"Great Job, Quester!" Assessing Language Skills on Quest Atlantis

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1. Introduction

The diffusion of computer technology has led to an increased interest in computer gaming. A study conducted by the Pew Internet and American Life Project (2001) found that over half of teens in the U.S. play or download computer games. Both boys and girls are proficient gamers, although boys are more likely to self-identify as such (Bryce & Rutter, 2003). The combination of the popularity of computers and proficiency with gaming technology by young people has sparked an interest in integrating gaming into educational settings.

Educational games are thought to increase learner participation and motivation, which in turn can lead to enhanced learning (Prensky, 2000). A challenge in assessing the success of educational gaming, however, is separating out its motivational effects from its cognitive effects. Are kids just having fun when they play educational games, or are they actually learning? If the latter, what are they learning, and are all students learning the same things?

This study analyzes language use as an indicator of learning in an interactive educational game. Quest Atlantis (QA) is a 3-D multi-user virtual environment (MUVE) designed for children between the ages of 9 and 12 (Barab et al., 2005). The goal of the QA designers was to develop a "technology-rich game without guns that teaches and

informs, where the excitement is about learning, growth and the development of a sense of wonder" (p. 87).

In QA, the students or "Questers" navigate the virtual worlds in the online space by means of graphical avatars. One of the activities encountered by the Questers is quests— focused educational tasks requiring a written response. In this study, quests completed by two classes of fourth grade students and their associated reviews were analyzed for language standardness and complexity, both measures of verbal skill. Two questions guided the analysis: Does verbal skill in QA vary by quest type, i.e., whether a quest is chosen and reviewed by the teacher or by other children? How, if at all, does verbal skill vary by gender? Informing these is the larger question of what factors contribute to more sophisticated language use in educational gaming environments, and how the design of such environments might optimize verbal learning for all demographic groups.

2. Background on Educational Gaming

A growing number of researchers assert that the use of computer games can be expanded beyond recreational purposes to motivate children and to enhance learning (Barab et al., 2005; Gee, 2003; Prensky, 2000). On the one hand, computer games are technological tools that enable educators to connect to the new generation of students, sometimes referred to as the Millennials (Oblinger, 2003). Playing some computer games has also been found to have positive effects on academic performance (Subrahmanyam, Kraut, Greenfield, & Gross, 2000). In addition, there is evidence that children who play such games can improve skills that may eventually lead to computer literacy (Subrahmanyam et al., 2000).

The potential of educational games to promote computer literacy is often cited as a means to get more girls involved in computing and technology-related careers (Gorriz & Medina, 2000). Early game playing is thought to increase familiarity and comfort with computers, and to forestall the "computational reticence" observed in many women (Margolis & Fisher, 2002; Turkle, 1988). However, the core audience for recreational computer games is predominantly boys between the ages of 8 and 14 (Subrahmanyam et al., 2000); such games tend to feature violent themes, which may not appeal to girls. Several studies have shown that girls prefer to create things, rather than destroy them (AAUW, 2000; Gorriz & Medina, 2000; Margolis & Fisher, 2002). Nonetheless, relatively less content is available that is aligned with the interests of girls, such as exploration, puzzle-solving, or social interaction (Gorriz & Medina, 2000). Educational games have the potential to level the gendered playing field, in that they tend to be non-violent and focus on problem-solving, and thus may appeal more to girls than do most recreational games.

Another relevant variable is the context in which gaming takes place. Educational games such as Quest Atlantis typically take place in school settings, where they are structured and monitored by adult instructors. In contrast, recreational gaming has been claimed to provide a type of immersion into technological worlds that allows children to "escape from adult regulation" (Jenkins, 1998, p. 265). Subrahmanyam et al. (2000) have gone further to suggest that "online communications among computer users of all ages tends to erode authority structures" (p. 131). This observation also raises gender issues. Boys are more likely than girls to identify as recreational online gamers (Bryce & Rutter, 2003), and they are also more likely to resist authority in the classroom, a tendency Renold (2001) attributes to the pressures of hegemonic masculinity on identity formation and the

perceived "feminisation of academic success" (p. 369). If educational gaming can effectively engage boys, it could potentially provide a bridge to socially acceptable academic learning.

