Learning in Video Games: A Model to Inform Instructional Design

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Good video games are highly optimized learning systems,[1-6] carefully engineered to keep players engaged for long periods of time while they develop and refine skills, explore and become facile navigating novel and often bizarre environments, overcome increasingly difficult challenges at the threshold of their abilities, and piece together understanding of a complex and initially mysterious back-story.

If we can understand how they work, perhaps we develop classroom-based courses that use game-like principles to teach physics more effectively.[7-8]

This is a model of learning in (good) video games. It was developed by synthesizing constructs, principles, and observations from a broad swath of literature, including writings by game designers, learning scientists, game scholars, and creative teachers.[9-11]

The model is complex and multifaceted, because good games are complex and multifaceted. They get much of their power from synergies between different elements and processes operating on different scales.

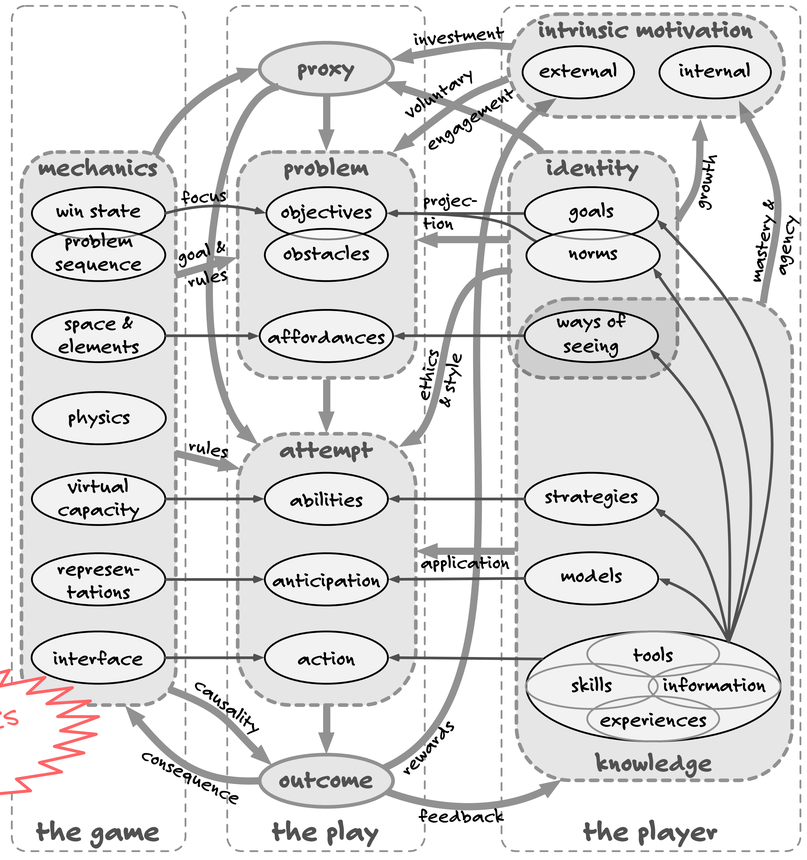
A game is an activity structure tightly coupling learning to intrinsically motivating experiences, through volitional and highly engaged activity directed at overcoming a series of problems (or challenges or obstacles or opponents).

Trial-and-error exploratory learning lets the player develop the necessary skills and knowledge play. A game offers the **pleasure of mastering challenges,** engages players in activities that are inherently rewarding, and promises that by learning to play the game better, more such experiences can be achieved.

The play of the game is **a co-construction of the game and the player,** offering players a great deal of **agency** in whether, when, and how they choose to play, as well as in how the play unfolds.

CAN WE FIGURE OUT HOW TO ACHIEVE THESE DYNAMICS IN FACE-TO-FACE PHYSICS COURSES?

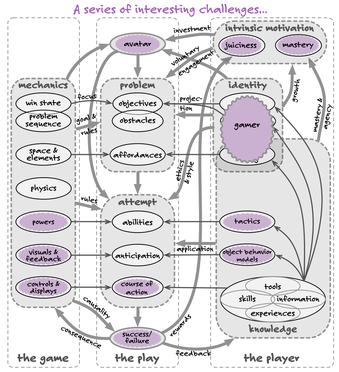
THE ELEMENTS: coarse and fine structure



THE MULTI-LAYERED GAME

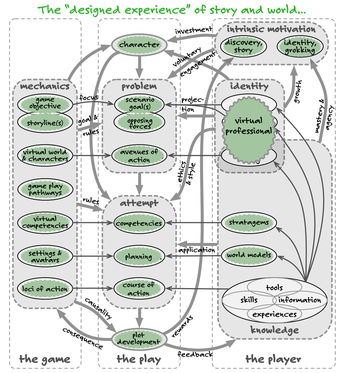
the micro-level game

A series of interesting challenges...



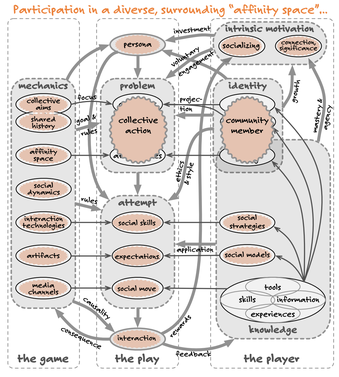
the macro-level game

The "designed experience" of story and world...



