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Adventure Games as Deaf Education Tools: Action Research Results

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Abstract

A dissertation funded by a Department of Education Student Initiated Research grant (award number H324B980063) and completed in May of 2002 sheds light on the potential of Panoramic Adventure games as English learning tools for Deaf children whose first languages varied from American Sign Language to Spanish and Tagalog. The investigator created a 3-dimensional model of the Gladys City museum, a monument to the first true oil gusher found in the United States. Within the game, students encountered various characters and interacted with them through English text. Optionally, the students could request the text be interpreted. Interpretations were provided by native Deaf ASL users and converted to QuickTime videos. Results indicate that some learning may have taken place, though the study was conducted as a case study. The results do not generalize to other Deaf children, but provide insight into future directions for educators desiring to develop computer-based educational materials, which target Deaf children. Twelve students used the game and a multimedia electronic dictionary type version of the same information. Students took pretests, posttests, and filled out questionnaires designed to measure the motivating value of the treatments.

Introduction

In the United States, video game consoles such as Sega, Nintendo and others have penetrated more than 80 % of households (Reuters, 2001) with children between 13 and 17 years old. Computer games have also proven popular. Studies have shown that such games can, on rare occasions, lead to addictive patterns of play (Funk, 1993). The motivating power of games stimulated a line of research that may lead to more effective computer-based materials for Deaf Educators and deaf children.

The Gladys City Adventure Game starts with Deaf characters in a journalism classroom. The teacher assigns students to research the history of Gladys city in light of the Exxon-Mobil merger. The main character, Jimmy, visits the museum, discovers an unusual key, and is transported in time 1901, shortly after oil was discovered at Gladys City. Jimmy must prevent a gang of time saboteurs from disrupting the history of Gladys City in order to facilitate a future oil monopoly. Subjects playing the game first view a series of videos outlining the story. Next they face four challenges designed to promote novel vocabulary acquisition: the Medical Scene, the Blacksmith Scene, the Oil and Gas Company scene, and the Texaco (Oil Rig) Scene. The scenes were selected for the availability of exotic vocabulary, which would decrease the likelihood of subjects having prior knowledge.

In two scenes, Medical, and Blacksmith the students needed to select the correct item from a set of items based on text instructions with some clues built into the instructions. Incorrect choices lead to decreased status (health and fuel), and catastrophe when the status reaches 0%.

Journal of Border Educational Research

The Texaco scene follows a more typical Adventure Game format. Game players had to first find one item, deliver it to the correct person, then receive a second item which allowed them access to the next item and so on. All three scenes, Medical, Blacksmith, and Texaco focused on vocabulary acquisition.

The Oil and Gas Company scene followed a more traditional drill-and-practice format. Students first interact with historical characters and learn about the Gladys City Oil and Gas Company. Following the interaction, students attempt to prevent a time bomb from exploding by matching historical facts to the correct historical character. Successfully matching the facts to the character unveiled a password that stops the bomb. The Oil and Gas Company scene departed significantly from the other scenes not only in the drill and practice format, but also in the focus on facts instead of vocabulary.

Method

Twelve (N=12) students participated in the research. The students first filled out questionnaires, which elicited background information such as computer experience and gaming experience. Additional background data on language and academic abilities was collected through teacher ratings. The students then took a computer-based multiple-choice pretest of vocabulary and facts related to the game. Continuing, the students proceeded to the game treatment, followed by a posttest identical to the pretest, but with the questions randomly presented. Following the posttest, students used a multimedia presentation of the same vocabulary and facts. The multimedia presentation had no gaming components; it represented a computer-based dictionary or encyclopedia more than a game. After studying the multimedia treatment, students completed the posttest again. At all times, the investigator was present to guide students through the game and to resolve technical difficulties. During interviews with the investigator, teachers provided background data on the students' reading skills, cognitive abilities, and languages. Of the initial 12 students who started the investigation, 7 yielded complete data sets and one produced data for the pretest and first posttest.

