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Authentic context as a foundation for gamification and game-based learning

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Engage learners, the results of these endeavours are varied and there is still limited understanding of the success factors and design principles of pedagogically meaningful gamified and game-based learning Gamified and game-based learning are becoming increasingly widespread in formal education. While the primary motivation for employing gamification and game-based learning tends to be the attempt to motivate and. This paper suggests that understanding the role of an authentic context is a useful starting-point for a meaningful gamified learning design. Drawing from human-computer interaction and educational research in situated and authentic learning it proposes the first steps for a roadmap towards a deeper understanding of the phenomena of gamification and game-based learning, venturing beyond the “fun factor”.

Keywords: Authentic learning, context, gamification, game-based learning, interaction design

Introduction

Video games are growing as an entertainment phenomenon. Based on Entertainment Software Association report from 2015, 155 million people play video games in the United States (Entertainment Software Association, 2015). The average age of a game is 35 while only 26 precent are under 18. Records from Australia show similar results with 76 precent of adults playing, while the average age has risen during the last 10 years from 24 to 32 (Brand, Lorentz, & Mathew, 2014). As gaming has become more popular, the interest of other fields and industries towards digital games has also increased. Some have postulated we are living the time of wider implementation of various forms of virtual environments, games and ‘gamification’ also for non-entertainment contexts such as business and learning (Gregory et al., 2013; Johnson, Becker, Estrada, & Freeman, 2014).

While the primary motivation for employing gamification and game-based learning tends to be the attempt to motivate and engage learners, the results of these endeavours are varied and there is still limited understanding of the success factors and design principles of these learning approaches. The “fun factor” can be difficult to capture in a gamified learning design, especially in a way that is simultaneously pedagogically meaningful.

More research is needed in order to better understand what constitutes meaningful game-based or gamified learning. In this paper we suggest that the understanding of context is a key in designing game-based and gamified learning. Although the question of context is of a central importance in both game design and learning design, it has not been discussed in much depth in game-based learning/gamification literature. On the other hand, its role and importance has been earlier emphasised in human-computer interaction (e.g. Dourish, 2001; Greenberg, 2001; Moran & Dourish, 2001; Moran, 1994) and interaction design (Garrett, 2010; Svanæs, 2013). In this paper, the concept of context and its relevance for the pedagogy of games and game-like environments is discussed and implications on educational design are suggested. The aim of the paper is to propose the first steps for a roadmap towards a deeper pedagogical understanding of gamification and game-based learning and identify questions for further research.

Games, gamification and education – venturing beyond the hype

It is no wonder educators have turned their eyes towards video games. Video games have been claimed to contain various positive affordances from improving general decision making skills, spatial awareness, overall health and wellbeing, and variety of professional skills in a safe surrounding (de

Freitas, 2006; Fröding & Peterson, 2013; Susi, Johannesson, & Backlund, 2007). Games also tend to hold a property that formal education often lacks: they are known to keep players engaged and motivated for extended periods of time. Such user experiences have lead to understand the deep engagement in interactive games (Takatalo, Häkkinen, & Nyman, 2015) through the concept of flow (Csikszentmihalyi, 2014).

Different approaches have been employed in the attempt of harnessing these user experience outcomes for learning purposes. *Gamification* is an approach that is gaining popularity at a fast rate. The term refers to the application of game elements in non-game contexts, such as education (Deterding, Dixon, Khaled, & Nacke, 2011; Johnson et al., 2014), usually with the prospect to improve students' motivation and learning engagement (Hamari, Koivisto, & Sarsa, 2014). On the other hand, *serious games,* games that have been purposefully designed for a non-entertainment purpose, are also on the increase. Serious games attempt to reach a balance between fun and learning (Bellotti, Kapralos, Lee, Moreno-Ger, & Berta, 2013; Ott, Popescu, Stănescu, & de Freitas, 2013). Finding a functional relationship between game elements and learning has been a hot topic in the area of education and training (Kapp, 2012). In order to achieve it, for example traditional instructional design models, such as the ADDIE model, have been compared to and combined with game design (Becker & Parker, 2012; Buendía-garcía, García-martínez, Navarrete-ibañez, & Jesús, 2013). Yet, the "silver bullet" remains to be found. The development costs of game-based learning projects tend to amount on the high side, and many of the initiatives have failed to redeem the high hopes placed on them (Moreno-Ger, Burgos, Martínez-Ortiz, Sierra, & Fernández-Manjón, 2008). Furthermore, the research reporting effectiveness of applications in this area of study have been claimed to be filled with questions of validity (Susi et al., 2007).

