IO3 - BeCSR Serious Games Research (O3/A1: Preparation)

Co-funded by the Erasmus+ Programme of the European Union

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Context and goals

The development of the BeCSR Serious Game (Blueprint) under IO3 has two main purposes. Firstly, to enrich the overall BeCSR programme, we plan to develop a first 'add-in' to the overall programme to enrich the teaching and learning of safe and responsible internet behaviour. Secondly, by doing so we provide an example of innovative on-line SEL for CAM to serve as a blueprint to encourage the development of other SEL 'add-in' materials by staff and others along the same established, structured and quality-checked lines.

The BeCSR Serious Games are specifically designed to make a major contribution to CAM's social and emotional competences, learning behaviour and consequently their on-line media literacy and ability to make sensible and safe decisions when they are on-line.The use of on-line platforms to encourage on-line safe and responsible behaviour turns a threat into a positive influence on CAM.

This report on the first phase of research (IO1/A3) aims to determine the key success factors in serious game design and the gathering of the latest best practices in this field. The summary of our findings and main conclusions are found in this document.

Research Introduction

Although there has been an increasing awareness about the potential of serious games for education and training in many disciplines, research still witnesses a lack of methodologies, guidelines and best practices. Which deal with how to develop effective serious games and how to integrate them in the actual learning and training processes.

Creating a serious game about bullying can be used as a way to support deep and personal understanding of the complex structure of bullying. Moreover, such game can stimulate and support informed discussions, which are mediated by teachers, educators, and other professionals – not simply to provide automated dogmatic recommendations or automated teaching.

Research Background

Serious Games

Serious games "do not have entertainment, enjoyment, or fun as their primary purpose" (Michael, Chen, 2005). Many serious games do actively strive for their end-user's enjoyment, however, also aim to achieve therapeutic or educational benefits, or other impacts, that the game entails. Certain serious games are dedicated to promoting issue-awareness and discussion, and actively try to undermine or reverse enjoyment. Unlike simulators which attempt to reproduce reality as close as possible, serious games often, however not explicitly, convey messages through gameplay restrictions, narrative, and underlying rules (Rodrigues et al, 2013).

Bullying

Bullying can be described as an act of one or multiple people with more power intentionally and repeatedly causing harm to another person or a group, who feel helpless to respond. (Rodrigues, Neves, Barroso, Morgado, 2013). Olweus (1994) offers a slightly different explanation of bullying. According to this source, "bullying" can be referred to as "a situation when a student is a victim, repeatedly and through time, of negative actions of one or more". Such actions include behaviours intended to harm and/or cause fear, through physical contact, word, gesture or intentional exclusion from a group. The victim, in most cases, is unable or finds it difficult to self-defend (Reijntjes et el, 2013).

In the recent years, the concept of cyberbullying has arisen (Hong, Espelage, 2012). Cyberbullying can be described as to intentional and repeated threats and offensive actions using the new information and communication technologies. Such technologies can be emails, text messages, and (often anonymous) comments in social media.

It is important to note, that according to Olweus (1994), bullying is more common among boys than among girls. Moreover, Reijntjes et al (2013) states that bullying can lead to problems in school outcomes, have influence on personal adjustment (depression, low self-esteem, social anxiety and in extreme cases, suicidal behaviour). As well as negative impacts on well-being and health. Data from Reijntjes et al (2013) also shows that students who are in the high risk of bullying in school are from racial or ethical minorities, those with health issues, learning problems, or from low-income families.

Serious game creation

Why you should use a video game

Serious games can be used as alternative and effective way to convey new knowledge to people. Modern theories of effective learning state that learning is most effective when it is active, experiential, situated, problem-based and provides immediate feedback (Boyle, Cannolly, & Hainey, 2011). Games have the potential to offer such learning experiences.

