Gamelet Design for Education

Engagement Analysis

One of the potential benefits of games as learning tools is that people want to play them, and (often) keep playing them, over and over. As we'll see soon, repetition is a powerful force in learning. So, how can we design games that people will actually want to play? Most thinking on this, perhaps understandably, focuses on fun, or enjoyment.

Unfortunately fun or enjoyment are very complex, poorly understood matters. Game designer Marc LeBlanc (quoted in Salen and Zimmerman, Rules of Play: Game Design Fundamentals, MIT Press, 2004, p334) lists eight kinds of game-related pleasure;

- sensory pleasure
- fantasy
- narrative or drama
- challenge
- fellowship
- discovery
- self expression
- submission to rule

Not all of these may be applicable to educational gamelets. We may find that there are limitations due to (1) restrictions in how immersive the gamelet medium can be (though the very low tech first generation adventure games were very engaging) and to (2) the requirement that an educational game has to support repeated, or at least sustained, play, given what we know about how dependent learning is on repetition.

But there's another issue we need to consider. How important is "fun",really, and what kind of "enjoyment" are we talking about? There's a lot of evidence that people spend a lot of time playing games that don't really seem like a lot of fun, or even to deliver very dramatic enjoyment. Card solitaire games like Free Cell are literally addictive, for some people; they can't stop playing. But they aren't jumping up and cheering as they play. What's going on?

We're going to use the more general, and more neutral, term "engagement", rather than "fun" or "enjoyment" in our analysis. The idea is that we want to identify whatever the factors are that keep people playing. These factors may include fun and enjoyment, are we aren't limiting ourselves to those.

Going beyond the high-level breakdown above, we can identify a number of features that seem to be responsible for sustained engagement in many games.

Competition. For some people, competing against someone face to face, or against a highest score list, or against a personal best, promotes engagement.

Goals with tuned difficulty level. If a gamelet's goal is too easy to attain the game will be boring; if too

difficult, it will be frustrating. Since people get better with practice, especially in an educational gamelet, there has to be some way to escalate the difficulty to compensate. Many games do this with explicit levels; some do it with automatic difficulty changes based on player performance.

Partial reinforcement. Though it violates common sense, it is very clear from a great deal of data that rewarding someone for their behavior *occasionally* creates much more dedication to a task than rewarding them *consistently*. This is related to difficulty level: if you win every time the game is too easy; if you never win you can get discouraged, but if you win occasionally you may stay with game for a long time. So, in a game design, partial reinforcement is a reward that is given only occasionally.

Note that partial reinforcement is a good example of a powerful factor in engagement that doesn't seem to relate to fun or enjoyment.

Observable progress toward the goal. Engagement seems to be increased if you can identify clear progress as you approach the goal, even if you don't ultimately win. If you are just randomly drifting around in the game, and then with no warning you find that you've won, that doesn't build engagement as effectively as an extended process in which you feel you are working your way towards the goal.

Emergent events. In many games, every now and then something interesting happens more or less automatically that marks progress. In the gamelet Snood, every now and then a hit causes a bunch of snoods to be released, not just the one you hit, if you have hit the right things to set this up. In many solitaire games you may be able to play off a bunch at cards on one play, also if you have set things up right. In Tetris, you can hope for a cascade of level clearances. Having these things happen may act as intermediate rewards during play, and help to sustain your interest. (Again, the partial reinforcement idea says these things will be more effective if they don't happen too often.)

In game design, an emergent event is something that is positive, that results from user actions (not just randomly), is extended in time (not just a short sound effect or a bump to the score), and gives a sense of progress with reduced (or no) effort.

Cycles of tension and release. In baseball, it happens all the time that a team makes progress, say by getting a runner on base, or even by having a batter get ahead in the count, only to have the batter make an out, or the inning end. In soccer, a team may have a promising attack on goal, only to have a shot saved and the ball cleared. It appears that these cycles of nearing the goal, with heightened tension as it approaches, followed by release, as the apparent progress dissipates, build engagement.