Results

The small sample size led to background data (collected from teacher and student interviews) which underscores the difficulties with generalizing the data from small and highly variable groups found in many Texas Deaf Education classrooms. Students spoke a wide range of languages and were rated with reading skills ranging from 3rd grade to at or above the 9th grade. Cognitive skills, based on teacher ratings, also varied widely. First language (L1) to which students were exposed included English-based signed systems, Spanish, spoken English, and Tagalog (one of the most common languages spoken in the Phillipines). The most common second language (L2) was English, followed by American Sign Language (ASL). Several students were reported by their teachers as having a 3rd language, most frequently ASL. The wide range of first languages could be expected to have a significant impact both on text comprehension within the game and on understanding the ASL video interpretations of the text.

Student	L1	L2	L3	LP	Read level	Memory (max. = 10)	Cog. Skills (max. = 10)
Ariel	Engl/MC			SL/PSE	4	9	8
Sue	SE	Eng	ASL	ASL	7 to 8	8	10
Daniel	Spanish	Eng	MC	Oral Eng	5	8 to 9	9 to 5
Frank	Eng	ASL		ASL	9+	9+	8
Julio	Spanish	Eng	ASL	Spanish	4 to 5	8 to 9	8
Juan	MC	Eng		ASL	7 to 8	9	10
Kristi	Tagalog	SE		SE	4	6 to 7	5
Mark	Uncertain	MC	ASL	ASL	3	7 to 8	7 to 8
Anthony	Eng	ASL		Eng/ASL	5+	9	10

Additional background information provided a glimpse of the wide range of computer skills and gaming experience among the subjects.

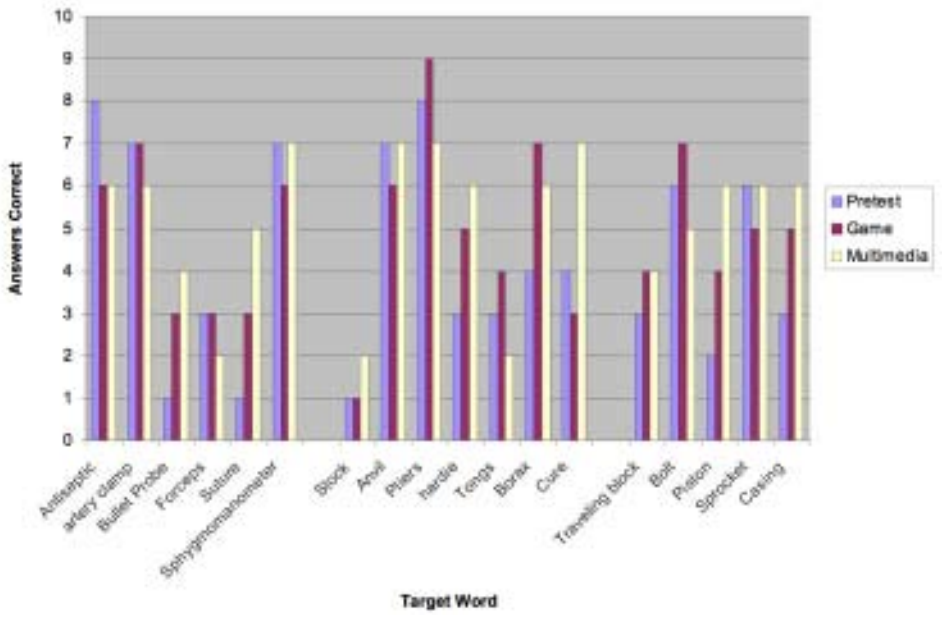
Computer Experience Questionnaire 1 = 0 to 1; 2 = 1 to 2; 3 = 2 to 3, 4 = 3 to 4; 5 = 4 or more 6 = no response									
Questions	**Ariel**	**Sue**	**Dan**	**Frank**	**Julio**	**Juan**	**Bob**	**Kristi**	**Mark**
How many hours per week do you use a computer at home?	5	1	2	5	2	5	1	2	5
How long have you been using computers at home? (years)	1	1	1	5	1	5	No Response	2	3
How many hours do you play games on the computer?	3	6	2	3	2	2	2	2	5
How many hours do you play console games (Sony, Genesis, Sega)?	4	4	3	5	5	No Response	4	2	No Response

The primary research question: Was the Game or Multimedia Treatment Successful in Teaching Students Vocabulary, Recognition of Faces and the Acquisition of Facts?