Theory

Bloom, Engelhart, Furst, Hill, Krathwohl (1956) explain how such process can be visualized as a 4 phase cycle: “Adults learn through a process that involves a set of sequential steps: (1) obtaining concrete experience; (2) observing and reflecting upon this experience; (3) formulating abstract concepts in response to this reflection and observation; and (4) (actively) experimenting to test the validity of these concepts”.

Any adequate intervention regarding bullying should combine traditional methods (individual or group actions to provide information and raise awareness among students, teachers, school managers and parents) with innovative approaches, including positive use of new information and communication technologies (Hong, Espelage 2012). From the perspective of an individual intervention it must consider two main issues to be effective: 1) to empower teenagers with competences and knowledge to deal with bullying, and 2) to provide information on how to deal with potential threats that may happen through e-mail, sites, chat rooms or social media.

Situating the learning

Situating the learning generally refers to the fact that in order to fit the context of use the best, the game must be appropriately deploying environment as well as have proper interactions. In practice, this may be applied in several ways. For instance, an immersive 3D environment could be powerful and effective, however only if it serves the learning objectives properly. Meaningful context can help learners a lot and fosters recall and new knowledge application to real life easier (Dalgarno, Hedberg, 2001). However, on the topic of 3D is must be noted that, the use of the 3D environment in online deployment should add value to the game and the learning itself. To illustrate that, a good example of 3D environment can be seen when the game is focused on the development of soft-skills like communication. Then the game might require reading the expression on the Non-player Character’s (NPC) face. In this case, 3D can be used to position the player avatar in the best distance from the NPC and instil trust. On the other hand, when the goal of the game is to learn about business process

management (as in Innov8), there is practically nothing constructive in wandering back and forth through the 3D world.

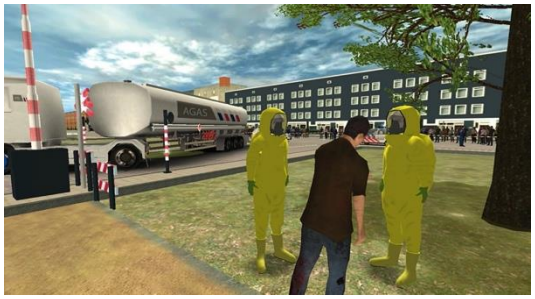

Figure 1 RescueSim using 3D as away to immerse the player

Figure 2 As Innov8 does not focus on exploring the office, this 3D feature only distracts the player

Metaphorical games can provide a high level of contextualization. An example of such game can be Elude, which aims to raise empathy and awareness of specific conditions related to others (depression) without flooding the player with large quantities of information to which (s)he has no relation with.

Cognitive load

This basic rule follows experiential learning recommendations from Rogers & Freinberg (1993) and Gagné (1985) (1992) for setting ideal learning conditions. It is noted in the beforementioned sources that removing the cognitive load contributes to keeping high the level of engagement, of attention and of game playability.

Games like Shortfall and Thiatro are reported to have a good design since players are introduced gradually to increasingly difficult learning tasks. Games with a user friendly interface, might also fall under this rule as the players do not need to waste time in understanding how to navigate the game. On the contrary, inherently complex game design as in Plantville can have a negative impact on both gaming and learning since the players are lost in trying to understand the goals and how to play (Catalano, Luccini & Mortara, 2014).

