論　　文

Four Design Rubrics for Teacher-Generated Digital Games

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Introduction

Computer games for learning EFL/ESL have great potential as teaching tools. So-called "serious games" have been shown to improve student motivation (Paras and Bizzocchi 2005; Clark 2007; Tuzun et al. 2009), as well as learning outcomes for EFL students (Liu and Chu 2010; Hong et al. 2009). Unfortunately, publishers of educational materials seem reluctant to involve themselves in game-making due to the perceived cost, complexity and low prospects for return on serious games (Kelly et al. 2007; Westera et al. 2008). Therefore, I suggest that it is up to individual classroom teachers to build their own computer games.

The proposal that teachers should self-generate computer games for ESL/EFL is not unrealistic considering that most experienced teachers generate much of their own materal anyway, and that technological developments can enable even those who may consider themselves "technically challenged" (Friedman 2005; Baskerville 2009). The general trend toward user-friendliness and low cost enables individual EFL/ESL teachers to create quality learning materials in the form of computer games, and to deploy them for multiple students around the world. There are already resources available online from such organizations as Moodle, Half-Baked Software, Immersive Education, Yo Yo Games, and the like, for teachers who wish to make their own computer games, but who cannot write a programming code, and do not wish to learn how.

Therefore, there is no real technical barrier to self-generating EFL/ESL computer games.

Nor should teachers be deterred by the notion that the need for sexy 3D graphics, sound effects, or inspirational narrative necessarily precludes "amateurs" from the business of game-making. As Gee (2003) points out, the "underlying architecture" is what makes a game pedagogically effective, not its "immersive 3-D graphics." Therefore, the ability to create graphics is less important than an understanding of good game mechanics. With regard to the need for narrative through quests in fantastical worlds, there are many game genres, and for each there is an important educational role to fulfill. Simple games that are highly repetitive are useful for providing sufficient practice to proceduralize knowledge of important linguistic sub-skills, such as grammatical patterns (Macedonia 2005), and simple "arcade" or "flashcard-type" games are ideal for this role (Rapeepisarn et al. 2008). Fortunately, good game design concepts are simpler to learn and easier to master than graphic art or the art of storytelling.

This article offers a set of game-design principles for teachers interested in creating their own online computer games for EFL/ESL learners. The guidelines are based on discussions in the game design industry, in particular on Koster's (2005, 120) list of qualities shared by "successful games" ("successful" here means in the commercial sense, and should be taken to imply "fun" and/or "interesting"). I have tried to shorten Koster's list while incorporating concepts from other sources (Rollings and Adams 2003; Rouse 2005; Salen and Zimmerman 2004) to give a more concise, and at the same time a more complete picture of the art of game design. The guidelines can apply to all games, not just

those that are digitally-mediated, so I will give examples of familiar games in order to illustrate the principles. For a real world example of how they can be applied specifically to an online EFL/ESL game, they are also explained with reference to a game engine that I designed and built with some freely available software tools, and a reasonably priced hosting service. First, I will describe how I built the game, then I will explain the design principles.

The Game

The game, *Meaning Matcher* (Figure 1), is a single-user, multi-stage matching activity (readers can find and play different versions of the game at http://babeeboo.com/mod/quizport/view.php?inpopup=true&id=58 and http://courses.fearnoenglish.com/mod/quizport/view.php?inpopup=true&id=913). It was created using Moodle, a Learning Management System (moodle.org), Hot Potatos, a quizz generation suite by Half-Baked Software Inc. (http://hotpot.uvic.ca/index.php), and Quizport, a third-party module for Moodle (available through a free download at the moodle.org site). Building the game requires very little

technical expertise since the software tools used require no programming skills; it is more a matter of knowing which files and settings to select. The authoring environments are relatively intuitive, and a detailed explanation of the technical aspect of constructing this particular game is already given elsewhere (Bateson 2009). So rather than detract from a focus on design, a general description of the software and what it does should be sufficient for understanding the principles of the game.