Interestingly, analogous cycles seem to be important in music (see http://music.linear1.org/2007/11/19/more-on-tension-and-release/), and in screenplays (see http://www.screenplaymastery.com/structure.htm). The fact that these cycles are so universal in film (even "serious" films like "Frost/Nixon", as well as potboilers like "The Golden Compass", have this in a very obvious way... the struggle upwards, with sucess looking possible, then the episode of despair, it's hopeless after all, and then the culminating triumph) suggests that this may actually be the most important of the engagement factors.

Emergent events may also play into the cycles: watching an emergent event releases tension. Observable progress towards the goal is also important: it doesn't matter if there is a cycle, if the player can't tell there is one.

Balance of chance and skill. While most games require some level of skill, there is abundant evidence that not much skill, or even user control, is necessary to make a game engaging, if other elements are present. I've spent a lot of time playing two forms of solitaire that have very, very little user control (and hence skill) but are quite strong on emergent events. In games like this, chance is essential to keep the game varied and hence interesting. Chance also plays a role in "lightening up" a game. If a game depends solely on your own skill, there can be stress associated with failure. The stress is diluted or eliminated if it is obvious that success or failure is influenced by chance as well as skill.

Collecting. Games like Pokemon are driven by the players' wish to collect sets of things. Maria Klawe and colleagues found that they could motivate a bunch of sometimes boring educational activities by providing cards that students could only collect by playing. So, in game design, collecting as a motive for engagement is some way in which players get things and keep them, when they play effectively. Often, the things come in sets, so that there is some overlap with progress towards a goal ("gosh, I just need to get the frammis card, and then I'll have all the widgets...").

Narrative. The Zoombini games embed a bunch of logic puzzles in a narrative frame in which the Zoombinis, little pygmy-like creatures, need to escape from their island, and the puzzles are set as challenges they have to figure out to cross rivers, etc. There's some reason to think that the narrative frame helps to sustain interest.

Character attachment. The Zoombinis are built from combinations of separate attributes (what kind of hair, what kind of shoes, what kind of glasses, and the like.) They are really just tokens in various logic puzzles that hinge on discovering what combination of attributes pass some test. But, unexpectedly for the designers, play testing showed that some players chose favorite Zoombinis and paid special attention to the fate of their favorite character. This kind of attachment could contribute to motivation and interest. Think cute bunnies, or a Chuck Norris character.

Social engagement. Some games are fun because of the interactions players have with one another while playing. Social forces may also act to encourage continued play rather than quitting.

Type Specimens of Some of the Above

Emergent Events

- Alchemy
- Breakout

Character Effects

- Chuzzle

Additions to the Framework

These have been suggested by students in earlier editions of the course.

- sound, music

- nostalgia, associations
- near misses as an amplifier of partial reinforcement... this may be related to cycles of tension and release
- grace

Example

One of the forms of solitaire that I play I'll call "up and down" (I don't know what its proper name is.) As I play it, you shuffle a deck of cards and deal out 6 rows of six cards, face up, partially overlapped, so that you can see all the cards. Call these cards the array. You keep the remaining cards face down, as the stock. You turn up the top card of the stock. You can play any of the top cards in the array on that card, provided that its rank is one more or one less than the card you turned up. (The sequence is ace, two, three,...,ten, jack, queen, king, with ace also being counted as one higher than king.) You can then play another card from the array, following the same rule, counting up or down, and continue in this manner until there is no card of any playable rank exposed in the array. When that happens, you turn up the next card from the stock, and continue. You win if you can play all the cards from the array before you run out of cards from the stock.

Here's my take on this game: *Competition*. As I play it, I keep track of how many cards are left when I run out. I try to improve my last score, which is kind of competing with myself.

Goals with tuned difficulty level. I sometimes use a variation in which if I win, I add a card to the array, and if I lose, I remove a card. This keeps the game at a level where it isn't too easy or too hard.

