Game based learning

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Introduction

- Learning in schools still heavily geared toward the acquisition of content within a teacher-centred model
- Instruction too often abstract and decontextualized, not suitable for pupils age
- Characteristics of efficient approaches to learning:
  - student centred
  - active
  - problem based
  - directed to higher ordered educational goals
  - motivational
  - supported by ICT
“Digital generations” of our students also called "gamer generations".

Game design has a lot to teach us about learning, and contemporary learning theory has something to teach us about designing better games.

Marshall McLuhan, famous Canadian philosopher of communication theory (predicted World wide Web in sixties), stated: "Anyone who makes a distinction between games and learning doesn’t know the first thing about either."

Games lead to changes in attitudes, behavior, and skills => that is actually exactly how learning is defined.
Convergence between core elements of a good game and the characteristics of productive learning:

- challenging, open-ended problems;
- goal-based scenarios as situated learning, player is involved in an iterative cycle of goal-based, interactive problem solving;
- formative feedback - a critical part of any learning effort and a key component in good game design (adjusts challenges and gives feedback)

Well-designed games support learning across a variety of content areas and domains.
But all games are not good for all learners and for all educational goals!

Cognitive psychologists have long claimed that the best instruction hovers at the boundary of a student’s competence.

And why aren’t the games used more widely in classrooms if they are so useful for learning?

- time constraints,
- cost and availability of appropriate games,
- lack of knowledge about their integration into learning,
- lack of good research on games and learning.
Games

- Game is a structured or semi-structured context where players have **goals** that they try to achieve by overcoming **challenges**.

- Players must respect a set of **rules** that exist in reference to that restricted context.

- Failure to follow those rules constitutes mistake and implies a **penalty**.

- Games can involve one player acting alone, two or more players acting **cooperatively**, and, more frequently, players or teams of players **competing** between themselves.
Serious games

What makes game serious (educational)?

- well defined learning goals
- promotion of development of strategies and skills of learners

Learning goals blurred in the game

Elements contributing to educational values of games, providing additional motivation for learning:

- sensual stimuli,
- fantasy,
- challenge,
- curiosity;

But even serious games have to be funny!
Our list of serious game **must have** includes:

- compelling storyline
- conflict or challenge (i.e., a problem to be solved)
- rules of engagement
- interaction within the environment and control
- continuous feedback (mostly implicit, but may be explicitly cognitive and/or affective)
- particular goals or outcomes to achieve (which often includes many sub-goals)

- These **game elements** are **similar** to the requirements for **good instructional design**.
Games are not used just in formal education, but also for training, and for informal learning.

Games are not just as a vehicle for delivering learning, but also as a means:

- to initiate discussion,
- to motivate students for different activities,
- for design (where learning happens through the design process).

Instructional designers can learn a lot from game design.
Different options for educators who decide to use game based learning (Whiton, 2010):

- Use of commercial entertainment game
- Adapt existing commercial game
- Use of commercial educational game
- Use of virtual worlds
- Custom designed games
- Learners as game creators
Use of **games for learning** has to be undertaken with a high degree of pragmatism:

- game must be designed to **facilitate** some kind of learning objectives
- use of games can only be justified if learning objectives can not be efficiently **achieved** otherwise
- game is **not** a **stand-alone activity** but part of learning of activities

Once the learning outcomes are defined:

- **activities** that would normally help students to **meet** those outcomes need to be **found** and
- **ways** how these **activities** can be **embedded** within a game have to be **identified**
Briefing, post-game discussion and reflection are essential supporting activities that

- ensure that students understand the purpose of the game,
- relate the activities during the gameplay to the intended learning outcomes.

This “learning package” ensure that the game based learning is focused and appropriate.

Kolb’s (1984) experiential learning cycle describes learning activities as a sequence of phases of experience, observation and reflection.
Involvement and engagement

- An important aspect of playing a game is intensity of involvement and engagement that games can invoke.
- Positive experience of being fully engaged in an activity is described as a state of “flow” (Csikszentmihalyi).
- **Flow** represents an optimal state of performance at a task, a sense of enjoyment and control, where an individual’s skills are matched to the challenges faced, with clear goals, feedback, high degree of control and where users are absorbed to the extent that they lose a sense of time and self.
Conditions that induce flow (Malone)

- **Activity** should be **structured** so that **player** can increase or decrease the **level of challenges** faced in order to **match** exactly **personal skills** with the **requirements** for action,
- it should be **easy to isolate the activity** from other stimuli, external or internal, which might **interfere** with involvement in it,
- there should be clear **criteria for performance**; a player should be able to evaluate how well or how poorly (s)he is doing at any time,
- the activity should provide concrete **feedback to the player**, so that she can tell how well she is **meeting the criteria** of performance,
- the activity ought to have a **broad range of challenges**, so that the player may obtain increasingly complex information about different aspects of her/himself.
Behaviorism

A lot of educational games designed according to behavioristic theory of learning (tutorials, which are basically forms of programmed instruction):

- **one correct answer, immediate response**
- **positive response** (happy sound, positive character reaction that stimulate positive emotions), instance of action-reaction pair enforced.
- with **wrong answer** the **connection** has to be **weaken** and reaction is provided in a form of **negative stimuli**.

- Trivia games, quizzes, point and click games...all of them have **drill and practice** concept built in a very core of the game design and are broadly used in game based learning.
Cognitivism

- Cognitive learning theory emphasizes learner’s **cognitive activity** and formation of appropriate **mental models**.

- The truth is “**out there**” and students are **learning** fundamental **concepts** and then using **logical deduction** to **gain new knowledge**.

- The most advanced forms of cognitive theory based games are **intelligent tutoring systems**:
  - use **machine learning algorithms** to **model student’s current knowledge**, his learning style and emotional responses.
  - **ITS compare** that to the **model of expert knowledge** in order to **provide personalized materials** enhancing the learning process.
Constructivism

- Constructivism is an alternative view suggesting that learners construct their own knowledge ➔ a number of individually constructed knowledge representation, all equally valid.

- Learning is active process of constructing rather the acquiring knowledge, built recursively on knowledge that user already has.

- In a process of construction, sensory data is combined with existing knowledge to create new viable mental models, which are in turn the basis for further construction.

- Constructivist learning emphasizes discovery and inquiry learning arguing that students should be placed in an environment (which can be modeled with computer game) where they construct their own knowledge.
Serious games replicate various real-life scenarios in game format. They present model of abstracted reality in which learner inhabit a certain role.

The role of teacher is to provide guidance and feedback when student is learning – constructing viable mental models.
Conclusions

- Games are powerful instructional technology.
- Their use can be justified by all relevant learning theories.
- But it can only be efficient when it is properly designed and properly integrated into teaching and learning.