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Abstract. In this paper, we focus on a new type of emerging learning games: Social Learning Games (SLG). We define SLG as games that enhance learning by offering educational contents according to a learning scenario and by supporting a community that offers condition for social learning. Leaning upon this analysis, we propose a model of SLG, which relies on five components: decision-making, contextual discussions, social capital, educational feedback and dashboard. We highlight the learning possibilities offered by this design approach, such as stimulating learners throughout decision-making process and cultivating learners' engagement in the game. This theoretical contribution has been integrated into a Social Learning Game called CIBUS dedicated to the field of entrepreneurship. We present the specific structure of the learning scenario that allows the regulation of the progress of the learners in the game, by giving freedom in the participation in the community. Finally, we explain how the design approaches we propose allow supporting three levels of learning involved in the game: individual, within the group, and within the community.

Keywords. Social Learning Game; Game-based Learning; Design approach

1   Introduction

This paper focuses on a new type of games, called Social Learning Games (SLG). This term has emerged in recent years but is not yet well defined. Some works refer to Multiplayer Learning Games (MLG), others to Massively Multiplayer Online Role-Playing Games (MMORPG), and others to Social Games (SG). So it is still unclear what are Social Learning Game (SLG) and what are their interests in the educational domain. Our approach relies on the initiative to combine two ways of learning: game-based learning and social learning. These two types of learning can be interconnected and involve each other, so as to enhance the learning of both pedagogical content and collaborative skills.

   The first part of this paper is dedicated to the study of MLG and MMORPG, to identify their strengths and weaknesses. This study allows us to identify the characteristics of SLG. In the second part, we propose a model of SLG based on five components. We show their interests for learning purposes. This approach is illustrated by a SLG called CIBUS, which has been developed to learn the basis of the field of entrepreneurship. We highlight the challenges to take up for designing such a game, prin-

cipally the regulation of the progress of the players. We detail the specific structure of scenario we have developed. We finally detail the three levels of learning that have to be considered (individual, group and community) and the way our approach allows it.

2   Learning in MLG and social interaction in MMORPG

2.1   Multiplayers Learning Games (MLG)

Michael and Chen [1] define serious games as "*games that do not have entertainment, enjoyment, or fun as their primary purpose*". Serious games can be applied to a broad spectrum of application areas, e.g. military, government, educational, corporate, healthcare [2]. According to Squire and Jenkins [3] "*What we do know is that games, simulated environments and systems, etc., allow learners to experience situations that are impossible in the real world for reasons of safety, cost, time, etc.*". Learning Game (LG) is a specific type of serious games that has learning as main objective, unlike political or advertising games. Game-Based Learning (GBL) has the potential of improving training activities and initiatives thanks to its engagement, motivation, role-playing, and repeatability (failed strategies can be modified and tried again). These games have proven to be useful to provide learners with pedagogical content in a ludic or/and realistic way [3].

However most of LG are played individually and learners evolve in the game making right or wrong decisions, without interaction with "real" learners. One way to enhance learning and engagement in the game is to allow collaboration by proposing a multiplayer environment. Actually, we observe the emergence and success of online multiplayer games in the world [4] and even in education [5]. Multiplayer Learning Games (MLG) usually immerse the players in a virtual 2D or 3D environment and propose collaborative activities [6]. This type of game can support development of a number of various skills: strategic thinking, planning, communication, collaboration, group decision-making and negotiating skills [7, 8]. Players learn not only from the game, but from each other [5].

But these games allow collaboration only within a limited number of students inside the virtual world. Furthermore, collaboration occurs according to a predefined learning scenario, often regulated by a teacher. Learners so lack freedom of choice and of possibility of interaction with other learners. We think that it is one of the main reasons why students tend to consider Computer-Based Learning Environments as unexciting [9]. We think that the participation in a large learning community can arouse the learners' engagement. That is why we were interested in studying Massively Multiplayer Online Role-Playing Games (MMORPG) that are nowadays predominantly played by digital natives.

