BUSINESS STUDENTS' PERCEPTION OF DIGITAL GAME-BASED LEARNING & COLLABORATIVE LEARNING ENVIRONMENT

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Abstract

This study explores game-based learning using a case example of a business simulation. Context of the study is a 5 credits course in a higher education institution, where multinational students were actively engaged in a digital business simulation as main part of the course. Following a quantitative research design, this study discusses students' approach to the importance of being part of digital game-based learning in terms of (1) ability to learn from mistakes, (2) room for failures, (3) holistic view of actual business environment, and (4) ability to feel the complexity of real-life business situations. The results indicate that these variables have statistically significant differences. The ranking of 'Ability to learn from mistakes' is statistically significant from the other given variables. Our analysis also incorporates the profile of the respondents. In terms of respondent's age, the study finds that the younger the respondent, the higher ranking they assigned to the variable 'Ability to learn from mistakes'. In terms of respondent's nationality, the results show that the French respondents' ranking order varied from the other nationalities' assessment. The French respondents assessed the 'Ability to learn from mistakes' statistically significantly higher than other nationalities. The variable 'Feeling the complexity of real-life business situations' was assessed significantly higher by the German respondents yet was assessed as the least important by the French respondents. The study further connects digital game-based learning with a collaborative learning environment. The study discusses students' perception of factors that influence the creation of a collaborative environment using factors including (1) students having a non-traditional role as a learner, (2) classroom depicting a real-life situation, and (3) classroom becoming a community of learning. Our results show that over 80% of the respondents considered each factor to have somewhat or considerable influence in creating a collaborative learning environment. Furthermore, the French respondents considered the factor 'Student having a non-traditional role as a learner' to have more considerable influence in creating collaborative learning environment than other nationalities. Our quantitative analysis sheds light on the significant aspects of students' perception of digital game-based learning and creation of collaborative environment. From an educational perspective, using digital simulations not only offers knowledge creation but also provides a variety of opportunities to apply and test such knowledge within a virtual world. This study suggests that such an innovative pedagogical method indeed supports and facilitates learning process. In this sense, this study is directly connected with the ongoing debates around innovative pedagogical methods in education arena. This explorative study contributes in providing insights into the digital game-based learning and collaborative learning environment in the higher education institutions.

Keywords: Game-based learning, collaborative learning environment, business simulations.

1 INTRODUCTION

The digital literacy is one of the most important domains of 21st century [1]. This study touches upon two learning methods, which are related to effective communication and high productivity. The game-based learning (GBL) has been successfully used as a teaching methodology in the higher education institutes around the world. For example, the GBL model by Garris et al. [2] has been applied in different teachings and trainings of the students [3]. There is a unanimous voice that games actually engage students and that GBL influences student motivation and learning. There are examples where games were simultaneously played by several thousand people and players showed a noticeable interest in the collaborative playing. Similarly, we can look at the examples of business games, which are used in business education and student trainings. Such business games offer a model of an entire enterprise or of parts of the enterprise [3]. The participating individuals learn through their experiences within a specific organizational setting, where the designed internal and external factors tend to influence the performance of that enterprise. Participants while playing; learn to implement business strategies, and try to deal with uncertainties during decision-making.

1.1 Game-based learning

In very simple words, the game-based learning broadly refers to a type of game play with defined learning outcomes to support teaching and learning [4]. A digital game represents an artificial system that encapsulates a fictional conflict, which is controlled by pre-defined rules for players to achieve a quantifiable outcome. Based on such proposition, digital game-based learning can be conceptualized as a game play with defined learning outcomes where the use of digital games facilitates teaching and learning activities. This method deals with the use of the video-game design concept for educational purposes, allowing learners to experience new modes of knowledge acquisition completely different from the conventional ones [5]. Game-based learning deals with the use of actual games to support acquisition of skills like problem solving, collaboration, critical thinking, and communication [6]. Gee [7] points out that such skills need to be tested and should be in line with learning tasks.