Partial reinforcement. You win only occasionally.

Progress toward the goal. As cards are played off the grid, or when you are able to play a long run of cards on one card from the stock, you can tell you are making progress.

Emergent events. There's a tendency for cards with similar numbers (say fives, sixes, and sevens) to get exposed in the array, because other cards are removed. Then when a five, six, or seven finally comes up you often can play a long run. This is satisfying. It takes a while for these runs to develop, so there is a partial reinforcement effect on these long runs.

Balance of chance and skill. There is obviously a lot of luck in how the cards are arranged in the grid. But you have a certain amount of choice in how to play, that can affect the outcome. Often there are two or three cards that you could play (for example, if the card turned up from the stock is a six, there could be two fives and a seven exposed. You could play any of these, and which one you play may determine subsequent plays, since one of the fives (for example) might have another six under it.

Collecting. NA

Narrative. NA

Character attachment. NA

Social engagement. NA

A design example.

Do we have a *useful* sense of Fun Analysis?

Our goal: As designers, doing better than, "My game will be fun because I've copied X."

Here's a sketch of a game that will help people understand simple electric circuits. I've used the factors in the engagement analysis to develop the idea, as follows.

The basic idea is that there is a circuit diagram consisting of a lot of switches wired together. The aim is that when certain switches are open and others are closed, current flow in some parts of the circuit and not others, and you have to understand how switches and circuits work to tell where the current can go.

Here are the ideas I've had about developing the idea into a game, based on some of the factors in the game:

Progress toward the goal. Introduce a timer that runs when current reaches it. The goal is to run the timer to a certain level. You can tell you are making progress as the timer runs.

Competition. Introduce a (robot) opponent with its own timer, who goes around the circuit switching switches. If their timer times out before yours, you lose.

Narrative. Associate your timer with a rocket launch, and the opponent's timer with a bomb that destroys the rocket and launcher if it goes off. Your challenge is to launch the rocket before the bomb goes off. [Note: I'd prefer a less martial or destructive narrative, but this is what I've come up with.]

Goals with tuned difficulty level. Two ideas here: the robot opponent can be given different degrees of smarts, and the circuit can be made more or less complex. Adjustments in difficulty can also be made by changing how far the two timers have to run (making the robot's timer run longer to go off would make the game easier.)

Balance of chance and skill. Introducing some randomness into the robot opponent could lighten up the game. Random circuit layouts could also enhance repeat playability.

Partial reinforcement. This can be achieved by adjusting the difficulty level, as above, so that it is neither too hard nor too easy to win.

Emergent events. This is a weakness of the design so far, as I see it. One idea for improvement would be to introduce relays, which are switches controlled by current in other parts of the circuit. It might be possible to arrange circuits such that if you got current to a certain place, a whole series of relays would be triggered, opening a path for current toward your timer (or closing off current to the robot's timer.)

This is as far as I've taken the design in my thinking so far. My process was to work my way through the list of factors, looking for ways to add that factor to the design as a source of engagement. I think this analysis really helped my thinking.

Looking now at the remaining factors in the analysis, I have these ideas:

Collecting. The game could have a set of images of different (actual) rocket launches. Each time you succeed in a launch, a new image could be added on the play screen (personalized to you by login.) This might encourage playing long enough to collect all of the images.

Character engagement. No real ideas.

Social engagement. One could create a two player version, and this could be played by teams, alternating moves.

Assignment

Find a gamelet, play it (if you aren't already familiar with it), and analyze the factors that make it engaging, using the inventory above. Grading will reflect how substantial your analysis is, so don't turn in an analysis of a gamelet for which there is little interesting to say. If you feel that there are engagement factors for the gamelet that aren't in the inventory, describe them; this is how the inventory gets improved over time. Your submission should have about 15 well chosen sentences.

You should plan to spend about 2 hours on this assignment.