Despite their potential benefits, examples of "entertainment" products that support learning activities are rare, and not many games have found their way into educational environments (Barab et al., 2005). Jones (2003) found that most gamers (69%) reported having had "no exposure to video, computer, or Internet gaming in the classroom for educational purposes" (p. 9). This study investigates claims about educational gaming and gender in the context of one game integrated into classroom use, Quest Atlantis.

3. The Research Investigation

3.1. Quest Atlantis

Quest Atlantis (http://questatlantis.org) is a 3-D multi-user teaching and learning environment for children that is funded by the National Science Foundation through the Indiana University School of Education (Barab et al., 2005). The environment incorporates a narrative backstory about a Council of young Atlantians. The purpose of the activities in QA is for children to help the Council members "save Atlantis from problems similar to those faced on Earth" (p. 99).

Figure 1. Quest Atlantis Screenshot

In QA (Figure 1), "Questers" navigate virtual worlds, engage in text chat, and complete quests. The quests are represented as rotating disks that can be clicked to display textual instructions. Quest instructions include two parts: the goal(s), which differ for each quest, and reflections, which consist of the same three questions (What advice would you give a friend on the best way to go about doing his Quest? In doing this Quest, what have you realized about yourself, or how you best learn? Why is what you learned important, and how can it make our world and the Atlantian world a better place?). Quest content is connected to real-world activities, as well as to local academic standards and QA itself. The following is an example of a quest completed by a boy:

(1) my quest is called your favorite pictures of nature.
     first you would get a camera and take a picture of your favorie place in the real world. then you would upload your picture and tell us why you like that place. This quest should be worth 6 lumins and should be found in ecology world next to the fire cave.

> First I would tell my friend to make up a quest. Then he would tell the procedures.
> I have realized that when you think you come up with a lot of cool ideas.
> What I learned is important because other people will read this quest and get good ideas so there will be more quests for people to do.

Three categories of quests are available, depending on who selects them and who may review them. *Teacher quests* are selected by the teacher, assigned to all students in a class, and reviewed by the teacher, sometimes using the name of one of the Atlantian Council members (e.g., Alim, Lan). *Class quests* are selected by the teacher, but students have a choice of which quests to do, and they are reviewed by their classmates. Finally, *community quests* are selected by the QA designers, are available for anyone in QA to do, and may be reviewed by anyone in QA. The three types of quests cover a similar range of content and levels of difficulty.

Reviews, like quests, are submitted online; they consist of a recommendation ('accept' or 'revise'), and, in most cases, feedback to the Quester about the quality of the quest. Examples of reviews submitted for teacher, class, and community quests are given below:

(2)   Review of a teacher quest[1]
        Status: Accepted

> You have done a good job. I think you mean role model in your attachment. A role model is someone that we all try to be like. You seem like a good role model.
>
> Thank you for your great work,
> Alim

(3)   Review of a class quest (girl)
        Status: Accept

        Quester-
> Great job! Your quest is full and complete! Good idea for a bill, too.
>
> -A Friend

(4)   Review of a community quest (boy)
        Status: Revise

        Don't forget to espell [sic] all the words correctly!

To motivate participation, Questers earn points in the form of "cols" and "lumins" for the quests and reviews they submit. These points can be used to obtain a variety of items, including QA stationary, stickers and pins, and trading cards. Students may also trade the points for "virtual world privileges" such as flying through the virtual space or permission to build within QA (Barab et al., 2005).

3.2. Research Questions

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[1] This review is signed "Alim," the name of one of the Atlantian Council members, but was written by a teacher. Both of the classroom teachers included in our sample are female.

This study investigated the linguistic sophistication of quests and reviews by examining language complexity and standardness. We were especially interested in the influence of quester gender and quest/review type on language use in core QA activities.