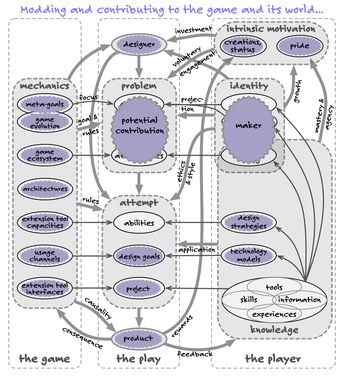
the social meta-game

Participation in a diverse, surrounding "affinity space"...



the builder meta-game

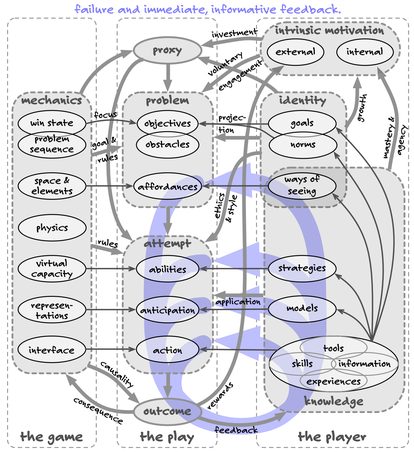
Modding and contributing to the game and its world...



DYNAMICS: four interconnected FEEDBACK LOOPS (learning, identity, motivation, game response) and five HUMAN/COMPUTER MELDS

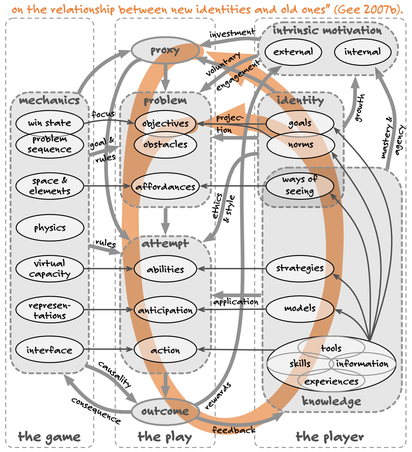
the exploratory learning loop

The very essence of game-based learning, and thus the most critical dynamic to capture, is trial-and-error exploration with safe failure and immediate, informative feedback.



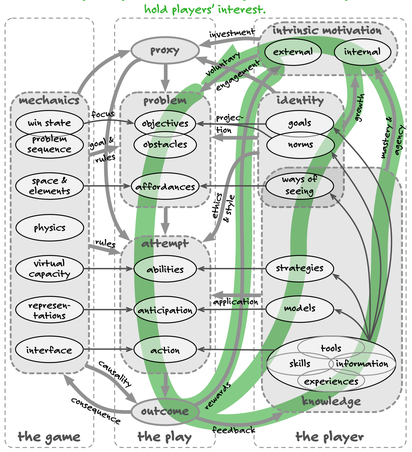
the identity growth loop

"Learning involves taking on and playing with identities in such a way that the learner has real choices... and ample opportunity to meditate on the relationship between new identities and old ones" (Gee 2007b).



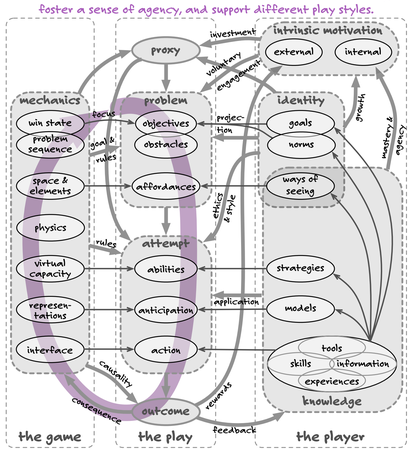
the intrinsic motivation loop

Most good games deftly employ three intrinsic motivation pathways—mastery & agency, growth, and rewarding experiences—to grab and hold players' interest.



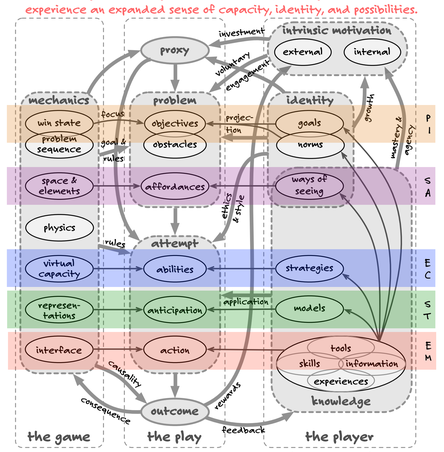
the game response loop

For game play to be a co-construction of player and game, the game must react to the player's actions to tune the level of difficulty, foster a sense of agency, and support different play styles.



human/computer melds

The player becomes part of a hybrid human-plus-computer entity operating within the game's virtual world, allowing the player to experience an expanded sense of capacity, identity, and possibilities.



PI: Projective Identity
SA: Seeing in Affordances
EC: Enhanced Competence
ST: Simulation Thinking
EM: Extended Manipulation

* Reference list available at http://ianbeatty.com/posters/perc-2014b