Hot Issues in Game Enhanced Learning: the GEL Viewpoint

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Abstract

The territory of Game Based Learning has been widely explored, yet much has still to be done in the field. Both the methodological and the empirical aspects of adopting games for educational purposes require further in-depth investigation. What are, then, the current hot issues in the field? What relevant research questions are still to be answered? This is the area that this paper showcases, encapsulating in a nutshell the efforts of the GEL Theme Team, a working group on Game Enhanced Learning active in the framework of the STELLAR European Network of Excellence.

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1. Introduction

This paper discusses Game-Based Learning (GBL) with the aim of highlighting some key aspects to be considered and tackled in order to strengthen research in the field. In doing so, it draws on the activities pursued by the Games Enhanced Learning (GEL) Theme Team. Theme Teams are clusters of researchers from different EU institutions who come together to collaboratively investigate emerging research issues in the field of Technology Enhanced Learning (TEL), since Game Enhanced Learning is widely considered as an...
increasingly relevant aspect of TEL. The Teams are co-financed by the EC under the STELLAR Network of Excellence for TEL.\textsuperscript{1}

2. GEL structure and objectives

GEL, a one-year initiative that concluded in May 2012, investigated the fields of Serious Games (SGs) and Game Based Learning (GBL). It brought together seven researchers from six different countries and also gathered contribution from a number of other researchers in the field. Ultimately, the GEL community comprised around twenty researchers with a wide range of specific research interests: pedagogically-informed game design; game deployment in different contexts (school, adult education, business) and for different learning goals (developing reasoning skills, finance concepts, etc.); game-based learning scenario design; collaborative GBL; theoretical frameworks for GBL; interactional immersion design and learning evaluation, and so on.

GEL’s main aim was to provide a fresh, multidimensional contribution in the area of Game Enhanced Learning. The intention underpinning the group’s activities was twofold: 1) to help foster more effective digital game use in formal educational contexts by supporting educators’ adoption of (possibly new) pedagogical approaches; 2) to provide insights that may lead to more pedagogically sound digital games, thus also enhancing the intrinsic educational potential of games in informal learning contexts as tools that can enhance and consolidate learning. In pursuing these directions, GEL members engaged in a general discussion and identified a set of “hot issues” of concern to those studying and working in the field. The variety in interests and expertise of the GEL team was central to GEL’s multifaceted approach to investigating key issues for supporting pedagogically-effective development and use of digital games in the education field.

3. GEL’s Working methodology

After jointly examining the “state of the art” in the field of game enhanced learning, based on review of relevant papers and best practices, an initial discussion among GEL participants was held to identify the most significant issues worth investigating in-depth. Consequently a series of tasks was outlined and related research work was subdivided among subgroups of partners, based on individual interests and skills.

Teleurope\textsuperscript{2}, the STELLAR networking platform, was adopted for hosting discussions, collaborating and sharing work results. This, together with virtual and face-to-face meetings, contributed to offer partners a common view of GEL’s ongoing research and to open the door to external contributions, mainly from the STELLAR community.

4. Hot issues addressed

As mentioned, a number of hot issues of particular concern in the field of game enhanced learning were identified through GEL participants’ internal discussions and related literature reviews. These were jointly investigated: the rationale behind each specific issue is briefly described below, together with emerging considerations.

\textsuperscript{1}http://www.stellarnet.eu/
\textsuperscript{2}http://www.teleurope.eu/
4.1. Do TEL-related pedagogical paradigms also fit Game Based Learning activities?

In its investigation of game-specific pedagogical issues, GEL considered whether GBL calls into question traditional pedagogical approaches. One undertaking made in this regard was a survey of the literature to collect explicit references correlating certain games considered to reify different pedagogical paradigms commonly referred to in the TEL field. These include experiential learning, situated learning, problem based learning, constructionism, project based learning, inquiry based learning, multi-sensory learning and collaborative learning. A list of games was compiled that are held to present characteristics related to the specific paradigms and/or can be used in accordance with these.

Results from this investigation showed how close the fields of TEL and GBL are. It revealed that digital games can be adopted for a variety of educational purposes by exploiting a variety of learning/teaching approaches and methodologies so as to better suit the needs of contemporary education generally and individual students specifically.

4.2. What is required in order to make effective use of digital games for educational purposes? Does the teacher’s role significantly change when adopting digital games in formal educational settings?

The adoption of new learning/teaching tools always calls into question traditional techniques of classroom instruction and scheduling: changing the activities to be performed can modify, to a greater or lesser extent, the ways in which learners carry out educational tasks as well as the ways in which teachers might/must facilitate learning. This is particularly true when games are new tools to be introduced into classroom practice. What emerged in the framework of GEL discussions and activities was that a number of concrete steps still need to be taken to support and enhance the use of digital games in formal education settings and that the teacher’s role should also be reconsidered. As to the concrete steps to be taken, what is clearly needed is: better training for practitioners, simpler tools for authoring educational game activities, dedicated web-based communities and resources for practitioners, more institutional support structures, and wide-scale access to pedagogically effective games, to use cases and to potential game content.

