Evaluating Interactive Gaming as a Language Learning Tool

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Abstract

We propose a methodology for evaluating second language acquisition in the context of massive multi-player online role-playing games (MMORPG). Careful examination of learning opportunities present in gaming requires us to direct our attention to the characteristics of MMORPGs and how these characteristics support learning. MMORPGs accommodate active learners who assume the role of characters they have selected, create immersive environments that promote the development of conceptual knowledge and engage players in social interaction among a community of players. Since MMORPGs support social interaction between players, MMORPGs serve as the catalyst for fostering students language proficiency as students interact in a foreign language while playing the game. For these reasons, we believe that MMORPGs embody an interesting and underutilized learning environment for second language acquisition. Based upon this premise, we introduce a game-language learning model and explore Sony Online Entertainments 3D game Ever Quest II as a pedagogical tool for students learning English as a second language.

Figure 1: *Conversational Dialogue with Game Avatar.*

1 Introduction

Typically, foreign language students struggle with developing conversational proficiency due to inhibitions about using the new language, especially in the traditional classroom setting; students become self-conscious, not wanting to make mistakes in front of their peers [A.Z. Guiora and Scovel 1972; Hudson and Bruckman 2002; Kolodner 1997]. Therefore, language instructors seek ample opportunities to engage students in target language discourse as a means of helping students to build their confidence and develop language competency. Research has shown that the use of computers (e.g. on-line chat rooms) to supplement language learning provides foreign language students with opportunities to practice their emergent language skills in a non-threatening environment [Backer 1999; Beauvois 1992; Beauvois ; Beauvois and Eledge 1996; Cononelos and Oliva 1993; Hudson and Bruckman 2002; Kelm 1992; Kern 1995; Payne and Whitney 2002; Warschauer]. As a result, students produce more interactive conversations that resemble normal face-face conversations in the target language, [Beauvois 1992; Beauvois ; Beauvois and Eledge 1996; Cononelos and Oliva 1993; Hudson and Bruckman 2002; Payne and Whitney 2002; Warschauer]. In addition, foreign language students who interact online demonstrate an increase in their cognitive skills in the target language and perceived learning [Beauvois 1992; Hudson and Bruckman 2002]. However, less research has been done on non-traditional computer-assisted language tools. We turn our attention to one specific form of interactive media—3D computer games and their role as language learning tools.

Video games have become more than a 7 billion dollar industry while educational software has grown to a 1.6 billion dollar industry in America [Mainelli ; Prensky 2001]. Though computer games have been criticized as being mindless entertainment with no educational value or content, Gee [Gee 2003; Gee 2004] and others argue that computer games have the potential to transform learning [Gee 2003; Gee 2004; Koster 2005; Prensky 2001]. Furthermore, research shows that computer games function as pedagogical tools that create active, interested and critical learners [Gee 2003; Gee 2004; Koster 2005; Prensky 2001]. Gee [Gee 2003; Gee 2004] posits that computer games teach us about the learning process in ways that the traditional classroom environment does not. One particular pedagogical strategy stresses "learning by doing" as a means for developing in depth knowledge of specific domain (e.g. mathematics), rather than reading about concepts and expecting students to spontaneously develop deep knowledge [Schank 1994]. Students begin to master domain specific concepts, progressing from novice to intermediate level, when they participate in situated learning activities. Games transform the learning process from being a passive task to one in which individuals engage in the experience of learning. Computer games supply authentic environments for learning, complete with ample opportunities for students to develop and test their knowledge. We believe that learning that occurs in the virtual world can be transferred to learning in the real world. Therefore, we explore the novel application of computer games as a language learning tool and propose a method of evaluation for computer games that support second language acquisition.

2 Background

Second language students strive to develop communicative competence in a foreign language [Canale and Swain ; Canale 1997]. Communicative competence refers to the ability to use the appropriate response in a particular context [Campbell and Wales 1970; Chomsky 1965]. Bachman [Bachman and Savignon 1986] extends communicative competence to include a language compe-

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tency, inclusive of grammatical competence—the ability to generate and comprehend the formal structure of language— and textual competence—the ability to construct discourse [Hadley 2001]. Foreign language students develop communicative competence by actively negotiating meaning with other speakers who have some knowledge of the foreign language. The experiential pedagogical approach advocates students sharpening their second language skills as they create their own meaning, producing language to carry out a range of tasks in the target culture [Stern 1990]. Subsequently, second language students apply their knowledge to real-life situations in the form of conversational fluency which supports development of language proficiency in the target language.

