A Comparison of Computer Game and Language-Learning Task Design Using Flow Theory

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Abstract
This article explores the relationship between Digital Game-Based Learning (DGBL) and Task-Based Language Teaching (TBLT). There are many recent studies showing that a gaming approach to language instruction is more intrinsically motivating than non-gaming approaches. A major focus of research has been to determine the design features of games that support intrinsic motivation, but such studies tend to focus only on computer game design. This article uses Flow Theory to compare computer game design and language learning task design and identify such design features. Specifically, this article explores the ways that goals, feedback and skill/difficulty balance are typically implemented in computer games and tasks. Important differences are highlighted, and the role of DGBL in TBLT is discussed.

INTRODUCTION

Digital Game-Based Learning (DGBL) is a term coined by Marc Prensky (2001) to denote the use of computer games in delivering educational content. For nearly a decade, Prensky and others (Clark, 2007; Gee, 2003; Squire & Jenkins, 2002) have been arguing for a greater focus on DGBL in various educational contexts, primarily on the grounds that computer games are better able to support intrinsic motivation in learners than non-gaming teaching materials and techniques. Intrinsic motivation is the desire to engage in a behavior for the sake of the pleasure derived from the behavior itself (Dornyei, 2003, p. 8), and is considered a key component to engaging learners over extended periods in challenging endeavors, such as learning a foreign language (Egbert, 2010). The motivational argument for DGBL originated with the observation of the commercial success of computer games for entertainment, and has been bolstered more recently by empirical evidence showing that educational or "serious" games positively influence the intrinsic motivation and/or learning outcomes of learners of various subjects (Batson & Feinberg, 2006; Papastergiou, 2009; Robertson & Howells, 2008; Tuzun, Yilmazsoylu, Karakus, Inal & Kizilkaya, 2009), including foreign languages (Ballou, 2009; Liu & Chu, 2010; Turgut & İrgin, 2009; Uzun, 2009). Furthermore, this positive effect on motivation has been shown across a broad spectrum of learners representing different cultural groups, as indicated by the varied international contexts of the studies cited above, and it seems to be equally relevant to both male and female learners (Papastergiou, 2009). For these reasons among others, DGBL is already well established in corporate and military training contexts (Bonk & Dennen, 2005), and has a considerable and growing presence in foreign language education.

Prensky (2001) refers to DGBL as a revolution but, despite his enthusiasm, it does not seem to constitute a revolution in learning theory so much as a focus on a different aspect of instruction.

For example, both DGBL and Task-Based Language Learning (TBLT), the predominant approach for teaching foreign languages, are heavily influenced by constructivism. According to Derry (1996) constructivism favors the notion that learning is an active process which alternately involves skill-challenging experiences and reflective thinking. In both DGBL and TBLT, skills are learned and/or improved through participation in activities that require the application of those skills. Hence, the theoretical underpinnings for the "basic units" of either approach—computer games and learning tasks—can be found in the constructivist notion of problem-based learning. On the other hand, while DGBL is concerned with game-like systems and computer-mediated deployment of multi-media activities for the purpose of engaging learners, TBLT emphasizes learning activities characterized by authentic language use, and training in language skills for the purpose of communication in real-life contexts (Kumaravadivelu, 2006). In other words, the focus of DGBL is to engage learners in the experiential learning process, and the focus of TBLT is to ensure that learners are taught knowledge and skills that will be useful to them in the real world. In this sense, DGBL is also distinguished from Computer-Assisted Language Learning (CALL), which can be considered computer-mediated TBLT. Therefore, DGBL is not a revolution in the understanding of how people learn, or what content should be taught, but it does offer a fresh perspective on, and powerful tools for dealing with an important, but perhaps somewhat neglected, aspect of foreign language education—intrinsic motivation.