As to the teacher’s role, it is widely accepted that educators enacting TEL activities in their professional practice need to adopt certain roles and attitudes to meet the challenges that these processes pose. In the case of Game Based Learning, teachers basically need to think outside the box and their new role requires a high degree of adaptation to new learning/teaching tools (knowledge of the pedagogical potential of each specific tool/game, personal experience in their use, capacity to integrate them into the curriculum and so on). The teacher should largely abandon the role of information-giver and assume that of facilitator and guide, acting also as a mediator and “ecoach”. Indeed, “not only should teachers know the game well, propose specific trajectories to the students and verify effectiveness” [1]. They also need to be mediators and foster post-game discussions: “the teacher can pop up some things from the game” and ask the students what they think about a situation or what made them act the way they did, as discussions lead to reflection [2].

Research is still being carried out into the formulation of clear guidelines to align game use with the curriculum and to help educators incorporate games in their practice so as to ensure a smooth continuum from theory/planning to deployment and evaluation; specific investigations on suitable/ specific learning analytics are also being investigated.

How can Game Based Learning activities be designed?

http://www.teleurope.eu/pg/forum/topic/130019/key-qs-corner-topic-1-pedagogical-paradigms/
To understand how best games can be exploited within formal education, we need to look not just at the nature of the game but also at how the game and its characteristics can be adopted and leveraged to enhance learning within the structural, organisational and cultural constraints of institutional education [3]. As a matter of fact the integration of these new technologies in class practice increasingly requires teachers to take into account a variety of different elements (e.g. changing roles, timing, contents, etc.), in an effort to ensure that these form part of a coherent, manageable whole that responds effectively to learners’ needs [4]. This entails investigation of different approaches to the design of game based activities. One way of tackling this question is through the definition of suitable learning scenarios based on specific pedagogical plans [5], artefacts that capture salient aspects of an instructional intervention and that represent a valuable aid both to its enactment and possible repurposing. Current research in the field of pedagogical planning mainly focuses on defining which instruments and methods best serve this purpose since a wide range of different tools and approaches can be adopted to assist teachers “in the thought processes involved in selecting appropriate methods, tools, student activities and assessments to suit the required learning objectives” [6].

As part of investigation into the specificity of pedagogical scenarios in GBL, GEL has devised a question matrix with the dual purpose of supporting educators’ reflection on the design process and for gathering data about their chief concerns in implementing game-based activities. Such reflection is critical at the very outset, before the practitioner begins planning a GBL-centred intervention, ideally with a suitable pedagogical planning tool. The matrix was derived from literature analysis and underwent a two-phase validation process. Input and feedback from a sample group of seven teachers resulted in iterative development resulting in the present stable beta version [7]. Use of the matrix for gathering data about practitioners’ concerns in GBL is currently being planned.

4.3. What scope is there for collaborative learning activities within GBL?

Collaborative GBL refers to the collaborative use of games and simulations for learning purposes [8]. In these games players can take advantage of the benefits of shared gaming experiences, assumed to facilitate mutual understanding, contribute to team building and develop the ability to learn with others in safe and engaging environments.

Collaborative GBL foresees different situations: games can be played in on-site based situations or in distance-learning environments where players are geographically distributed and interact in real time. Players or groups of players can collaborate or compete. The basic definition of collaborative GBL takes into account whether the game is played individually or in groups, and refers to situations involving more than one player, from dyads to massive player populations in MMORPGs (Massive Multiplayer Online Role Playing Game), a game-category that, by definition, involves a high number of players [9]. Further significant differences can be found among different games if we consider the group size and the different learning dynamics. Multiplayer games, for example, can contain a number of simultaneous communication channels, meaning that the traditional turn-taking problem of groupware applications does not apply. The players do not need to wait for their turn; they can continue to act and interact using various channels. If talking is not feasible, they may choose to have their avatar jump up and down or perform some other non-verbal action instead [10].

The GEL investigation and discussion on this subject revealed a scarcity of theoretical and experimental studies, even though many consider this to be a key field of study inside GBL research. The impression emerged that better understanding of collaborative processes in educational games could help the development of tools and methodologies for implementing collaborative-based environments and activities with potential benefit for learning outcomes both at individual and collaborative levels.
4.4. How can game mechanics and pedagogical design be reconciled?

One of the main problems in the educational games field is successful integration of educational/pedagogical design principles and game mechanics. In the digital games design sphere, the ultimate challenge is to strike an effective balance between engaging gameplay and effective learning (or at least providing the foundations for such). To meet that challenge, instructional and game designers require a shared vocabulary and a shared understanding of their different perspectives. One approach to this issue is the definition of a set of game design patterns addressing the pedagogical dimension. Patterns can be defined as: "semiformal interdependent descriptions of commonly reoccurring parts of the design of an educational game that concern and optimize gameplay from an educational perspective focusing on the integration of engagement and learning objectives" [11].

Pedagogically-informed educational game design patterns can represent a key practical tool to support the necessary collaboration among experts in different fields, mainly computer programming, pedagogy and the specific target domain, in all the choices to be made when designing a learning game.

