Abstract—Recent developments in the field of education have led to a renewed interest in teaching methodologies and practices. Gamification is fast becoming a key instrument in the education of new generations and besides other methods, serious games have become the center of attention. Ready-built serious games are available for most higher education institutions to buy and implement. However, monetary restraints and the unalterable nature of the games might deter most higher education institutions from the application of these serious games. Therefore, there is a continuously growing need for a customizable serious game that has been developed based on the Entrecomp framework of the European Union is features and applicability in entrepreneurship education. Then, entrepreneurship education.

II. GAMIFICATION AND SERIOUS GAMES

Gamification has been at the center of research interest in the previous years. Several different definitions surfaced, but one of the earliest could be attributed to Brett Trill, who stated that gamification is “taking game mechanics and applying them to other web properties to increase engagement” [2]. While according to others, it is “the adoption of game technology and game design methods outside of the games industry” [3] or it is “the process of using game thinking and game mechanics to solve problems and engage users” [4].

Reference [1] includes a definition which was later challenged and a more complex definition was needed. Gamification was later defined as “a process of enhancing a service with affordances for gameful experiences in order to support user’s overall value creation” [5].

In the current paper, the latter definition is used, affordance meaning the “possibilities that allow actors to take actions to satisfy their needs” [6].

Serious games are considered to be the tools of gamification, as they are defined as “games (that) have been developed for the broader purposes of training and behavior change in business, industry, marketing, healthcare and government NGOs as well as in education” [7].

It should be noted that the concept of ‘serious games’ is often used interchangeably with ‘game-based learning’, the difference being that serious games are developed for specific learning outcomes [7].

Most serious games have three main elements: Mechanical (progression, instant feedback, etc.), personal (status, visibility, leaderboards, etc.) and emotional elements (psychological state or flow), and gamification refers to using any of these elements [8]. Different approaches have been considered to define gamification, depending on which gamification elements were chosen for each definition [9].

Reference [10] has investigated 1164 research papers on gamification and found that the most common types of
research in gamification are development of proof-of-concept prototypes (computer science education, ecological lifestyles and sustainability and motivational tools); theoretical papers arguing the components or applicability; studies presenting the eLearning concepts such as massive open online courses. The current paper adds to the literature by analyzing the needs of HEI educators.

A. Gamification in Education

Another large number of scientists review the effectiveness of gamification in education [11]. Reference [12] states that education and learning is the most studied context of gamification implementation (over almost half of the papers studied). One of the reasons why gamification is such a field of interest at the moment is because the needs of the new generation, in other words, the digital natives, challenge educators, as they demand new and innovative learning methods and pedagogical models. The traditional ways of teaching seem to be ineffective for the young students [13].

Reference [13] states that students nowadays are searching for interactive, fast-paces, visually stimulating and engaging learning methods. The key to understanding them and offering all these is to create serious games for them, which are such games in which education is the primary goal, rather than entertainment, and can facilitate learning from the experiences of others. In the context of education, “SGs have learning goals and structure, but in addition are adaptive and interactive and most importantly they provide enjoyment, pleasure, motivation, ego gratification (through competition and winning) and emotion, in order to achieve learner engagement and involvement” [13].

At the same time, teachers can monitor students’ data and track their progress [14].

In the educational context, gamification incorporates game-centered thinking and game elements. Therefore, gamification is usually applied in learning to enhance learning outcomes and motivate students [15]-[19]. Reference [15] argues that gamification has a great potential to become an impressive force in education, and can include the development of skills such as creativity, critical thinking, collaboration, and communication.

Gamification in education can be divided into two different categories, which are gamified courses – course-long gamification, typically applied at the university level – and gamified activities – supplementing teaching instead of replacing it [8].

Gamification principles in education most usually include elements of the game such as visible user status (reputation and recognition, social engagement, freedom to fail (low risk submission), goals, challenges, quests and immediate feedback. Moreover, the most used game mechanics include badges, points, levels and leaderboards. These gamification methods are most used in the subjects of computer science, information technology, programming, mathematics, science and engineering [20].

