The Six Facets of Serious Games

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Abstract

Numerous serious games are based on a domain knowledge simulation with which the serious-players are playing through a metaphor. The balance between fun and learning is a criterion of success in the design of this kind of serious games. This is possible thanks to an articulation of pedagogical and game design expertise. In order to have an effective mix, we have built a conceptual and analysis tool: the six facets of serious games. This is a conceptual framework to help question the design, streamline the work. Either during the design or post-mortem to extract design patterns [Marne et al., 2011; Capdevila Ibáñez et al., to appear].

A collaborative tool library for the facets:
http://seriousgames.lip6.fr/DesignPatterns/

Pedagogical Objectives

Problem: How to define what is going to be taught to the “serious players”?

Solution: Setting the frame of reference (including misconceptions) of the domain and educational goals.

As a serious game is a learning system, at first we must define what are the learning objectives. The learning design can be done with the help of knowledge modeling tools like MOT [Paquette et al., 2006].

Example of Design Pattern: Price of the playability versus educational objectives

As part of the categorization of skills, it is possible to prioritize the most important skills. This requires exploding each skill into atomic skills with an estimated price.

For instance, the serious game project “Donjons & Radon” is meant to learn water phase transitions to junior high school students. In early game design, in order to help “serious players” to learn the game-play, we had some kind of tutorial levels with less important pedagogical objectives. It was not a very good idea because the playing time used for these levels would have been lost for our learning objectives. So with the help of pedagogical model, we decided to ensure that each level had some valuable pedagogical objectives, even in the tutorial.
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Domain Simulation

Problem: How to respond to the proposals of the “serious players”?

Solution: Defining a formal model of the domain based simulation.

We consider that serious games based on intrinsic metaphor are running with a simulation engine. This engine is made to return domain relevant values to the “serious players” depending on their actions.

Example of Design Pattern: Don’t simulate everything

It is not possible to design the “absolute” simulation. The more realistic is the simulation, the more complex and costly it is.

Don’t simulate everything, but just be able to reproduce the knowledge that is in the pedagogical objectives.

For instance, the serious game project “Donjons & Radon” is meant to learn water phase transitions to junior high school students. To help the game designers to rely on a consistent engine, we had to figure out what we could simulate. After researches on state of matter and triple point of water, we proposed a simplified simulation model based only on a three axis phase diagram, with a fake kinetic. This model was accepted by domain experts and teachers, and we are building our game engine on it.

Fig. 2: three axis water phase diagram from http://fr.wikipedia.org/wiki/Diagramme_de_phase
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Interactions with the Simulation

Problem: How to engage the “serious players” by allowing them to interact with the simulation?

Solution: Define interactions with the formal model thanks to the intrinsic metaphor.

We must build a playable interface to the simulation. To do so, the game designers must imagine some kinds of interactions between the “serious players” and the simulation engine. The more engaging is this interface, the funnier will be the serious game. This interface must also be relevant with the domain and the simulation.

Example of Design Pattern: Times to Practice and Times to Reflect

Users can unlikely control interactions and do high-level thinking because of cognitive overload. Video games are based on interactions while some knowledge requires slowness to be matured. Video games often provide less-intensive phases. Even if they are based on interactions, the progression often alternates tension phases with more peaceful ones, e.g. before a mission or when there is a game over, when a goal is reached or a level is completed. [Kiili, 2007] propose to design Pedagogical Gameplays during actions phases to make discover, feel or experiment elements of knowledge. During reflection phases, you can use Debriefings explaining what happens during actions.

For instance, we had to work on a serious game with some high-level thinking (Immunology for junior high school students): it is difficult for them to manage combinations between microbes and the different types of lymphocytes such as leukocytes, macrophages, etc. So we decided to split the game-play in two phases: a thinking phase for placing the defenses (using the interface items 1, 3 and 5), and an action phase to test the defenses and interact with microbes (2 and 4). For that we used a kind of Real Time Strategy game-play named Tower Defense.
Problems and Progression

Problem: What problems to give to the “serious players”?

Solution: Definitions of the “serious players”’ progression in the levels of the serious game.

Serious games are both games and learning tools. In games, the progression is conceived to keep the player motivated. In learning systems, progression allows learners to acquire new knowledge and competencies. The purpose of this facet is to ensure that the mix of both these objectives is sustained.

Example of Design Pattern: Measurement achievements

Achievements are great tools to increase engagement and motivation of the “serious players”. Usually achievements are given at the end of a level, or a difficult task. Because the feedback given by these achievements is often poor and redundant, [Blair, 2011] explains how Measurement Achievements are better for the intrinsic motivation. These achievements are given depending on the progresses of the “serious players” and do not depend on the real achievement of a task. As they give a measured feedback they are interesting both for increasing intrinsic motivation and tracking the learner in their learning progress.

For instance: “Ludiville” is a serious game for account managers where we use “Stars achievements”. At the end of each level, “serious players” win some stars depending on their performance. They are encouraged to try again and perform better to win all the stars.
**Decorum**

**Problem:** What kind of multimedia elements to increase the motivation of “serious players”?

**Solution:** Definition of the decorum.

The decorum is both multimedia assets, scenario elements and interactions that are not related to the domain simulation. These are used to engage the “serious players”.

**Example of Design Pattern: Comical World**

To create a fun experience, it’s a good idea to create world and characters with the sense of humor.

For instance, in “Prévenir-la-grippe-A-H1N1”, questions are asked about the flu in a world where cowboys fight against kinds of aliens with soap. Cowboys’ and aliens’ representations create a comical atmosphere based on an absurd situation. See the cowboy and his weapons (soap) in the picture (Fig. 5).

![Fig. 5: Screenshot of the serious game "Prévenir-la-grippe-A-H1N1"](image)

**Deployment Conditions**

**Problem:** How to deploy the serious game while maintaining its educational and recreational qualities?

**Solution:** Defining the usage conditions of a serious game.

During the design of a serious game it’s a real matter to describe how it can be used by the “serious players”, i.e. Alone? In a team? Online, or in a classroom? How long will last a game session? How this session is included in the curriculum, etc.

**Example of Design Pattern: Two Learners Side by Side**

When two serious players are playing together on the same screen they may naturally explicit their choices and thus reflect on their actions.
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Short Bibliography


