Aspects of a field experience in Entrepreneurship Education

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This contribution deals with Entrepreneurship Education; in doing so, it draws on the experience conducted in the framework of the EU project "stimulating Entrepreneurship through Serious Games (eSG)"[1] ,where a theoretical model for EE was devised and an innovative working methodology based on Serious Games and gamification was adopted.

Actually, it aims at supporting experience-based reflections on: 1) what are/should be the pillars of Entrepreneurship Education and 2) whether innovative learning/teaching methodologies such as Serious Games and gamification can effectively contribute to renew and enhance EE.

After framing the concept of Entrepreneurship Education in the European context, the paper briefly describes the eSG project by focusing on the field experiment conducted in Italy. The theoretical model devised and adopted in the experiment is outlined. Subsequently a glance is cast to the innovative learning/teaching methodology employed, which was largely based on gamification techniques and integrated online with in presence collaborative activities

1. Introduction

Nowadays the unemployment rate is very high (around 11. 2% in Europe)[2] and for a young person it has become very difficult to find a job. Key factors are putting new pressure on western economies, Nowaday

In the light of the recent documents from the European Commission (EC) (European Commission, 2012), we acknowledge that the term Entrepreneurship Education (EE) refers to the development of a wide range of different abilities. It actually encompasses those educational processes oriented to support the development of an entrepreneurial mindset as well as those aimed at developing general competences (such as adaptability/flexibility, creativity...) and specific skills related to a functional and profitable management of business enterprises (e.g. administrative and managerial abilities). For sure, it should not be confused with mere economics or business management studies.

We also acknowledge that Entrepreneurship Education is assuming increasing importance in the present EU panorama where becoming an entrepreneur represents a concrete alternative for young people who experience serious difficulties in finding a job.

In our opinion, Entrepreneurship Education should be regarded as a lifelong learning process, not limited to secondary or higher educational contexts. It could actually fit primary school

1   http://www.esg-project.eu/
2   http://ec.europa.eu/eurostat/tgm/table.do?tab=table&language=en&pcode=teilm020&tableSelection=1&plugin=1

curricula well, where specific work can be done aimed at clarifying the characteristics of working as self-employed and soliciting the development of an entrepreneurial mindset. It should then be continued up to university and beyond, when decisions about personal career become more urgent; here it should rather target the development of specific managerial and technical skills.

In any case, EE could (and should) play a crucial role in today's society by providing students with: (1) the possibility of developing an entrepreneurial mindset (2) the opportunity to acquire general knowledge and the specific competences needed to become an entrepreneur.

In the following, we then focus on a field experience conducted in Italy in the framework of the eSG project with university engineering students (non business studies).

In doing so, our main aims are:

1) to present the theoretical model which was devised ad hoc by the research team in order to structure and conduct the educational intervention.

2) to share some key aspects of the adopted methodology with specific attention to the adoption of Serious Games, collaborative and gamification learning techniques.

A short foreword is also proposed, aimed at shedding light on the eSG project and the context in which it was carried out (the European and Italian present situation as to EE implementation in formal education).

2. An Insight Into The Present Situation Of Entreprenership Educaton

Since 2006, the European Commission has recognized "a positive correlation between entrepreneurship and economic growth" and underlined that: "entrepreneurship is a key competence for all, helping young people to be more creative and self-confident in whatever they undertake and to act in a socially responsible way"[3]. In this direction, the EC has also identified entrepreneurship as one of the eight key competences for lifelong learning and has proposed a European development plan for EE, based on systematic strategy and on transversal actions to be implemented at all school levels, also in the vocational training field. These declarations by the EC, were followed, in the next years, by a sequence of recommendations and communications, reported in the "Europe 2020"[4] document, some of which are explicitly directed to define and sustain specific actions in different formal education settings.

In the following, we explore the current level of implementation of EE in EU Member States, and in particular in Italy. Afterwards, we discuss the tools and methodologies that could be adopted, with particular attention towards Serious Games and the potential that they can have in this specific field.