Second language theorists stress the importance of students hearing and speaking the target language as an important process for assisting second language acquisition [Krashen 1991; Savignon 1991; Lee and VanPatten 1997]. Though a necessary practice for foreign language students, teachers may find it difficult to afford students sufficient opportunities to hear as well as speak the foreign language. To assist students with developing foreign language proficiency, second language teaching methods have begun to embrace the use of technology, specifically computers as assisted language learning (CALL) tools[Alatis 1983; Pusack 1981; Soper 1982; Stevens 1983]. CALL reinforces foreign language course objectives while addressing the individual needs of learners. The use of technology to supplement language proficiency covers a broad spectrum, including traditional foreign language learning software that features listening, speaking, writing and reading modules, asynchronous networks of communication using email where students provide written responses to the professor and others, and synchronous networks of communication via online chat rooms among foreign language students as they participate in real-time discussion. Recently, research studies of online sessions have shown promising results for second language acquisition. In fact, students produce more interactive conversations that resemble normal face-face conversations in the target language, thus forming a social network of support with other language students in online chat rooms [Beauvois 1992; Beauvois ; Beauvois and Eledge 1996; Cononelos and Oliva 1993; Hudson and Bruckman 2002; Kelm 1992; Kern 1995; Payne and Whitney 2002; Warschauer]. Online chat rooms in foreign language classes accelerate students' reading, thinking and writing skills in the target language [Beauvois 1992]. Additionally, online chat rooms promote a democratic learning environment that is conducive to both introverted and extroverted learners, evolving into learner-centered environments in which students of different language levels accept more of the responsibility for developing target language proficiency [Beauvois 1992; Beauvois ; Beauvois and Eledge 1996; Cononelos and Oliva 1993; Hudson and Bruckman 2002; Kelm 1992; Kern 1995; Payne and Whitney 2002; Warschauer].

Another application of computers as language learning tools is Multi-User Domains (MUDs) or Multi-user Object-Oriented (MOOs) domains. Backner [Backer 1999] proposes a modular approach to ESL/EFL, using schMOOze—a text-only Multi-user Object Oriented domain (MOO)—to support synchronous communication as an online chat tool. SchMOOze facilitates students' second language proficiency skills by requiring students to exclusively use text to interact with others in this virtual environment. For example, participants construct an identity using text to describe their character. Navigation throughout the mud is possible based on textual information giving location (e.g. "in the living room") and other MOO inhabitants' responses to your actions[**?**]. Extensive use of written communication serves as a mechanism for non-native English speaking students to hone their English grammatical and written communication skills. Because the interaction is text-based with no visual information and progression through MOOs requires students to learn a programming language to construct their own virtual space, students may experience difficulty attaining higher levels of functionality in the MOO (e.g. wizard) due to the need for extensive time commitments and possible lack of motivation. The lack of graphical representations to support textual information may result in frustrating attempts to develop second language proficiency. In comparison, computer games extend the benefits of MOOs for second language acquisition. Rather than relying solely on text as the means for providing critical information about the virtual environment, computer games leverage sophisticated graphics to generate images, sounds, gestures, and objects that take on different meanings relative to context of the game. Visual information becomes a critical part of communicative competence as players interpret meaning and respond accordingly. In addition, games furnish both intrinsic and extrinsic motivation for players in that players desire to advance levels by purposefully developing their selected character's skills and completing various tasks [Tracy Fullerton and Hoffman 2004; Gee 2003; Gee 2004; Koster 2005; Prensky 2001]. Such activities overcome the lack of motivation attributed to text-based MOOs.