Since DGBL and TBLT have shared theoretical underpinnings, but at the same time focus on different (yet equally important) components of the business of foreign language education, it would be useful to compare the two approaches so that the practice of one may inform the practice of the other. Specifically, a comparison of the basic units of either paradigm—computer games in DGBL and tasks in TBLT—would be useful, particularly for task designers who want to better understand the design elements that support intrinsic motivation. This is not an entirely new exploratory undertaking. Many researchers have already investigated computer games with the purpose of identifying game elements that support intrinsic motivation, and then considering how they may be applied in learning activities. For example, Malone (1983) identified the features of challenge, fantasy and curiosity, to which Hong et al. (2009) added such features as interactivity, uncertainty, fairness and competition. Dickey (2006a, 2006b) looked at narrative, and Dormann and Biddle (2009) at humor. However, such game features would be difficult to use in a comparison between computer games and tasks because they apply almost unilaterally to games. On the other hand, this article attempts to focus more generally on comparing elements of both games and tasks that may or may not support intrinsic motivation, so a more broadly applicable analytic tool is needed.

Intrinsic motivation is often examined using the concepts of Flow Theory, which generally describes a state of total mental engagement in an activity or endeavor. Flow Theory is often applied to the study of a variety of challenging endeavors, including computer games (Chen, 2008), and foreign language learning tasks (Egbert, 2003), but it has not been applied in a direct comparison of the two types of activity. Therefore, this article compares stereotypical computer game design with language learning task design through the theoretical lens of Flow Theory with the purposes of (1) informing language-learning task design, and (2) exploring the relationship between DGBL and TBLT. First, flow and conditions that support flow are explained, and games and tasks are defined. Second, computer games and language learning tasks are compared with reference to how the conditions that support flow are designed and/or implemented. Finally, the insights revealed by the comparison and implications for foreign language task design are considered.

Flow

Flow is a term coined by Csikszentmihalyi (1975) to refer to a mental state experienced during challenging activities in a comfortable zone between "anxiety" and "boredom," where the activity at hand is neither too difficult to be frustrating, nor too easy to be menial. Flow is characterized by such experiential phenomenon as a loss of self awareness (bodily needs may go unnoticed) and a distortion of time (hours become minutes) because, as Csikszentmihalyi (2008) explains, nearly all attentive resources are devoted to performing the activity, leaving little or no capacity to monitor self or the passage of time. Flow is also reported as being "pleasurable," and Marr (2001) suggests that the euphoric sensation during flow may result from a release of dopamine associated with rapid decision-making necessitated by engagement in a challenging activity, or from a sense of "control" when positive progress is perceived. The fact that the flow experience seems to impart pleasure likely explains why, as Guastello, Johnson and Rieke (1997) report, people tend to spend more time engaged in activities in which they experience flow (i.e., they are "intrinsically motivated" to engage in such activities). Because flow is associated with mental states of concentration during tasks, it has been applied in various contexts involving challenging endeavors. Furthermore, since both computer games and language learning tasks are reasonably considered to be challenging endeavors, Flow Theory is applicable to both types of activity.

Flow Theory has been applied to the study of both computer games and tasks. In the case of games, designers such as Chen (2008), Koster (2005, p. 98), Salen and Zimmerman (2004, pp. 337-393), Schell (2008, pp. 118-122), and Rouse (2005, p. 69) have all addressed flow, often extensively, indicating the importance that game designers place on intrinsic motivation and creating an engaging experience. Schell in particular provides detailed instructions for would-be game designers, making reference to specific conditions that ensure that their game designs support flow. In contrast, Egbert (2003) is perhaps the only investigator to study flow in language learning tasks. She found that learners of Spanish as a foreign language did in fact experience flow when engaged in certain tasks, but that most activities looked at in her study were only modestly successful at putting learners in a state of flow. Thus, Flow Theory has been shown to be useful in describing and/or fostering intrinsic motivation in both computer games and tasks. However, there have not been any investigations using flow in a direct comparison of the two types of activity, nor has task design been discussed specifically in terms of the conditions that tend to foster flow.