Outlining the implementation of EE in the Member States and in Italy

Even though the EC has repeatedly and strongly highlighted the importance of EE, not all Member States have yet undertaken specific actions aimed at increasing and/or introducing EE in official curricula. EE is still insufficiently reflected in educational policies (European Commission, 2008a) thus we must acknowledge that: "Europe needs to prioritise entrepreneurship education" and "universities need to be at the heart of its efforts" (European Commission, 2009), by promoting entrepreneurial skills to facilitate the creation of new opportunities from study and research (European Commission, 2006).

For sure, EE is still rarely adequately addressed at a strategic level by universities. This is true in particular in technical universities, which is critical, particularly considering the innovation potential coming from technological studies and research (Bellotti et al., 2012).

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3   http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2006:0033:FIN:
EN:PDF p.p. 4-5
4   Europe 2020. A European strategy for smart, sustainable and inclusive growth:
http://ec.europa.eu/eu2020/pdf/COMPLET%20EN%20BARROSO%20%20%20007%20-%20
Europe%202020%20-%20EN%20version.pdf

A further survey commissioned by the EC shows that, of the 21 million students in the EU, only around 5 million are involved in entrepreneurship courses (European Commission, 2012). The fact that almost only business schools offer entrepreneurial education is problematic, since innovative and viable business ideas are also likely to originate from technical, scientific and creative studies (European Commission-Enterprise and Industry 2008).

As for the Italian situation (which represents the context of the experience reported in this paper), the Europe2020 document recognizes that EE is not explicitly recognized in the formal instructional/educational processes foreseen for both 1st and 2nd levels of the ISCED (International Standard Classification of Education) while at the 3rd level EE is considered "transversal" (cross-curricular). Here entrepreneurial skills are listed among the key competences that students should develop at the end of that school level.

Indeed, the present Italian scenario confirms what was highlighted by the above mentioned EC survey: at university level, except for economy, management, industrial engineering courses, and some MBAs (Master of Business Administration) specific actions aimed to support EE (European Commission, 2008b) have not yet been developed.

Casting a glance at the tools and learning/teaching methodologies for EE with an eye to the potential of games.

Given the above mentioned "fluid" situation, the research on EE is also still relatively immature. This entails the need to clarify what exactly the objectives and the contents of EE should be and what the learning methodology adopted should be. In this paper, both a theoretical framework and a methodological proposal to sustain EE are put forward.

As for the educational methods to be adopted, the expert group called by the EC to analyse Entrepreneurship in higher education especially within non-business studies (2008b), concluded that a multi-disciplinary approach is essential and that particular attention should be devoted to the development of entrepreneurial attitudes problem-solving abilities and creativity. They also agree that, for students in the scientific and technical fields, a strong practical component should always accompany theory. More recently Neck and colleagues (2014) suggested a practice-based approach and advocated teaching

entrepreneurship using a portfolio of practices, which includes play, empathy, creation, experimentation and reflection.

In this line, an accurate choice of the tools to be adopted is necessary and these will be integrated into a coherent whole serving the different learning objectives underpinning EE and offering various and diversified perspectives and opportunities.

As for the tools to be employed, following a consolidated trend in Technology Enhanced Learning one possible choice (the one that characterized the eSG project) is that of making use of Serious Games.

As a matter of fact, games have proved to have a high potential to support learning (Garris, Ahlers, & Driskell, 2002) also because they make use of human inclination to play games as a source for highly motivated learning (Connolly, Boyle, MacArthur, Hainey & Boyle, 2012). Motivation in the use of games may support students' efforts, thus enabling them to understand things more easily, and may also contribute to enhance their creativity (Ott & Pozzi, 2012). Games can provide an engaging context for learning if they are properly designed and they are able to balance challenges in order to generate an optimal learning experience for players, and provide realism. According to Foreman (2003), in game-based learning, active discovery is required as much as analysis, interpretation, problem-solving and memory.

Despite their actual potential and although the educational use of business and management simulations and/or games dates back to the years around 1960 (Greenlaw et al. 1962), games have been scarcely adopted in EE so far, at least in the framework of formal education curricula.

As a matter of fact, in early times, business and management simulations and games were mainly used by firms with the aim of fostering their employees' competences in the field. Thanks to a specific analysis of the field conducted by Faria (1989) we know that at the end of the 1980s there were approximately 228 business games available in the US used by business companies mainly for staff training purposes.