Basically, the Quizport Module wraps Hot Potato-generated quizzes into "units," and deploys them on a Moodle website. The game, which consists of eight "stages" of matching activities, is nothing more than eight Hot Potato matching activities strung together into a unit. Each successive stage is more difficult than the preceding in that an increasing number of items must be matched within the same time limit for each stage (the relevant settings are all in the Hot Potato authoring environment). Navigation through the unit is determined by the Quizport module, which allows authors to set pre and post conditions for each activity. For example, in one version of *Meaning Matcher,* a score of 100% will advance players two stages, a score of
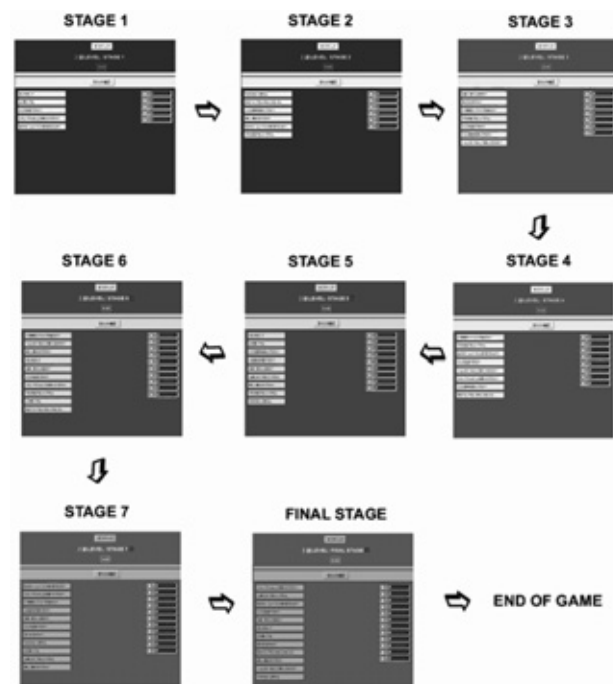

Figure 1. Screenshots of the eight stages of *Meaning Matcher*.

90% or better will advance them one, a score of 80% or better will require them to repeat the same stage, and a score of 79% or less will send them back one stage. Thus, the unit forms a simple flashcard, or arcade-type game.

There is an important difference between a flashcard-type game and simply using flashcards. Activities that follow game design concepts have the ability to intrinsically motivate learners to continue, whereas normal drill-and-practice requires learners to engage in an activity more because they have to, and less because they want to. *Meaning Matcher* was devised with such design concepts in mind, and therefore constitutes a proper game, as will be demonstrated below.

Game Design Guidelines

1. Make the core mechanic as accessible as possible.

"Core mechanic" is industry-speak for the most fundamental operation of a game, and often corresponds to a simple description of game play. For example, the core mechanic of golf is to knock a ball into a hole with a club, and the core mechanic of *Pac-Man* is to navigate a maze to eat as many point-pills as possible. "Accessible" means that the core mechanic should, as far as possible, be intuitive (i.e., it should not require complex explanations or a high level of expertise to grasp the concept), and it should not require a high degree of aptitude to perform. Golf has a good core mechanic because the concept is easily understood simply by watching, and *Pac-Man* has a good core mechanic because it only requires players to move in four directions and is operated by a single joystick. Having an accessible core mechanic allows players/learners to become more readily engaged at the outset, and allows for an appeal to a wider audience encompassing more varied skill levels. This explains why there are more golfers and *Pac-Man* players in the world than there are Chess players.

Meaning Matcher has an accessible core mechanic, which is simply matching items to clear successive stages. Matching tasks are very intuitive, as evidenced by their widespread use in teaching materials, and the same can be said of the notion of advancing through stages. Also, a click-and-drag operation is required to physically match the items on the computer screen, but this is a very simple task that only requires a few seconds of practice for a novice to master (a fact which makes it a favorite among online game designers) (Rouse 2005, 429). In practice, most students that I have observed have been able to simply open the game window and start playing, very few even pausing long enough to read the instructions.