A variety of conditions that facilitate flow have been discussed. Salen and Zimmerman (2004, p. 337) list four: "a challenging activity, clear goals, clear feedback," and "the paradox of having control in an uncertain situation." Schell (2008, pp. 118-119) also lists four: "clear goals, no distractions, direct feedback," and "continuous challenge." Song and Zhang (2008, p. 511) list three: "goals of an activity, unambiguous feedback, and challenge-skill balance." Salen and Zimmerman's "paradox," Schell's "continuous challenge," and Song and Zhang's "challenge-skill balance" all seem to describe the same concept; that the element of challenge is always present but not overwhelming. Therefore, the most commonly shared, and hence most important conditions seem to be (1) goals, (2) feedback, and (3) a skill/difficulty balance. That the activity must have "goals" implies that participants expect to achieve something; "feedback" implies that participants are made aware of their progress toward achievement; "skill/difficulty balance" implies that while an individual has a pre-existing skill set sufficient for achievement, failure is also possible if effort at applying the skills falters.

The three conditions of goals, feedback and skill/difficulty balance support flow, but it would be incorrect to assume that an activity exhibiting such characteristics would induce flow universally. Individual variation can be expected in goal relevance (i.e., whether the "something to be achieved" matters in the first place), in perceptions of risk vs. reward (i.e., whether the consequences of failure are sufficiently offset by the rewards of achieving a goal), and in pre-existing skill sets. As Salen and Zimmerman (2004, p. 339) point out, the values, interests and aversions that characterize individual people are as relevant to achieving flow as the conditions inherent in an activity itself. In other words, rather than being attributes of an activity itself, the conditions of goals, feedback and skill/difficulty balance can be considered attributes of the relationship that exists between activity and participant. Therefore, if the goals of an activity (game or task) are clear and relevant, the feedback is clear and relevant, and the skill/difficulty balance is appropriate for a given participant, then it can be expected with a high degree of probability that that participant will experience flow.

COMPUTER GAMES AND TASKS

Definitions

If educational computer games and language-learning tasks are both grounded in problem-based learning, there should be significant similarities between the two activities. However, definitions of games and tasks seem to differ in the literature primarily because game descriptions tend to take the point of view of the player, while task definitions tend to be formulated from the practitioner’s perspective. For example, the nine “definitions” by various authors enumerated in Ellis (2003, p. 4) all describe the pedagogical use of tasks rather than how a task might be experienced by a learner. This is problematic because intrinsic motivation pertains directly to the learner’s mental state, so the learner’s perspective must be considered here.

Oxford (2006) provides a relatively learner-oriented discussion on the definition of “task” (p. 96). She quotes several sources, and an examination of the definitions reveals recurring groups of apparently interchangeable terms that describe task aspects. One group consists of words such as “(specific) objective,” “outcome,” or “problem” that a learner must “accomplish,” “attain," “achieve” or “overcome.” Another such group consists of words such as, “(working) procedure,” “process” and “structured endeavor” to describe a course that learners must follow to reach the conclusion of an activity. Oxford summarizes a task as being an “outcome-oriented…behavioral framework,” which effectively encompasses both sets of terminology. Therefore, from the learner’s perspective, a task can be considered an activity with a projected outcome and a set of procedural guidelines to follow in the pursuit of that outcome. This definition is strikingly similar to theoretical descriptions of computer games. Salen and Zimmerman (2004) discuss “goals” (p. 342) and “rules” (p. 149) as the defining properties of games, and Schell (2008, p. 144) describes a game as a set of rules that define a goal. The description of a game as comprising goals and sets of rules is intended to describe an abstract dimension of all game-like activity, including sporting competitions, gambling, and computer games. Therefore, goals and rules are the two fundamental properties of games, and it is proposed here that “goal” corresponds to task descriptors such as "objective," "outcome," and "problem to be solved," and "rule" corresponds to terms such as "procedure," "process," or "behavioral framework." In other words, computer games and language learning tasks are fundamentally identical in that both can be considered goal-oriented, rule-driven activities.