Further on, we witnessed the penetration of business gaming in Universities/Academia. A thorough review conducted by Dickinson and Faria in 1994 showed that, at that time, in the US over 200 business games were being used by nearly 9,000 teachers at over 1,700 colleges offering business programmes.

More recently, Faria et al. (2009) have published an extensive survey of the current state of business games for educational purposes. The emerging panorama testifies the increasing interest for the use of such tools in US Universities and the progressive adoption of cutting edge technologies for the development of such games and simulations (e.g. virtual reality techniques). The European situation, as a whole, is less investigated and appears to be highly fragmented although a number of interesting initiatives have to be considered (e.g. the project carried out at Exeter University)[5].

Despite increased interest in the academic use of this type of tool shown by Universities, the validity and effectiveness of their educational use is questioned by Stainton et al. (2010). These authors' main concern attains to the actual unavailability of specific evaluation tools and methods, due to the high variability (dimension, content, structure...) of the educational actions carried out in the field.

3. New Perspectives In Ee: The Esg Project

In this panorama the eSG project ("stimulating entrepreneurship through Serious Games"), was co-funded in 2011 by EACEA in the framework of the Lifelong Learning Programme (LLP-ERASMUS-FEXI); it represents an attempt to introduce significant methodological novelties in the field of EE.

The project (which started in 2011 and ended in March 2014) involved three universities with a technical-scientific background from three different European countries (in Italy, the Faculty of Electronic Engineering, located in Genoa; in Spain, ESADE Business & Law School of the Ramon Llull University, located in Barcelona; in the Netherlands, the Technical University of Delft).

The main objective of the eSG project was to design, develop and enact learning processes aimed to sustain EE in technical universities. The eSG consortium was first engaged in the definition of both didactic objectives and contents connected with EE. Subsequently, it was involved in the design and conduction of field experiments, which in turn required the devoting of specific attention to the choice of the instructional tools to be employed. Three experiments were deployed in each of the three partner countries. They followed a common pedagogical model based on the use of SGs (as learning tools) but in each country different courses were implemented, which followed different educational approaches and methodologies: ESADE in Spain developed a MOOC, TU Delft in the Netherlands

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5   http://projects.exeter.ac.uk/feele/index.shtml#fdtl5

a Game Based Learning (GBL) course and UNIGE in Italy a fully gamified course.

In the next section, we present the theoretical model behind the three courses, that was devised by the research team as a whole. Afterwards, we describe the innovative methodology adopted in the Italian eSG experiment, highlighting its advantages.

4. From The Esg Experience: Which Objectives And Contents For Entrepreneurship Education?

According to the guidelines provided by the EC, "entrepreneurial competence" nowadays should be considered a "composition of an entrepreneurial attitude, entrepreneurial skills and knowledge of Entrepreneurship"(European Commission, 2012).

In particular:

- Entrepreneurial attitudes cover "aspects that help individuals to take actions including taking responsibility for their own learning, careers and life". The educational actions in this sector should be oriented to help students to improve/change their mental attitudes towards the possibility of becoming entrepreneurs; they should support the learner to understand the potential and drawbacks of an entrepreneurial career, which will allow them to "responsibly" include entrepreneurship in their personal career plans;

- Entrepreneurial skills concern those "skills needed to turn ideas into action"; the related educational actions should be aimed to offer the students the opportunity to develop those skills (such as creativity, analysing, motivating, networking and adaptability) that can enable them to run a business;

- Knowledge of entrepreneurship refers to "having a broad understanding and knowledge of entrepreneurship including the role entrepreneurs and entrepreneurship play in modern economies and societies" (such as recognize opportunities, understand the context where you live and work, know the topics connected with the "business ethic").
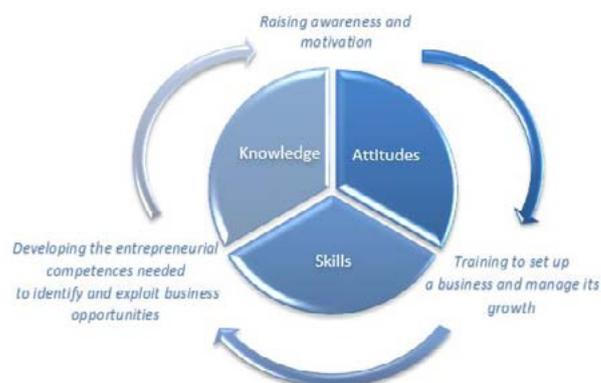

