESP	EST	FIN	PL	Yes	No	Mean	SD
Necessary skills	Communications	4.1	3.3	3.9	3.3	2.7	4.6	3.9	3.3	3.5	4.1	3.76	1.24
	Decision making	4.6	3.9	4.3	4.4	3.9	4.9	4.3	3.9	4.2	4.5	4.31	1.12
	Team work skills	4.4	3.7	4.2	3.7	3.3	4.8	4.3	3.6	3.9	4.4	4.13	1.19
	Flexibility	4.2	3.3	3.9	3.6	2.9	4.6	4.1	3.4	3.5	4.2	3.86	1.18
	Analytical skills	4.2	3.6	4.0	3.9	3.3	4.7	3.8	3.6	3.8	4.1	3.95	1.17
	Independence	3.4	2.9	3.3	3.0	3.0	3.6	3.3	2.8	3.0	3.5	3.23	1.02
	Problem solving	4.3	3.7	4.1	3.9	3.6	4.7	4.2	3.4	3.8	4.3	4.03	1.13
	Time management	3.8	3.1	3.6	3.2	3.0	4.2	3.7	3.0	3.3	3.9	3.56	1.21
	Computer skills	3.5	2.9	3.4	2.7	2.8	3.4	3.9	2.6	2.8	3.8	3.29	1.27
Developed skills	Communications	3.9	3.7	3.8	3.9	3.6	4.3	3.6	3.6	3.8	3.9	3.81	1.15
	Decision making	4.3	3.8	4.2	3.8	3.8	4.7	3.9	3.8	4.1	4.2	4.11	1.09
	Team work skills	4.1	3.8	4.0	3.8	3.7	4.6	3.8	3.7	3.9	4.1	3.98	1.17
	Flexibility	3.9	3.4	3.8	3.3	3.1	4.4	3.6	3.3	3.5	3.9	3.67	1.11
	Analytical skills	4.0	3.5	3.9	3.6	3.6	4.7	3.7	3.2	3.7	4.0	3.81	1.17
	Independence	3.3	2.9	3.2	2.6	2.7	3.8	3.1	2.6	2.9	3.4	3.12	1.02
	Problem solving	4.1	3.6	4.0	3.4	3.3	4.6	3.9	3.4	3.7	4.1	3.92	1.16
	Time management	3.6	3.2	3.4	3.5	3.4	3.9	3.4	3.0	3.3	3.6	3.42	1.22
	Computer skills	3.3	3.0	3.3	2.8	3.8	3.3	3.5	2.4	2.9	3.5	3.19	1.19

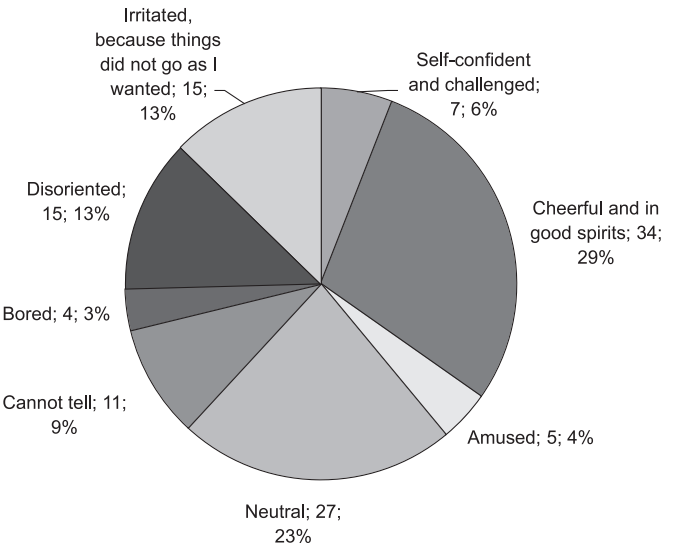

Fig. 7. Students' feelings after playing the game

Table 3. Differences between dichotomous variables by t-Test

	Played a similar game		Gender		Curriculum	
	No	Yes	Female	Male	Business	Not business
N	70	48	96	22	64	54
Mean	4.39	5.73	4.63	6.27	5.81	3.89
Std. Deviation	2.07	1.63	1.97	1.64	1.74	1.82
F	5.726		3.880		.349	
Sig.	.018		.051		.556	
t	–3.927		–3.642		5.868	
df	113.681		116		116	
Sig. (2-tailed)	.000		.000		.000	

and analysis of variance (ANOVA) to compare groups' differences. In Table 3, the results of comparison are shown.