Computer games and tasks are not only structurally comparable, but they are also typologically very similar. Littlewood (2004) proposes a continuum of task types between the extreme poles of "tasks" or "communicative tasks" on one end, and "exercises" or "enabling tasks" on the other. He states that a "task" is a holistic, meaning-focused activity that requires learners to integrate and apply multiple skills, and an "exercise" is a discrete, form-focused activity that requires learners to practice or learn individual sub-skills. At the same time, according to Rapeepisarn, Wong, Fung and Khine (2008), various game genres can be used to target different learning objectives. For example, role play games, strategy games or simulations can be used to integrate skills in holistic problem-solving activities, while arcade-type or flashcard games can be used to learn or practice discreet skill-sets. It is proposed here that the former type of computer game corresponds to what Littlewood would consider a "task," and the latter to what he would consider an "exercise." Therefore, both computer games and learning tasks are both structurally and typologically the same type of activity.

Despite their similarities, computer games and learning tasks are often distinguished based on the experience that takes place in the mind of the participant. Schell (2008) proposes that "a game is a problem-solving activity, approached with a playful attitude" (p. 37). If this is an acceptable description, the only way to discern computer games and learning tasks would be based on the judgment of the individual player/learner, because both games and tasks are essentially problem-solving activities. In fact, it is indeed reasonable to assume that some activities designed as games (with the intention of creating a fun and engaging experience) are actually found to be tedious or uninteresting by some players. Conversely, some activities designed as tasks (with the intention of conveying useful language skills) could be intrinsically motivating for some learners. Nevertheless, based on the research, it is also reasonable to conclude that learners are more likely to be intrinsically motivated in activities influenced by computer game design theory. Therefore, it is appropriate to ask what property of games or tasks affects the mind of the participant to determine whether or not there is intrinsic motivation. As already mentioned, many researchers have sought answers to this question, and one of the purposes of comparing games and tasks is to shed even more light on the issue.

A COMPARISON OF COMPUTER GAMES AND TASKS USING FLOW THEORY

Before examining the differences between computer games and tasks, it should be noted that, generally speaking, computer game traits are more uniform than TBLT activities, presumably due at least in part to over three decades of game designers refining their craft in a competitive commercial market (Rollings & Adams, 2003, p. 9). On the other hand, TBLT methodology is less consistent, and there is even controversy over classifications for types of "task" (Bruton, 2007), making it difficult to identify overall trends in task design. Nonetheless, if computer games as a group are claimed to be more intrinsically motivating than tasks as a group, an attempt should be made at a comparison that may illustrate why. Here, the modes in which the conditions that facilitate flow—goals, feedback and skill/difficulty balance—are generally manifest in computer games and tasks will be compared. A summary of the comparison is shown in Table 1.

Table 1
A Comparison of Computer Games and Common TBLT Practice

Conditions that Support Flow	Computer Games	Tasks
Goals	Tend to be concrete and explicit. Often intuitive for a target audience. Outcomes are quantifiable and objective.	Often clear, but may require explanation or elaboration from instructor. Often abstract or subjective.
Feedback	Usually immediate and unambiguous to give a clear indication of progress. Usually just-in-time, and just-enough.	Often not present or delayed when on-task. Students may have to wait several days for comments or grades.
Skill/Difficulty Balance	Computer games are often incrementally more difficult so that difficulty increases gradually as skill increases. Many games can adapt in real time to match players' skill level. Many games allow players to choose their own level of difficulty.	Emphasis on "holistic" activities often precludes incremental design. Practitioners may design for the "appropriate" level for their students, but one size must fit all in multiple-student classrooms.

Goals

Computer game designers seem more adept at creating goals that are easily understood and interesting. Successful computer games tend to have concrete goals in the form of quantifiable scores, payoffs and/or accomplishments that express outcomes which are explicit and objective. For example, in *SimCity* (simcitysocieties.ea.com), in which the objective is to design and manage a virtual city, the scoring system is based on such concrete factors as public approval ratings and property values. Also, in *Civilization V* (civilization5.com), in which the objective is to found and develop a civilization, players may earn points for the construction of significant cultural artifacts (such as aqueducts or monuments), and lose points for not responding adequately to famine or plague. Also, these goals tend to be targeted at specific audiences so that they require little or no additional knowledge to understand, and are more relevant to players' interests. According to Schell (2008, p. 107), while not every type of player enjoys "blowing up bad guys," there are ways of either targeting certain demographics, as do most games for entertainment, or of incorporating elements appealing to various demographics into one game. Finally, computer games may also give prompts of various sorts to show players "direction" when necessary. For example, in *Worlds of Warcraft* (us.battle.net), players may encounter non-human characters that are specifically designed into the virtual world to give players missions to fulfill. Thus, in a well-designed game, players are likely to recognize goals and understand their relative importance easily.

