

## TEACHERS AS GAME DESIGNERS: ENHANCING INNOVATION AND CREATIVITY IN THE CLASSROOM

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### Introduction

During the last part of the 20th century and early part of the 21<sup>st</sup>, creativity has been seen to be increasingly significant in education (Craft, 2008). Indeed, many authors (e.g. Ferrari et al., 2009; Sawyer, 2006) suggest that creativity should be an important educational objective. Nevertheless, creativity still does not seem to play a central role in the curriculum or learning objectives that teachers are asked to follow in every country (Cachia et al., 2009).

Teaching creatively refers to teachers using imaginative approaches to make learning more interesting, exciting and effective (NACCCE, 1999). Game-based Learning (GBL) is a good candidate to fulfil these requirements. Indeed, games provide challenging experiences that promote the intrinsic satisfaction of the learners and offer opportunities for authentic learning (Gee, 2007; Mims, 2003).

In the context of the ProActive<sup>1</sup> European project – Fostering Teachers' Creativity through Game-Based Learning, this paper presents a study in which a GBL design approach is used to promote creative teaching methodologies. ProActive promotes an innovative pedagogical approach where practitioners at various educational levels become game designers and engage in creative teaching practices. Within co-design training workshops, teachers and trainers distributed in 23 pilot sites in four countries (Spain, UK, Italy and Romania) used two game editors for designing their learning games: <e-Adventure><sup>2</sup>, an open source software for creating adaptable 2D point-and-click adventure games for educational applications; and EUTOPIA<sup>3</sup>, a free of charge tool for designing multiplayer educational scenarios in a 3D environment. In total, 60 GBL scenarios were created, and are currently being implemented in real teaching contexts.

The main objective of the study is to analyse the conditions needed to stimulate the creativity of educators by engaging them in GBL design processes. This paper presents first results in school settings, considering creative GBL from the point of view of teachers and students.

### Creativity and game-based learning

Creativity in educational contexts can be seen from two perspectives. NACCCE (1999) made a distinction between teaching creatively and teaching for creativity. The latter refers to forms of teaching that are intended to develop students' own creative thinking and behaviours. On the other hand, the former refers to teachers using imaginative approaches to make learning more interesting, exciting and effective. Teachers can be highly creative in developing materials and approaches that foster children's interests. Sale (2005) provides a simple operational definition of creative teaching: "*Creative teaching occurs when a teacher combines existing knowledge in some novel form to get useful results in terms of facilitating student learning*".

Often teaching creatively has the major aim to make learning experience interesting, relevant to learners, as well as to assure the relevance of the curriculum to the learner, leading to increased understanding and learning (Jeffrey & Craft, 2004). However, there is a close relationship between these two approaches, as "*teaching for creativity involves teaching creatively. Young people's creative abilities are most likely to be developed in an atmosphere in which the teacher's creative abilities are properly engaged*" (NACCCE, 1999).

This study mostly focuses on fostering creative teaching practices and, through it, influencing students' creativity.

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<sup>1</sup> Lifelong learning Programme, Key Action 3, 2010/2011 – Website: <http://www.proactive-project.eu>

<sup>2</sup> <http://e-adventure.e-ucm.es/>

<sup>3</sup> <http://www.lanas.unina.it/eutopia/>

**How can games enhance creative teaching / learning practices?**

GBL is a good candidate to promote creative teaching practices that make learning experience engaging for learners, and that improve learning achievements while matching the curricular objectives. Indeed, digital games represent a good medium to promote active learning and improve students' problem-solving skills instead of simple fact memorization. It has been demonstrated that for certain target groups (e.g. school students), they can increase personal fulfilment and lead to higher performance (Blunt, 2007). Furthermore, digital games can provide challenging experiences that promote the intrinsic satisfaction of the players, keeping them engaged and motivated (Gee, 2007). Moreover, players have fun while playing a game because they have to learn it (Prensky, 2001). Indeed, in games, the challenge and fun usually increases as long as the game goes on. Therefore players need to improve their skills and learn new strategies until the game is completed. Furthermore, GBL has proved to promote authentic learning (Mims, 2003), "learning by doing" processes (Aldrich, 2005), and meaningful learning experiences by simulating highly interactive scenarios (Gee, 2007).