Figure 1- Didactic objectives and competences in the eSG Project

Figure 1 represents, in the centre of the picture, the three core competences to be addressed, as suggested by the EC. They are surrounded by the educational objectives derived by the EU document on "Entrepreneurship in higher education, especially within non-business studies" (European Commission, 2008b), namely:

Raising awareness and motivation which entails promoting students' awareness of what the concept of entrepreneurship really means and stimulating their potential motivation to become entrepreneurs;

Developing the entrepreneurial competences needed to identify and exploit business opportunities, that is contributing to help students develop those competences that are required to identify and manage a business;

Training to set up a business and manage its growth which aims at endowing students with those practical and conceptual tools that are necessary to set up, manage and improve a business.

The educational objectives and the entrepreneurial competences to be addressed (attitudes, knowledge and skills) are closely connected. Figure 2 shows the theoretical model that was devised in the framework of eSG to shed light on the connections and links between objectives and areas to be addressed.

It actually shows how each one of the mentioned educational objectives is directly linked to one or more of the core competences to be addressed. The idea underpinning the model creation was that of supporting the pedagogical planning of the learning activities to be conducted. Actually, following this model, specific pedagogical plans can be created addressing

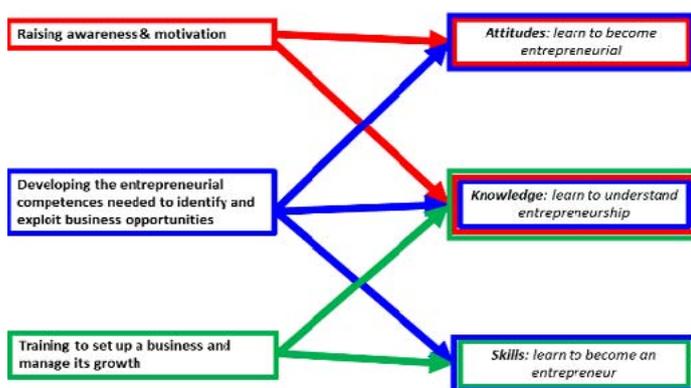the objectives to be reached in each of the target areas of competence.

Figure 2-Connections between entrepreneurial competences and didactic objectives in the eSG Project

The first objective - R*aising awareness and motivation* – targets both the attitudes and knowledge areas.

The second goal of the project - *Developing the entrepreneurial competences needed to identify and exploit business opportunities* – has direct connections with all the three core competences. The third, and last, objective, which is more "technical" - Training to set up a business and manage its growth aims at providing students with tools that enable them to create and manage a business; it actually addresses the knowledge area and, in particular, also entails sustaining the development of specific skills, particularly the procedural ones.

This model represented the common basis of the different pedagogical plans developed in the framework of the eSG project[6] with the aim to inform and sustain the different experimental learning teaching actions carried out in Spain, the Netherlands and Italy; this last experiment is reported in the following section and is the basis for some reflections on the adoption of innovative methodologies in the field.

5. From The Esg Experience: Which Tools And Educational Strategies For Ee?

The Italian courses (one per each of the two project years) were conceived and structured according to specific and detailed pedagogical plans (Bottino et al, 2008) taking into account the target population, their prerequisites and the learning objectives to be pursued. The two courses followed

a blended modality, which included both face to face and distance learning activities: lectures, entrepreneurs' talks, game sessions, debriefing activities and tests. They made in-depth use of Serious Games which were integrated into the course activities together with other more traditional media (Antonaci et. al, 2014). Furthermore, with the aim of pushing both competition and collaboration among students, the courses were entirely gamified, which means that game design elements (Kapp, 2012) were introduced in the courses which were based on inter-team competition. These two aspects (use of Serious Games and Gamification techniques) were the pillars of the learning interventions and proved to be good sources of students' external and internal motivation thus also increasing their engagement in learning tasks (Bellotti et al. 2013).

