Virtual Worlds for Serious Applications (VS-GAMES'12)

Serious Games for Personal and Social Learning & Ethics: Status and Trends

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Abstract

The blooming growth of interest in Serious Games (SG) over the last decade spread its applicational areas into an extremely wide and fragmented domain. As a consequence, it is extremely difficult to create a complete panorama snapshot regarding the application of SGs. With this work we contribute to the de-fragmentation of the domain Personal and Social Learning & Ethics (PSLE). We established a shared vocabulary with the creation of a detailed taxonomy based on which we carried out two surveys to analyze 1) the current status, trends and gaps and 2) the barriers and facilitators of SG adoption in PSLE.

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1. Introduction

The use of Serious Games (SG) is commonly motivated by a need to educate, train or inform regarding a given topic [1]. The potentiality of SGs as a tool for learning rests fundamentally in the ability to balance the entertainment, interactivity and re-playability of typical games with the learning goals of a given educational objective. Currently there is a wide range of applications for serious games such as Cultural Heritage [2], Health [3], Classroom Teaching [4], Cultural Training [5], Social Awareness [6] amongst others [7].

Given this variety of SGs applications it becomes difficult to completely analyze the development status of the diverse application fields. This results in overlooked areas that could be opportunities to be explored in new developments. Furthermore, the discussion of games in these areas frequently suffer from a fragmentation in

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terms of vocabulary given the vast amount of topics addressed by people from very different work backgrounds [7-8].

One solution to this problem is the creation of taxonomies to establish a shared vocabulary for a given application field. At the same time the taxonomy is also a fundamental tool to create a structured snapshot of an updated status, trends and gaps for a field of interest. Several works have provided taxonomies/categorizations in serious games with different levels of detail and characterizing properties. Michael and Chen [1] provided a categorization fundamentally based on the target audience. It presents categories with a low level of detail such as Educational, Corporate or Healthcare and using these to structure a survey of the field and provide development and design guidelines. Susi et al.in [9] provided a similar low level of detail categorization (example: Military, Government or Educational). This categorization is based on the differentiation of the distinct application fields used to provide a small snapshot of each of them, with a special focus on Healthcare. Sawyer and Smith [7] presented a taxonomy categorization aiming to include all types of SGs. The taxonomy has two orienting classification topics: the area of activity and the purpose of the game. A more detailed categorization is provided for each of the different game purposes. Ratan and Ritterfeld in [10] propose a different approach to the categorization by using a 4 dimensional classification: (1) Primary educational content (2) Primary learning principle (3) Target age group (4) Platform.

Our work is part of a coordinated effort to de-fragment the many applications of SGs. This effort is carried out by 6 major special interest groups (SIG) each addressing one major application field: Business and Management, Engineering and Manufacturing, Health and Fitness, Security Safety & Crisis Management, Humanities and Heritage, Personal and Social Learning & Ethics. Our target application field is Personal and Social Learning & Ethics (PSLE). We specifically focus on SGs that promote social awareness as well as the acquisition of ethical analysis competences and soft skills. Social awareness actions are becoming increasingly important to inform and mobilize people to tackle many problems, such as sustainability [11] and humanitarian crisis [12]. In today’s world morality competences and skills such as the capacity to make decisions and empathy are also key factors to face everyday challenges both the individual and collective level [13-14].

Our goal is to survey and critically assess this field by creating and using a more detailed taxonomy. The taxonomy we present is the result of a cyclic process of identification, discussion and review of terms that involved a SIG composed by 17 members from 11 institutions, and included serious games developers and researchers. We applied this taxonomy on two surveys that were carried out during the first semester of 2011. First we surveyed several sources of games for identifying current status, trends and gaps from existing games. Second, we carried out a stakeholders survey to understand their particular needs and perspective on the barriers and facilitators for the adoption of SGs.