Thanks to the development in the information and communication technology (ICT) domains, the present era of a connected world has paved the way for different means of knowledge delivery and learner engagement. Learners have become more aware of the benefits of ICT supported pedagogical methodologies as well as learner-centered knowledge delivery modes [3]. The prevailing computer technology development and sophistication made it possible to simulate real-world situations, adding real value to traditional teaching curricula. This has become significant because it not only brings real-world training and understanding to higher education students but also enhances their interaction and experience of learning situations [8]. The paradigm of game-based learning mostly emphasizes the design process of games for learning including balancing the need to cover specific subject matter with a desire to prioritize game play among participating students or student teams.

The review of the literature related to the game-based learning suggests that as an alternative teaching pedagogy, the business simulation has been adopted to achieve three types of outcomes: learning objectives, attitudinal objectives, and behavioural objectives. For instance, a learning objective is said to be achieved when students are able to transfer knowledge learnt from classes to a real simulated business situation. Attitudinal objectives are met when students are fully engaged and interested in the simulation learning experience. Behavioural objectives are achieved when students show the ability to implement business concepts and principles to solve real business problems [9]. A study [5] highlights that game-based learning positively influences problem-solving skills, knowledge acquisition, motivation, and engagement provided that it is used with a clear pedagogic process. In the prevailing literature, the most cited characteristics of game-based learning are motivation, player engagement, adaptivity (personalization or customizability by player) and graceful failure [4]. This study discusses students' approach to the importance of being part of digital game-based learning in terms of (1) ability to learn from mistakes, (2) room for failures, (3) holistic view of actual business environment, and (4) ability to feel the complexity of real-life business situations. According to the game cycle model proposed by Garris et al. [2], it should motivate the players to repeat the game rounds within the context of a game [3].

1.2 Collaborative learning

The construct of collaborative learning (CL) can be described as a method of instructions in which participants at different performance levels work together in teams or groups to achieve a common goal [10]. In this setting, the participants or learners become responsible for their own learning as well as learning of all team members [11]. According to Klemm [12], in contrast to traditional class-room setting that focuses on fact learning, this method provides an opportunity for the learners to develop higher-level reasoning skills, enabling them to understand meaning of given information, analyse, evaluate, synthesize and finally apply it. Similarly, the CL method facilitates critical thinking of the learners. This happens because the learners try to find practical applications in a real world context trying to figure out real-life problems [10]. This method offers an avenue for students to easily transfer their learning to real-life and back [3].

The literature highlights that the CL can be considered as an umbrella covering the joint intellectual efforts of team members, where participants acknowledge and respect other group members' abilities and contributions [10]. While discussing the topic of CL, Pivec et al. [3] emphasize that within collaborative learning method, students produce ideas, simplify problems and resolve issues. Previous studies posit that the CL has few key elements including positive interdependence, individual accountability, considerable interaction, group processing, and social skills [10].

Prevailing research within CL proposes several advantages of this learning method. Most prominent of them are related to academic as well as social benefits. According to Laal and Ghodsi [13], some of

the benefits within the former are that (i) CL promotes critical thinking skills, (ii) CL involves students actively in the learning process, (iii) classroom results are improved, and (iv) CL models appropriate student problem solving techniques. Similarly, benefits within the later are that (i) CL helps to develop a social support system for learners, (ii) CL leads to build diverse understanding among students and staff, (iii) CL establishes a positive atmosphere for modelling and practicing cooperation, and (iv) CL develops learning communities. This study discusses students' perception of factors that influence the creation of a collaborative learning environment using factors including (1) students having a non-traditional role as a learner, (2) classroom depicting a real-life situation, and (3) classroom becoming a community of learning.