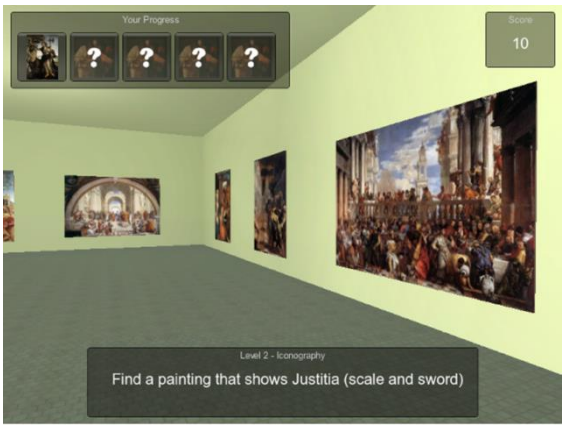

Figure 1 Simple design and user-friendly interface in Thiatro

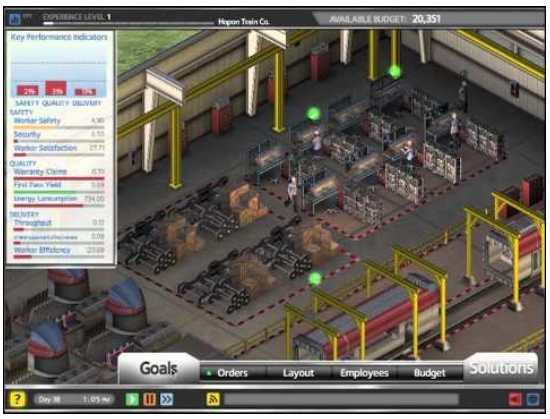

Figure 2 Task & Visual overload in PlantVille

Learners engagement

Learner's engagement has to be triggered and kept high during the game session (Catalano et al, 2014). Learners engagement can be enrichened when they are engaged in building their new knowledge (e.g. by role playing, solving puzzles, achieving a task, coming to a decision collaboratively). In order to support this, it is good practice to remove any useless redundancy (e.g. avoiding repeating the same tasks, providing hints at the right time for preventing blocks in the game flow, and choosing the appropriate interface and interaction mode). Instead, the provision of maps that gives the snapshot of current achievements progress could be helpful. Any kind of real-time feedback and of self-evaluation is an important factor that supports engagement and follow the experiential learning best practices. In addition, a variety of scenarios or the introduction of random elements that may affect the game development should prevent repetitiveness and too deterministic action flows that would help players in predicting and anticipating the flow of events and likely missing part of the learning goals (Catalano et al, 2014).

It is very important for the game to provide full engagement, so that the player is constantly focused on the learning task. However, the goal should be focused not on the reach a winning state, but on learning effectively from a rich and realistic experience and in a safe environment. Therefore, even the frustration felt by players failing their tasks is part of the learning triggers that is typically used by facilitators during the game session itself (whenever the player realizes that a decision made has brought to negative consequences on the game development), but likely more in the debriefing session just after

Facilitating the task

If the complexity of the game is high, it might require efforts to support learning with facilitation. This can be done by :

1. the briefing phase has the goal to raise the attention of the learners by exposing them to their learning objectives, game rules and recall of prior knowledge;
2. the facilitation during the gaming session builds on the previous stage and helps in providing the actual learning guidance;
3. the debriefing phase is designed to consolidate the learning not only via facilitated debating and assessment of the game learning experience but also by transferring it to the ordinary reality.

it is very important to consider carefully whether the learning objective and the subject domain require facilitation or not at the very beginning of the game design. If it is the case, the relevant stakeholders (e.g. educators, facilitators, domain experts) have to be involved from the beginning of the project and the three stages of the workshop have to be considered as a learning process continuum of activities (Catalano et al, 2014).

Flexibility, reusability, exploitability

One of the best ways of keeping high the level of engagement is presenting a wide variety of situations and scenarios which may bring value well beyond the original scope of the game (Catalano et al, 2014). For example, the same game scenario can be used to address different learning objectives, or presenting multiple scenarios for the same goals. This kind of flexibility offers the possibility of reusing the serious games in different contexts.

EagleRacing, Synergy, WhatADay are all good examples of games that have been successfully deployed in different industries. Beyond the quality of the design, most of the merit is likely due to the fact that

they address soft skills such as collaboration, change management and crisis management that can be applied into every business and management sector.

