Overview

- Games-based Learning
- Why use games for learning
- Why not use games for learning
- Theories of Education
- Constructivist Learning Environments and Games

Games-based Learning

- Revisit: Serious Games are Solutions to Problems
- **Serious Games =**

  "Any meaningful use of computerized game/game industry resources whose **chief** mission is not entertainment"
- **Games-based Learning =**

  "Any meaningful use of computerized game/game industry resources for education or training"

Education and Younger Generation

- Arrival of digital technology has been a "big discontinuity … a 'singularity' - an event which changes things so fundamentally that there is absolutely no going back".
- Has created fundamental differences between the younger generation (*digital natives*) and the older generation (*digital immigrants*).

Education and Younger Generation

- Like portability and frustrated by technology that ties them to a specific location.
- Studies show that they do not read as much as previous generations but prefer video, audio, and interactive media.
- Some have argued that they have a shorter attention span and require learning in 'small size chunks'.
- Others argue that they learn more collaboratively than previous generations and demonstrate a bias towards learning *in situ.*

Why use Games within Education?

- Various arguments:
  - Much of eLearning is "boring and mindless", non-interactive, non-engaging whereas games are the opposite
  - Much of education is not relevant to the skills that will be required in the future (ie. information searching and processing) but games as a medium could be
  - Fits characteristics discussed above
  - Supported by various theories of learning

Why not use Games within Education?

- Various arguments:
  - Belief by some that “fun” and “education” don’t mix
  - No real empirical evidence to support the approach
  - No longitudinal studies
  - No generic solution (each game needs to be hand crafted to each module/unit)
  - Cost
  - Need to bring together educationalists, subject matter experts and games developers

Theories of Education

- Constructivism
- Motivation
- Flow
- Situated learning
- Problem-based learning
- Cognitive apprenticeship
- Learning by doing
- Learning inherently social

Theories of Education

- By creating virtual worlds, computer games integrate:

"…not just knowing and doing. Games bring together ways of knowing, ways of doing, ways of being, and ways of caring: the situated understandings, effective social practices, powerful identities, and shared values that make someone an expert" (Shaffer, Squire, Halverson & Gee).

Constructivism

- Learning viewed as an active process in which learners construct new ideas or concepts based upon their current/past knowledge.
- Learner selects and transforms information, constructs hypotheses, and makes decisions, relying on a cognitive structure to do so.
- Focuses on knowledge construction, not knowledge reproduction.
- Contrast this with traditional (didactic) approach, which views learner as passively receiving information.

Motivation

- A critical factor for instructional design and for learning to occur the learner must be motivated to learn.
- In self-determination theory, Deci and Ryan (1985) distinguish between different types of motivation based on the various reasons or goals that give rise to an action:
  - **Intrinsic motivation**: doing something because it is inherently interesting or enjoyable.
  - **Extrinsic motivation**: doing something because it leads to a separable outcome (such as a verbal reward like praise or a tangible reward like money).

Motivation

- Malone and Lepper (1987) present a theoretical framework of intrinsic motivation in the design of educational computer games.
- They postulate that intrinsic motivation is created by four individual factors:
  - challenge, fantasy, curiosity and control
- and three interpersonal factors:
  - cooperation, competition and recognition

Motivation – Individual Factors

- *Challenge*:
  - player must be able to vary the difficulty of the game,
  - there should be multiple goals for winning the game,
  - there should be sufficient randomness in the action and constant feedback about performance.
- *Fantasy*: Player should feel involved with the game characters and the gaming environment.
- *Curiosity*: Activity should offer sensory stimulation and enough novelty to want to continue playing the game. Senge (1990) believes people are inherently curious, creative and seek challenges that relate to what they value.
- *Control*: Player should feel in control over the game activities, be able to make choices and witness effects of such choices. When choices are unclear, learner should be able to gather information to make an informed choice.

Motivation – Interpersonal Factors

- *Cooperation*: The player should feel satisfaction by helping others achieve their goals.
- *Competition*: The player should feel satisfaction by comparing their performance favourably to that of others.
- *Recognition*: The player should feel satisfaction when others recognize and appreciate their accomplishments.

Flow

- Achieved when challenge level matches player's skill level.
- To reach this state of optimal experience: "there have to be rules, a goal, and a way of obtaining feedback. One must be able to concentrate and interact with the opportunities at a level commensurate with one's skills":
  - tasks that are too difficult raise anxiety;
  - tasks that are too easy contribute to boredom;
  - both situations decrease motivation toward learning.
- Flow is characterized by a feeling of being in control, by highly focused attention, and by an adequate match between challenge and skill, resulting in an intense state of joy and emotional involvement in an activity for its own sake.