When it comes to the sense of community, Chatterjee and Correia [14] highlight that previous studies looked at this construct as an indicator of success of communities where participants interact face-to-face. Nevertheless, the value of sense of community cannot be ignored in online or virtual environment. Blanchard [15, p.827] proposes a definition of the construct in online virtual context as "members' feelings of membership, identity, belonging, and attachment to a group that interacts primarily through electronic communication". The CL has been discussed within the context of virtual environment; for example in the case of business simulations [16].

At present, both the game-based learning and collaborative learning have become common methods to promote student learning in the higher education institutes, receiving considerable attention. Because learners while working in teams take ownership of their learning process, hence show increased cooperation, problem-solving capabilities, negotiation skills, and interpersonal communication.

The research design and context of this study are provided in the next section. The results of the analysis are presented. Then the conclusion of the study is presented. Research limitations are provided with recommendations of the possible future directions at the end.

2 METHODOLOGY

A description of the context of the study and research design are provided as under:

2.1 Context of the study

This study focusses on business students' perception of the game-based learning and collaborative learning environment. The context of the study is a 5 credit course offered to multinational business students who belong to 3rd year of their degree program. This specific course is developed around a digital business simulation. Business students, while working in teams, actively participate in playing the digital simulation game. A leading Finnish education technology company, who is designing and marketing business simulation games for higher education institutes and corporations, provides this game. Such digital games are seen efficient educational tools that help putting theory into practice, supporting students' engagement, enhancing knowledge retention, and developing soft skills.

During the implementation of the course, students play the game in teams. For instance, in one course, there are around 5 to 7 teams playing the game. Each team consists of 3 to 5 students. Each team plays eight rounds of the simulation game. While playing the game, each team competes with other teams rather than competing against the simulation game itself. The game is developed around an automobile manufacturing industry that manufacturers cars with various technologies and having numerous features. These cars are sold primarily to three global regions including the USA, Europe and China. In order to achieve a profitable business outcome, team members collaborate with each other while making strategic decisions.

2.2 Research design of the study

The primary data for this study is collected from 47 multinational business students belonging to three implementations of the course. This study follows a quantitative research design that utilizes empirical data collected during the spring and autumn semesters of year 2021. A questionnaire was developed pertaining to the two main concepts of game-based learning and collaborative learning methods. The variables were based on the literature review. Four variables related to the game-based learning were included in the questionnaire. These variables are (1) ability to learn from mistakes, (2) room for failures, (3) holistic view of actual business environment, and (4) ability to feel the complexity of real-life business situations.

Similarly, three variable that influence the creation of a collaborative environment using factors including (1) students having a non-traditional role as a learner, (2) classroom depicting a real-life situation, and (3) classroom becoming a community of learning were included in the questionnaire. Both of the main concepts and relevant variables help analyze business students' perception of these constructs. This study also includes student profile data. The analysis also takes into consideration student profiles including the 'age', 'gender', and 'nationality' of the respondents. The analysis sheds light on significant aspects of students' perception of digital game-based learning and creation of collaborative environment.

The respondents were asked to rank the importance of four factors in being part of game-based learning in a scale from most important (1) to least important (4). For the analysis, the rankings were modified into scores where the most important factor were given a score 4 and the least important factor score 1. Furthermore, the respondents were asked to analyze to what extent do these factors influence in creating collaborative environment. The researchers analyzed the data with the help of SPSS and Excel. The empirical data was entered into IBM SPSS statistical tool for the analysis. The analysis methods applied were Friedman test, Wilcoxon Signed Ranks test, and Spearman's correlation. Authors carefully reviewed the questionnaire. The students were informed about the voluntary nature of their participation and the confidentiality of their responses.

3 RESULTS

A total of 47 responses was received from the participants. A third of the respondents have prior experience of simulation games, however, majority (64 %) have not previously played simulation games.

The respondents represent thirteen different nationalities. Finnish, French and German respondents were the most common nationalities. The other nationalities are e.g. Mexican, Pakistani, Italian and Russian. (Table 1.)

Table 1. The respondents' nationalities.