The more and more widespread application of serious games and the continuously growing number of papers on the topic conclude that the effects of these games seem to be positive [20]. The main benefits of gamification in education are called the ‘four freedoms’, which include the freedom to fail, freedom to experiment, freedom to assume different identities, and freedom to effort. It would also allow automated teaching and individualized learning. Potential challenges of gamification include distracted attention of the learner, the social tension of being a newbie, and extrinsic rewards (short-term rewards or badges) [8]. Additional barriers could be educational, technical and financial [21].

Serious games can have several learning outcomes and they were categorized and it was found that knowledge acquisition and understanding, perceptual and cognitive skills, motor skills, behavior change, soft skills and social skills, affective and motivational outcomes, physiological outcomes can be affected [7]. Therefore, gamification and serious games should be studied in the context of higher education as well.

B. Gamification in Higher Education

Similarly to the research about gamification, in general, scholars have shown a keen interest in studying the concept in the higher educational context as well. The main reason is that teachers are challenged by the new generation who have different needs and preferences in terms of education. Teachers have been using new and different teaching methods to adapt in higher education too by adapting game elements in the learning process.

The higher education gamification process started in the 21st century, when the usage of game-like elements (points, rewards, awards) began to take off, as classes with gamification elements had significantly better results and output higher quality work than those without [22]. Especially in an academic environment, gamification can be positively applied to an online context [23].

Reference [19] states that a successful gamification model in higher education includes three main aspects that have to be carefully planned and weighted. These elements are mechanics (player’s progress, tasks, controls and features), dynamics (rewards, tasks, controls, features), and aesthetics (sensation, challenge, discovery, narrative). If a game is successful, it would have a positive effect on student performance and attitudes at a university level [24]. Reference [25] also looked at the motivational changes aroused by gamification and found that both teachers and students could confirm that they had an increasing motivation and fun towards learning.

Reference [26] researched the motivation of students who experienced game-based learning, but did not find significant differences between the pre- and post-motivation of students.

Reference [27] investigated the applicability of gamification in higher education and found that it could successfully be applied in several study-fields, such as business studies, communication, computing, entrepreneurship, languages, engineering, mechanical engineering, nursing, pedagogy, psychology and science.

Several other studies were concerned with the applicability
of gamification in higher education and most of them found that the gamification approach resulted in better academic achievement, engagement and attitude [28]-[30]. Based on these results, it can be concluded that entrepreneurship is a field which is suitable for the application of gamification and serious games.

C. Gamification in Entrepreneurship Education

The literature seemed to lack an extensive study of serious games in entrepreneurship education even though entrepreneurship and its education is one of the key issues today. However, there is a renewed interest in entrepreneurship education and relevant research started to appear. Reference [27] recognized that gamified learning is being increasingly studied and applied in business and science studies.

Entrepreneurial learning and related serious games initially have been studied [31], [32]. The games’ characteristics include fun, play, rules, goals, interactivity, outcomes or feedback, conflict, and problem solving [33].

The essence of gamification in entrepreneurship education is that the games are not directly associated with knowledge and skills, because the games affect student behavior, commitment and motivation, which then would have an effect on knowledge and skills [34]. Moreover, most serious games help developing the entrepreneurial mindset, motivation, skills, innovation and ability of finding new solutions and understanding others’ needs, while fostering lifelong learning. If the curriculum is difficult to be explained in words or in the traditional educational system, serious games can help [35].

Developing games specifically for this education is thought to be challenging. However, there are certain benefits once it is successfully implemented, such as studying with modern technology, modularity and flexibility of the game, inclusion of both national and international students, using university alliances and contacts to develop the game, and learning outcome analysis [36].

Reference [37] is of the most recent studies and claims that different types of learning can be relevant in gamified environments, such as active learning (learning by doing), entrepreneurial preparedness (game adds to the learner’s experience), reflective learning (reflection encouraged), situated learning (game places learners into a situational context), vicarious learning (level of involvement of peers, mentors or instructors), and affective learning (emotional engagement). Furthermore, a more exact definition of serious games within the entrepreneurship education has been determined.