In contrast, the goals of a good task are described as "clear" (Ellis, 2003, p. 276), but this does not necessarily imply that they are concrete or objective. In fact, goals are often rather abstract with a pedagogical orientation, such as "To practice the past tense." These types of goals are typical of "exercises" (both digitally mediated and paper-based), while "tasks" often have subjective outcomes (e.g., "To decide on how to spend money budgeted for a marketing campaign"). Also, in terms of tailoring tasks to be responsive to the interests of certain types of learners, the TBLT literature has often remained purposefully vague, relegating such work to individual classroom teachers. The reasoning seems to be that only teachers know their students' "histories and lived experiences" (Norton, 2000, p. 142) well enough to frame goals that will engage learners. Finally, instructors may have to elaborate goals, suggesting that they are neither intuitive nor explicit. Therefore, in terms of intrinsic motivation, goals in computer games seem more likely to be perceived and understood, and thus more likely to contribute to a flow experience.

Feedback

Good computer games provide real-time information so that players are almost constantly aware of their progress/performance. In well-designed computer games, feedback is usually immediate and unambiguous, provided through the use of audio/visual cues such as timers, score boards, collapsing or exploding foes, spatial movement and the like (referred to collectively as "output" by Rollings & Adams (2003, p. 183)). Feedback also tends to be "just enough" and "just-in-time" (Rouse, 2005, p. 136; Song & Zhang, 2008), making it highly contextualized and relevant to the immediate situations. For example, the virtual environment in *Tactical French* (alelo.com), a role-playing game used by U.S. military personnel to learn French, includes a perpetual textual display of feedback on a learner's speaking performance (e.g., "That was close, but you used the wrong tense" (Sagae, Kumar & W. L. Johnson, 2009)). In an associated arcade game for learning Pashto, the player must guide a squad through a village using spoken commands (W. L. Johnson & Wu, 2008, p. 522). In this case, performance is indicated by spatial movements on a map.

In contrast, the TBL methodology often dictates that learners have no indication of their performance until after a task is completed. Feedback in what would be considered a well-designed task is often delayed because it may be provided in a post-task session (Ellis, 2006, p. 36), or it may even be delayed for days as instructors reformat student output (Lynch, 2001). Instructors may also provide on-task feedback, but more often than not one instructor must attend to several students during an in-class task, making it impossible to ensure that each student or group of students receives timely and personalized feedback to an extent comparable to computer games. In order to ensure more timely feedback in a conventional classroom setting, instructors may attempt to design tasks where students provide each other with feedback, but such methods are usually successful only with advanced learners and do little to improve the quantity of expert input from the instructor (Palloff & Pratt, 2010, p. 382). If, as mentioned above, the euphoric sensation of flow is derived from a dopamine release associated with the perception of progress or a sense of control (Marr, 2001), learners would have more opportunity to experience pleasure during a computer game than during most tasks.

Skill/difficulty balance

There are three design techniques often used in computer games for creating activities that are approximately neither too difficult, nor too easy. First, Rouse (2005, p. 11) describes good game architecture as being hierarchical, comprising multiple orders of incrementally more difficult goals. The "higher order" goals are interwoven with a series of simpler "short-term" challenges that provide (1) ongoing satisfaction through immediate accomplishments, (2) practice for achieving higher order goals, and (3) direction in what may be a complex gaming environment (Salen & Zimmerman, 2004, pp. 343-344). The intention of such architecture is, of course, to facilitate an environment where the level of difficulty increases gradually and concurrently with player skill level. Second, computer-mediated games are able to respond in real time based on player feedback, and so are ideal for supporting adaptive learning (Torrente, Moreno-Ger, & Fernandez-Manjon, 2008). For example, Agudo, Sanchez, Holguin and Tello (2007) describe *SHAIEx*, a computer game for Spanish pre-schoolers to learn English. The system presents goals incrementally to the learner at various levels of difficulty based on the efficiency with which previous goals were accomplished. Finally, many games allow players to choose their own levels of difficulty with payoffs being adjusted accordingly (Rouse, 2005, p. 466). In *Civilization*, for example, players can choose from machine opponents of various strength levels to hone their skills before challenging a relatively advanced human opponent.