We first asked whether gender differences in verbal skill are evident in QA. Not only do girls have a more positive orientation toward school than do boys, but they are also more verbally advanced. Previous research has shown that there are developmental differences in verbal skill among children in the QA age group (Morisset, Barnard, & Booth, 1995). These include differences in vocabulary, grammar, and punctuation (Ladegaard & Bleses, 2003); the language of females is closer to the "prestige standard" than that used by males. On the basis of this research, we hypothesized that girls would show greater verbal skill than boys in quests and reviews.

Social equity is also of concern as regards gender. Research in the field of computer-mediated communication (CMC) has shown that the "genderlects" men exhibit online include such features as a tendency to be more assertive and to dominate the discourse (Herring, 1993). According to Leman, Ahmed, and Ozarow (2005), boys and girls also have different conversation styles. Boys tend to exhibit characteristics of independence, dominance, and competitiveness, while girls' conversation is characterized by closeness, cooperation, and personal exchange. This previous research led us to hypothesize that boys would be more competitive and dominate in QA in contexts where choice and amount of questing activity is not controlled by teachers.

Quest type was also of interest for several reasons. Class and community quests were introduced by the QA designers to give students more autonomy, and to enable the questing activity to scale up without requiring that a teacher review each quest. However, there is a question as to whether community quests, in particular, are workable. While previous research has found that students can provide effective review of their peers' work (Topping, 1998), the students in such studies have tended to be college aged. Are fourth graders mature enough to adopt the role of peer reviewer of other students' quests? If so, are the voluntary community quests of as high quality as the assigned teacher quests? We hypothesized that children would associate questing with schoolwork and would therefore participate less in voluntary than in assigned quests and reviews. We further hypothesized that children would use more sophisticated language in assigned than in voluntary quests and reviews, knowing that what they typed would be reviewed by adults.

3.3. Data Collection and Analysis

Data for the study were all three types of quests and their reviews from randomly selected students. From the Quest Atlantis database, sixty students who submitted community quests that received 'accept' (N=40) or 'revise' (N=20) reviews were randomly identified; one teacher quest and one class quest (if available) were then randomly selected for each student, along with the reviews for each. This resulted in an initial sample of 112 quests and 217 reviews.

In order to control for language proficiency and length of time questing, we subsequently narrowed the sample to two active fourth grade classes in Bloomington, Indiana, which had been doing quests for the longest period of time—from December 2004 to August 2005. The two fourth grade classes contributed 71 quests which garnered 129 reviews, 100 of them from children. The final sample included 13 girls and 11 boys.

Linguistic sophistication of the quests and reviews was analyzed according to two dependent variables, complexity and standardness, following the coding and counting approach of computer-mediated discourse analysis (Herring, 2004). Complexity was measured in terms of word length, utterance length, and message length (cf. Hickey, 1991). Standardization measures included errors in spelling, grammar, punctuation, and capitalization (cf. Ferrari, Bouffard, & Rainville, 1998). Complexity and standardness were chosen because they could readily be operationalized and quantified, and because they had been found to distinguish between boys and girls in different modes of CMC in earlier analysis of QA data (Herring, Das, & Penumarthy, 2005). Amount of participation was also a dependent variable. Gender and level of difficulty of the quest were considered as independent variables. All three authors were involved in the coding process, which involved successive refinement of the category definitions until a level of interrater agreement in excess of 90% had been reached.

4. Findings and Discussion

Gender differences were found in both the quests and reviews, although the pattern differed in the two types of activity. In the quests, girls used more standard language, and they also completed more quests of each type, partly a result of there being more girls in the sample. There was no clear effect of quest type on language complexity or language standardness. Similarly, in the reviews, girls used more complex and standard language in class reviews, and completed slightly more of them. However, boys used more complex and standard language in community reviews, and completed more of them.

These patterns are illustrated in Figures 2-4. Figure 2 shows participation as measured by number of quests and reviews completed according to quest type and student gender. Figures 3 and 4 show the frequencies of non-standard language use (capitalization and punctuation in Figure 3, and spelling in Figure 4) per 1000 words for quests and reviews.