2.2   Massively Multiplayer Online Role-Playing Game (MMORPG)

Massively Multiplayer Online Games (MMOG) are games that are played online by hundreds of players simultaneously. Educational MMOG often works as tournaments

and are based on competition between groups of students like in [10]. The most popular type of MMOG, and the sub-genre that pioneered the category, is the Massively Multiplayer Online Role-Playing Game (MMORPG). An MMORPG is "*an immersive 3D worlds where hundreds or thousands of players connect simultaneously from all over the world in order to meet each other in a simulated reality*" [11]. Many MMORPGs offer support for in-game guilds or clans, that are groups of players coming together to share knowledge, resources, manpower to reach common goals. For example, World of Warcraft [11] is a MMORPG set in a fantasy world (like The Lords of the Rings). The aim of the game is to conduct a series of missions, so-called quests, with progressive levels of difficulty.

There is much international scientific research in the sociological and psychological field that clearly demonstrates how this kind of game changes significant characteristics of the players; for example, the ability to be a group, to take on leadership, to manage roles and to interact in order to achieve a common goal [12, 13]. We agree with Egenfeldt-Nielsen [14] that, "*in a socio-cultural perspective, video games are the tools for constructing a viable learning experience, but not the learning experience per se. Video games mediate discussion, reflection, facts, and analysis facilitated by the surrounding classroom culture and the student's identity. In other words, video games are interesting not for their content but for the way new explorations initiate negotiations, constructions, and journeys into knowledge*". We can think interaction in a MMORPG as a condition for social learning [15]. In fact, social learning is based on the mutual aid between players like in any other online community [16, 17]. Players exchange ideas, solve problems and create relationships, by the way of technologies like chat or forum. Online social networks have proven that people can be highly motivated to become part of a community activity, participate in group activities and form committed behavior patterns [18]. Social Games (SG) like Zynga's Farmville and others are surpassing traditional gaming in terms of ongoing participation.

So MMORPG help to learn collaborative skills, foster learners' engagement in the game and create dynamic learning opportunities due to the community. Role-playing incite players to help each other to solve problems, by using their different knowledge and capabilities. But their use is rather limited in the educational domain, since they do not propose educational content and are not based on a learning scenario.

3   A model of Social Learning Game

In this section, we propose a generic model of Social learning Games (SLG) that answers the following issue: how to combine social and educational aspects in a same game? This model aims to encourage learners to participate in the learning community in a relevant manner, i.e. related to the educational content of the learning game.

3.1   A generic model of SLG

We define Social Learning Games (SLG) as games that enhance learning by offering educational contents according to a learning scenario and by supporting a community

that offers condition for social learning. We propose on Fig. 1 a model of SLG based on five main components that connect the learning community to the learning game. We think that decision-making is the main component that makes the link between the two aspects of SLG. The other components help the process of decision-making.
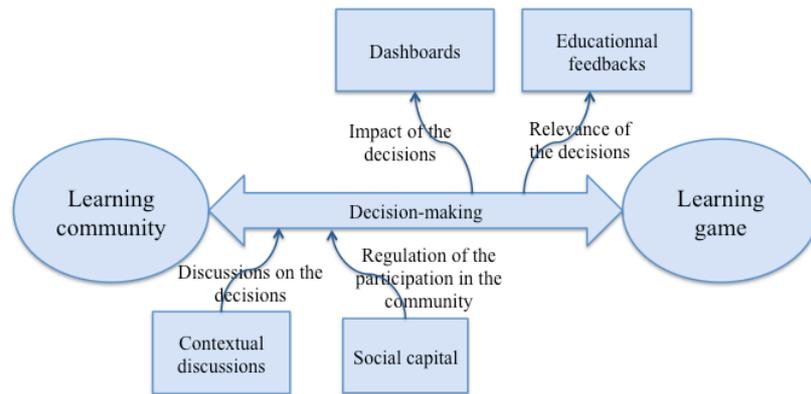

Fig. 1. Components of a Social Learning Game (SLG): the elements are presented according to their proximity with the extremities of the double arrow