![Fig. 1 Taxonomy higher-level (low-detail) categories.](image-url)
2. A Taxonomy for SGs in PSLE

This taxonomy was developed within our sig through a cyclic process of identification, discussion and review of the terms to be included. During this process members suggested categories, these could then be merged to others if considered to represent the same subject in the games, accepted as new terms or eliminated if it was considered out of topic for PSLE. In such a case, these terms were to be communicated to other SIGs performing similar categorization work in other topics (example: health and business related categories). The final result is a categorization that differentiates three predominant fields - Soft Skills, Ethics, Social Awareness - each including several specific topics, at the lowest level totaling thirty-two. The higher-level categories of our taxonomy are presented in figure 1 and the detailed categorizations for each of these is presented in figure 2.

During early testing of our taxonomy we quickly understood that a common characteristic of the games analyzed is that they can be classified under several terms. Even though there is usually a term which represents the main educational objective of the game, it is frequent that several other terms apply to the game because they are either deeply coupled to the subject being addressed or are fundamental bases for the game about that topic. As such, to use this taxonomy one should identify the main term (usually from the higher-level terms) and then use a “tagging” approach (as also suggested in [8]) to classify all the other terms that apply to the educational objectives of the games.

2.1. Soft Skills Category

This category classifies SG that relate to individual’s Personal skills and the Interpersonal Skills. The personal deal with the individual’s capacity to perform them by himself, while the interpersonal ones deal with

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**Fig. 2 Taxonomy lower-level (high-detail) categories.**
skills that require a specific interaction with others. The acquisition and assessment of these skills is an extremely challenging process for traditional guided education, thus presenting an opportunity for SGs.

2.2. Applied Ethics Category

Used to classify SG which provide the user with elements of thought helpful to address and rationalize ethical issues. One should note that this is substantially different from exposing the user to a moral message where the moral thought is already formulated. Challenges within this category are related with questions of morality and vary according to the context where the ethical problem emerges. SGs in ethics can facilitate the exposition to morality scenarios and promote moral behavior.

2.3. Social Awareness

The games in this category address social relevant issues that are normally forgotten or are not very publicized, with the goal of promoting collective recognition of the issue as a first step towards its resolution. The idea is to transmit a message and not a skill.

3. Game Survey

The aim of this survey was to identify the PSLE subtopics being addressed or overlooked by SG. The addressed topics should allow identifying the current trends, while the overlooked topics should allow identifying opportunity niches.

3.1. Procedure

The first step of this survey was to identify its sources and use it to create a list of games relevant to PSLE. Next the members discussed and performed a qualitative assessment about the relevance and impact of each game regarding the category (within the defined taxonomy) to which they belong. Based on this a set of games representative of each of the major taxonomy categories were selected and finally an analysis of the collected data performed. The resources were then internally shared through a wiki platform.

3.2. Categorization of Representative Games

During the resources identification phase a total of 27 sources of SGs information were found, composed by 8 online collections/databases [15-22] and 10 companies/institutes (see Acknowledgments at the end). From the surveyed games, 17 were considered to be representative of the field. From these 17, 5 were categorized under Soft Skills, 2 under Ethics and 11 under Social Awareness (one game was tagged with two topics). In the following sub-sections we present the games selected as representative cases for our survey. Each game tagged with its higher-level taxonomy categorization and its educational objective. The full categorization results are presented in table I.

- Choices & Voices (Primary and Secondary)[Soft Skills]: The primary version is aimed at developing resilience to adverse influences, managing peer pressure and questioning poor advice. The secondary version has the educational objective to encourage young people to discuss the underlying issues that can lead to divisions and tensions in communities [23].
- McTycoon[Personal Skills]: In this game students are encouraged to explore and develop their own virtual life, where their decisions directly affect their prosperity, achievements and happiness [13].
Table 1. Serious Games representative of “Personal and Social Learning & Ethics” categorization under our taxonomy.