By contrast, an incremental approach as seen in a hierarchical game structure seems to be discouraged by some TBLT scholars who argue that tasks should be “holistic,” rather than "linear" and "atomistic" (Swan, 2005). Also, while Ellis (2003, p. 276) admonishes task designers to consider an "appropriate" level of task difficulty, in most cases there is only one task for multiple students, and one size must fit all. This makes it difficult to emulate the adaptive functionality of computer games with conventional, paper-based tasks, or to allow students to choose their own level of difficulty. Also, according to Chen (2008), the "flow" zone between "too difficult" and "too easy" is relatively narrow, as individuals have varied tolerances for failure. This implies that, in a multi-student situation, designing a "middle ground" for a conventional learning task would likely result in an activity being too difficult for roughly half of the class, too easy for roughly half of the class, and at an appropriate level only for a narrow band in the middle. Thus, computer games are more precise at striking a balance between too difficult and too easy.

DISCUSSION

Insights

A comparison of computer games and tasks through the theoretical lens of Flow Theory yields useful insights into designing for intrinsic motivation in learning activities. First, it clarifies the notion of “clear goals,” and underscores the importance of learner-centeredness in choosing goals. The common sense interpretation of the rubric of “clear goals” in task design is that learners should be able to readily understand them. In this regard, the comparison indicates that setting concrete, objective and quantifiable goals based on learners’ prior knowledge and interest is more advantageous than expecting instructors to be able to adequately explain and elaborate ambiguous, subjective or abstract goals, or to frame existing goals to suit learner interest. Second, the comparison suggests a slightly different role for feedback than what may be commonly assumed by TBLT scholars. Feedback in tasks is usually treated as a means of supporting reflection and fostering new knowledge construction, and so the emphasis is on providing it after a task is completed (Ellis, 2006, p. 36). However, the comparison with computer games shows that a form of feedback is also important for supporting flow during a task, so the nature of such feedback and ways to provide it are also important considerations. Finally, this comparison clarifies the notion of an “appropriate” level of difficulty for a task. Specifically, TBLT practitioners may, by necessity, be considering difficulty level as it applies only for large groups of learners because one task is typically deployed for a plurality of students. Yet, the comparison suggests that a means of addressing individual skill levels is well worth considering.

At the same time, the comparison also suggests that task design may ultimately be more important than the task medium. The description of flow-supporting conditions in computer games was idealized in the sense that they were taken from explanations of what constitutes a (commercially) successful game, but there are also examples of commercial game failures (Rollings & Adams, 2003, p. 12), indicating that games can be designed poorly as well. Also, it should not be overlooked that Egbert (2003) found at least one learning task that facilitated a high degree of flow, which led her to argue that task design is more important for facilitating flow than merely using a technology-based medium. Also, according to Chen (2007), if conditions supporting flow are designed properly, people can experience flow in a wide variety of activities, and not just computer games. For example, Franciosi (2010) discusses how to apply game design principles to make a cloze activity more game-like, and hence more engaging for students, without the use of a digital medium. Ultimately, then, activity design may trump the medium of deployment.

Nevertheless, computer mediation can make task environments more dynamic and more responsive to individual learners' needs to an extent that would be difficult to accomplish with conventional activities. As Salen and Zimmerman (2004) state,

> One of the most compelling qualities of digital technology is that it can offer immediate, interactive feedback. Designing systems of actions and outcomes, where the game responds seamlessly to a player's input, is a common element in digital games. Digital technology thus offers real-time game play that shifts and reacts dynamically to player decisions. (p. 87)

In other words, there are certain conditions for flow that can be optimized with computers. Which conditions pertain is discussed in the next section.