GEL has studied the problem and subsequently developed a library of game design patterns structured specifically to meet this need. The library currently features example patterns in a range of categories: accessibility and inclusion patterns, assessment patterns, difficulty-balancing patterns, engagement patterns; integration patterns, metacognitive judgment patterns, performance visualization patterns, posture patterns, presentation patterns, reflection patterns, social patterns, storytelling patterns, temporal awareness patterns, teaching patterns, pedagogical paradigm patterns.

Each pattern category is further detailed and the pattern library itself is open to further contributions. The conviction is that a shared vocabulary and an understanding of how the instructional designers’ and game designers’ work can align and synergize could facilitate the development of high quality educational games.

4.5. What scope is there for educational exergames?

Exergaming is increasingly popular pastime activity that offers potential benefits in terms of both personal well-being and social health [12]. So the question arises about their potential application and adoption in education. Educational games controlled by players’ physical movements could represent a winning combination of learner engagement and educational effectiveness. In the field of Serious Games, exergames represent a new, unstudied branch of research. The integration of learning content and exertion interfaces raises new game design challenges.

GEL’s initial investigation of educational exergames considered some critical questions, such as the balancing of cognitive and physical workloads. A call for further educational exergames research was launched.

4.6. What is the significance of authenticity in games?

Authenticity is the quality of having correspondence to the real world [13]. As game-play is an experience, an authentic game is one perceived as such by players based on their past and their sociocultural context. It’s one thing to create conditions for authenticity in game design, it’s another to measure perceived authenticity at run-time. Authenticity is supposed to bring trust, involvement and thus motivation, and is closely related to other aspects such as immersion (feeling a situation as if it were real) [14, 15], presence (“being there”) [16] and credibility (linked to notions of trust as in Human Computer Interaction (HCI) studies - “trust the information” or “believe the output”). [17]

With respect to GBL, authenticity clearly plays a vital role in fostering engagement and motivation. In particular the meaningful experiences related to the learner’s life, the interdisciplinary nature of the real world
problems, the contextualization of learning objects and concepts are all motivational aspects that can be drawn upon in authentic games. These features in a learning tool also have, evidently, a bearing on the transfer of learning to real world situations. GEL has focused on authenticity, pointing out the need for creating conditions for authenticity when designing a learning game; two central questions have been discussed: Why should a learning game be authentic? How to bring authenticity to learning games?

As to the first question, in addition to the motivational, engaging aspects, it was noted that authenticity is especially important in those fields that are difficult to teach because students do not immediately see the purpose: learners are not motivated because they do not relate the learning goals to their personal training project. This is for instance the case with abstract teaching contents (e.g. statistics for medical students, calculus for engineers, etc.). Game-based learning brings an authentic context to the learning at stake by means of immersion and presence (as other approaches may do, e.g. inquiry learning, problem-based learning, by other means).

As to the second question, the fact was stressed that in a learning context, authenticity should be a key concern; it has also been underlined that authenticity does not necessarily mean a perfect reproduction of reality. What needs to be authentic are the main characteristics of the problems and activities, that is, those characteristics that require learners to mobilize the targeted knowledge in order to be successful in the game.

5. OPEN QUESTIONS & FUTURE PROSPECTS

As a funded research initiative, GEL had a one-year mandate to identify and explore a series of hot issues in games enhanced learning. The investigations carried out during that period have generated some interesting results and (given GEL’s limited timespan) have also left a number of open questions for further exploration. Much of the work undertaken in GEL will continue in the framework of the EU GALA Network of Excellence on Serious Games **, and specifically in GALA’s Technical Committee on Pedagogy (TC 2.8), a group to which most of GEL’s members belong.

GEL’s work has pointed to some possible routes towards broader practitioner adoption of games and appropriate leveraging of game activities to help meet specific learning/teaching objectives. The association of different pedagogical approaches with game artifacts/features, and developments in game-oriented pedagogical scenario design are two particular areas in which GEL has made a useful contribution towards advancement in the field. Furthermore, the creation of an (open) library of pedagogically-informed, educational game design patterns represents a significant step forward in supporting and fostering communication and collaboration among all those engaged in some manner in the game design process.

GEL has also revealed a need for deeper investigation into multiplayer collaboration and competition. While research evidence has already been provided for improved knowledge transfer, further investigation is needed into the impact of factors like individual player profile, contextual constraints, and player/learner time management, i.e. time on (game) task and its possible links with flow experience, performance and learning outcomes [18].

On-going innovation in Serious Games and GBL is opening up new frontiers and generating new issues to tackle. Authenticity is a prime example: new technologies and interfaces certainly have the potential to make the gameplay experience more immersive, with all the benefits that may bring for player engagement, but the question remains as to how best this can be balanced with effective learning. Another area where (technological) innovation is coming into play is exergames; further study and experience should reveal whether these have the potential to reach beyond entertainment and impact significantly in education.

** http://www.galanoc.eu/
A key GEL concern has been to consider GBL both from the viewpoint of game designer/s and also from those with responsibility for deploying and enacting game-based learning activities. This has highlighted the need to strengthen reciprocal understanding, and further explore how different pedagogical approaches may be supported both in game design and in game-based learning scenarios.

References