Some barriers to the implementation of GBL in formal learning settings by using commercial off-the-shelf games have been identified (Williamson, 2009), such as the lack of integration of most games with the current curriculum and assessment framework, time constraints, and teachers and parents concerns over the content of some games (e-safety). The big companies tend to ignore the educational market because of the difficulties posed by a wide and varied curriculum, a lack of interest on behalf of educational policy makers, the inability of schools to find the sort of money that commercial games tend to command and also the security issues associated with large institutions with small IT budgets.

In this context, educators may benefit from the ProActive approach where they are given the opportunity and the means to develop games for themselves that have direct relevance to their teaching practices.

**The ProActive approach**

ProActive offers to educators the possibility to use GBL as an innovative and imaginative approach in their teaching practices, in order to provide challenging experiences to the learners, that promote their intrinsic satisfaction and offer opportunities for authentic learning. To overcome the obstacles of introducing GBL in formal learning settings, a constructivist approach is adopted, in which teachers design their own GBL scenarios. The following figure summarizes the approach of the study. It links the concepts of creativity and GBL, in order to draw a four stages circle of creative GBL.

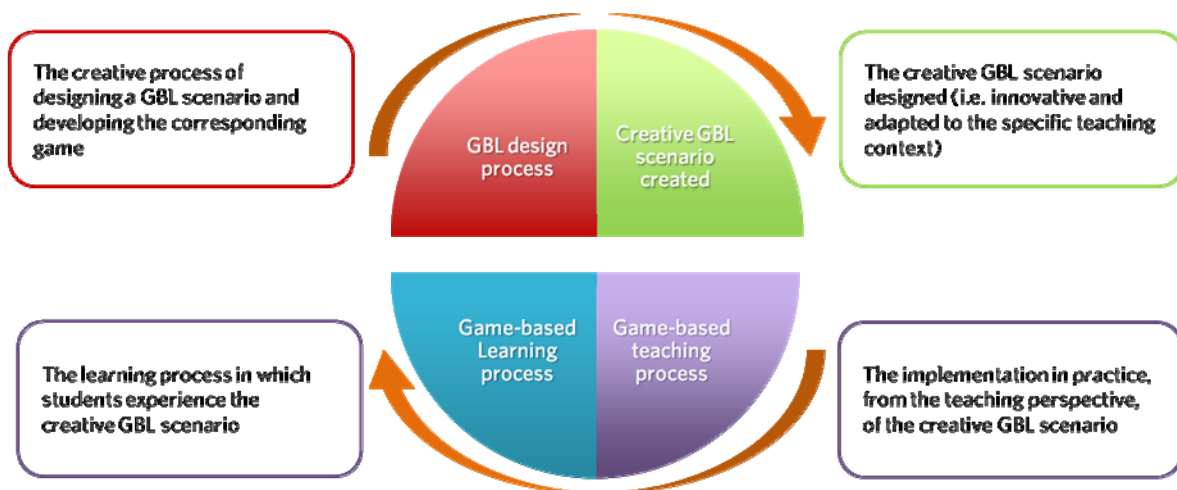


Figure 1 The integrated model of the creative GBL approach

The study proposes an innovative model through which educators become creative GBL instructional designers for their specific teaching purposes. The objective of the study is to explore each of these stages in order to analyse the conditions needed to stimulate the creativity of teachers by engaging them in GBL design processes.

Various activities were conducted in order to define the project methodology, concretize the approach and achieve the research objectives. This includes user needs analysis, GBL co-design process, and creation of GBL scenarios and their implementation in the classroom.