“Serious games can be defined as computer-based learning simulations that engage players in realistic activities designed to increase knowledge, improve skills, and enable positive learning outcomes. While such simulations are not always “games” per se, the main focus is the use of a digital game-based learning environment to support “serious” outcomes. Despite having an entertainment component, these simulations are designed to promote learning, primarily by leveraging a narrative or story centered in an entrepreneurial setting. Serious games also differ from entertainment games as they focus on problem-solving tasks and incorporate the imperfect nature of interactions with the real world.” [37].

The effects of serious games have also been studied in entrepreneurship education. Reference [38] found that the perceived competence of students is higher after playing the game. Their business-related knowledge is higher and according to the longitudinal results, game satisfaction is high. However, the motivation to start an own business is occasionally lower.

Based on the literature review, it can be concluded that several different serious games exist for entrepreneurship education. Therefore, the next chapter summarizes and analyses these serious games and their applicability in the classroom, with special emphasis on their advantages and disadvantages.

III. REVISION OF SERIOUS GAMES

Regarding serious games, several steps have been taken to provide students with the appropriate tool for education in the future. In this chapter, already existing games are reviewed [39], [37].

Entrepreneurship Simulation: The Startup Game is a multiplayer game simulating the establishment of a new company. Students can play the roles of founders, investors and employees in order to reach the success of the company. Hot Shot Business (HSB) is a Flash game introducing the entrepreneurship environment to students. Similarly to the previous game, students can open and run their own business, in which they make decisions from very early on, from acquiring their capital to advertising their new business. Industry Player is a massive online real-time game, in which the student has the role of the CEO of a multinational holding company. They can create investments in 245 different industries and compete in real-time with other players on the market. The game has 10 levels, during which there is heavy competition in the market. The aim for the student is to manage the company in the best way, as the game becomes more and more challenging.

INNOV8 is an IBM Business Process Management (BPM) simulation game, suitable for IT and business players. The aim of the game is to demonstrate the possibility of building a smarter world. The game scenarios include Smarter Traffic, Smarter Customer Service, and Smarter Supply Chains. The virtual world is in a 3D format, in which players can cooperate to solve the business problems and to see how each decision affects their businesses. The 3D version helps understanding the company, while the online single-player game can pursue competition.

SimVenture is a single player simulation game in which the player can manage a small computer retail business over a period of one simulated year, or until bankruptcy. The game offers real-world examples without a time limit. Business parameters are shown at the end of each month. Different difficulty levels are available with given scenarios. The
Entrepreneurship competences and education have been a neglected field of studies in the past. Currently, there is a growing interest and an urgent need to develop entrepreneurship competences of students, as it can provide them with essential skills for their future working lives. Universities are considered to be actors in global economic relationships, even though the curriculum mostly lacks entrepreneurship-related education. There is a growing concern for Europe to handle entrepreneurship and its education more seriously, while universities are pressured to add entrepreneurship to their curriculum. Europe lags behind other countries such as the USA and Canada, because only a small portion of students learn entrepreneurship and it is only taught in the field of business. However, it would be crucial at other fields of sciences as well, as new business ideas or inventions can stem from there too [40].

The European Union believes that entrepreneurship education is key and has to be fostered. Therefore, there are projects aiming at developing serious games in education, with special emphasis on entrepreneurship education. An earlier project about ‘Stimulating Entrepreneurship through Serious Games’ (2011-2013) was conducted within the framework of the Erasmus Lifelong Learning (LLL) program, including project partners from the University of Genoa, the Italian National Research Council, the Delft University of Technology, and ESADE Business School Barcelona. The aim of the project was to develop game-based entrepreneurship training [41].

