What Makes Things Fun to Learn? A Study of Intrinsically Motivating Computer Games

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"Most extrinsic fantasies depend on whether or not he skill is used correctly (ie. whether the answer is right or wrong), but other factors like how quickly the answer is given or how close the answer is to being correct can also affect extrinsic fantasies .... In noe of these cases (extrinsic fantasies) however, does the exercise of the skill depend in any way on the fantasy. The same arithmetic or spelling problems could be given with different fantasies or with no fantasies at all." (P. 58)

"In intrinsic fantasies, on the other hand, not only does the fantasy depend on the skill, but the skill also depends on the fantasy. This usually means that problems are presented in terms of the elements of the fantasy world. (eg. Darts game) .... In intrinsic fantasies, the events in he fantasy world usually depend not just on whether the skill is used correctly, but on how its use is different from the correct use. For example, players of the Darts game can see graphically whether their answers are too high or too low and if so by how much.... Notice that a fantasy is always intrinsic or extrinsic with respect to a particular skill." (P. 58)

"... analogies of the kind provided by intrinsic fantasies can often help a learner apply old knowledge in understanding new things. For example, players in the Darts game already know about physical objects (like arrows and balloons) being higher or lower than other objects. If they make the crucial connection between number size and position on the number line, then they are able to use this old knowledge in the new domain to make inferences about the relative sizes of unfamiliar fractions." (P. 59)

"The final cognitive advantage of intrinsic fantasies is simply that, by provoking vivid images related to the material being learned, they can improve memory of the material." (P. 59)

"My hypothesis is that if the fantasies in instructional environments serve the same kinds of wish fulfillment and conflict resolution functions as other fantasies, then they can 'harness' the pre-existing emotional motivations and use them to increase interest in learning. There are several ways this might be done:

1. By providing a single fantasy that is likely to be appealing to the target population.
2. By providing several fantasies for the same instructional material and letting students choose their favorite fan.
3. By providing an environment into which students can project their own fantasies in a relatively unconstrained way. For instance, one could let students name imaginary participants in a computer game.

(P. 60)

"...environments can evoke a learner's curiosity by providing an optimal level of informational complexity. (Berlyne, 1965, Piaget, 1952). In other words, the environments should be neither too complicated nor too simple with respect to the learner's existing

knowledge. They should be novel and surprising, but not completely incomprehensible." (P. 60)

"Challenge involves reducing uncertainty about one's own ability to reach a goal; curiosity involves reducing uncertainty about the state of the world. Both depend on feedback to reduce uncertainty." (P. 61)

"Sensory curiosity involves the attention-attracting value of changes in the light, sound, or other sensory stimuli of an environment." (P. 61)

"In contrast to the perceptual changes that evoke sensory curiosity, cognitive curiosity is evoked by the prospect of modifying higher level cognitive structures.... In general curiosity can be thought of as a desire to bring better 'form' to one's knowledge structures. In particular, I claim that people are motivated to bring to all their cognitive structures three of the characteristics of well-formed scientific theories: completeness, consistency, and parsimony." (P.62

"In general games that inculde fantasy show or evoke images of physical objects or social situations. These objects or situations may involve varying degrees of social or physical impossibility from completely possible (running a lemonade stand in Lemonade) to completely impossible (moving instantly from one barrier to another in Chase)." (P. 67)

"... there seems to be an important correspondence rather than a contradiction between most of the features that make an environment fun and those that make it educational. For example, environments that vary in difficulty level increase both challenge and the potential for learning. Intrinsic fantasies not only stimulate interest, they can also provide instructionally useful analogies. Finally, environments that evoke cognitive curiosity and then satisfy it can be both captivating and educational." (P. 82)