The largest part (29%) of students felt cheerful and in good spirits after playing the game, but there was also 32% of students who stand neutral or could not tell about their feelings. The third biggest part (26%) was irritated or disoriented.

There is a statistically significant difference for all variables. The highest average score was from males, who were more than amused but not so high as to be cheerful. Experienced players and business students were on average amused, while unexperienced players and females were neutral. The lowest average score was for students not studying business, who marked themselves between "cannot tell" and "disoriented". By the standard deviation score, it can be noted that the variance is quite high, so there are many students who are below or above average score. This result is also adumbrated from Figure 7.

Statistically significant differences were noted between Finnish students and those of other nationalities (Bonferroni multiple comparisons were used in ANOVA test). Finnish students marked themselves feeling, by average score, between "disoriented" and "cannot tell" (see Table 4). Estonians also received the lowest score, but it was statistically significant from Polish ($p=0.042$) and Finnish ($p=0.006$) students' scores.

It is also important to look at results not only by average; in Figure 8 are feelings by nationality and by percentage.

Table 4. Descriptive Statistics in ANOVA test for the question "How did you feel while playing this game?"

	N	Mean	Std. Deviation	Minimum	Maximum
ESP	16	5.88	1.67	1	8
EST	33	4.94	1.92	2	7
FIN	38	3.55	1.72	1	7
PL	31	6.13	1.57	3	8
Total	118	4.93	2.01	1	8

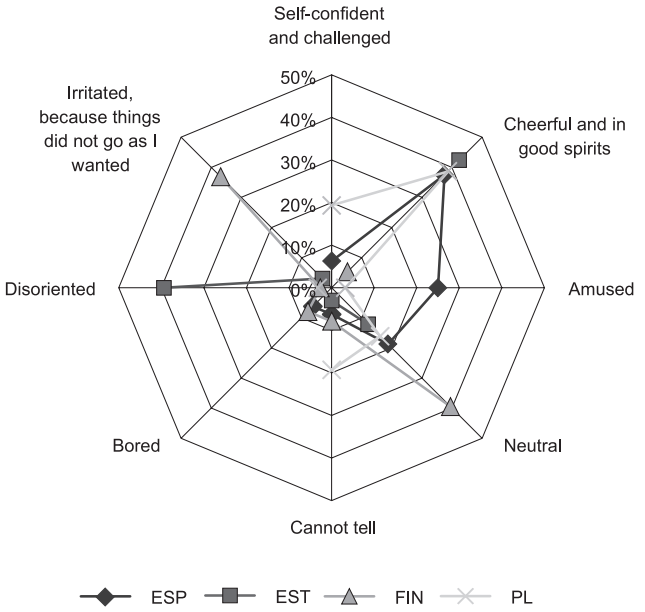

Fig. 8. Feelings by nationality

Estonian, Polish and Spanish students were in almost the same proportion cheerful and in good spirits, but only 5% of Finnish students felt the same way; they were mostly neutral or irritated. Estonian students were also disoriented while others were not. For Estonian students, it was the first time playing such a simulation game, which might be the reason for this kind of answer.

There was also the idea that students differ by personality. In the questionnaire, the simplest version of the Myers-Briggs Type indicator was used, and it consisted of eight agree/disagree statements. Only one question has statistically significant difference ($p=0.007$) for the feelings variable, and this was the statement about how the respondent gets his/her energy: "I get energy by spending time alone; I am focused on my inner world and I rather like to think, then speak". Those students who disagreed with this statement got a higher average score between "Neutral" and "amused", and others between "neutral" and "cannot tell". The same result by all MBTI statements and feelings variable are shown in Table 5.