2. Make the challenges integrated and incremental.

The "challenges" of a game are distinct from the core mechanic. In simple terms, the core mechanic is the goal, and the challenges are obstacles to that goal. For example, one challenge of golf is to hit the ball straight, and one challenge of *Pac-Man* is to avoid encounters with ghosts in normal game play. Abstracting the challenges from the core mechanic has several advantages. First, a game can be accessible and challenging at the same time. Second, it allows game developers to recycle core mechanics for use in different games. Most importantly, however, is that treating the challenges separately allows game difficulty to be manipulated more easily so as to provide a better balance with player skill level through the course of the game. That is, challenges are made incremental in that they begin at a relatively basic level and gradually become more difficult. Challenges begin at a basic level so novices can build confidence without becoming frustrated. Novice golfers are more likely to become interested in golf if they begin on easier courses, or simply by hitting balls in an empty field, and *Pac-Man* would probably not have had so much success if the intial ghosts moved at the speed and numbers seen in later stages of the game. More difficult challenges are introduced later because without an increasing measure of difficulty, there is no sense of progress or accomplishment. In other words, the game becomes menial, and players lose interest. Challenges are integrated in that they share certain salient features. This is to ensure that as novices master the initial, easier challenges, they are gaining the skills necessary to overcome more difficult challenges that are introduced later.

The architecture of most computer games is typically hierarchical in which larger, higher-order challenges are interwoven with smaller, more immediate challenges (Rollings and Adams 2003, 308). In one version of *Meaning Matcher,* a low-order challenge is comprehending an English audio file (e.g., "Why do you want to study?"), in order to match it correctly with its Japanese textual counterpart (e.g., なぜ勉強したいの？). A higher order challenge is to clear a stage by matching enough items correctly within a time limit. The initial stages are easier because there are fewer items to match, but as learners progress through the stages they must match more items within the same time limit, thus making the game more difficult as it progresses. In this sense, the challenges of *Meaning Matcher* are incremental. The game challenges are integrated because each stage is an identical matching activity, distinguished only by the number of items it displays and a different color schemes and label to indicate stage number. Furthermore, each stage draws its items from the same item inventory. Therefore, as learners progress up through the stages, they encounter more repeated items. The more items are repeated, the more easily players can match them, thus their skill level increases as the game progresses.

3. Force players to make strategic decisions.

Players should not be able to rely on a single "trump" skill to beat a game. Rather, they should be required to make strategic decisions that ultimately determine the outcome of the game. Golfers have several clubs to choose from, and *Pac-Man* players can choose to either concentrate on eating all the point pills to finish a stage, or eat a power pill to overcome the ghosts. The choices are strategic in that they ultimately influence the outcome of the game, effectively putting the player in control. This is a key factor in engaging players. Conversely, the absence of such meaningful choices is not interesting. The scoring system of *Meaning Matcher* illustrates this point.

Each of the eight stages of *Meaning Matcher* are weighted so that the lower the stage, the lower a maximum score is worth. Players can opt out of the game at any point by pressing a "Give Up" button, but if they opt out at Stage 2, for example, they will only receive an overall score of 24%, even if they have matched all items correctly at Stage 2. Players can only achieve an overall score of 100% by reaching the final stage and matching all items correctly. Further, if players fail at a higher stage, there is a possibility of losing what they have gained. For example, if a player completes Stage 2 perfectly, he will have a current overall score of 24%, but if the player subsequently challenges Stage 3, which is weighted at 36%, and completes only half of the items correctly, then the current overall score will drop from 24% to 18%. So, players must choose at each advancement whether to continue to a higher challenge where there is the promise of a higher score, but also the risk of losing points, or to opt out with what they have already achieved.