### Research design

At the beginning of the study, 15 focus groups were organized by the ProActive consortium in the different project countries with more than 70 educators. The main objective was to explore educational practitioners' use and attitude towards ICT and GBL in their teaching methodologies. Collected data enabled the identification of educators' interests and needs for developing their own creative GBL scenarios.

Many practitioners shared the idea of educational settings where learning happens in more natural and playful, student-centred ways. GBL perfectly fits in this vision. Furthermore, they stressed the importance of establishing a link between a subject and its application in real life context. Educational games were seen as a relevant solution, as they provide a safe environment where students are encouraged in exploring and experimenting. Practitioners also stated the importance of adapting their teaching methodology to students' actual computer skills and to society's changes, filling the generational gap. Indeed, pupils live in a society full of images, sounds and action, so that the concept of book, that is a static tool, cannot be claimed to be central to their repertoire. They feel that GBL approach is appropriate to respond to these issues. Finally, all participants positively valued the design approach proposed by the project, as it can provide them a context for bringing diversity and innovation to their daily teaching practices.

Among 23 pilot sites, more than 100 educators have been trained to the use of the ProActive pedagogical approach. Through both face-to-face and virtual training, practitioners were introduced to the ProActive approach to GBL and learnt how to use the two game editors. On this basis, an ongoing collaboration process took place during three months, in which the ProActive research team provided support to the participating teachers to help them in the GBL scenario design process. Support was given through regular meetings (co-design sessions) and online (Moodle, e-mails, etc.) and was related to pedagogical aspects (definition of learning objectives), game design strategies (writing of games' storyboards, definition of game dynamics and mechanisms) and technical guidance (help on the usage of the game editors).

In total, 60 GBL scenarios were created by teachers and trainers in the different project countries. They are related to a wide range of learning subjects (e.g. History, Physics, Computer Sciences, Language Learning, etc.) and address different educational levels (primary-secondary education, universities and professional training).

### Exploring creative GBL: initial results

First pilot implementation was organized in two pilot sites in Spain. During two classroom sessions (one in a primary and another in a secondary school) four games were tested in secondary school level, and one in primary education. In total, 14 teachers and 47 students were involved. The games, created with the <e-Adventure> game editor, were related to multidisciplinary subjects, such as local History and physical education.

In order to explore creativity in depth, data collection tools were designed and are being used at different stages:

- An open-ended questionnaire aiming to explore the characteristics of teachers' and trainers' GBL design creative process, linking the creative process with the GBL design process. The questionnaire was validated by recognised experts in the field.
- A questionnaire (validated by recognised experts in the field) aiming to evaluate the creativity of the designed GBL scenarios, according to three criteria: gaming, learning and technical aspects.
- In-depth interviews with teachers and students exploring the field implementation of the GBL scenarios created.
- Participant observations where researchers examine teachers' and students' behaviours during the field implementation.

The following sections explore the three evaluation axes that were examined at this stage: a) the creative process of the GBL design, b) the game-based teaching experience and c) the game-based learning experience.

### ***The creative process of GBL design***

Results obtained outline some well-defined stages that appear to be critical during the GBL design process. These stages do not appear in a particular order in time, as they can be revisited by teachers at different moments of the process:

