Introducing the "Serious Games Mechanics"

Citation for published version (APA):

Suttie, N., Louchart, S., Lim, T., Macvean, A., Westera, W., Brown, D., & Djaouti, D. (2012). *Introducing the "Serious Games Mechanics": A theoretical framework to analyse relationships between "game" and "pedagogical aspects" of Serious Games.* Poster session presented at the 4th International Conference on Games and Virtual Worlds for Serious Applications, Genoa, Italy.

Document status and date:
Published: 22/11/2012

Document Version:
Peer reviewed version

Open Universiteit
www.ou.nl

Introducing the "Serious Games Mechanics":
A Theoretical Framework to Analyse Relationships Between "Game" and "Pedagogical Aspects" of Serious Games

Neil Suttie[a], Sandy Louchart[a], Theodore Lim[a], Andrew Macvean[a],
Wim Westera[b], Damian Brown[c], Damien Djaouti[d]

[a]Heriot-Watt University, Edinburgh EH14 4AS, Scotland, UK
[b]CELSTEC-Centre for Learning Sciences and Technologies, Open University of the Netherlands, Edinburgh EH14 4AS, Netherlands
[c]Serious Games Interactive, Ravnsborggade 2-4, 2nd floor, 2200 Copenhagen N, Denmark
[d]Institut de Recherche en Informatique de Toulouse, Université Paul Sabatier, 118 Route de Narbonne, F-31062 TOULOUSE CEDEX 9, France

From a pedagogical perspective it is difficult to dissociate **G**ame **M**echanics (**GM**s) from educational components at implementation level, a **S**erious **G**ame (**SG**) forms an entity for which its function is to educate and entertain through a single compelling experience. If, as we suggest, **S**erious **G**ames **M**echanics (**SGM**s) are represented at a higher-level of abstraction than **GM**s, crossovers between game and learning strategies that combine to form **SGM**s should be indentifible. Therefore, we propose that through dissecting a wide range of successful SGs and examining their individual learning and play components through the theoretical framework below, we can identify **SGM**s that have proven successful and advance towards a practical conceptual design tool for effectively implementing educational mechanisms for future **SG**s.
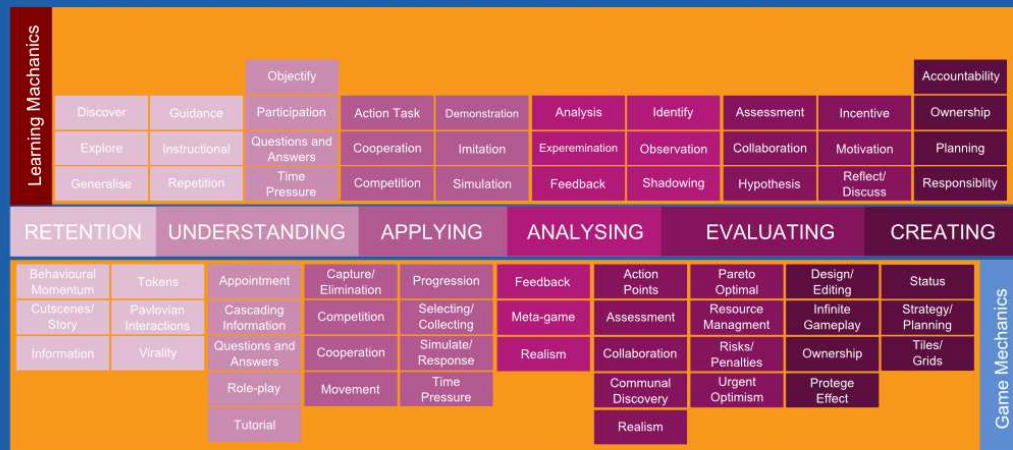
Pedagogy

Instructional Design
The domain of pedagogy heavily fragmented and comprises a variety of non-exclusive learning theories, each favouring a particular view on learning and each focussing on a subset of variables, such a individual motivation, affect or social aspects of learning.