The data shows some growth in knowledge acquisition for three categories: faces, facts, and vocabulary. Background data and field notes help explain the results. The faces data shows how the students matched the faces of people involved in the Gladys City history to their names. The facts data shows how well the game and dictionary treatments influenced acquisition of facts related to the people who influenced Gladys City history. Overall, there appears to be some fact acquisition for a few students, but this appears to be the weakest part of the game and dictionary treatments. The vocabulary data shows how well the game and dictionary treatments succeeded in influencing the ability of students to match pictures of items to their names and (in a few cases) their functions. Both the game and multimedia dictionary treatments appear to have influenced vocabulary acquisition for many, but not all students.

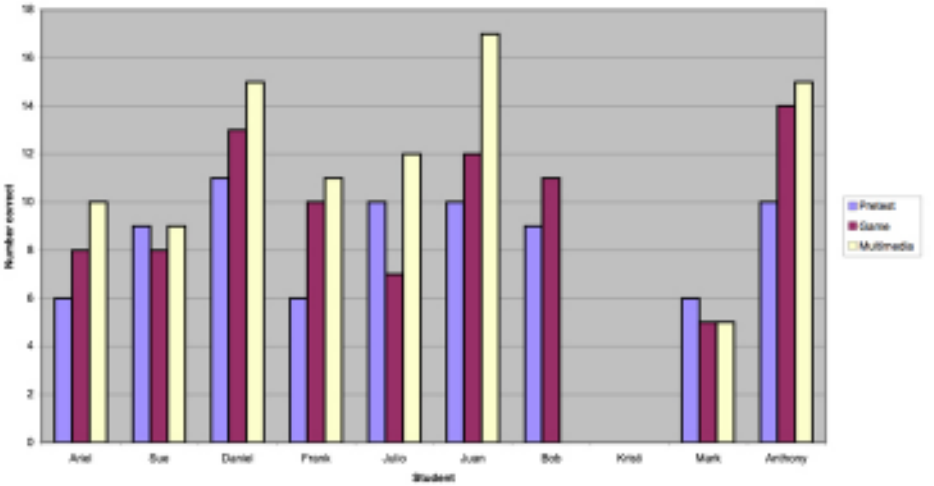
Acquisition of Facts, Vocabulary, and Face Identification
General Vocabulary Acquisition

The data appears to show a somewhat consistent trend to acquire vocabulary during the entire game phase and additional amounts of vocabulary acquisition during the multimedia dictionary phase (figure 4). The data for growth by word shows no obvious pattern. Figure 1 shows the words in order of presentation, grouped by game section. “Stock” shows little recognition from the beginning and little growth throughout the experimental phase. “Bullet Probe”, “Suture”, “Hardie”, “Piston” and “Casing” show apparently consistent increases in recognition. Other words show apparently high recognition at the pretest with little decay during the tests and some show unpredictable patterns of growth and decline in student acquisition. There is no immediately obvious pattern of growth by order of presentation.