The most commonly used gamification strategies appear to be the incorporation of digital badges, rewards or points into the learning environment. However, it must be kept in mind that game-based learning – and gamification to an extent - combines games design and learning design. This is no easy and straightforward task and it should go without saying that a sloppy design with regard to one or the other will not result in effective and meaningful learning outcomes. Merely adding badges or leaderboards to traditional learning activities will hardly constitute quality gamified learning (see e.g. Kapp, 2012). As Gregory et al. (2015) point out, game mechanics that are applied without adequate pedagogical planning may turn out to be counterproductive and result in unintended consequences.

Research in the actual impact of gamification is still sparse and sometimes methodologically restricted. Moreover, there are grey areas in definitions: serious games, gamification and simulations seem to sometimes be used interchangeably, which makes comparison of results challenging. The available research knowledge suggests that game and simulation-based learning shows promise. For example, D'Angelo and her colleagues (2014) examined 260 STEM simulation studies and found a total of 59 unique studies that were either experimental (i.e., random assignment with treatment and control groups) or quasi-experimental (i.e., not randomized but with treatment and control groups). The results from the meta-analysis indicated that, overall, simulations have a beneficial effect over treatments in which there were no simulations. However, the studies analysed consisted predominantly of science education at the K-12 level, suggesting that there is a need for a more robust pool of high quality research studies in other domains. Hamari, Koivisto and Sarsa (2014) conducted an extensive quantitative literature review in order to examine the effects of gamification. Their findings highlighted that the manifold nature of gamification often not regarded in related studies. They introduce two aspects that are of a central importance in gamification: context and qualities of the user. This paper concentrates on examining the aspect of context and its role in the design of gamified or game-based learning.

Context in human-computer interaction

Before the advent of gamification, the importance of context has been discussed when designing technological applications. In human-computer interaction it has been examined especially in the area of context-aware computing (Moran & Dourish, 2001), which aims to create seamless people, process, place and time appropriate computing applications. Dey, Abowd, and Salber (2001) proposed a definition of context as:

> any information that can be used to characterize the situation of entities (i.e., whether a person, place, or object) that are considered relevant to the interaction between a user

> and an application, including the user and the application themselves. Context is typically the location, identity, and state of people, groups, and computational and physical objects. (p. 106)

Humans make meaning through interaction (Dourish, 2001). At the same time, human perception is actively directed towards the world and its objects, and it is shaped by previous experiences (Svanæs, 2013). This means that context is dynamic and ever-changing (Greenberg, 2001), and under constant redefinition by those who act in it. Whenever a technological system is introduced to an existing context, the context will impact and change it (Moran, 1994). At the same time, changes in the context impact on how existing technologies might be used, valued and supported. As such, contextual understanding is an important part of user experience design that aims to support everyday practices (Garrett, 2010).

Intentions, roles, time and place affect how users interact with a technology, and how they perceive it. Phenomenological and ethnographic descriptions, in addition to on-going design research, can provide rich accounts that can advice interaction design that supports everyday practices (Cilesiz, 2011; Greenberg, 2001).