— *Decision-making*: According to Steven Johnson, the basic feature of videogames is that they force us to make decisions [20]. In a SLG, decisions are made in a social context and the discussions between learners within the community can help them to make the decisions in the game.
— *Contextual discussions*: the players have to be able to have contextual discussions so as to progress in the game, for example to make a decision, or to exchange on knowledge to acquire.
— *Social capital*: it is based both on the level of participation in the community and on the relevance of this participation according to the decisions made in the learning game. It is the most important indicator associated with a player and has to work like a reward system.
— *Educational feedbacks*: it is very important to present to learners information on the relevance of the decisions they made, so that they can learn from their errors and acquire the knowledge of the game.
— *Dashboards*: dashboards have to present indicators that give information to learners both on their participation in the community and on the impact of their decisions at different levels: at the individual level, at the level of the players that have the same role and at the level of all the community. They so support and enhance a monitoring and a reflexivity process for learners [19] involved in collaborative and social activities.

3.2 Learning through our model of SLG

There is a reciprocity link between the game and the community: on the one hand, playing the game incites learners to participate in the community to discuss on the educational contents, to make decisions in the game and to share their knowledge; on the other hand, participating in the community helps learners to progress in the scenario of the game and to learn the associated knowledge. These characteristics involve different ways to enhance learning in SLG, among which we highlight:

— *The engagement in the game through the community*: we think that the participation in a community can foster the learners' engagement in the learning game. The interactions in the community involve a social dynamic that can incite learners to play the game, even if it is "serious".
— *The mutual help in the community to make decisions in the game*: we think that the discussions within the community can help learners to understand the contents of the game. For that, the discussions have to be linked to the decisions to make into the game.
— *The educational contents to initiate discussions in the community*: the contents of the game, more particularly the decisions to make, can initiate discussions between learners that have different knowledge and skills. The online community is the place for these discussions.
— *The freedom in the community and the control in the game*: the learners benefit from both the controlled progress in the learning scenario and the free discussions in the community. The association of these two components offers an adequate level of regulation.

4 An example of SLG: CIBUS

The model of SLG proposed in the previous section has been integrated into a Social Learning Game called CIBUS. CIBUS is based on the mechanisms of entrepreneurship and distinguishes four roles: investors, shareholders, company managers and politicians. We first illustrate our model with this game. We then show the design choices that have been made to answer the following issues: how to regulate the progress of the learners in the predefined learning scenario, while the participation in the community is free? How to support the individual learner, the groups of learners within collaborative activities and the learning community in a same game?

4.1 General presentation of CIBUS

As illustrated on Fig. 2, the interface of CIBUS presents the game (learning scenario and decisions), the collaboration functionalities and the dashboards at once. In order to achieve a clear and functional interface for the players, the interface has been decomposed into these three thematic frames. It is very easy to navigate from one to another via a slider, which allows keeping game data loaded and ready to display. We present the three frames of the CIBUS game according to our model of SLG:

— *Scenario/Decisions*: it is composed of three main elements: (1) the learning *scenario* displays the progress of the simulation and the learners have to make decisions according to different types of modules (see part 4.2); (2) the *social capital* is calculated on the number of events created, the number of messages per discussion, the rating of the messages, the influence of the individual decision of a collective decision; (3) *educational feedbacks* on the decisions are given at different levels, according to the structure of the learning scenario detailed in part 4.2 (feedbacks on one or several decisions inside a phase, global feedbacks after a phase, a final feedback on the way the game was conducted by all the players).

— *Collaboration*: at any time learners can create an event to start a contextual discussion in a forum. The invited learners can participate by indicating the aim of their message so as to make it contextual: introduction to the discussion, question, affirmative answer, negative answer, neutral, idea proposal, intention of decision or a search for information. This aims to provoke a reflection when posting a message and the others can better understand the message. Furthermore, learners can rate the messages written by the others (with a like or a dislike).