<table>
<thead>
<tr>
<th>Game</th>
<th>Year</th>
<th>Main Focus</th>
<th>Personal Skills</th>
<th>Interpersonal Skills</th>
<th>Applied Ethics</th>
<th>Social Awareness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choices &amp; Voices</td>
<td>2009</td>
<td>Soft Skills</td>
<td>11</td>
<td>1, 2, 4, 5, 6, 8</td>
<td>-</td>
<td>5, 8</td>
</tr>
<tr>
<td>McTycoon</td>
<td>2010</td>
<td>Personal Skills</td>
<td>5, 6, 8, 11</td>
<td>6</td>
<td>-</td>
<td>7</td>
</tr>
<tr>
<td>What Should We Tell Them?</td>
<td>2010</td>
<td>Soft Skills</td>
<td>11</td>
<td>6</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Wawis World</td>
<td>2010</td>
<td>Social Awareness</td>
<td>-</td>
<td>5, 6</td>
<td>-</td>
<td>1, 3</td>
</tr>
<tr>
<td>Global Conflicts</td>
<td>2008</td>
<td>Applied Ethics, Social Awareness</td>
<td>-</td>
<td>-</td>
<td>1, 6</td>
<td>1, 2, 3, 4, 5, 7, 8</td>
</tr>
<tr>
<td>PING (Poverty Isn’t a Game)</td>
<td>2010</td>
<td>Social Awareness</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1, 2, 7</td>
</tr>
<tr>
<td>PeaceMaker</td>
<td>2010</td>
<td>Social Awareness</td>
<td>1, 3, 5, 7, 8</td>
<td>4, 7, 8</td>
<td>-</td>
<td>1, 5, 8</td>
</tr>
<tr>
<td>Enercities</td>
<td>2010</td>
<td>Social Awareness</td>
<td>6</td>
<td>-</td>
<td>-</td>
<td>1, 3, 7</td>
</tr>
<tr>
<td>Virtual U</td>
<td>2001</td>
<td>Personal Skills</td>
<td>1, 5, 6</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Team-UP</td>
<td>2004</td>
<td>Soft Skills</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Cooking Mama: Mama Kills Animals</td>
<td>2008</td>
<td>Applied Ethics</td>
<td>-</td>
<td>-</td>
<td>1, 4</td>
<td>-</td>
</tr>
<tr>
<td>Elude</td>
<td>2010</td>
<td>Social Awareness</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Operation Climate Control</td>
<td>2007</td>
<td>Social Awareness</td>
<td>5, 6, 8</td>
<td>-</td>
<td>-</td>
<td>1, 3</td>
</tr>
<tr>
<td>Climate Health Impact</td>
<td>2009</td>
<td>Social Awareness</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2, 3</td>
</tr>
<tr>
<td>3rd World Farmer</td>
<td>2005</td>
<td>Social Awareness</td>
<td>6</td>
<td>-</td>
<td>-</td>
<td>7, 8</td>
</tr>
<tr>
<td>Darfur is Dying</td>
<td>2006</td>
<td>Social Awareness</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>5, 7</td>
</tr>
<tr>
<td>Finding Zoe</td>
<td>2006</td>
<td>Social Awareness</td>
<td>-</td>
<td>6</td>
<td>-</td>
<td>5</td>
</tr>
</tbody>
</table>

- **What Should We Tell Them?**[Soft Skills]: The educational objective of the game is sexual health communication. The game is a tool to help parents discuss embarrassing issues with their children [24].
- **Wawis World**[Social Awareness]: The game’s objective is to teach schoolchildren about the everyday life of children in Papua as well as encourage them to take care of the environment [25].
- **Global Conflicts**[Social Awareness, Ethics]: This game series is focused on both social awareness (example: Sweatshops) and ethics (example: Checkpoints) categories. The series includes several standalone games, each simulates a different key problem worldwide (games: Sweatshops, Checkpoints, Afghanistan, Border Crossing, Election Day, El Patron, Year One, Maquiladoras, Child Soldiers and Military Operation) [26].
- **PING (Poverty Isn’t a Game)**[Social Awareness]: The educational objective of the game is to form a starting point to discuss the subject poverty and what it means to be poor [27-28].
- **PeaceMaker**[Social Awareness]: The educational objective of the game is to increase perception about the ongoing conflict between Israel and Palestine [29].
- **Enercities**[Social Awareness]: The goal of the game is to create and expand virtual cities dealing with pollution, energy shortages, renewable energy, etc [6], [11], [30].
- **Virtual U**[Personal Skills]: It aims to provide a better understanding of the management choices and practices in an university [14].
- **Team-UP**[Soft Skills]: The goal of the game is to solve puzzles cooperatively and as a team by taking into account the team’s individual capabilities [31].
- **Cooking Mama: Mama Kills Animals**: This game is focused on ethics. The educational objective is to make the player aware about the cruelty involved in animal based food production [32].
- **Elude**[Social Awareness]: The educational objective of this game is to make people aware of depression as an illness, by presenting metaphorical representations of different emotional states, in order to create empathy with depressed people [33].
• Operation Climate Control [Social Awareness]: The educational objective of this game is to teach about the challenges presented by climate change [34].