The current Erasmus+ project of the EU is the ISGEE project – Implementing Serious Games in Entrepreneurship Education, which includes partners from the University of Szeged, Hungary, West University of Timisoara, Romania, Technical University of Ostrava, Czech Republic, Stucom, Spain, Univations from Germany, Expertissa from Romania, Nottingham Trent University from the UK, and Mongolian University of Life Sciences. The aim of the project is to develop a customizable serious game to be applied in entrepreneurship education free of charge. The project builds on the theoretical framework of the European Union, namely the Entrecomp framework, which enlists the competences of entrepreneurship.

As the current paper aims to introduce the need analysis results of the ISGEE project, the Entrecomp framework is introduced first. Fig. 1 shows the Entrecomp framework wheel that has been developed by the European Union. The framework has three main elements that are ideas and opportunities, resources and into action. These include other sub-categories such as spotting opportunities, creativity, vision, valuing ideas, or ethical and sustainable thinking. All the competences were taken into account while conducting the need analysis of the colleagues in higher education.

V. NEED ANALYSIS OF HEI TEACHERS

The ISGEE project has three main stakeholders, teachers, students and business partners. The current paper aims to introduce the results of the need analysis among higher education teachers through two workshops. The first one was held at the University of Szeged, 05 December 2018, and the second one at the Technical University of Ostrava, 11 January 2019. Altogether, 25 teachers participated in the workshop all of them teaching in economic education. Results of the workshops are introduced according to three main categories:
General views and experience with gamification, role of gamification in education, and the advantages of serious games in the classroom. At the end, general implications and suggestions are summarized.

A. General Views on and Previous Experience with Gamification

Both gamification and serious games were terms that some of the participants have already heard. Teachers associate gamification with “learning through playing”, “implementation of the learning material into games”, or “the use of games in teaching”. There is a bit of confusion about the term itself, because some teachers regard simple games, such as self-developed board games, as gamification.

Regarding previous experience and usage of serious games, only the minority of participants have actual experience with applying digital gamification in education. Those colleagues who have experience, mainly used simpler (text) platforms or games, but could enlist many applications that can be used in education and that they regularly use in education.

They mentioned five different games, one of which is the banking game, where students take part in the management of a bank. The second game they mentioned was team cooperation game, which lets students get a delegated role within the company. The third game was an HR management game, which included finding the appropriate skills of a bank. The second game they mentioned was team cooperation game, which lets students get a delegated role within the company. The third game was an HR management game, which included finding the appropriate skills of a bank. The fourth game was a software development game that allows students to be involved in the software development process, while the last game mentioned was an investment game. Only one participant could name concrete games, which were Marketplace, JaTitan, Markethero.

As a conclusion, the majority of teachers know about the term gamification, but the exact meaning behind it is not always clear. They can name many software and applications they use to make learning more joyful for students, but serious games are rarely used and less known.

B. The Role of Gamification in Education – Risks and Opportunities

Participants were mainly open and positive towards the concept of gamification and serious games. They found many positive effects of gamification: “The game is able to develop application skills, ability to teamwork and promotes competition”, “The game allows a natural division of roles”, “The game will help reveal the characteristics and abilities of students”, “The game can convince students that theory and practice goes hand in hand”, “Games provide a great background for the research. We can observe the behavior of students, which can be an inspiration to upgrade games”.

On the other hand, one participant stated that if the game provides students with a PDF file, then students would just ignore the game and go for the book instead. Therefore, it is questionable whether a serious game can transfer hard skills to students. Moreover, some participants were concerned about the role of the teachers. Once the game is brought into class, they did not know what happens to the teacher, while students are playing. Additionally, real-life risk cannot be simulated in a game, which is a barrier when developing a game aiming at developing soft skills. They stated that “the main downside is that students may over time find out the principles of the game and start to make decisions mechanically. They cease to think” and “Competition during the playing of the game can lead to fights in the group”.

Participants were asked what ideas they have for the development for serious games. They identified that activities have to be subject-related, so students have to know the notions and the basic theoretical background in order to be able to play. Adding a spying element could raise excitement, if you have to ask for some information from others or from the game. A special ‘user guide’ for each player could be useful and would introduce avatars of players.