The overall experiment was structured in two main experimental cycles (leading up to the two editions of the courses) involving:

- Definition of the objectives and of the theoretical framework adopted (this was set at the beginning of the project and subsequently improved).

- Scouting, assessment and choice of the most appropriate Serious Games.

- Planning of the course structure and definition of the content and modalities of each lecture, definition of the homework and home SG-based competition, definition of the entrepreneurs' talks; preparation of the relevant material.

- Execution of the courses, with: lectures, organization of the student teams, briefing, SG-playing sessions, debriefing, entrepreneurs' talks, play-offs, final competition, pre and post-questionnaires.

- Analysis of the results.

Structure of the courses

Students were divided into teams (2/3 players each) that could collect points for each course activity with the final aim of acquiring a high ranking on the leader board for the final-day playoffs. Competition and collaboration among students were among the pillars of the learning interventions and proved to be good sources of both external and internal motivation and considerably increased engagement in learning tasks (Bellotti et al., 2012).

6   http://esg.itd.cnr.it/list.php

During the courses, the students were exposed to a range of topics and to an increasing level of difficulty in games, game-play and home assignments. Various types of activities (performed both in class and at home) were foreseen among which:

- Short theoretical introductions, where teachers presented business topics relevant to entrepreneurship.

- Talks by invited entrepreneurs presenting their experience in building and managing a company and also speaking about a particular entrepreneurship topic.

- Games played at home (homework and competitions), preceded by an in-class game debriefing and concluded with a debriefing.

- Home assignments in the form of writing a report and filling in thematic questionnaires.

- "Playoff" competition matches on the final day between all teams.

Gamification

As to the gamified structure of the courses, we adopted a scoring system which is a fundamental aspect of gamified processes (Deterding et al., 2011). As a matter of fact after each activity (both face to face and at a distance) each team (composed of three or four students), received a score resulting from their specific performance and the level of interest and participation they had shown during lectures and entrepreneurs' talks. Scores were given by the course managers and made available on the team's leader board.

After the qualification phases, the teams played the playoffs consisting of game sessions. The position in the playoff grid was based on the team's ranking on the whole course's leader board.

The four best teams played finals, after which the winning team was proclaimed.

Use of Serious Games

Playing with Serious Games represented an important aspect of the courses; the use of business simulation games offered the students the possibility of having hands-on experience and of experimenting with some important aspects (strategic decision-making, management and concrete operations) of the entrepreneurial world.

From the very beginning of the experiment, it was clear that the effectiveness of the activities carried out with Serious Games cannot be taken for granted but rather largely depends on the characteristics of the games adopted. It is strictly linked to the game functionalities and, in particular, to the appropriateness of its contents, structure and of the entailed methodology.

The educational relevance of these elements internal to the games requires one to operate an extremely careful and focused choice of the SGs, in coherence with the learning contexts and the educational objectives.

To this aim, a structured process was carried out, based on an analysis of the games available on the market and their adherence with the contents and objectives of the project and an a priori evaluation of their usability and educational effectiveness.

The preliminary investigation about the games available had revealed that a wealth of suitable SGs exist, but also that, despite the relative abundance of products (among them one hundred SGs were examined in detail) most of them were too specific (e.g. on supply chains) or dealt exclusively with economic aspects (Bellotti et al. 2014). Thus, in order to select the most suitable, SGs were accurately evaluated on a set of parameters related to their contents their adherence with the educational objectives and their specificity as to the competence to be trained but also to their usability, ease of use, and potential pedagogical effectiveness.

The process underpinning the game choice and evaluation represented a common methodology that was devised centrally by all the project partners. Each partner country then chose the games to be adopted in the country-specific experiment/course.

The template presented in Figure 3, which takes into account the EE model presented in the previous paragraph (core competences and educational objectives for EE) served as the main tool to classify games.

Figure 3- Evaluation template developed in the eSG project for game screening

In Italy, five different games were adopted: Hot Shot Business, Sim Venture, Enterprise game and Go Venture-Any Business.