Authentic context in learning design and virtual environments

The role of context is not only important in human-computer interaction, but in learning as well. The pedagogical model of authentic learning (Herrington, Reeves, & Oliver, 2010) has proved to be a useful foundation for learning design in different types of virtual environments (Teräs & Kartoglu, forthcoming; Teräs, 2014). The authentic learning framework provides practical guidelines for operationalizing pedagogical ideas deriving from situated learning (Brown, Collins, & Duguid, 1989). Situated and authentic learning models emphasise the contextualised nature of effective learning. The models have been developed to bridge the all-too-common gap between academic/school activities and the activities undertaken by practitioners in the actual contexts where the knowledge and skills will be used. (Brown et al., 1989; Herrington et al., 2010).

While authentic learning is often associated with game-like environments, the concept of authenticity tends to be used rather lightly, typically referring to the visual realism of the 3-dimensional environment. Caird (1996) makes a distinction between *physical* and *psychological fidelity* in the design of virtual environment training systems, and points out that the aspect of physical fidelity tends to be overemphasised, even to the point of naivety. From a learning perspective, the psychological fidelity, or *cognitive realism* of the learning environment may be of a far greater importance (Herrington et al., 2010). The idea of cognitive realism puts the role of an authentic context in the spotlight: it is essential that the learning tasks activate similar thought processes and actions as the ones required in the actual real-life context.

Suggestions for further research

Drawing from previous research in the areas of human-computer interaction and education opens new avenues for investigating gamified and game-based learning. Specifically, it is crucial to shift the focus from the “fun factor” and the novelty appeal towards a more pedagogically-driven research agenda in order to find meaningful and sustainable ways of integrating gamified learning and educational games in the curriculum. Moreover, in addition to controlled environments, gamification would benefit from being studied in natural settings in order to gain a richer understanding of the complexities brought about by contextualization. Examples of research questions yet to be explored include the following:

1) What are the user qualities, intentions and roles that affect how learners interact with educational games and gamified learning?
2) How does curriculum as a context affect and change an educational game / gamified learning experience?
3) What are the design principles of authentic game-based / gamified learning?
4) What factors create an authentic context in game-based / gamified learning?

The research methodologies appropriate for such research questions include phenomenology, ethnography, case studies, grounded theory and design-based research.

Discussion

Understanding the role of context in both games and learning is crucial for the development of meaningful game-based learning. Merely attempting to convey curriculum content through a game and attempting to use gameplay to motivate students in consuming that content is not a very in-depth approach to game-based learning. In particular, it is important to draw attention to the education philosophical underpinnings that inform the development of game-based and gamified learning environments. Focussing on physical fidelity at the expense of psychological fidelity or cognitive realism of the learning environment may result in insufficient attention to the learning side of the design. Consequently, the learning environment may be based on traditional views of learning as memorizing content and teaching as instruction, instead of reflecting contemporary constructivist pedagogies. Knowledge construction always takes place in a context. In the words of Dourish (2001), it is "creation, manipulation and sharing of meaning through engaged interaction" (p. 126), and it is this very process that defines the context in which we operate. This has direct implications on learning: action creates understanding. The essence of an authentic context consists of processes, skills and actions that take place in a certain setting. Therefore, for game-based or gamified learning to be meaningful, it must allow for and promote actions and interactions that create understanding and meaning. There must be cognitive realism, as the authentic context is socially constructed through the actions and interactions that resemble real-life settings. This transcends striving for learning engagement, and also finding the "fun factor", which some have debated as a dead end for games research (Calleja, 2011).

Gamification and learning connect people from various disciplines and fields. These people are still unfortunately working too often in silos, inside their own disciplines and worldviews. In *Where the Action Is: The Foundations of Embodied Interaction*, Dourish (2001) proceeded to lay the foundations of multidisciplinary conversation between technologists, practitioners, designers and researchers to build interactive systems with higher quality. He underlined the value people with different disciplines and roles can bring to development. The authors of this paper recommend connecting expertise and understandings in authentic learning, HCI and game studies in order to gain a deeper understanding of meaningful game-based learning that goes beyond the engagement hype.

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