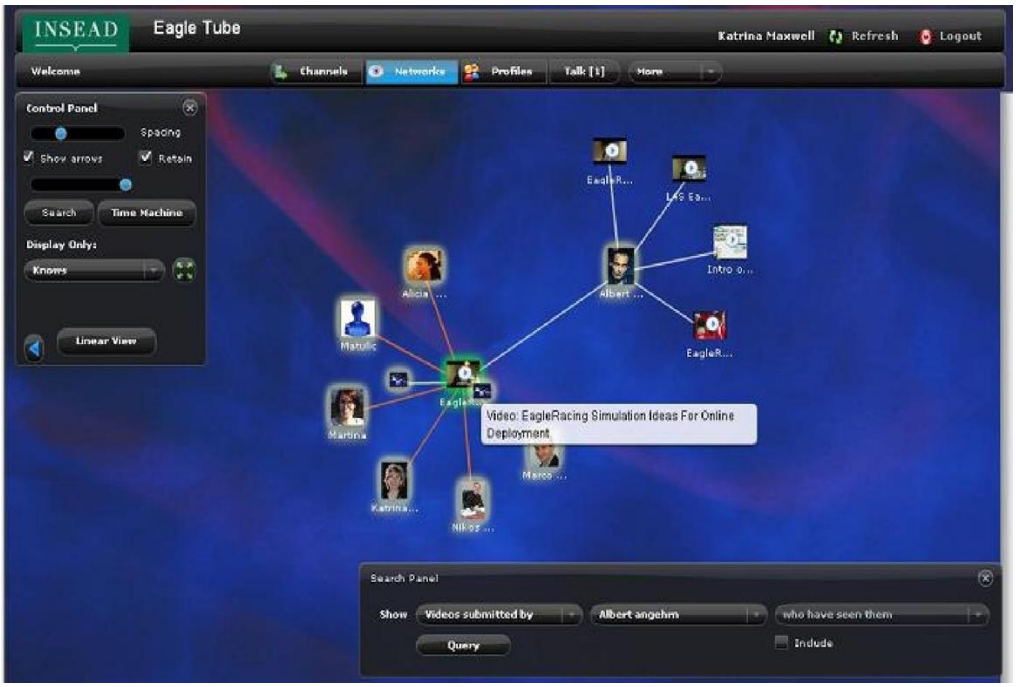

Figure 3 EagleRacing also shows that Serious Games can take many forms

It is possible that a game can be found useful in contexts which were not foreseen originally. However, when this happens, it is probably due to the richness and complexity of the scenarios. The technological choices made at design level are necessary conditions for successful diffusion.

Evaluation of learning impacts

While some game-based learning models have been developed already, they do not specifically tackle the evaluation of the learning impact produced in the learner by playing serious games.

Pre/post-game questionnaires and interviews are the most widely used instruments for capturing pre-existing knowledge, on the one hand, and what has been learnt during the game session, on the other hand. It must be noted that Multiple-Choice Questionnaires (MCQs) do not give the respondents enough freedom to express themselves, and it is necessary to introduce open questions so that learners can find a less rigid framework to provide their feedback.

In addition to this, when filling post- or pre-test questionnaire, there is the risks of “selective attention” and “confirmation bias” according to which people tend to favour information that confirms their belief or hypotheses (Wason, 1968). Therefore, it should be recommended to change the order of the questions between the two questionnaires. It can also be possible to disperse the final questions among many other less or no relevant ones in the pre-game questionnaire. This is done because the player may be affected by patterns in the questions and brought to pay attention only to the few aspects of the game, related to the questions of the pregame questionnaire.

When choosing on the data collection method it is important to remember that all the questionnaires that are related to tests, closed questions and in particular to MCQs are good for deriving statistical analysis findings that could be useful when a game is deployed at large scale. All the other data collected via open questions, interviews and direct observations are good for qualitative evaluations. However, another category used to assess the level of learning and is given by interaction and activity logs that can track players' behaviours while playing the game and assess their performance in real time (Bellotti, Kapralos, Lee, Moreno-Ger & Berta, 2013).