By contrast, a possible alternative scoring system would be to make the stage scores accumulative so that multiple attempts at lower stages would be equivalent to a high score at a higher stage. For example, if a player successfully completed Stage 2 four times while moving back and forth through the course of a game attempt, then the four scores of 24% would result in an overall score of 96% for the entire game. This scoring system may appear attractive because it seems to reward effort, but it would also result in what is called a "saddle point" in game design terminology (Salen and Zimmerman 2004, 21). A saddle point in geography denotes the lowest point in a range of mountains, and therefore the obvious place to choose for passing over the range. In game design, it refers to an obvious strategy choice for gaining a desired result (i.e., a "no-brainer"). In other words, faced with the option of working to improve one's skill level sufficiently to challenge higher stages for higher scores, or taking the time to repeat lower, easier stages for the same score, most players would (reasonably) opt for the latter. Not only would this be ineffective pedagogically, because the players accomplish very little as far as skill improvement, but it would also make for relatively uninspiring game play.

4. Make the outcome uncertain

It may seem counter-intuitive to suggest, as in the previous section, that players should have ultimate control over the outcome of a game, but at the same time that the outcome should be uncertain. However, as Salen and Zimmerman (2004, 337) state, this "paradox" is also a key factor in engaging players. Golfers know that a sudden gust of wind may ruin a shot, and *Pac-Man* players, at least those not familiar with the movement patterns of the ghosts, know that the seemingly random movements may corner and doom their avatar. At the same time, golfers are still in control because they can make decisions to compensate for weather issues and still finish a hole under par. Similarly, *Pac-Man* players know that if they navigate the maze carefully, without letting their attention falter, the chances of being cornered are reduced. Uncertainty leads to anticipation, and a deeper involvement in the task at hand.

The uncertainty of *Meaning Matcher* stems from the fact that matching items for a stage are selected randomly from the item inventory of that stage. Therefore, although there is a higher probability of encountering repeat items as the game progresses, it is never certain which items will be encountered, or whether they will be remembered sufficiently. At the same time, players can compensate for this uncertainty by relying on strategies other than linguistic comprehension to overcome challenges. One obvious strategy is to skip over unknown items, and deal with them later through the process of elimination. Another interesting strategy I have observed is that players who realize that items will repeatedly appear, and who finish matching all the items on a stage will run out the clock by practicing the matched items rather than press the "Check Answer" button to finish the stage. By doing so they are compensating for the uncertainty that unknown items, or unlearned items, will appear at a later stage.

Is it Worth the Effort?

Admittedly, putting together a game like *Meaning Matcher* is more time-consuming, and requires more mental effort than creating a regular flashcard activity. Therefore, the issue of "relative advantage" (Kebritchi 2010, 258) must be addressed. While no formal studies have been completed on this particular game, there is some anecdotal evidence that it positively influences the intrinsic motivation of EFL learners. First, from watching the body language of some students playing the game, it is evident that they are in a state of intense concentration. There have also been obvious signs of intense emotion such as table-pounding when a game ends with a low score, and fist-pumping when it ends with high scores. Second, a reporter for a local newspaper visited a class where I was using the game and interviewed the students. They reported that this particular set of materials was "fun," and "didn't seem like teaching materials" (Kakichi 2009), where "teaching materials" has negative connotations in the original Japanese. Third, students have reported on a school survey that they spent more time and effort on homework when it consisted of the *Meaning Matcher* game, than when it consisted of more conventional "drill-and-kill" exercises. I interpret this as a good indication that the game, however simple, has been fun and useful for many of my students, so I consider the time used to create it worth-while.

Conclusion

This paper has introduced four simple rubrics for designing a game for EFL/ESL students. A good game has a simple core mechanic, begins at a basic level and becomes increasingly more difficult, forces players to make strategic decisions, and has an uncertain outcome. These features make a game more interesting and fun to use for players, contributing to student morale and intrinsic motivation. The purpose of presenting these guidelines was to help English teachers who want to create and publish their own online educational computer games. Teachers are enabled to do so by user-friendly and cheap (or free) software tools, but they should learn some simple design principles in order to create games that are more engaging. I hope that this article will contribute to the number and quality of

online teaching materials for EFL/ESL.

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