This is not to say that 3D games with their powerful graphical interfaces have become the panacea to learning [Michael Begg and Macleod ; James Elliot and Bruckman 2002; Gee 2003; Gee 2004; Prensky 2001]. Rather thoughtful design and application of computer games determine effective digital learning environments. Gee [Gee 2003] suggests that computer games can teach us about the learning process in ways that the traditional classroom environment does not; he identifies principles that good computer games use to engage players in active, critical thinking that informs their decisions in both the virtual and real world [Gee 2003; Gee 2004]. Game-based learning builds upon the key elements of game play, presenting challenges to players, promoting the aspect of fun and enjoyment, providing immediate feedback of performance and immediate rewards. Thus, computer games facilitate and effectively model the learning process[Michael Begg and Macleod ; Prensky 2001; Tracy Fullerton and Hoffman 2004].

3 Thesis

We believe that learning that occurs in the virtual world can be transferred to learning in the real world. We examine the learning opportunities present in 3D games and direct our attention to situated, immersive learning experiences that allow students to make decisions and adapt to the consequences of their decisions as they engage in role play. Though there are various genres of computer games, we believe that massive multi-player online role-playing games (MMORPGs) best support situated learning based on the following factors:

an immersive learning environment that promotes the development of deep, conceptual knowledge of a particular domain by allowing players to experience the virtual world through sight, sound, participation and imagination,

social interaction among players in support of reflective learning as players consider the consequences of their decisions and game outcomes,

active learners who assume the role of the characters they have created and consciously commit to the advancement of these characters in the virtual world[Gee 2003; Turkle 1995].

Acknowledging that learning does not occur in a vacuum, context plays a crucial role in the learning process. Role-playing fantasy games motivate players, creating a virtual world as the context for

foreign language students to concentrate on accurate and coherent use of the target language to communicate intent and to assist with completing game tasks. While there exists numerous game tasks that the player can select, the structure of MMORPGs supports character evolution and game progression. In addition, computer games supply authentic environments for learning, complete with sufficient opportunities for students to practice, develop and test their emergent communicative abilities. The practice of producing language that is evaluated for meaning by other role-playing characters constitutes authentic dialogue between native and non-native language speakers. Furthermore, computer games emulate the experiential approach of second language acquisition by providing an immersive learning experience. The target language is spoken by virtual characters, providing foreign language students the opportunity to hear the accents and intonation specific to that language. Moreover, text is displayed on the screen, giving visual cues to determine context of meaning and language content as well as identification of second language vocabulary. Thus, language becomes a necessary artifact of successful game play.

MMORPGs are designed to create and support social networks of gamers. Experienced gamers realize successful progression through the virtual world depends on well-formed affiliations, affiliations that lead to well-developed characters that possess advanced skills needed to complete increasingly difficult game tasks. Powerful alliances play a key factor in gamers abilities to defeat enemies and accomplish tasks that are virtually impossible to perform alone. MMORPGs sustain social interaction between players and serve as the catalyst for fostering students grammatical and conversational competence as students chat in a foreign language while playing the game. Social interaction is a prerequisite to students language proficiency. Without social interaction, students lack motivation, opportunities for practicing target language skills, and immediate feedback; all three components are crucial if students desire to increase their communicative abilities in the target language. Online role-playing games are transformed into computer assisted language learning tools for successful second language acquisition for novice, intermediate and advance language students [Michael Begg and Macleod ; Gee 2003; Gee 2004]. For these reasons, we believe that MMORPGs create the ideal learning environment for second language acquisition in addition to the social interaction among players that supports meta-thinking abilities for semantic, syntactic and contextual knowledge of a foreign language[Prensky 2001]. Using game-informed practices and second language teaching practices, we evaluate Sony Online Entertainments Ever Quest II, a massively multiplayer online role-playing game (MMORPG), as a language learning tool for students acquiring a second language.

4 Evaluation Criteria

We propose a methodology for evaluating games as language learning tools, we will conduct studies with foreign language students. Currently, we are planning experimental studies that will answer the following questions:

1. Do students acquire and/or increase in their second language literacy skills (i.e. oral and written skills) as a result of playing Ever Quest II relative to those students who do not play Ever Quest II? For which specific literacy skills (e.g. reading, writing, and speaking) do we see an increase? Are there any differences in acquiring one second language versus another second language (e.g. learning French vs. learning English)?