Challenges

On one hand, there are several aspects that must be taken into consideration regarding methods of dealing with an aggressor/bully, to avoid instances in which victims may become vindictive and violent. This behaviour reproduces bullying itself, which is undesirable. On another hand, it is important to realize that both parties – victim and aggressor – need to be targeted for intervention, in order to diminish the likelihood of bullying occurrence. A way to solve this can be presented in a game that is continual, non-ending story: regardless of one's actions, as long as there is no catastrophe of eucatastrophe, there would always be another day. Meaning, if one escapes the bully, there is another day; if one confronts the bully, there is another day. Whatever one does, as long as a catastrophe doesn't occur, there is another day. This holds the potential for including in the game thought-provoking events: will a victim, if taking wrong actions in response to bullying, become a bully himself/herself, come the next day?

Designing properly the learning evaluation metrics is an impact project. It is key to identify all the goals that are not domain specific and that may be collectively recapped as intangible values to be captured (e.g. raising awareness, supporting motivation) as early as possible. As well as the kind of data to be collected (based on game deployment, on privacy and ethical settings and requirements, and on the availability of data analysis tools / instruments) in order to define what are the suitable learning metrics.

Another challenge that might arise is designing a serious game as an integrating part of a learning program. If the serious game is an integrating part of a learning program, it acquires a more significant status and value to the eyes of the learners. However, particular care should be posed to the early involvement of all stakeholders not only in the design phase but also in the evaluation one. If the game is facilitated, if the learning objectives are complex and require training of the trainers, if it is possible to bring the serious game from a deeply contextualized setting to a more general one and addressing different domains, it is very likely that not only the maximization of the learning impact will be pursued but also that effective instruments for measuring the actual learning gain will be put in place.

One of the most criticized but still implemented way for collecting feedback and data is the use of questionnaires. If not carefully designed, questionnaires are ignored or refused any time that a responder is not really obliged to answer them. For instance, it has been reported in business environments that executive managers delegated the task of answering to questionnaires to their assistants, which clearly affects the quality of the evaluation based on the collected data. Educators and game designers could cooperate to try to find such alternative instruments, by gamifying the questionnaires, or by assessing learning achievements and collecting the related data in a different but still transparent way. Even the latter may represent another challenge as the actual risk of interrupting the flow while measuring/assessing could be quite high as it gets along with the risk of increasing the cognitive load of the game.

Both consequences might be likely more undesirable than the original issue eventually. Another partially addressed issue is the measurement of the learning impact over time. Learning retention and the ability of sustaining learning actionability in the medium and long period should be better investigated.

Conclusion

This manual attempts to gather reliable data on bullying, serious games and the combination of the two. The paper highlights the best practices as well as shows the issues that might occur when trying to develop a serious game about bullying. With the advent of new technologies, different serious game advances as well as popularization of it can be expected. Some of the developments will relate to game mechanics, while others will focus on accurate modelling and game design. Moreover, it can be pointed out already that AI will play an important role and possibly even reshape the way facilitation is performed. This can result in virtual facilitators, who, by being a part of the game, preserve playability. Additional technological contributions can come along with the increased AI. For instance, substantial advancement can be expected also from Semantic Web (WEB3.0) which would allow to support AI itself and create more flexible, adaptable and customizable serious games: games played on the web can benefit of getting the right data and content and can support the player in the learning task in real time.

Serious game design would be certainly affected as it should allow to make the game “porous” towards the web and extremely reactive. Social Network Analysis (SNA) (Carrington, Scott & Wasserman, 2005) and learning analytics can become an important asset in this and not only for social games, but also for all the community of learners that can be gathered around collaborative/social platforms. Hopefully, SNA should support both aspects: maximization and evaluation of the learning impact. Anyway, not all of these scenarios will certainly happen or are even devisable. However, they will represent possible challenges that will be able to influence the way serious games will be designed and the way learners may play and acquire new knowledge.