	Frequency	***Percent***
Finnish	18	38,3 %
French	10	21,3 %
German	7	14,9 %
Other	12	25,5 %
Total	47	100,0 %

Somewhat over half of the respondents (57 %) are females and 40 % are males. One respondent not preferred not to reveal their gender. Half of the respondents are 21-25-year-old and about a third are 26 years or older. One fifth belong to age category 17-20-year-old. (Table 2.)

Table 2. The respondents' age distribution.

	Frequency	***Percent***
17 - 20 years	10	21,3 %
21 - 25 years	22	46,8 %
26 year or older	15	31,9 %
Total	47	100,0 %

The respondents were asked to rank the importance of four factors in being part of game-based learning in a scale from most important (1) to least important (4). The factors ranked were 'Ability to learn from mistakes', 'Room for failures', 'Holistic approach to actual business environment' and 'Feeling the complexity of real-life business situations'. For the analysis, the rankings were modified into scores where the most important factor were given a score 4 and the least important factor score 1. The respondents ranked the 'Ability to learn from mistakes' as the most important factor in being part of game-based learning (Fig. 1).

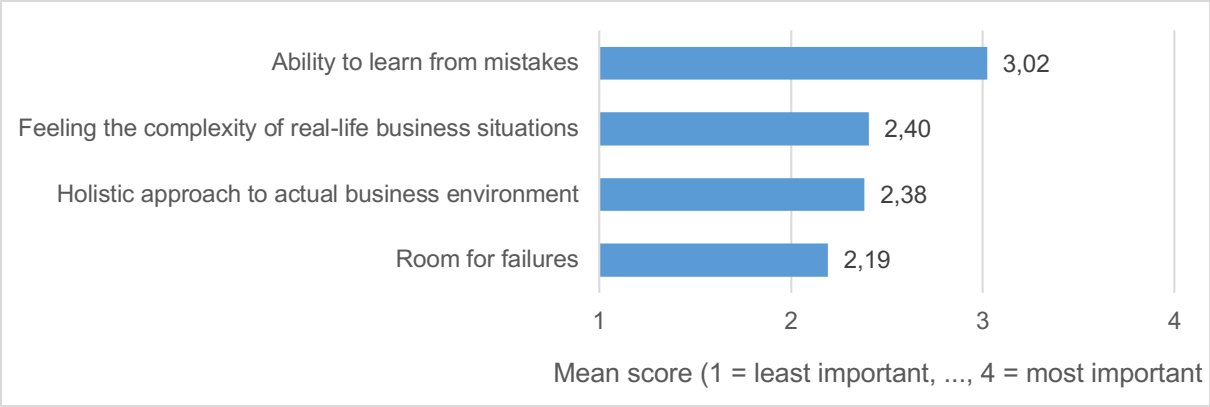

Figure 1. Ranking of variables related to the importance of being part of digital game-based learning.

Friedman test indicates that the rankings have statistically significant differences (χ^2 = 10.991, Sig = 0.012). Based on the Wilcoxon Signed Ranks Test, the ranking of 'Ability to learn from mistakes' is statistically significant from the other given variables (Sig. 0.000-0.022, Table 3).

Table 3. Pairwise Wilcoxon Signed Ranks Test

	Z	*Sig.*
Room for failures - Ability to learn from mistakes	-3,858[b]	**0,000**
Holistic approach to actual business environment - Ability to learn from mistakes	-2,295[b]	**0,022**
Feeling the complexity of real-life business situations - Ability to learn from mistakes	-2,288[b]	**0,022**
Holistic approach to actual business environment - Room for failures	-,823[c]	0,410
Feeling the complexity of real-life business situations - Room for failures	-,741[c]	0,459
Feeling the complexity of real-life business situations - Holistic approach to actual business environment	-,180[c]	0,857

Furthermore, the younger the respondent, the higher ranking they assigned to the variable 'Ability to learn from mistakes' (Spearman's correlation, r = -0.381, p = 0.008). In the other statements, the ranking order did not correlate with the respondents' age.