• Climate Health Impact [Social Awareness]: The educational objective of the game is similar to that of the previous game, it is to give a better understanding of health impact on climate change [35].

• 3rd World Farmer [Social Awareness]: The educational objective of this game is to teach about the hardships (food, education, medicine, etc) brought by the reality of poverty in Africa [36].

• Darfur is Dying [Social Awareness]: The objective of the game is to make people aware of the Sudan humanitarian crysis [12], [37].

• Finding Zoe [Social Awareness]: The objective of this game is to make people aware of violence between genders in relationships [38].

3.3. Analysis

From our survey the most salient pattern is the distribution of the games across the different categories of our higher-level taxonomy terms, according to their main focus (see table 1). The current status especially promotes games from the Social Awareness category (11 identified) and furthermore it seems that it is also a trend since about half of these are from 2010, pointing to a growing interest in this type of SGs. By more closely looking into the specific topics addressed in these games, one of the fundamental contributing reasons for this trend seems to be the increased need/motivation for people to communicate social and global problems to other people. The main drivers seem to be problems of inequalities (ex: poverty), environment (ex: global warming) and conflicts (ex: Israel-Palestine conflict) that have underlying problems of social responsibility and economic nature.

Ethics is the category with the less number of representative games (2), more evident if we look at the number of total tags for this higher-level category when compared to the others. The reason for this low representativeness is not clear. One hypothesis is that evident morality issues are not that common since they are easily framed in a conflict of interests situation where there is both arguments in favor and against the issue being considered. In these cases the problem of morality is so intertwined with the conflict of interests that it frequently dissipates or merges into a social awareness problem. For example consider the “Checkpoints” game from the “Global Conflicts Series” which simulates situations where people are forced to wait in queues to cross the Israel-Palestine border, and some, possibly even in sensitive conditions (example: pregnant women), suffer prolonged discomfort and possibly health consequences while the guards neglect to give any type of care (This situation is depicted in the trailer of the game). One can think that these borders are a necessary measure for the security of the Israeli people, but is this negligent treatment “right”? Even though the situation’s frame can be one of security, the reality and the moral impact of the situation on people remains.

Regarding Soft Skills, and its two immediate sub-categories (Personal and Interpersonal Skills) the development of SGs in this area is far from that of Social Awareness, but still much more developed than that of Ethics. Furthermore, several of these representative games are from recent years that show some current interest in the area.

While analyzing the full categorization we notice that sometimes a SG can address several topics from a given branch of our taxonomy, but the main focus be in a totally different one. For example consider the game “PeaceMaker”, it has 5 Personal Skills and 3 Interpersonal Skills, but only 3 terms in the taxonomy branch of Social Awareness. This case and others with even less emphasis on taxonomy branches other than that of the main focus result from the contextualization and mechanics of the game developed to support that topic. The more demanding the game mechanics in terms of required skills or the more intertwined the concept to be presented with others, the higher the probability that there will be many terms outside the main focused area.

Finally, our categorization enables us to identify some gaps in terms of unexplored topics regarding Personal and Social Learning & Ethics. Regarding the higher-level categories all have representative games, but from
the 32 lower-level ones there are 8 with no game identified as including them. These areas with no representative games are gaps in terms of the topics covered and show opportunities for new SGs. For example, Clinical Ethics applied to the context of medicine: “Every clinician should recognize that ethics is an inherent aspect of good clinical medicine” [39]. A possible SG from this category would present several situations that physicians encounter in their own practice [39] and instruct them in the most ethical practice possible. Another example, Education (from Social Awareness) applied to the context of Africa’s development and quality of life for its inhabitants. There are several studies that explain and discuss the benefits of different types of education [40-41]. A SG promoting these findings and experiences to the general public could promote further aid to educational programs in that continent.