- *Exploration of GBL and game editors:* This stage consists of acquiring relevant knowledge about how to create a quality educational game and explore the affordances of the game editors proposed.
- *Idea Generation:* Teachers' ideas of GBL scenarios mainly emerge from an exploration of the functionalities of the game editors. Furthermore, the examples of games showed within the training or found by teachers were an important source of inspiration. Generated ideas always took into account their specific teaching objectives and the students' profile. Furthermore, in many cases, ideas took into account external constraints (time available and editors' limitations). While some teachers chose to develop an idea which was rather easy to develop, according to resources available, other did not mind choosing challenging ones, as their objectives were to develop innovative resources.
- *Idea Validation:* Ideas evolved through the design process, as teachers adjusted them according to time constraints, editors' affordances, and their own skills to manage the editor. In some cases, ideas were discarded because they were not possible to implement with the toolset, or were perceived as too time-consuming or difficult to develop.
- *Detailing game dynamics:* Teachers found it very useful to write a storyboard in order to effectively expand their ideas into the plan of a full consistent game, by planning details about the game dynamics, the forms of gameplay, the content of scenes, and the progression of the narrative.
- *Using the game editor:* Implementation activities were interwoven with cycles of testing and redesign. Problems or gaps sometimes become apparent, prompting revision. Continuous adjustments of the game elements were necessary before the achievement of a working game.
- *Incubation:* Most of the teachers stated that they experienced incubation phases, during which ideas and solutions occurred while they were away from their games, e.g. while walking back home after an intensive day working on the game.
- *Evaluation:* Through an iterative process, the GBL scenarios were continuously reviewed by teachers according to their teaching objectives, in order to evaluate their appropriateness, usefulness, correctness, and value. Sometimes, teachers called out students, peers or experts in order to evaluate the quality of their scenarios.

In addition, the following elements appeared as important factors that have notable impacts on the creative GBL design process:

- *Intrinsic motivation:* Motivation in conducting the task was fundamental to achieve the objective. Besides their educational interest in GBL, many teachers are personally interested in games *per-se*, and were intrinsically motivated by the design process itself. Most teachers considered the process as enjoyable, fun and entertaining. However, some teachers felt pressure (because of time constraint) and frustration (because of some interactions with the editor).
- *Time constraints:* Time constraints acted according to a double dynamic within the design process. On one hand, it constituted a limitation, as teachers had to adapt (or in some cases discard) their ideas and strategies according to the time available. On the other hand, time acted as a motivation element by pushing teachers in achieving their goal within a limited period.
- *The editors' affordances:* The game editors appeared to have two roles in the design process. On one hand, they acted as mediators, by shaping the game dynamics and profiling its mechanisms, as well as facilitating the production of ideas. On the other hand, they acted as constraints, as scenarios are conditioned by the limitations of the software.
- *Collaboration:* In many cases, teachers collaborated with peers to create their games. This was perceived as very positive, as teachers highly valued sharing opinions and gathering new ideas, and felt involved in a common goal. In other cases, teachers involved their students in the design process, which enabled them to continuously evaluate the adequacy of their games for the targeted audience. Thus, collaboration acted in the form of inspiration, feedback, and guidance.

### ***The game-based teaching experience***

During the implementation of the games created in classroom settings, some important observations could be made regarding game-based teaching practices:

- *New methodology*: Teachers highly valued the fact of having learnt how to use videogames as a teaching tool, as they have to constantly evolve, renew and mature their teaching practices.
- *Get closer to students*: The teaching experience was perceived as very rich, as it enabled teachers to enter in their students' culture and reality by using tools that fully integrate their everyday environment.
- *Visibility*: Teachers considered that the experience contributed to the visibility of their teaching activities in the eyes of the public administration, the local educational policies and communities.
- *Role of the teacher*: The teacher's role in the classroom evolved from transmitting knowledge to flexibly tutoring and guiding students, by giving them appropriate feedback when needed.

### ***The game-based learning experience***

Regarding students' learning experience and interactions with GBL scenario, the following observations were made:

- *Improving learning achievement*: GBL practices appeared to contribute to the achievement of high learning outcomes. For students, it is easier and richer to learn with games, as they feel more actively involved in the activity than in a lecture: "*I have the impression that I am more attentive with the game*". Furthermore, teachers reported that students effectively learnt the knowledge embedded in the game, and that they would better remember the information taught, as the activity was engaging and the game appealing.
- *Motivation and engagement*: A high level of involvement of students in the GBL activity was observed. Students considered games as a new way to learn that is pleasant and enables them to "*learn without realizing it*". They expressed their preference for GBL sessions regarding normal classes. They especially enjoyed the visual and interactive aspects of the games (e.g. to be able to walk and to take objects), as well as the humorous elements. Some students even stressed that they would like to participate in the design process of the games. They positively valued the games as interesting, fun and well designed.
- *Self regulation*: Students showed a high level of autonomy during the GBL sessions, as they perfectly managed to interact with the computer and with the game interface. They naturally learnt how to interact with the game environment, to take objects and to speak with characters.
- *Collaboration*: A rich collaboration among students was observed. Mostly, students collaborated in order to help at each other or to arrive at an agreement before deciding which action to take in the game.