The French respondents' ranking order varied from the other nationalities' assessment in two statements. The French assessed the 'Ability to learn from mistakes' statistically significantly higher than other nationalities (H(3)=8.703, p=0.032). The statement 'Feeling the complexity of real-life business situations' was assessed significantly higher by the German respondents and the least important by the French respondents. (Fig. 2.)

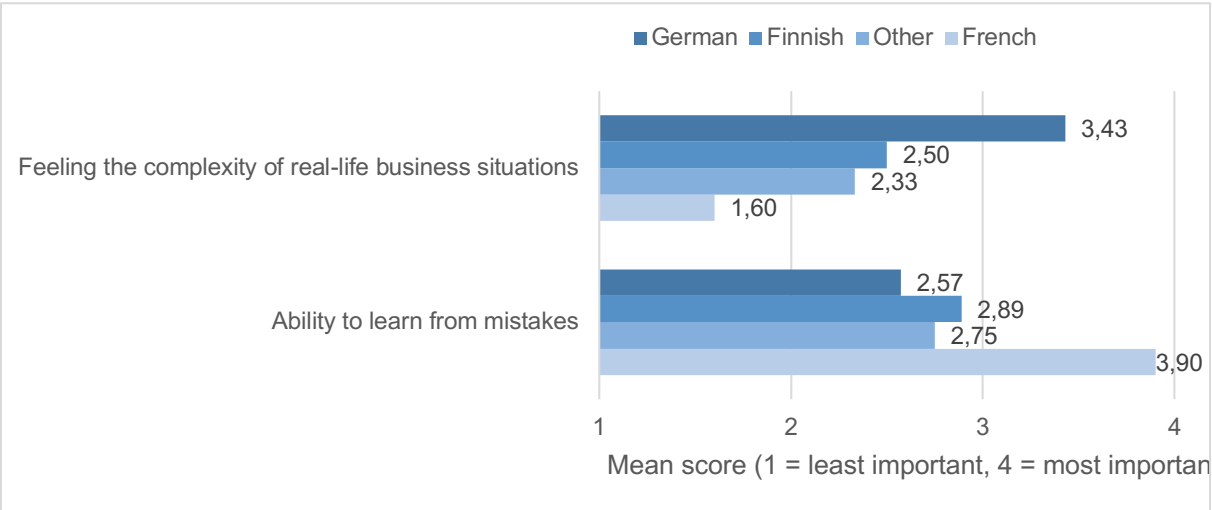

Figure 2. The ranking order based on the respondents' nationality.

For the second part of the study, the respondents were asked to analyze to what extent do the following three factors influence in creating collaborative environment. The factors assessed were 'Student having a nontraditional role as learner', 'Classroom depicting a real-life situation' and 'Classroom becoming a community of learning'. The assessment was done on scale 'Not at all' (1), 'Only a little' (2), 'Somewhat' (3) and 'Considerably' (4).

Over 80 % of the respondents considered each factor to have somewhat or considerable influence in creating a collaborative learning environment. Only one respondent considered that community of learning did not influence in the learning environment. (Fig 3.)