4. Stakeholders Survey

In the stakeholders survey the aim was to understand the stakeholders perspective on SGs regarding Personal and Social Learning & Ethics. To do so we assessed their needs, perceived barriers and facilitators for the adoption of SGs using a questionnaire.

4.1. Procedure

A questionnaire template was elaborated by the coordination of all the SIGs and reviewed for adaptation and uniformization regarding our application field by our SIG members. The questionnaire was composed of three sections each with a specific objective: (1) collect general information about the respondents, (2) identify the current use of methodologies for training/teaching/communicating (with and without SGs) and (3) identify new lines for the research and development in the application field based on open issues in the current state.

After the uniformization the questionnaire was then used by the members of the special interest group to perform to all available stakeholders. The compilation of this data enabled a critical assessment of the most relevant insights offered by the stakeholders’ perspective.

4.2. Stakeholder Types

The stakeholders to be considered where generally divided into three categories: developer, client and user. The developer represents people that create and implement SGs. The client stakeholders represent people that manage or coordinate the usage of SGs. Finally, the user category represents the stakeholders which actually play the SGs.

Additionally to the categorization the search for the target stakeholders was based on the different higher-level branches of our taxonomy. The environments where these stakeholders can be found vary. Accordingly, below is the description of the guidelines used in our search for candidate stakeholders to be contacted.

4.2.1. Personal Skills

Organizations/institutions where a given set of personal skills are required. Every situation requires a different set of personal skills, examples of positions where certain skills are needed and the corresponding stakeholders can be found are research institutions, management schools and designing companies.
4.2.2. Interpersonal Skills

Organizations/institutions where interpersonal skills are required. Many situations require interpersonal skills, examples of situations where they are needed and the respective stakeholders can be found are team building companies, social help institutions and leadership positions such as governments.

4.2.3. Applied Ethics

Organizations/institutions where ethical skills are important. Examples of situations where these skills are needed and the respective stakeholders can be found are hospitals, human resources management of institutions and social policy makers.

4.2.4. Social Awareness

Situations in a society where people need to be made aware of a given topic. Some examples of organizations which address these subjects and where the stakeholders for the sensitization process can be found are environmental protection companies and public health organizations.

4.3. Results

4.3.1. Respondents’ Profiles (Section 1)

During this activity 17 candidate stakeholders were identified. From these we received feedback from 8 stakeholders, in the other cases there was no answer or they were not available for participation. The participants’ organizations varied in terms of type and also the associated core activities: medium-small company (3), school (2), higher education (1), large company (1) and research (1). The respondents’ profiles varied accordingly (notice that one person can have multiple profile roles): frequent gamer (3), professional developer (3), researcher (3), trainer (2), university teacher (2), learner (1), school teacher (1), decision maker (1), university student (1), game competition organizer (1), game developer (1), day care teacher (1), occasional player (1), socio-cultural animation (1), game interaction designer (1) and “consultant on using games in culture, Education, Health & Tourism, Game & Interaction Designer” (1).

The next section of the questionnaire addressed the current status and practices put in action in the organizations where the stakeholders carry out their activities. The answers to these questions are divided into two sets, one for the participants that use SGs for their activities and another for the participants that do not use SGs. Regarding the distribution of participants, 4 use SGs in their activities and 4 do not use them for their activities. From those that do use SGs, 3 do it on a regular basis and 1 only occasionally. From those that do not use them, 1 uses them elsewhere, 1 plans to use them in the future, 1 thought about using them and 1 never used or thought about using.

4.3.2. Participants that do not use SGs (Section 2)

The questions for the participants that do not use SGs for their activities focused on why they do not use them, what alternatives are currently used and how interested would they be in using SGs. The SGs barriers identified are lack of expertise/knowledge (2), financial reasons (1) and lack of time (1). The main barrier is the lack of expertise/knowledge. Regarding alternatives to SGs currently being used the participants more commonly use off-the-shelf training tools.