IMPLICATIONS

How does the comparison inform task design?

The aforementioned insights have several implications for task design in relation to goals, feedback and skill/difficulty balance. Specifically, the ability of digitally-mediated activities to react in real-time to player (or learner) input seems to have more relevance for feedback and skill/difficulty balance than for goals. The dynamic nature of a digital medium has modest significance for goals because they are typically determined prior to an activity and rarely change once it begins, so there is no need to adjust them in real time during a task. Furthermore, a digital medium is not required to make goals more concrete, objective and quantifiable. Numerical values that yield quantifiable outcomes could be incorporated into nearly any type of goal conceivable. For example, even a subjective goal such as "to prepare a marketing budget" could be made more objective by attaching efficacy values to various types of expenditures, and setting a benchmark that a group of learners must achieve. Furthermore, computers are not necessary to devise goals that are more learner-centered. Rather, the task-designer must, in Schell's (2008, p.

13) words, take on the role of "anthropologist," and become familiar with the values, interests and aversions of a targeted demographic. Therefore, a computer game is not required to employ goals that would support a flow experience.

On the other hand, computer-mediated activities seem to offer clear advantages over conventional classroom lessons in providing on-task feedback, and maintaining an optimum skill/difficulty balance. Feedback for sustaining flow should give learners an ongoing indication of progress and/or performance. Without a digital medium, the only way to create this level of dynamic interaction in most tasks is with one-to-one coaching, which is too inefficient in most educational contexts because it requires a faculty-to-student ratio that is simply impractical. While certain types of exercises can be designed to provide ongoing feedback, it is clear that computer-mediation provides a broader range of options.

With regard to skill/difficulty balance, Chen (2008) shows how computer games are ideally suited for sustaining flow by adjusting difficulty in real-time to suit individual players' needs. Flow, he suggests, is not actually static, as the term "mental state" may suggest. Rather, flow involves a series of minor fluctuations between frustration and boredom. Failures that are not offset by success lead to frustration and a loss of flow, and easy successes not offset by an appropriate challenge leads to boredom. Thus, for Chen, computer games maintain flow by continuously adjusting and re-directing players back to the comfortable zone between frustration and boredom at each new increment of game play. Since computers are constantly monitoring players, they can sense the moment when performance falters, or excels, and adjust difficulty accordingly. As Chen demonstrates with two example games, *Traffic Light* and *FLOw*, a digital medium is ideally suited for designing activities that have a high probability of inducing flow for a greater number of people.

What is the relationship between DGBL and TBLT?

The discussion thus far provides significant reasons for using computer games in foreign language instruction to motivate learners, but it is also clear that DGBL is not poised somehow to supplant TBLT because they are focused on separate aspects of instruction. In other words, TBLT's emphasis on authentic language and preparing learners for real-world communication could be supported by the use of computer games to facilitate intrinsic motivation in learners. This section briefly considers the nature of such a relationship.

How can computer games fit into a typical TBLT curriculum? Nunn (2006) describes a course of study he refers to as "task-based" and "exercise-supported," following Littlewood's (2004) description of the terms. In Nunn's curriculum, the task is central in that adequate performance therein is considered the overall pedagogic purpose, and learners are supported in achieving this by satellite exercises. Computer games could theoretically fit within this framework as either tasks or exercises. For example, role play games, strategy games or simulations can be used for what Nunn would call a "task," and arcade-type or flashcard games can be used for what he considers an "exercise." Thus, computer games have the potential to fulfill all important roles in a TBLT curriculum. However, there remains the question of to what extent they should.