2. What specific learning and meta-cognitive skills for second language acquisition does Ever Quest II support? How does this relate to theories and practices of second language teaching?

Figure 2: *Role-playing character chatting with non-role playing character in English.*

3. Does Ever Quest II provide opportunities for students to engage in authentic discourse relative to a specific culture? If there are opportunities for authentic discourse, are they self-contained within the game or provided externally (i.e. player forums)?

4. Do MMORPGs support specific aspects of second language acquisition? For example, does Ever Quest II support increase in vocabulary more so than accurate use of syntax or use of appropriate tense?

5. How does the players game playing ability affect second language acquisition? If the player advances levels, do we see a direct correlation in second language acquisition?

6. How can we better design computer games to transform them into language learning tools and support second language acquisition?

These studies will be conducted over a designed period to determine if we see an increase in students second language skills because of game play.

5 Implementation

Though we have the option of designing and implementing an educational game that facilitates foreign language learning or using traditional language learning software, we suggest that computer games already exists that support second language acquisition. Ever Quest II is an example of such a game; Sony Online Entertainment (SOE) has graciously agreed to provide software licenses for Ever Quest II at no additional cost in support of this research effort. Ever Quest II is a Massively Multiplayer Online Role Playing Game (MMORPG) that is set 500 years after the original Ever Quest MMORPG, both designed by SOE. Prior to playing the game, players select a character from 16 races (e.g. dwarfs, barbarians, etc.) and 5 archetypes (e.g. mage, scout, artisan, priest, and fighter) with each race and archetype having specific abilities. Players assume the role of their character and the character is represented as an avatar on the computer screen. For example, if the player selects a cleric from the race of dwarfs who is a member of the priest class, then the player is represented as an avatar

short in height and empowered with divine magic that banishes diseases. Players are immersed in a fantasy world of beautiful 3D graphics while journeying across various terrains, including rolling hills, barren deserts, dense forests, and bustling cities. Players advance from one level to another as they successfully complete challenges/quests; Ever Quest II contains 60 levels. Players may form groups known as guilds that work together to complete quests or choose to play as individuals. Ever Quest II accommodates social interaction among players, allowing players to communicate with one another using text and audio while playing the game and participating in player forums which serve as a useful resource for sharing and discussing effective game strategies, forming relationships with other players, receiving assistance when faced with trouble, and learning how to play the game. Ever Quest II can be played in English, French, German and Japanese and has an international player base.

6 Methods

We believe that Ever Quest II can support second language acquisition. Our goal is to evaluate Ever Quest II as a language learning tool, and to achieve this goal, we have identified supportive tools that aid in data collection and analysis and allow us to measure second language acquisition. The ideal setting for conducting experiments is a language lab that consists of several computers with Ever Quest II available on each machine. Microsoft Research has generously donated machines to support this research effort. Students have the ability to interact with non-playing characters—characters that share information through the use of dialogue about game tasks but do not participate in game tasks—as well as role-playing characters—avatars who can participate in physical interactions and verbal and nonverbal communication with other role-playing characters while completing various game tasks. Using Ever Quest II built-in keylogger, we track each players actions throughout the game. Data is collected via keystrokes, representing time spent playing the game, discourse within the community of foreign language students playing the game, and student generated discourse within the community of Ever Quest II gamers. We are primarily concerned with the following data items per language student:

Date and time of game play Total time spent playing video game Completed challenges/quests Levels of advancement Number of messages generated Receiver of messages Message text/content

Though players can play the game in any one of these four languages, Ever Quest II does not have a mechanism for parsing online chat sessions during gameplay. Therefore, we have selected Link Grammar, a natural language processing (NLP) tool developed by Davy Temperley, Daniel Sleator, and John Lafferty of Carnegie Mellon University to parse online chat messages of ESL students. Link Grammar is responsible for parsing second language discourse between players engaged in the game (e.g. language students who talk to each other while playing the game) and second language discourse within the community of Ever Quest II gamers. For ethical purposes, no data will be collected for Ever Quest II players who are not foreign language students. Our goal is to compare ESL students communicative competency skills prior to playing Ever Quest II with demonstrated second language skills after playing the game. The NLP tool will allow us to compare subject-verb agreement and vocabulary.

```
LEFT-WALL  this.p is.v [so] going .v to get.v us killed.v

(s  (NP  This)
       (VP  is  so
            (VP  going
                 (s  (VP   to
                           (VP  get
                                (NP   us)
                                (VP   killed) ) ) ) ) )
```