C. What a Digital Game Is Good for in General

When teachers were asked about what a digital serious game is good for, they enlisted certain potential characteristics of a good serious game. First of all, it should provide practice, develop students’ soft skills, and can substitute tests or exams. It is though, not a practical way of transferring study material.

Additionally, students should be able to check their knowledge with the help of the game. The game should be applied and be useful for courses with a high number of students, where individual contact is not feasible. If students play throughout the semester, their progress or lack of progress can be monitored. Moreover, certain game theory examples can be illustrated (prisoner’s dilemma or tragedy of the public) with the game. These can be linked to more than one course.

Serious games do not seem to strengthen the student-teacher relationship, but it could potentially build stronger student-student relationships. Therefore, there should be a common platform, where students can see their own progress and...
shows all their subjects in which they can play serious games. Table I shows the purposes serious games can be used for.

### Table I: Serious Games’ Main Purposes

<table>
<thead>
<tr>
<th>Target group</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students</td>
<td>practice</td>
</tr>
<tr>
<td>Students</td>
<td>self-check</td>
</tr>
<tr>
<td>Students</td>
<td>personal bonds between students</td>
</tr>
<tr>
<td>Teachers</td>
<td>testing students</td>
</tr>
<tr>
<td>Teachers</td>
<td>monitoring students</td>
</tr>
<tr>
<td>Teachers</td>
<td>illustrating theory with practical examples</td>
</tr>
</tbody>
</table>

Source: Need analysis of the ISGEE project.

**D. A Serious Game that Can Be Brought to Classes**

As one of the primary target group of the ‘Entrepoly’ is teachers, they were also asked what kind of serious game they would like to bring to their classrooms. Their answers can be grouped into three big categories. These are suggestions about the introduction of the game, game characteristics and game content.

First of all, regarding the introduction of the game to classes, the game should have an introduction and a users’ guide, which would enable the potential users to understand the logic of the game easily. The reason for this is that social media sites such as YouTube made it natural for them that there should be a story. The game should represent a real-life scenario.

In terms of the game characteristics, teachers suggested that competition is a factor that has to be present among students or groups of students. Additionally, the competition can even last a whole semester. There should also be a link between the students, which could be a chatroom, a direct messaging contact or a common platform, which can link courses too.

The characters should be customizable in the game, so that students would feel personally connected to their character. They should also be able to collect certain items, such as badges, money and different achievements. The story of the game should be a real-life scenario. “It is appropriate that there should be a story. The game should represent a real case.” Additionally, the game should have a limited time for certain tasks that would put a pressure on the students, but encourage having the task done in a timely manner. Having a modularly structured game could also enhance the player experience as it would allow students to play a shorter game or a game extended throughout the whole semester.

“It depends on the type of module and type of game.

For some modules it may be appropriate to only play one exercise, in other module game can be played full semester.”

Teachers’ ideas about the game content were also of broad scale. They suggested that for developing negotiation skills, the game can include a scenario where the student meets two different people. The first one is hard to come to terms with one, while the other one accepts every solution. At an international trade class, the game could be used in intercultural situations, in which the first person is a Chinese partner, the second is a Polish, and the third is American. In HR classes, the script could be that an employee is undermotivated and has to be motivated. Table II summarizes the findings of the required features of a serious game in a classroom.

### Table II: How to Apply Serious Games in a Classroom

<table>
<thead>
<tr>
<th>Category</th>
<th>Idea</th>
</tr>
</thead>
<tbody>
<tr>
<td>introduction</td>
<td>users’ guide for teachers</td>
</tr>
<tr>
<td>introduction</td>
<td>users’ guide for students</td>
</tr>
<tr>
<td>game characteristics</td>
<td>customizable avatar</td>
</tr>
<tr>
<td>game characteristics</td>
<td>collectibles (badges, money)</td>
</tr>
<tr>
<td>game characteristics</td>
<td>competition</td>
</tr>
<tr>
<td>game characteristics</td>
<td>connected students</td>
</tr>
<tr>
<td>game characteristics</td>
<td>real-life situation</td>
</tr>
<tr>
<td>game characteristics</td>
<td>time limit for decision making</td>
</tr>
<tr>
<td>game characteristics</td>
<td>modular structure</td>
</tr>
</tbody>
</table>

Source: Need analysis of the ISGEE project.