Although digitally-mediated activities seem better at supporting flow through dynamic feedback and skill/difficulty balance, there are also limitations that restrict the application of computer games in a TBLT curriculum. First, it is probably not desirable for learners to perpetually be in a state of flow. According to a constructivist approach to learning, new knowledge is created when experiential activities are followed by reflective thinking (Derry, 1996), but a state of flow does not afford reflection because it requires the use of nearly all attentive resources. Thus, reflective thinking cannot occur when learners are engaged in an activity that puts them in a flow state. For this reason, Paras and Bizzocchi (2005) emphasize the need to create opportunities for reflection outside of a game. Just as they are often discussed in the TBLT literature, these opportunities should be formalized in the sense that students are prompted to engage in reflective thinking by "feedback for reflection" such as questions, comments and advice from the instructor (Ellis, 2006, p. 37). Also, with no need for ongoing, real-time "feedback for flow" in a post-game session, there is no obvious reason to mediate it digitally.

Second, it is not clear to what extent computer games are needed to benefit overall student motivation throughout an entire course, or if overreliance on computer games would actually be detrimental to student motivation. Some tasks that are not digitally-mediated are still very capable of inducing flow, as reported by Egbert (2003), so it makes little sense to disregard these simply because they are not computer-mediated, or they are not considered "games." Also, as Egbert (2010) puts it, motivating students for the long term involves a series of "micro-flow" experiences that encourage students to return regularly to their coursework. That is to say, the ideal curriculum could not, or should not involve one long, uninterrupted flow experience. Furthermore, not every student has a positive attitude toward computer games (Whitton, 2007), so restricting coursework exclusively to computer games may not serve to intrinsically motivate all students in all contexts. Finally, there are no empirical studies indicating to what extent an emphasis on DGBL has a positive influence on overall motivation, and research into this issue has only just begun (Wen-Hao Huang, Wen-Yeh Huang & Tschopp, 2010).

Third, while not directly related to flow or intrinsic motivation, the technical and logistical aspects of education and computer game-making are also important considerations. Some games, role-plays, strategy games and simulations in particular, are highly complex and may require years to design and test, which makes them relatively inflexible as pedagogical tools. It would not be desirable for an educational institution to devote large amounts of resources to develop a game only to have a later curriculum change eliminate the role it was intended to fulfill. This risk also deters private materials publishers from engaging in the business of making educational computer games. While some educational game designers are investigating ways to streamline the design process (Westera, Nadolski, Hummel & Wopereis, 2008), it remains a more time- and resource-consuming pursuit than designing and deploying analogue (paper-based) activities.

Having said that, it is suggested here that there are ways to advantageously, and prudently, incorporate computer games into foreign language education, and such avenues are appropriate subjects of future consideration and study. Based on the discussion above, the most likely route to DGBL incorporation in TBLT is the use of arcade-type games as exercises to practice sub-skills for later integration with other sub-skills in tasks. This notion is not unlike the proposal by Macedonia (2005), who argues that highly repetitive and focused games are useful for proceduralizing the knowledge of discrete skills because they relieve some of the tediousness associated with standard drill-and-practice exercises. Arcade-style games would serve well in this regard because they tend to be repetitive and require players to practice isolated or very small sets of skills, and come with the added benefit of a dynamic, computer-mediated interaction that supports flow. Also, from a technical and logistical standpoint, arcade games are much simpler than role-plays or simulations to design and test, and so would be relatively flexible as pedagogic tools. Therefore, future research may be more efficiently and productively focused on the use of arcade games as exercises in a TBLT curriculum.

CONCLUSION

This article has compared computer games and learning tasks using Flow Theory as the conceptual framework. Specifically, computer games and language learning tasks were looked at with reference to goals, feedback and skill/difficulty balance. Three important insights resulted from this comparison: (1) goals should be concrete, quantifiable objective, and appeal to learner interests; (2) feedback as a means of fostering flow should be considered in addition to feedback as a means of supporting reflection; (3) task difficulty and player skill are ideally balanced moment-by-moment at the individual level. It was suggested that while the first insight does not apply exclusively to computer games, the second and third provide strong arguments for incorporating computer games into TBLT coursework to some extent. It was recognized that there are limitations on the appeal and capability of computer games as pedagogic tools, as well as technical and logistic issues. Finally, it was suggested that a productive focus of future research is the use of arcade-type computer games as exercises for supporting learner performance in tasks.

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