Flow

- Conditions likely to induce the flow state are:
  - *Challenge*: Activity should be structured so that learners can increase or decrease the level of challenges to match exactly their skills. And, the activity should have a broad range of challenges, and possibly several qualitatively different ranges of challenge, so that learners may obtain increasingly complex information about different aspects of themselves.
  - *Control*: Should be easy to isolate the activity from other stimuli (external or internal) that might interfere with involvement in it.
  - *Performance criteria*: Should be clear performance criteria; learners should be able to evaluate how well or how poorly they are doing at any time.
  - *Feedback*: Activity should provide concrete feedback so that learners can tell how well they are meeting the performance criteria.

Situated Learning

- Learning is viewed as a function of the activity, context and culture in which it occurs (Lave, 1988).

Problem-based Learning

- Started out in 1960s in medical education where groups of students were presented with a problem in the form of a patient with particular symptoms.
- Students' task is to diagnose patient's condition and be able to justify the diagnosis and recommend treatment.
- In diagnosing condition, students have to discuss the symptoms, generate hypotheses based on whatever knowledge and experience they have, and identify learning issues.
- At end of each session, students reflect verbally on their current hypotheses and each student assumes responsibility for investigating one of more of the identified learning issues through self-directed learning.
- Constructivist.

PBL and Cognitive Apprenticeship Model

- Teacher (facilitator) is available for consultation and plays a significant role in modelling the metacognitive thinking associated with the problem-solving process.
- Reflects a cognitive apprenticeship environment with **coaching and scaffolding** (e.g. offering hints, reminders and feedback) provided to support the learner in developing metacognitive skills.
- As these skills develop, the scaffolding is gradually removed.
- Intention is to force learners to assume as much of the task on their own, as soon as possible.

PBL and Cognitive Apprenticeship Model

- Cognitive apprenticeship model also advocates:
  - *modelling*, which involves an expert (the teacher) performing a task so that the learner can observe and build a conceptual model of the processes required to accomplish it;
  - *articulation* (verbal or written);
  - *reflection*, to enable learners "to compare their own problem-solving processes with those of an expert or another learner;
  - *exploration*, to push learners into a mode of problem-solving on their own.

Learning by Doing

- Many learners prefer to learn an activity by actually doing the activity, rather than just memorise or discuss concepts.
- Obviously very important for practical skills (eg. driving a car, programming, design).
- According to Schön the following are some of the key problems in teaching design:
  - It is learnable but not didactically or discursively teachable: it can be learned only in and through practical operations.
  - It is a holistic skill and parts cannot be learned in isolation but by experiencing it in action.
  - It depends upon the ability to recognize desirable and undesirable qualities of the discovered world. However, this recognition is not something that can be described to learners, instead it must be learned by doing.
  - It is a creative process in which a designer comes to see and do things in new ways. Therefore, no prior description of it can take the place of learning by doing.

Learning is a Social Process

- All learning includes three dimensions, namely:
  - the cognitive dimension of knowledge and skills,
  - the emotional dimension of feelings and motivation,
  - the social dimension of communication and cooperation
- *"all of which are embedded in a societally situated context" (*Illeris, 2003).
- And so are games:
  - Think of MMOG, games networks, Xbox Live, walkthroughs, forums, cheats, …

Principles of Constructivist Learning Environments

Principle	Games
Start with an authentic problem. Should be both realistic and sufficiently complex to develop analytical and problem-solving skills.	√
Encourage learners to take ownership for learning and to be aware of the knowledge construction process.	√√
Allow learners to develop their own process to reach a solution.	√√
Provide learners with the opportunity to experience and appreciate other perspectives.	√√
Provide opportunities for interaction and collaboration, either learner-learner, learner-teacher or learner-system.	√√

Principles of Constructivist Learning Environments

Principle	Games
Ensure that learning environment motivates, engages and challenges the learner.	√√
Provide feedback mechanisms to enable learners to be fully aware of their progress.	√√
Provide support mechanisms for learners using coaching and scaffolding.	√√
Be flexible to support different learning styles.	?
Provide opportunities for reflection, self-evaluation, articulation and debriefing.	√
Provide an integrated assessment.	X

Principles of Constructivist Learning Environments

- With the exception of assessment, games are constructivist learning environments!