At the end of this section the participants were asked to rate (from 0, not important, to 5 very important) their interest regarding eight characteristics commonly associated to SGF technology. The proposed facilitators
covered: fun teaching, employee training simulation, realistic situations, inter-user challenges, stimulates cooperation among co-workers, the possibility of being used for leisure, the possibility to be used in a family/friends context, gains in learning effectiveness. Even though all the characteristics were considered relevant facilitators for the adoption of SGs (all rating above 4) the ones most highly rated were “ Allows users to make realistic experiences in real-world simulations”, “Allows users to challenge themselves and colleagues in accomplishing realistic simulations of work tasks” and “Gives gain in learning effectiveness (in terms of retention, adoption and application of knowledge)”.

4.3.3. Participants that do use SGs (Section 2)

From these participants some more details regarding the SGs used was collected. First, the specific users of the SGs used in the activities of the respondents varies widely across the different games they mentioned in the questionnaires: elementary students, school students, university students, adult workers in general, children visiting museums and adults interested in Japanese culture. Regarding the frequency of play (example: daily, monthly, etc.) for the games used, it varied according to the context of the game. Some games were played both as one-shot and as re-playable, depending on the context and the willingness of the person to repeat the same tasks.

Next we collected information on current SG design trends. The reported preferred game mode is single player (3) when opposed to multi-player (1). Regarding the environment the respondents identified a design trend for 2D environment (3) opposed to 3D environment (1), with similar preference pattern regarding a cartoon style (3) over a realistic one (1).

In the final part of this section we tried to understand what are the barriers for SGs adoption from the perspective of SG users. To do so we asked them to rate (from a 0, strongly disagree, to 5, strongly agree) how much they agreed to 13 proposed SG adoption barriers. The proposed barriers covered: unknown practical application, business models, costs, return of investment, unwillingness to change processes, business practicality, low familiarity with the technology, reliability of the technology, low availability, worries about integration, lack of interest by customers, educational effectiveness not proven and a lack of a suitable learning model. Most of the proposed barriers received very split answers. Interestingly, the two highest rating characteristics: “Key customers or suppliers will not be interested in using it” rating $M = 3.75$ with $SD = 0.5$ and “Not enough is known about the practical application” rating $M = 3.5$ with $SD = 0.56$; were among the five most unanimous. Less unanimous, but still the only other properties rating above 3 and with a $SD < 1$ were the properties: “Cost of the system”, “Unconvinced of the business case” and “Educational effectiveness not proved”; all rating $M = 3.25$ with $SD = 0.96$.

4.3.4. Needs and Desiredata (Section 3)

In this section we analyze the participants’ answers regarding SG needs. To do so we used open-ended questions regarding characteristics of SGs and their view on SGs challenges. First we asked if the respondents were satisfied with the learning/fun of SGs and to identify their weaknesses. From the respondent’s answers we identified the set of weaknesses:

- **Learning:**
  - The expected impact in means of usage was not achieved;
  - Bad integration of learning into gameplay;
  - Bad instructional design tasks;

- **Fun:**
  - Often not motivating compared to pure entertainment games;
  - Lack of fun.

After the weaknesses question we asked how the SG experience could be improved for them and the following possible solutions were given:
• Closer cooperation between schools and teachers;
• Identify game mechanics that match the teaching approach;
• Personalization for player character customization;
• Design realistic learning paths;
• Feedback about formative assessment;

Next we asked the participants what are the major challenges for SGs in their domain. The challenges identified were the following:
• Production is expensive;
• Limited school acceptance;
• Too little budget for engaging graphics;
• Too little pedagogical expertise on the part of game designers;
• Too little game design expertise on the part of researchers;
• Quickly changing education fields that might quickly turn games obsolete;
• Turning reality, which sometimes is not fun, into entertainment.

Following the identified challenges we asked about possible solutions for them. Several participants did not offer any, the ones mentioned are the following:
• Structured approaches (pick a suitable genre, identify learning-gameplay matchings, implement these in reusable software);
• Outline psychological frameworks;
• Better game design.

4.4. Summary of Insights Gained

The questionnaires performed offered insights into the current state and possible developments in this field of interest.