Figure 3: *A diagram of the system detailing the fluid jet and splatter modeling (Left) as well as the rendering components (Right).*

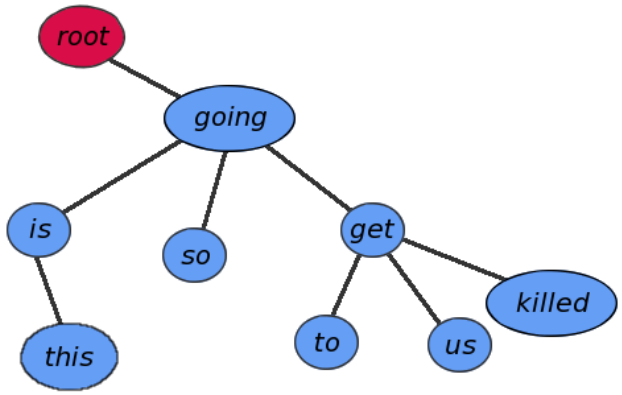

Figure 4: *A diagram of the system detailing the fluid jet and splatter modeling (Left) as well as the rendering components (Right).*

7 Data Collection and Analysis

The goal of the first phase of our research is to determine if Ever Quest II successfully supports second language acquisition. To accomplish this goal, we will need to conduct studies of ESL students playing Ever Quest II over a designated period of time. Currently, we are soliciting student volunteers from the Northwestern University English as a Second Language (ESL) program. As an incentive, SOE has agreed to provide free keys and three months of access to Ever Quest II for each participant.

Using a between-subjects design, we will randomly assign language students to two groups. Students who do not play Ever Quest II but are enrolled in an ESL class will comprise the control group. Students who play Ever Quest II and are enrolled in an ESL class will comprise the test group. Students will be randomly assigned to each group. We will administer a pre-assessment using the SPEAK assessment tool to test overall spoken English proficiency for both groups of students. Participants in the test group will be given access keys to register to play Ever Quest II. To address the issue of learning curve, we will host a 4 hour tutorial session to review the basics of game play during the first week of game play. Sessions will be conducted in students native language. We will cover the following topics: back story, avatar archetypes, character creation and navigation in the virtual arena, inventory, communication options, hot keys, rewards, and additional game artifacts. Once students have reached level 4, students will be encouraged to play Ever Quest II for a minimum of 4 hours per week for the next 8 weeks. Using the keylogger, the aforementioned student data will be collected for each player and student-initiated discourse parsed for subject-verb agreement and vocabulary. Using a t test for the two groups of participants, results will be analyzed for a significant increase in target language proficiency skills. We will administer a post-assessment using the SPEAK assessment tool for each student. In addition, students in the test group will complete a questionnaire evaluating students perception of Ever Quest II as a computer assisted learning tool. The results of our data analysis will be used to inform design decisions of subsequent experimental studies.

8 Discussion and Conclusion

We have extended the popular MMORPG Ever Quest II to function as a language learning tools for ESL students. Using Ever Quest II's keylogger and the Link Grammar NLP, we offer a methodology for evaluating MMORPGs as a second language acquisition pedagogical tool for ESL students. We have chosen to submit this paper during the initial stages of the research process for two reasons. First, we realize that in order for computer games to reach their full potential as educational artifacts, we need input and feedback from experts—educators, second language instructors, linguists and game designers. In fact, we encourage dialogue and the exchange of ideas as a means of informing our research and revising our evaluation methods. Secondly, we seek to positively affect education, creating effective learning environments that leverage the skills, intelligence, and tech-savvy of the next generation of students. To address these issues, more exploratory research is necessary if we are to find creative solutions to the age-old problems of how do we motivate students to learn, and more importantly, how do we get students to learn. We believe that the novel application of interactive 3D games for language learning can facilitate positive learning outcomes for foreign language students.

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