— *Dashboards*: there are three dashboards: a *decision dashboard* (summary of the impact of the decisions made: e.g. number of decisions made by phase, number of decisions that made the indicators increase or decrease), a *collaboration dashboard* (summary and statistics on the collaboration: e.g. number of messages, number of rates) and a *general dashboard* (summary and general statistics of the game).
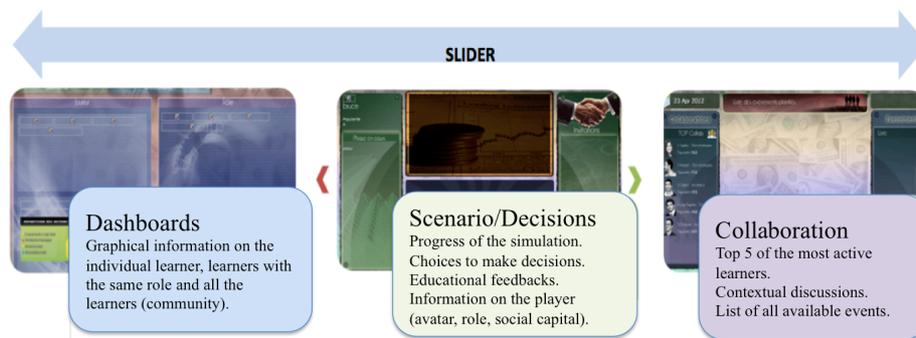

Figure 2. The three interfaces of the Social Learning Game CIBUS

4.2 The players regulation in CIBUS

In this part, we describe the structure of the learning scenario chosen for the CIBUS game to regulate the progress of the learners in the simulation, taking into account the free participation in the community. In fact, some players may progress more slowly if they participate more in the community. The structure of the scenario is composed of four elements: phases, buffer states, modules and allocation of roles and phases.

— *Phase*: a phase corresponds to a set of knowledge the learners have to acquire. A phase can be dedicated to a role, to several roles or to all players. According to the

phase, the learners are asked to collaborate with the learners of their team (e.g. the board meeting of a company), of their role (e.g. all the company managers), or with learners that have other roles. For example in Fig 3, the phases 1, 2 and 8 are carried out in parallel by all the learners, in order to learn the basic notions on the role: Phase 1 has two roles is common (investors and shareholders), whereas Phases 2 and 8 are dedicated to a single role (respectively company managers and politicians). Then, Phase 3 is common to all players. They are finally separated into several parallel phases (4, 5, 6, 7); each role is represented in each phase. The learners can collaborate, collect information from other roles, negotiate and exchange the knowledge they have acquired during the first phases of the scenario.
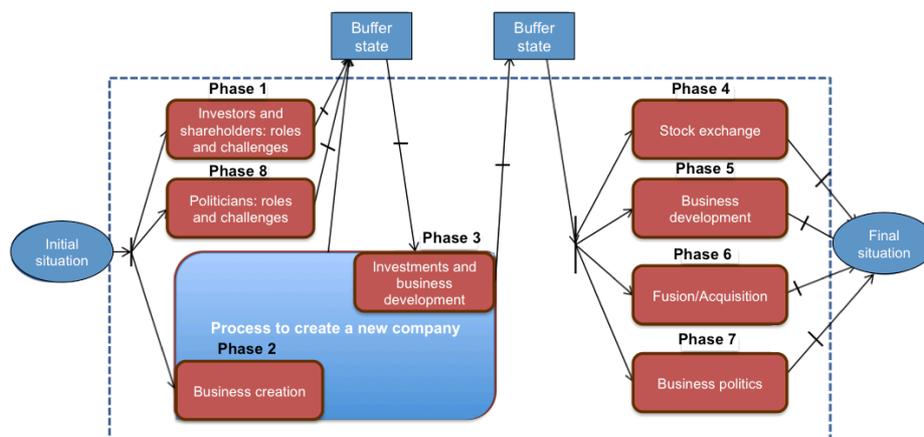

Figure 3. Structure of the learning scenario in the CIBUS Social Learning Game (SLG)