Hot Shot Business is a game developed by Disney for K-12 Students, it is useful for introducing students to the basic principles of the entrepreneurship environment. The student can open and run his own business and take the best decisions to make it successful. Even though developed for younger students the game was positively accepted by higher education students.

Sim Venture is a single player, detailed business simulation game, where the player is an entrepreneur managing a small computer assembly and sales company. The player can operate in different areas: Organization, Sales & Marketing, Operations and Finance but the game also offers the opportunity to deal with product development. It provides a good tutorial explaining the game mechanics and can be played at different levels of difficulty. Each round of the game lasts a virtual month. At the end of each month the player gets a detailed report about his/her performance covering several parameters (e.g. company value, cash-flow, profit and loss), oriented to help him/her to understand errors made and how to improve the business.

Enterprise Game is a single player, on line, role-playing, business simulation. The game has several goals among which: matching the customers' and the market needs, increasing the company's profit and cash flow, ensuring the workforce motivation and controlling the reaction of competitors. The player, who is the CEO of the Enterprise, can interact with business advisors and consultants that guide, educate and inform the player, virtual competitors and employees that react to players' decisions. The enterprise encompasses different departments (marketing, finance and production) to be organised. The Enterprise has

a cycle of three virtual years and the game provides monthly reports.

GoVenture - Any business is a highly customizable business simulation where players manage enterprises alone or in teams. The game allows the player(s) to define the product and the market sector or to select one of the available scenarios/simulations. The aim of the game is to manage a successful business competing with other enterprises led by real or virtual competitors.

Some lessons learnt

The detailed results of Italian course are not presented here as they are extensively treated in Bellotti et al. (in press), where data highlighting the efficacy of SGs in the experiment are provided thus fully supporting the idea of the positive impact of the use of SGs and gamification techniques on the overall learning process and in particular on students' motivation.

The use of games proved to be effective especially in some areas related to the development of the practical skills an entrepreneur should be endowed with (Smith et al, 2007),

Students themselves judged the course positively. As to the overall evaluation, shown in Figure 4, most of the students considered the course "Useful" (79.4%), around 9% evaluated the course "Very useful" while no one found it "Very useless" or "Useless". The course was also considered interesting by the majority of students. 55.9% of the learners considered the course "Interesting", 32.4% "Very interesting", only 8.8% judged the course "Uninteresting" (Fig. 4).
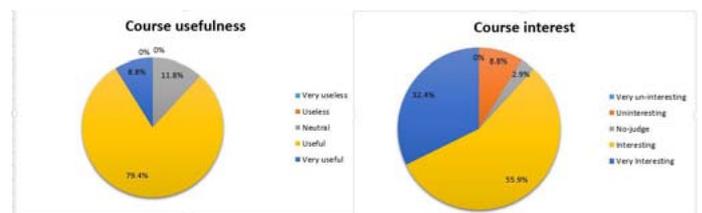

Figure 4: Course usefulness and interest as judged by students

As for the specific games adopted, the post-test administered at the end of the courses, registered a good level of acceptance, even though with margins of improvement both for the structure of the games and the contents delivered. In particular, students pointed out that the games should be improved with regard to the level of entertainment and the feedback provision (that was sometimes not clear or well linked to the mistakes

made by the player); moreover they pointed out the lack of attention for innovation and ICT tools. It was also noted by students that some aspects, in particular those related to the development and the structuring of an entrepreneurial mindset and motivational aspects were scarcely addressed by the SGs adopted.