Learning Theories
Amid the number or conflicting and a often contradictory pedagogical theories, it was decided to structure our framework around Bloom's Taxonomy of learning Objectives [1], as Bloom's provides an established scaffolding structure for learning objectives that often mirrors the learning found in game-play, and has previously been employed for the analysis for both Serious Game [2] and entertainment game design. More appropriate structures may become apparent as we progress.

Serious Game Analysis towards a Serious Games Mechanic
We propose the concept of a **S**erious **G**ame Mechanic as the mechanisms linking pedagogy and gameplay. Through the analysis of existing Serious Games with the proposed framework we aim to identify appropriate combinations of Learning and Game Mechanics that form successful **SGM**s.

Game Mechanics/Learning Mechanics Framework oraganised according to a modified version of Bloom's Digital Taxonomy [3].
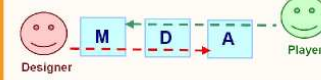
Game

Game Design
Certain game aspects can provide indications as to where pedagogical constructs might be represented within SGs. Researchers have thus far commonly focused on genres, design patterns [4] and Game Mechanics[5,6].

theoretical models suited for the design of games include:

MDA Model
The MDA Model [7] is a simple framework, It defines three 'levels':
The 'Mechanics' level, where lies the rules crafted by the Game Designer
The 'Dynamics' level, the results of a player interacting with the 'Mechanics'
The 'Aesthetics' level, which gathers the inner feelings the players are when playing the games (i.e. what the players feels in reactions to the 'Dynamics').

Game Bricks
This concept proposed by Djaouti et al. describes the "fundamental elements whose different combinations seem to be able to cover the game-play of videogames." [8]
Djaouti et al identified ten bricks through which most games could be described at a low-level of abstraction.

Game Design Patterns
Game design patterns focus on the re-occurrence of structural game components and can be regarded as a structural analysis of game-play and gaming activities. Björk et al. identified and described over 200 game design patterns [4].

Game Mechanics
GMs can consist of the actions describing the player's agency within the game world throughverbs such as buy, jump, hide, etcetera [5,6].
we observe that the user-centric description of GMs represents an attractive alternative to the game-centric representation of design patterns.

References:
[1] Anderson, L.W. and Krathwohl, D. 2001. A Taxonomy for Learning, Teaching and Assessing :a Revision of Bloom's Taxonomy of Educational Objectives. Longman, New York.
[2] Buchanan, L., Wolanczyk, F. and Zingini, F. Blending Bloom's Taxonomy and Serious Games Design. The 2011 World Congress in computer Science, Computer Engineering and Applied Computing.
[3] Churches, Andrew. 2009. Bloom's Digital Taxonomy.
[4] Björk, S. & Holopainen, J. (2004). Patterns in Game Design. Charles River Media.
[5] Björk, S. and Lundgren, S. 2003. Game Mechanics: Describing Computer-Augmented Games in Terms of Interaction. Proceedings of the Technologies for Interactive Digital Storytelling and Entertainment (TIDSE) Conference.
[6] Sicart, M. 2008. Defining Game Mechanics. The International Journal of Computer Games Research. Volume 8, Issue 2.
[7] Hunicke, R., LeBlanc, M, and Zubek, R. MDA: A Formal Approach to Game Design and Game Research. Proceedings of the Challenges in Game AI Workshop, Nineteenth National Conference on Artificial Intelligence. http://www.cs.northwestern.edu/~hunicke/MDA.pdf.
[8] Alvarez, J., Djaouti, D., Jessel, J-P., Methel, G. and Molinier, P. A Game-play Definition through Videogame Classification. International Journal of Computer Game Technology. Hindawi Publishing Corporation, Quarter 1, 2008.

Links:
www.hw.ac.uk
www.galanoe.eu
www.macs.hw.ac.uk/cs/digitalstorylab