**VI. ‘ENTREPOLY’ – A CUSTOMIZABLE SERIOUS GAME**

The need analysis of teachers provided valuable feedback for the development of the serious game at hand. The current results will be supplemented with the need analysis of students and business partners too in the future. In this chapter the current results are analyzed and an ideal customizable serious game concept is introduced.

The game might be suitable for developing entrepreneurship competences, but much more for introducing entrepreneurial competences and self-check. It should also contain a handbook with a clear description of the game and its mechanics.

The game could be made attractive for teachers if it is able to connect students and classes with a high number of students, and can get to those students, who do not attend regular classes. It is also able to strengthen student-student or student-teacher relationships. The interface can become familiar to students after playing at one class. For the second time, they will already know the mechanics.

Moreover, the game can link many different topics in a scenario.

A good serious game is able to develop soft skills rather than hard skills and is good for students’ own self-check. It can also link not only study materials of one course, but several courses too. It should also be able to expose users to failure scenarios. Moreover, a good game is fun to play. Collecting badges, ribbons, money, or certain items can bring fun to the learning experience together with an attractive design. Once a game scenario is played, students should be able to replay it, but with various other questions or scenarios. This way, they will not get bored and can play many different times if they want to spend their time on one specific competence.

The risks and potential problems of developing a serious game also have to be taken into account. Not surprisingly, there have been fewer risks and obstacles were found than
advantages. First of all, it consumes a lot of time to prepare and to keep a serious game up-to-date. Setting the rules and scenarios of the game is thought to be extremely challenging, similarly to evaluating the results and getting a standardized game.

### TABLE III

<table>
<thead>
<tr>
<th>FEATURES OF A GOOD SERIOUS GAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>According to teachers, a good serious game is attractive for both teachers and students.</td>
</tr>
<tr>
<td>attracts students who do not attend regular classes.</td>
</tr>
<tr>
<td>is easy to understand based on its handbook.</td>
</tr>
<tr>
<td>strengthens the relationship between students and teachers.</td>
</tr>
<tr>
<td>links different topics at a course.</td>
</tr>
<tr>
<td>develops soft skills.</td>
</tr>
<tr>
<td>is good for self-check.</td>
</tr>
<tr>
<td>is able to link courses.</td>
</tr>
<tr>
<td>is able to produce failure situations.</td>
</tr>
<tr>
<td>is consistent regarding the interface.</td>
</tr>
<tr>
<td>including collectibles (badges, money) repayable with similar scenarios.</td>
</tr>
</tbody>
</table>

Source: Need analysis of the ISGEE project

### TABLE IV

<table>
<thead>
<tr>
<th>POTENTIAL CHALLENGES OF DEVELOPING A SERIOUS GAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>According to teachers, developing a serious game is challenging, because of</td>
</tr>
<tr>
<td>time-consuming preparation and maintenance.</td>
</tr>
<tr>
<td>complicated rule development.</td>
</tr>
<tr>
<td>problematic evaluation of results.</td>
</tr>
<tr>
<td>problematic standardization.</td>
</tr>
</tbody>
</table>

Source: Need analysis of the ISGEE project

### VII. CONCLUSION

All in all, we can conclude that serious games provide value in education, as students can engage in activities that can make learning fun, while they are learning by doing [31]. Serious games allow student to use an interactive learning environment and develop their entrepreneurial skills relatively risk-free [37].

The aim of the current paper was to uncover the real needs of higher education teachers of a serious game they think is necessary in today’s education system. The paper introduced a proposed concept of a currently developing serious game ‘Entrepoly’, in the framework of the Erasmus+ project of ISGEE (Implementing Serious Games in Entrepreneurship Education). The importance of these findings is not questionable, even though further steps are taken to conduct the need analysis of students and business stakeholders.

### ACKNOWLEDGMENT

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