# Game based learning

**Jože Rugelj**

**University of Ljubljana**

# 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 students

- "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 build 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.