There are no clear types of personality, so the students were given some statements and they did not know which kind of personality type these sentences covered. The self-confident and challenged marked themselves as extroverts, sensing, thinking and judgment personality type, so their personality type is, by theory, "ESTJ", and this type is, according to the results of this survey, the best player of developed games. The cheerful and in good spirits are type "EIT(J/P,)" but there is no such clear separation of personality types. Neutral is "ISTP", cannot tell "EITJ", disoriented "(E/I)ITJ", and irritated the "EIFJ" personality type. Amused and bored students' counts were so small that their personality type does not appear clearly.

Table 5. The Myers-Briggs Type indicator statements comparison with feelings about the game students played. (Number of respondents=118)

The Myers-Briggs Type indicator statements		Self-confident and challenged (7)*	Cheerful and in good spirits (34)	Amused (5)	Neutral (27)	Cannot tell (10)	Bored (4)	Disoriented (14)	Irritated, because things did not go as I wanted (13)
Extravert	Agree (69%)	100%	74%	100%	44%	90%	50%	64%	77%
	Disagree (31%)	0%	26%	0%	56%	10%	50%	36%	23%
Introvert	Agree (47%)	14%	35%	40%	56%	40%	50%	64%	69%
	Disagree (53%)	86%	65%	60%	44%	60%	50%	36%	31%
Sensing	Agree (60%)	86%	62%	80%	59%	50%	75%	57%	46%
	Disagree (40%)	14%	38%	20%	41%	50%	25%	43%	54%
Intuitive	Agree (64%)	29%	76%	60%	52%	80%	75%	64%	69%
	Disagree (36%)	71%	24%	40%	48%	20%	25%	36%	31%
Thinking	Agree (64%)	71%	65%	80%	63%	70%	50%	79%	46%
	Disagree (36%)	29%	35%	20%	37%	30%	50%	21%	54%
Feeling	Agree (53%)	43%	59%	80%	52%	40%	75%	36%	54%
	Disagree (47%)	57%	41%	20%	48%	60%	25%	64%	46%
Judgment	Agree (69%)	100%	68%	60%	59%	80%	75%	79%	77%
	Disagree (31%)	0%	32%	40%	41%	20%	25%	21%	23%
Perception	Agree (64%)	43%	68%	100%	67%	60%	75%	50%	54%
	Disagree (36%)	57%	32%	0%	33%	40%	25%	50%	46%

Conclusions and the limits of the survey

In the article, we wanted to bring up the need to consider the personality type of the players of educational games. The problem arose when teachers of Estonian partners played the game and different attitudes appeared. There was also literature where we found support for our aims. In the survey, students marked how they felt after playing the game and the feelings were divided for three similar-sized groups: good, neutral and bad. So this result indicates that there are differences, but it is hard to say if they are caused by personality types, as statistically significant differences also appeared between gender, curriculum, and experiences of this kind of games. There were 118 respondents in our survey from four countries, and the cultural differences of these countries might also be the reason, in addition to the quite small number of respondents, which may be why the results were not so reliable and clear. We can say that respondents are not afraid of computers and are willing to play simulation games. The students who had played similar games did not find the game developed during this project very interesting and different from games they played before. The students who not played similar games before assessed the game as interesting, but they also concluded that during the first time playing, it is hard to understand the game logic. So-called "beginners" also often agreed with statement that learners can

use their previous knowledge in building new knowledge and that collaboration was encouraged during the game, while "experienced" players did not agree with this. The most needed skill in the developed game was the decision-making skill.

There are also some limits of this survey. At first, the number of respondents was lower than expected and all the compared groups were not statistically equal, but their answers gave at least some directions for conclusions. Secondly, the personality types questions needed to be measured on at least a 5-point Likert scale or a scale which have two opposite ends. And lastly, a limitation is that there were four different games, and because of that the feelings after the game might differ.

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