With respect to the specific course components, students were asked to assign a value (1: very negative – 5: very positive) and briefly comment the value they recognize to various course components. An average of the students' evaluations was calculated and is reported in Fig. 5. It shows that the entrepreneurs' talks were the most valued aspect of the course but also that competition (the gamified aspect of the course) was well accepted by students. The activity with Serious Games was less valued, mainly because of the scarcely entertaining features of the game adopted, as mentioned above.
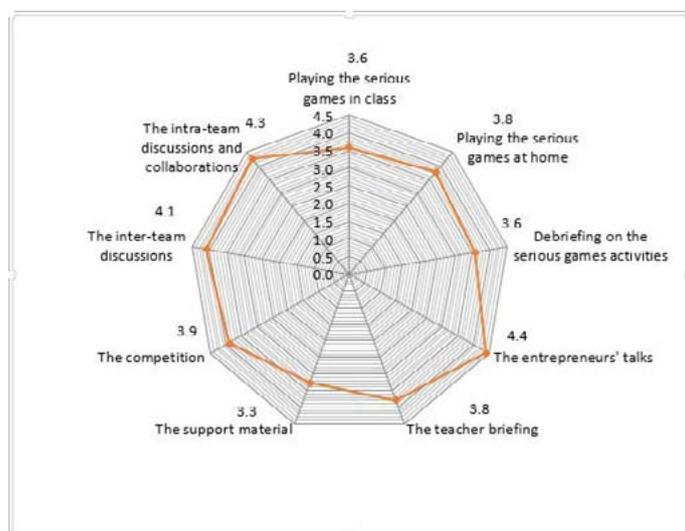

Figure 5: Average rates of the different course components

Conclusions

In this paper we have proposed a theoretical model and an innovative working methodology based on Serious Games and gamification for EE. Its ultimate aim was to provide food for thought and stimulate some reflections about which are the core competences to be taught in Entrepreneurship Education courses and how this can be done, using innovative software tools. In particular starting from European documents we have briefly outlined the current Entrepreneurship Education diffusion in the European Member States.

Based on the experience of the eSG project, we outlined (following precise European Commission recommendations) what have to or should be considered the specific objectives and contents in EE. It is evident that educational interventions need to go beyond the pure management of economic aspects of a business and should aim at developing an entrepreneurial mindset and also at tackling other aspects like motivation and attitudes.

In a Technology Enhanced Learning (TEL) perspective, we then reflected on how EE could take advantage of innovative methodologies and tools. To this aim, we referred to the use of an innovative methodology, gamification, and the adoption of Serious Games as educational tools. This was done in a concrete situation, namely the courses developed in Italy under the eSG project framework. As shown in the paper, we acknowledge that the choice of Serious Games for EE course should be grounded on a solid pedagogical approach and their use needs to be carefully planned. In the Italian experience presented, they were accurately selected so as to be functional and able to effectively support the educational process, allowing students to train themselves in complex simulations related to a variety of topics/situations. Students gave a positive evaluation of the course, as they were conceived; the gamified structure of the courses made them more appealing and students considered the experience different from those in other university courses as they were more interactive and personalized.

SGs were positively valued as well, even though students considered them less entertaining than expected. Generally speaking the students perceived the course as useful and interesting. Its pleasantness value, however, was lower than expected. We argue that this is also due to the workload, especially in terms of homework, given by the course and to the fact that the SGs used have a fun level that is not comparable with that of commercial games with which the youngsters are familiar.

Furthermore, based on performance data and the analysis of pre and post-questionnaires administered to the students (Bellotti et al., in press), we can say that the selected SGs, supported by briefing and debriefing activities, demonstrated to be useful tools in particular for developing procedural knowledge and competences. Competition based on scores, an engaging graphic look and game interactions proved to be good motivators to spur the students to gain practice by doing

several matches/exercises. Intra-team collaboration in playing and reporting was another key motivator.

Obviously, the use of games as educational tools must be proposed and perceived by students as an activity requiring the same commitment and attention as others and teachers need to always be able to mediate the learning experience, interpreting data and discussing the possible choices made by the students during the games.

For sure, the conducted experience paves the way for further investigations; many of the issues raised still remain open and call for further in-depth analysis.

In particular, we consider it very important to make a comparison between the use of SGs and other tools; an understanding of how to implement some gamification elements, (e.g. badges) is also needed in order to increment the overall long-term impact of a gamified course. Assessing the benefits of each gamification element for each given pedagogical goal in detail and trying alternatives (within a gamification approach and outside) is a major goal for future research.

What is evident from the Italian experience and from the overall eSG project results, is that Serious Games and gamification techniques can be considered effective educational means only provided that their use is supported by sound pedagogical planning and corroborated by well focused educational strategies.

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