## **Conclusions**

This paper presented an innovative pedagogical approach where teachers become game designers and experience creative educational practices. The game development is supported by two game editors especially made to facilitate the creation of powerful educational environments. The result is a learning artifact (i.e. an educational game embedded in a learning scenario) tailored to the learning needs, institutional and curricular constraints and which can be shared with students. Creativity appears to be more a shared process rather than an individual skill. A scenario-based creativity emerged, in which students, teachers, games, domain and social culture are at stake.

Through a first evaluation cycle, initial results enabled to describe key aspects of the creative process of GBL design, which is characterised by certain creative stages, and is influenced by a series of factors (intrinsic motivation, time constraints, editors' affordances and collaboration). In addition, the implementation of the created GBL scenarios in real teaching settings proved to promote creative teaching practices in which high educational objectives were achieved, through the active involvement of students in rich learning processes. The approach directly addresses transversal competences needed in the information age, such as self-regulation and learning by doing. The successful implementation enabled validation of a concrete tested methodology for contributing to the development of creative competencies that match the challenges of the digital culture, and contribute to bridging the innovation skills gap.

The next steps of the study will provide a wide range of examples of innovative practical teaching experiences put in practice in real settings and validated, as well as contribute to the creation of active local and international communities of practice sharing a creative view on GBL. Such examples promote new models for integrating GBL approaches in creative teaching and learning practices applicable to various learning contexts.

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### References

1. Aldrich, C. (2005). *Learning by Doing: A Comprehensive Guide to Simulations, Computer Games, and Pedagogy* In e-Learning and Other Educational Experiences. San Francisco, CA: Pfeiffer
2. Craft, A. (2008). *Creativity in the School* London: UK Department for Children, Schools and Families' Beyond Current Horizons project
3. Blunt, R. (2007). *Does Game Based Learning Work? Results from Three Recent Studies* In Interservice/Industry Training, Simulation & Education Conference (I/ITSEC)
4. Ferrari, A.; Cachia, R.; Punnie, Y. (2009). *JRC Technical Notes – Innovation and Creativity in Education and Training in the EU Member States: Fostering Creative Learning and Supporting Innovative Teaching – Literature review on Innovation and Creativity* In E&T in the EU Member States (ICEAC)
5. Gee, J. P. (2007). *Good videogames and good learning: collected essays on video games*. New York: Peter Lang Publishing
6. Cachia, R., et al. (2009). *Creativity in Schools in Europe: A Survey of Teachers* In Report JRC55645 of the Joint Research Center of the European Commission
7. Jeffrey, B. and Craft, A. (2004). Teaching creatively and teaching for creativity: distinctions and relationships. *Journal of Educational Studies*, 30: 1, (pp. 77-87)
8. Mims, C. (2003). Authentic Learning: A Practical Introduction & Guide for Implementation. *Meridian: A Middle School Computer Technologies Journal*, 6(1)
9. NACCCE (1999). *All Our Futures: Creativity, Culture and Education, Report to the Secretary of State for Education and Employment the Secretary of State for Culture, Media and Sport*, UK
10. Prensky, M. (2001). *Digital game-based learning*. New York: McGraw-Hill
11. Sale, D. (2005). *De-mystifying Creative Teaching Competence*. International Conference on Redesigning Pedagogy: Research, Policy, Practice
12. Sawyer, R. K. (2006). *Educating for innovation* In Thinking Skills and Creativity 1
13. Williamson, B. (2009). *Computer games, schools, and young people. A report for educators on using games for learning*. Bristol: Futurelab