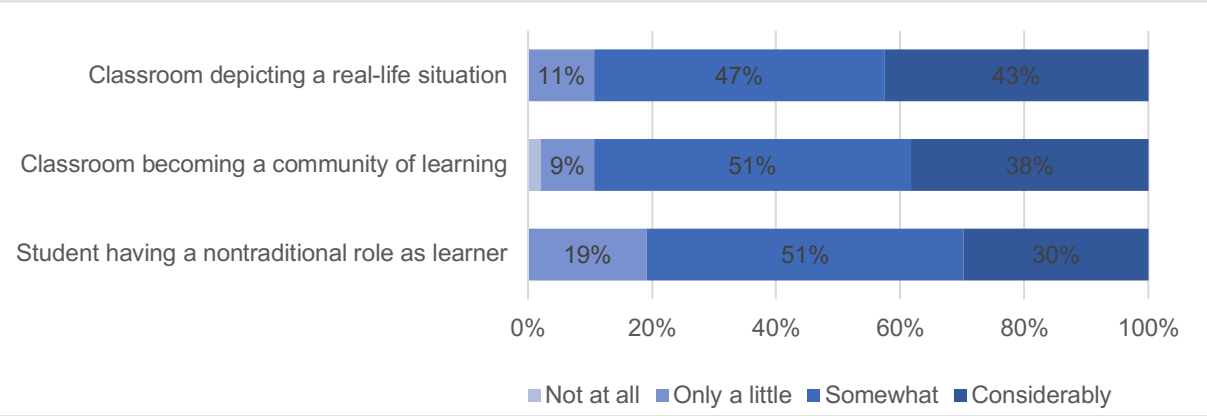

Figure 3. The factors influence in creating collaborative learning environment.

The French respondents considered the factor 'Student having a non-traditional role as a learner' to have more considerable influence in creating collaborative learning environment than that the other nationalities ($H(3)=7.905$, $p = 0.048$). We present the conclusion of the study in the following section.

4 CONCLUSIONS

In line with the aim of the study to explore digital game-based learning method using a case example of a business simulation. In this study, game-based learning is seen as a game play with defined learning outcomes where the use of digital games facilitates teaching and learning activities. The results of the data analysis are discussed which shed light on students' approach to the importance of being part of digital game-based learning in terms of (1) ability to learn from mistakes, (2) room for failures, (3) holistic view of actual business environment, and (4) ability to feel the complexity of real-life business situations. The results indicate that these variables have statistically significant differences. Based on the test analysis, the ranking of 'Ability to learn from mistakes' is statistically significant from the other given variables. The data analysis also incorporates the profile of the respondents. In terms of respondent's age, the results reveal that the younger the respondent, the higher ranking they assigned to the variable 'Ability to learn from mistakes'. In terms of respondent's nationality, the results highlight that there are differences in students' perception. For instance, the results show that the French respondents' ranking order varied from the other nationalities' assessment in at least two variables. The French respondents assessed the 'Ability to learn from mistakes' statistically significantly higher than other nationalities. The variable 'Feeling the complexity of real-life business situations' was assessed significantly higher by the German respondents yet was assessed as the least important by the French respondents.

In line with the scope of the study, it further connects game-based learning with the collaborative learning method. In this case, digital simulation game was played by student teams, hence this study discusses students' perception of factors that influence the creation of a collaborative environment using factors including (1) students having a non-traditional role as a learner, (2) classroom depicting a real-life situation, and (3) classroom becoming a community of learning. Our results show that over 80% of the respondents considered each factor to have somewhat or considerable influence in creating a collaborative learning environment. With an exception of only one respondent, who considered that variable 'Community of learning' does not influence the collaborative learning environment. Furthermore, the French respondents considered the factor 'Student having a non-traditional role as a learner' to have more considerable influence in creating collaborative learning environment than the other nationalities.

The analysis sheds light on significant aspects of students' perception of digital game-based learning and creation of collaborative learning environment. From an educational perspective, using digital games or simulations not only offers knowledge creation but also provides a variety of opportunities to apply and test such knowledge within a virtually created world. Such an innovative pedagogical method indeed supports and facilitates learning process. In this sense, this study is directly connected with the ongoing debates around innovative pedagogical methods in education arena. This explorative study contributes in providing insights into the digital game-based learning method and collaborative learning method in the higher education.

This study avails a smaller data sample. It is considered as a research limitation, thus care should be taken in generalizing the finding of this study. It is recommended that a larger empirical sample should be availed to further explore the two concepts from the perspective of students from higher education institute. As a potential future direction of the research, we suggest a comparative research study could be performed using a larger empirical sample of student belonging to other fields of study.

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