— *Buffer state*: at the end of a phase, the learners are directed in a buffer state where they have additional information on the educational concepts via different media (e.g. videos, web sites) and are asked some questions to deepen these concepts. As some modules inside the phases require collaboration between players that have different roles, it is necessary to regulate the progress in the game so that all players begin a new phase at the same time. The buffer states allow the players waiting for the others and continue playing.
— *Allocation of roles and phases*: the learners do not always collaborate with the same people. At the initial phase and after a buffer state, the learners can choose a role and phases based on a limited number of players per role and per phase. When the maximum number is reached, we allocate automatically a role (only at the initial phase) or a phase. For example on Fig. 3, the learners can choose one of the four phases (4, 5, 6 and 7) but a phase is automatically closed when the maximum number of participants is reached.
— *Modules*: the phases are composed of different types of modules, allowing regulation within the phases. The different types of modules are:

- Free module: the learners answer individually a series of questions. The learners can create events to debate on a decision, since the decisions made by a learner can influence the progress of the scenario for the others (for example, if the majority of the investors do not want to invest in an industrial sector, the concerned companies risk to go bankrupt). Finally learners make their own decision.
- Critical module: learners involved in a same phase have to reach an agreement on one or several decisions. If only one player do not agree, a message appears to warn all the participants. This type of module is used for important decisions (and associated concepts) of the learning scenario. The aim is to lead the learners to collaborate with the other players involved in a given phase.
- Sliding module: at any moment of the learning scenario, a critical event can occur and all the learners have to discuss to make a collective decision by a referendum. The final decision is made automatically according to the rule: « majority is right ». This type of module aims to give the opportunity for all players to discuss. For example in the scenario of CIBUS, we inform the players of a hurricane and its consequences on the stock market. They have to make a decision for all the community.

4.3   Individual, collaborative and community levels

In SLG, we have to consider and support both the individual player and the whole community, and a middle level of the players who have the same goals. In fact, we think that different kinds of learning processes can occur [21]: reflective learning when learners are conscious of the impact of their actions (like in learning games); collaborative learning when learners collaborate for the same goal (like in multi-player games, for example for a quest); and social learning when learners have interaction within the community with learners who do not necessarily have the same objectives but that may have useful information and provide help (like in a MMORPG). As mentioned in previous parts, this distinction appears in several elements of CIBUS:

— The dashboard: it presents several indicators at the three levels we distinguish. On a same interface, learners can visualize their own indicators (that evolve according to individual decisions), the indicators of the learners that have the same role (that evolve according to individual and collective decisions) and the indicators of the whole community (that evolve according to individual and community decisions). It can enhance a reflexivity process, by comparing the level of their indicators with the others and help them to situate within the group and the community.
— The different types of module: according to the type of module, the decisions are made at different levels: at an individual level in free modules, at a collective level in a critical module and at the community level in the sliding module.
— The contextual discussions: when starting a discussion, learners can invite the players and the roles that they want, so creating discussion within one role, several roles or the whole community (all the players). These discussions can be started at any moment of the scenario, not necessarily only when intended.

5   Conclusion and future works

As a conclusion, we have contributed to specify the characteristics of a new type of games that emerges: Social Learning Games (SLG). SLG offer educational contents according to a learning scenario like Learning Games and learners participate in a learning community that can help them to solve problems, exchange ideas and be more engaged in the game like MMORPG or Social Games. We proposed a generic model of SLG based on five components: decision-making, contextual discussions, social capital, educational feedback and dashboard. We highlighted the possibilities offered by this design approach of SLG, like the stimulation of the learners for decision-making, reinforcement of the learners' engagement in the game, and conditions for social learning based on the educational contents provided in the game.

We then illustrated our model of SLG with the CIBUS game. The structure of the learning scenario is based on specific elements (phases, modules, buffer states, allocation of roles and phases) that allow the regulation of the progress of the learners in the game, by giving freedom in the participation in the community. The design approach we propose allow taking into account and support three levels of learning involved in the game: individual, within the group, and within the community.

At present, we are preparing an experiment to evaluate the learning effects when playing the CIBUS game, according to the different types of learning expected. This experiment will take place on a large scale, so as to be able to evaluate the impact of the community on the processes involved and the learners' behavior in the game and the community (e.g. engagement, participation, motivation). In a short-term perspective, we also plan to transpose the game in another domain, so as to test the genericity of the approach and the effects of the domain on the results observed.

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