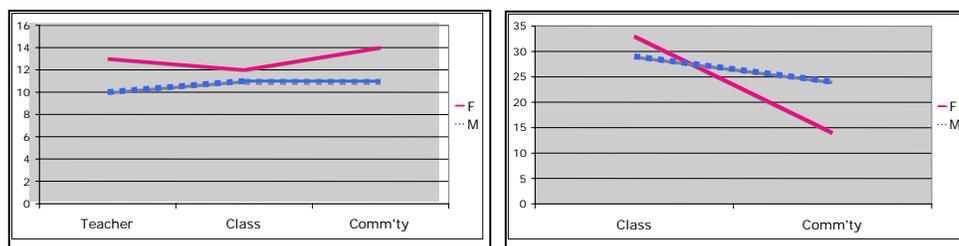Figure 2. Average number of completed quests (left) and reviews (right)

Figure 3. Capitalization and punctuation errors in quests (left) and reviews (right)
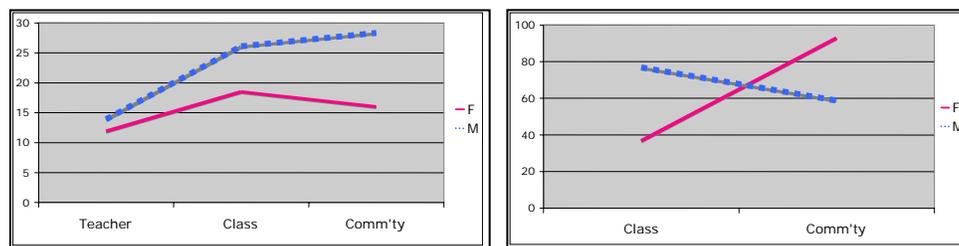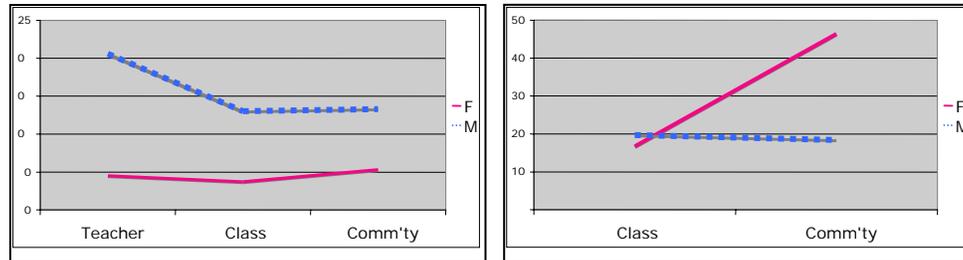
Figure 4. Spelling errors in quests (left) and reviews (right)

In each figure, the chart on the left shows girls being more active or making fewer errors than boys, while the chart on the right displays a cross-over pattern, with those tendencies reversed for community quests. One measure of language complexity, utterance length (not illustrated), also shows this cross-over pattern in reviews. While the gender results for quests were as expected, the cross-over pattern for reviews was unexpected. Why do reviews differ from quests? Why do community quest reviews differ from class reviews? (Teacher reviews are not included in this comparison, as their language use was considerably more sophisticated than the children's.)

An examination of gender in relation to quest level helps shed light on these unexpected findings. Table 1 presents the average level of difficulty for each type of quest completed by girls and boys. Quests were pre-assigned a difficulty level on a scale of 1 to 10 by the QA designers.

Table 1. Average difficulty level of quests completed

Quest type	Boys	Girls
Teacher	3.06	3.43
Class	4.13	3.56
Community	5.05	3.71

Table 1 shows that the more choice the children were given about which quests to do, the more difficult quests they chose. However, this tendency is more pronounced for boys than for girls. Even in the community quests, where they had complete freedom to choose any quest, girls were more timid than boys, averaging only 3.71. Boys' choice of more difficult quests is not difficult to explain. The students received more points (cols and lumins) for completing more difficult quests. Bruner, Bennett, and Honey (1998) noted that boys "often appreciate the opportunity to rack up more points" (p. 84) in games. This is supported by observations made by the authors during visits to the computer labs, where they noticed many boys orienting to QA competitively, checking each others' profiles repeatedly to see how many points they had, or asking each other about points directly.

