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Game and Learning Alliance
The European Network of Excellence on Serious Games

Deploying Serious Games for Management in Higher Education: lessons learned and good practices

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Introduction

- European economies tend towards being knowledge-driven,
- Success and competitiveness of European companies are ever more bound to their ability to be innovative and competitive.
- Leads to the need for changes in educational requirements.
- Need for teaching methods involving direct participation of students (O’Sullivan et al., 2011; Chryssouris and Mavrikios, 2006, Baalsrud Hauge et al., 2012).
- Game-based learning (GBL), in particular through SG might contribute Prensky 2003, Gee 2003; Ebner and Holzinger, 2007, Bellotti et al., 2010; Greitzer et al., 2007; De Gloria et al, 2012)
Problem description and objective

- Certain consensus about the educational potential of SGs in higher education (HE)
- Low deployment rate of SG in HE and their proper insertion in meaningful curricula.
- Generally attributed to an undefined teacher’s reluctance towards the use of games.
- Lack of papers describing deployment of SGs for HE
  - their educational benefits
  - providing guidelines and practices on their use,
  - comparison with other educational tools/techniques.

Make a first step in the direction of better characterization of the effectiveness and the use of SGs in HE
### Theoretical foundation

#### Cognitive competences in the Bloom taxonomy (Bloom, 1956) vs. Learning goals in the Revised Bloom taxonomy (Anderson and Krathwohl, 2001)

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<th>Cognitive competences in the Bloom taxonomy (Bloom, 1956)</th>
<th>Learning goals in the Revised Bloom taxonomy (Anderson and Krathwohl, 2001)</th>
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Original and revised Bloom taxonomies

Kolb’s learning cycle:
- Concrete experiment (feeling)
- Reflective Observation (watching)
- Active Experimenation (doing)
- Abstract conceptualisation (thinking)
• Analysis based on teachers‘ experience in using the games
• Looked at how the games reflect Kolbs learning cycle and Bloom‘s revised taxonomy
• Analysis of three different games used for HE
  – managerial topics
  – Four different universities
  – Master courses
  – Two games developed specifically for the course, one commercial
  – One game used for online teaching only
  – Two used in class room settings
• Derived guidelines based on the analysis
Case study 1: The Scheldt

- Web-based, role-playing, single-user game developed via the EMERGO methodology and toolkit
- Learning objective is to analyze, understand and explain the problem of the soil-water systems in the Scheldt
- Used (0.7 ECTS) in a distance learning course on soil and water (4.3 ECTS) since 2010 at the Open University Netherlands (OUNL) mostly with 30-50 persons/course.
• Remembering:
  – Needed for carrying out other tasks
• Understanding:
  – Related to understand interaction between groundwater and
    surface water and between soil and water
• Applying:
  – Intervention and proposition of right measures
• Analysing:
  – Students learn to analyse, understand and explain the eco-
    system
• Evaluating:
  – Students need to evaluate and contrast
• Creating:
  – Students can propose alternative solutions
Kolb‘s Analysis

• Concrete experience (feeling):
  – systematically analyzes concrete problems using different tools, carrying out tasks

• Reflective observation (watching)
  – Observes how the process evolve and can match the observed

• Abstract conceptualisation (thinking)
  – Feedback from the NPC helps to conceptualize new knowledge

• Active experimentation (doing)
  – The player may change the scenario based on his observations and conceptualisation
Case study 2-Any business

GoVenture Any Business (http://goventureanybusiness.com)

- Modular and customizable simulation platform
- Company management and decision making
- Facilitated -> Course driven competitions
- Normally single users -> Multiplayer (teams of 2)
Analysis – Blooms

- Remembering:
  - Not a special focus. Practice helps remembering

- Understanding:
  - Understanding business concepts is fundamental for reading the reports

- Applying:
  - Apply the concepts in decision making

- Analysing:
  - Data are to be analysed to take decisions

- Evaluating:
  - Planning and decision journal writing

- Creating:
  - Not expected by players
Kolb’s Analysis

- **Experience the results of a simulated month**
- **Kolbs learning cycle**
  - Any Business
- **Analyze the simulation outcomes and compare with competitors**
- **Decide based on the models and set the decision parameters**
- **Formulate a mental model of how his decisions affected the results**
Objective: Increasing the awareness and understanding of the impact of strategic decision making in distributed manufacturing by simulation of production networks

- Used since 2007
- Blended learning concept
- Curriculum and game developed in parallel
• Remembering:
  – Necessary for other tasks, but information mostly available

• Understanding:
  – Essential for taking decisions to understand the environment and interrelations

• Applying:
  – Supports the application of specific methods for strategic SCM

• Analysing:
  – The decision making process requires that the students analyse the situation and the indicators available

• Evaluating:
  – Continuesly needed in order to decide and change

• Creating:
  – helps to identify specific structures and pattern. It encourages the players to combine different information and to construct new knowledge
Kolb’s Analysis

• Concrete experience (feeling):
  – Starts with a scenario, carry out tasks, systematically analyzes concrete situations

• Reflective observation (watching)
  – Observes how the process evolve and can match the observed with the given target

• Abstract conceptualisation (thinking)
  – during game play, the student can draw his conclusion based on how his indicators (financial, stock level, use of material, material flow etc.) emerge.
  – strongly supported in the common debriefing session and by the facilitation of the game.

• Active experimentation (doing)
  – The game evolves by letting the players change the scenario
• Course designed games: fulfilment of learning objectives of the course is given the highest priority

• COTS are usually more attractive, as they feature high level graphics and multimedia look, cheaper, more transferable

• Assessing existing games from a curriculum point:
  – adjusting the curriculum towards embedding the game for the purpose of transfer of learning,
  – offer functional requirements for modding such a game towards evidence-based transfer of learning within the game.

• To guarantee successful development and deployment it is important to carefully align gaming goals with course goals and course assessment
Best practices and lessons learned II

- SGs should typically be used in blended learning settings, with briefing and debriefing sessions.

- The duration of the session is critical.

- A critical factor concerns the instructions given to the students before and during the game.

- Degree of freedom important.

- The facilitator or the teacher should pay attention at the students’ learning outcomes after the game.

- A crucial step when preparing a course exploiting SGs is the actual choice of the games.
• The three games through the revised Bloom’s taxonomy:
  – focus more on supporting the level of analysing, evaluating and creating
  – in different ways
• highlight that this has a strong relationship with the role of the
  teacher/facilitator.

• The higher level to be achieved according to Bloom, the more need for
  supporting the abstraction process

• We do not agree that new education practices should turn the teacher
  from a “teaching machine” into a consultant nor a simple facilitator.

• All the three games seem to correspond to the Kolb’s learning model

• The effectiveness of the games: All case studies shows positive
  learning outcome and seem effective
Conclusion II and Future work

- Courses often have to undergo an iterative design process, adapting the course set-up.
- Continuously monitoring and a proper working experience needed.
- The high use of resources challenge developers and users to look at new ways of designing and reusing elements.
- The deployment rate of SG in HE is still quite low, but
  - Seems effective and motivating in applying and constructing knowledge.
  - Games often more suited to children than to adults, needs to be adapted to their needs.
- Games teaching complex material requires suitable LA tools both for feedback to the students as to support the teacher.
- Integration in existing curricula requires a careful pedagogical planning and a smart usage of games.
Bibliography

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