

Essential Features of Serious Games Design: Search and Analysis Process

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1 Introduction

Instead of playing a digital game for entertaining purposes where learning might occur serendipitously, serious games are designed purposefully on creating, increasing and improving knowledge, attainment and skills for a specific subject field at any scale (Boyle et al., 2011; Barzilai & Blau, 2014). However, academics may feel overwhelmed by being involved into the process of designing a game. The process of designing a serious game involves specialist expertise on core fields such as pedagogy, psychology and computer science which when combined together may engender a high-fidelity serious game (Zyda, 2005).

Based on a scoping study as part of an SRHE award, this paper attempts to present the searching and analysis strategy undertaken to inform the process of conducting a systematic literature review on the design and use of serious games. The scoping study aims to provide a synthesis on the learning features and pedagogical-driven practices resulting in an agile integration with game features. The immersive and highly interactive features of digital games afford learning and teaching to be collaborative and situated in a context by scaffolding students' efforts to acquire knowledge and to develop useful skills (Starks, 2014; Sawyer, 2007). This led to an assumption that games may contribute on current efforts to transform learning and teaching as authentic processes (Raybourn, 2014) that comes naturally by engaging students learning situations that would trigger intrinsic motivation, self-efficacy and rapid feedback (Boyle et al. 2012; de Freitas, 2006).

In the following section the methodology of searching, collecting and analysing items that currently formulate a corpus of 76 papers is presented with emphasis on searching and data collection as well as on the data analysis framework used for creating the high-level categories and coding logic.

2 Methodology

2.2 Search Process and data collection

To represent the range of forms of knowledge in the field, the paper adopts a flexible definition of what constitutes research evidence from the wider evidence base. For example, much current evidence may be derived through practice, and communicated through case studies that provide contextual evidence of trends in practice, and an evaluative or reflective dimension. Material based on serious games and pedagogical research or practitioner-led scholarship/ evaluation, using a wide range of research methods are included in the datasets. Search design processes are conducted via a number of bibliographic databases (e.g. EBSCO – Academic Search Complete, Scopus, ERIC, BEI, AEI, CORE, BASE and ScienceDirect) to retrieve items based on parameters that are defined on the basis of an inclusive conceptualisation, a fully comprehensive approach to search and review of the research literature on serious games that would need to cover specific themes using search terms such as: “serious games” OR “serious games design” OR “serious games frameworks” OR “game-based learning” OR “serious games” AND “learning attributes” OR “behaviour” OR “learning outcomes” OR “teacher roles” OR “student roles” OR “assessment” OR “collaboration” OR “engagement” OR “pedagogic planner” thus to make judgements about inclusion and exclusion of items according to the centrality of the research inquiry on designing games in HE. Following selection of items from the corpus, preliminary analysis and classification is conducted to identify key themes relating to the study's main review questions. Each item will be classified according to a number of associated categories. The classification prepares the ground for the compilation of an annotated bibliography which provides fuller summaries of the content of each item; thus it informs the construction of the serious games pedagogic planner as a supporting architecture for academics to design their own games.

2.3 Data analysis

The 76 papers collected to date are being coded using a data extraction framework that was developed by reflecting on previous research, which categorised technology-enhanced learning dimensions, themes and outcomes along with specific descriptors for each coding as shown in Table 1 below.

Codes/Themes	Description
Resource identifier	Title, author, date of publication
Resource type	Research report, journal article, conference paper, policy document, book chapter
Research approach and methods	case study; survey; empirical research; quantitative; RCT; Correlation, Survey, Anova, qualitative, grounded theory mixed methods approach;
Serious games definitions	What serious games means? Different meanings and differences between gamification, game-based learning, online serious games etc.
Serious games genres	Simulations, role playing, puzzles, online games, strategy.
Learning Mechanics	Learning attributes used like in-game learning activities; assessment, feedback, learning outcomes; teaching and learning strategies, learning theory
Game mechanics	Game attributes like levels, game hints, scores, game narration; extrinsic and intrinsic rewards; avatars; dialogues;
SG Frameworks	Informed ways of designing and using serious games in visual and textual representations as means to support practitioners' use of games.
Behavioural factors	Affective and motivational; engagement, curiosity; behavioural change; motivation vs. rewards.
Role of the teacher	What is the role of the teacher in using games? Designer, co-player, use of existing games in own context; facilitator, transmit information and knowledge, assessor.
Role of the student	What is the role of the students in using games? Designers, players, self-direction, self-motivation, level of students in playing games
Pedagogical Planners for SGs	Resources for academics that provide principled guidance on planning in-game activities, and the preparation of associated learning resources.

Table 1: Themes used to code the literature

3 Conclusion

This short paper presented the search, data collection and data analysis methods currently being used as part of an SRHE scoping study investigating essential features of serious games design. It is envisaged that the coding procedure and a final set of synthesis of the evidence base will be close to completion by the time of the actual conference as to be able to provide preliminary findings on essential features of serious games design. It is also expected that systematic empirical evidence focusing on types of in-game learning activities, ways of providing feedback and learning outcomes associated with game mechanics will be reviewed. It is also hoped that by the time of the conference, the author will be able to propose a 'Serious Games Design Planner' for providing principled guidance to academics for the practice of designing their teaching ideas and interventions instantiated in a serious game.

References

- Barzilai, S., & Blau, I. (2014). Scaffolding game-based learning: Impact on learning achievements, perceived learning, and game experiences. *Computers & Education*, *70*, 65-79. doi: 10.1016/j.compedu.2013.08.003

- Boyle, E., Connolly, T. M., & Hainey, T. (2011). The role of psychology in understanding the impact of computer games. *Entertainment Computing*, 2(2), 69-74. doi: <http://dx.doi.org/10.1016/j.entcom.2010.12.002>
- Boyle, E., Connolly, T. M., Hainey, T., & Boyle, J. M. (2012). Engagement in digital entertainment games: A systematic review. *Computers in Human Behavior*, 28(3), 771-780. doi: <http://dx.doi.org/10.1016/j.chb.2011.11.020>
- de Freitas, S. (2006). Learning in Immersive Worlds: A Review of game-based learning. JISC. Available at: http://www.jisc.ac.uk/media/documents/programmes/elearninginnovation/gamingreport_v3.pdf [Accessed 19/06/2014].
- Raybourn, E. M. (2014). A new paradigm for serious games: Transmedia learning for more effective training and education. *Journal of Computational Science*, 5(3), 471-481. doi: <http://dx.doi.org/10.1016/j.jocs.2013.08.005>
- Sawyer, B. (2007). Serious Games: Broadening Games Impact Beyond Entertainment. *Computer Graphics Forum*, 26(3), xviii-xviii. doi: 10.1111/j.1467-8659.2007.01044.x
- Zyda, M. (2005). From visual simulation to virtual reality to games. *Computer*, 38(9), 25-32. doi: 10.1109/MC.2005.297