Regarding the adoption of SGs, we captured two different perspectives from stakeholders that use SGs and those that do not. For non-users the proposed facilitators offer insights into paths to explore in the dissemination of SGs. However, there are barriers that should be addressed through proper SG diffusion dynamics, especially the lack of knowledge/expertise on the side of stakeholders. From the SGs users’ perspective some SG design trends were clearly identified: single player games in a cartoon style 2D environment. Regarding adoption barriers these users’ responses highlighted the lack of knowledge about practical application and the lack of interest by customers. Additionally, some SG challenges and possible solutions for these were also identified. Some can be readily addressed by actions of integration of current research:
• Closer cooperation between schools and teachers;
• Personalization for player character customization;
• Structured approaches (pick a suitable genre, identify learning-gameplay matchings, implement these in reusable software).

However, other problems/solutions are open issues that cannot be solved by such simple actions and will require further research:
• Identify game mechanics that match the teaching approach;
• Designing realistic learning paths;
• Feedback about formative assessment;
• Outline psychological frameworks.
5. Discussion

In the game survey we strived to cover as most sources of SG information as possible. It is impossible to be absolutely certain about the inclusion of all the existing games in this area. Hence, our claims are completely based on our data collection and its representativity is based on our team of experts’ judgment. The distribution of SG through our taxonomy varies much across the different topics covered. From the games selected as representative cases we could observe that the main focus is mainly in Social Awareness. In section 3.3 we analyzed possible reasons for this trend.

Additionally, two other factors can bias our survey. First, it is possible that several games relevant for our subject have not been publicly or widely advertised in order to be added to those sources of information. Second, these sources frequently contain SG addressing many topics and games that based on our taxonomy, should be taken into account by us but might have been overlooked since different sources have different ways to present the games to which they have a register. For example, games classified under taxonomy terms such as Social Awareness - Health are especially prone to possible overlaps with other SIGs focused on health topics.

A different result from our game survey was the identification of SG development gaps, which show what are the areas less covered by current SGs and represent opportunities for companies and institutions interested in those topics. Ethics is a gap that stands out since games addressing this topic have a wide range of applicable complex moral situations existing in today’s world. Additionally, the use games and ethics is already a topic being explored which facilitates the addressing of this gap. In [42] many of these topics are discussed such as the importance of ethics, value of games for ethics and even game design principles for games addressing ethics are presented.

The stakeholders’ survey provided us with information about their perspective on SG status, barriers and facilitators. One central difficulty we faced was to commit the contacted stakeholders to reply to our contacts in order to increase the impact of the survey. However, as presented in section 4.3.1 many times they were not available to participate. One of the key problems in this activity was to motivate the people to answer our queries, in future assessments this issue should be more carefully planned in order to obtain more answers.

However, even though we only received 8 answers we managed to cover several types of stakeholders as can be observed by the data in section 4.3.1 on the participants’ working organizations and also the wide variety of their profiles. This is encouraging since it widens the range covered of our stakeholders’ perspectives.

Finally, regarding our taxonomy it was a very useful tool for the analysis preformed. Nonetheless, we do not consider it to be a static construct but rather a dynamic categorization of the application field Personal and Social Learning & Ethics which can be subject to modifications based on future contributions and the evolution of the overall SGs panorama.

6. Conclusion

The presented taxonomy for the field of interest Personal and Social Learning & Ethics worked well for our survey purposes. It provided a common vocabulary for the surveying activities carried out and as such was crucial to the contextualized discussion of the two different types of analysis performed. The representative games selected are an example of the type of complete categorization that can be achieved with it. This taxonomy was well suited for our activities and a good starting point for any attempt to analyze the targeted field of interest, but it is to be considered an evolving construct according to future contributions.

The game survey resulted in a structured view of the current status, trends and gaps of game development in Personal and Social Learning & Ethics SGs. However, notice that this survey was carried out during the first
half of 2011 and as such more games have been brought to our attention. We already have an extensive list of games to continue our analysis.

The stakeholders’ interview enabled us to see the field we addressed from their perspective. They represent the people who develop, buy and use the serious games approaching the targeted topics. The main contributions from these perspectives was the information collected regarding the major barriers and facilitators for serious game adoption in diverse learning contexts which can lead to future improvements in the process of SG development and dissemination in the field.

This work constitutes a view of current panorama of SGs in the field of Personal and Social Learning & Ethics presenting opportunities for the development of games in this area as well as directions of future research to improve the creation and dissemination of SGs to the adequate learning environments.

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