Reviews of community quests also garner points, and they are shorter and easier to complete than quests. Boys' greater propensity to review quests may reflect a strategy to accumulate points quickly and with minimal effort. In keeping with this suggestion, we observed that boys' reviews more often lacked feedback (consisting only of the assessment 'accept' or 'revise'), and that boys (but not girls) had sometimes cheated by copying someone else's review and submitting it as their own. Taken together, these behaviors are suggestive of a competitive orientation on the part of boys towards QA activities, consistent with the communication characteristics described by Leman et al. (2005).

At the same time, boys' verbal performance improved in community quest reviews as compared to their class quest reviews; boys even outperformed girls' class quest reviews in terms of capitalization, punctuation, and spelling (Figures 2 and 3). Given that boys generally lag behind linguistically in QA, including in the chat, bulletin board, and blog data analyzed by Herring et al. (2005), this finding is noteworthy. It suggests that fourth grade boys can succeed academically—in this case, verbally—when they are highly motivated—in this case, by the game-like features of Quest Atlantis—even when their intention is simply to take the shortest route to "win" the "game." In the present study, this neutralizes some of the girls' developmental advantage. Obvious cheating is also rather rare in our data. Our findings thus suggest that community questing, with its voluntary aspect and absence of direct adult supervision, may be especially beneficial to boys.

The girls, in contrast, appeared to orient towards QA primarily as an educational environment. The girls treated quests as schoolwork, and put more effort into teacher and class quests, performing well on them. However, the girls put less effort into the optional community quests. This is consistent with the findings of Bruner and her colleagues that girls are more interested in "analyzing responses, mulling over phrasings, and testing alternatives" (Bruner et al., 1998, p. 84) than in competing against others in games.

The results of this study both supported and refuted our hypotheses about participation and language use. The hypothesis that fourth graders would participate less in voluntary than in assigned quests and reviews was supported for the reviews, but not for the quests. The hypothesis that girls would participate more than boys in voluntary quests and reviews was weakly supported for the quests, but not for the reviews. These results suggest that the quests and the reviews were perceived as two different types of activities, and that the children's perceptions were related to their gender. In particular, the boys appear to have perceived reviews as a strategic means for gaining points, and produced more reviews for this reason.

The language hypotheses also produced mixed results. The hypothesis that children would use more sophisticated language in assigned than in voluntary quests and reviews was supported for punctuation and capitalization in quests. It was also supported for punctuation and capitalization, spelling, and complexity (utterance length) in the reviews, but only for the girls. In general, the hypothesis that girls would use more sophisticated language than boys was again supported for the quests, but not for the reviews.

These findings have implications not only for understanding the educational effects of technologically-mediated environments, but also for interpreting gender differences in children's language and writing skills. Specifically, they support the view that motivation plays a role in learning, and suggest that if boys appear not to be learning, it may be that school activities are not motivating them. Even seemingly unrelated activities such as competitive gaming, if it involves a language component, may enhance language skills.

5. Conclusions

Questing activities in QA favor boys and girls in different ways. In terms of developmental differences, girls have the advantage. However, in terms of gender differences in socialization, which is the case of the voluntary community quests, boys are favored. This study also illustrates that girls and boys take different approaches to the

quests and the reviews, with boys orienting towards them as part of a game to be played for points. This reminds us that incentives designed to enhance motivation may not work the same way for all students. Previous research indicates that motivational tools may even distract from the learning process (Hickey, 2003). In this study, motivations (cols and lumins) affected boys and girls in different ways, to the boys' advantage.

On the one hand, this is good news for educators who are concerned that boys are "falling behind" in school (e.g., Sommers, 2000), in that it suggests ways that gaming technologies can benefit boys. On the other hand, it underscores the fact that fourth grade boys have already been socialized to compete, a process that can be traced back to preschool, if not earlier (Sheldon, 1993). While girls may do better in the protected, egalitarian environment of school, the world outside is rougher, favoring those who assert themselves and compete. Boys are trained to do this in various ways, including through playing computer games (Jenkins, 1998). Viewed from this angle, we may not be doing girls a favor by socializing them to orient towards classroom norms. We should perhaps direct them, at a much younger age, to venture out, even if only into virtual worlds.

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