Journal of Border Educational Research

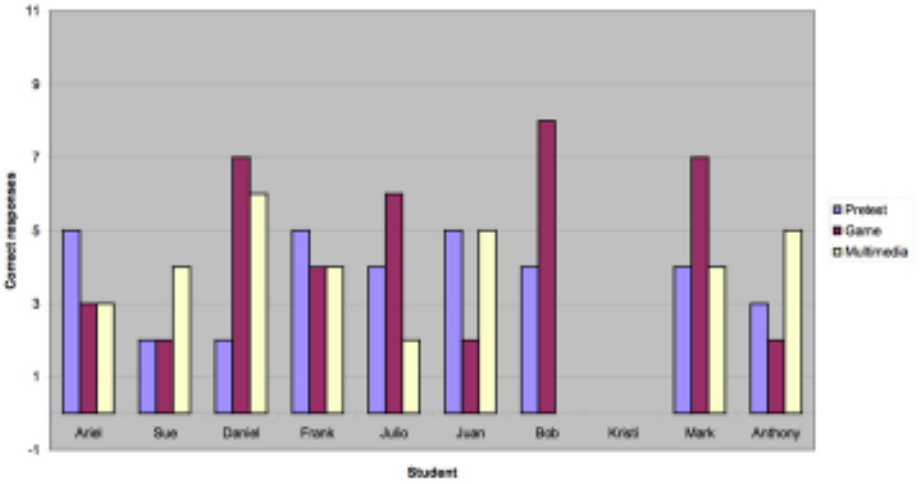
Analysis of vocabulary gains by student (figure 5) shows a general pattern of more correct responses on the game posttest and multimedia posttest when compared to the pretest results. The investigator lost Kristi's pretest and posttest data due to programming errors and student confusion. Bob did not complete the multimedia dictionary posttest. Sue and Mark show no apparent increases in vocabulary following the treatments. Julio's posttest scores indicate no benefit from the game, but some possible benefit from the multimedia treatment. Of the students yielding usable data, then, 5 out 7 showed apparent growth in facts acquisition.



Oil and Gas Company Scene Facts Acquisition

Only Daniel appears to have demonstrated real acquisition of the factual information related to the Oil and Gas Company scene, as evidenced by the posttest results (figure 6). Bob may have acquired the greatest amount of factual information, but his missing multimedia posttest makes it difficult to judge how much acquisition may have been due to random guessing. The results of all the other students' responses on items related to the Oil and Gas Company scene show what appear to be random fluctuations: where there may have been gains in posttest 1 (game treatment) the next posttest (multimedia) showed apparent decreases in knowledge. Anthony may have learned some of the facts from the multimedia presentation, but his apparent gains are no higher than some of the other pretest results.

Journal of Border Educational Research



The initial hypothesis that the similarity of names of characters (George Washington O'Brien and George Washington Carroll) caused the low scores on fact acquisition tests was not supported by an analysis of face recognition. The students scored higher on matching faces to names than on most other tests, even when compared to the highest scoring vocabulary items. This may be due to the high amount of attention to the face and the importance of facial grammar in ASL. After the first posttest, 4 students got all the face-to-name items correct and one student missed only one face-to-name question. One additional student got all the face-to-name questions correct on the second posttest. Two students' scores could not be counted due to incomplete or lost data.

Another potential explanation of the lack of facts acquisition is the format of the game in the Oil and Gas Company scene. It represented a rote memorization game in which students read dialogues from each character, then had a limited time to complete a multiple choice game before a time bomb result in a "Game Over" event. Students could save the game before starting the multiple choice section. Choose their responses, and watch which ones were correct, simply memorizing the answers without really attending to the preceding dialogue.

Interestingly, the gains in vocabulary and in facts seemed to have little correlation with L1, L2 and L3. It could be that the sample size was too small to detect any such pattern, but it could also be that the visual nature of the game had an equalizing effect that allowed all students access to the information regardless of their language foundation.

Conclusions

Because of the chosen methodology, small sample size, and the nature of the questions under investigation, the results cannot be generalized. They are useful in a descriptive study of an innovative technique and tool. The description in this study is useful to launch improved studies using action research supplemented by more traditional research to provide clearer pictures of the value of the Gladys City Game. The results also guide the investigator in efforts to improve future games while utilizing the experimental design model. Data from this study is used in several ways, to determine success in the utilization of the interactive gaming for teaching vocabulary, to determine the success of the creation of the game, to determine direction of action research with

Journal of Border Educational Research

this game, and the future for the Gladys City game in further research activities or as a teaching tool.

It is apparent that the games development focuses on the vocabulary component and future devices within the game could assess other aspects of reading and literacy. While the game could remain a vocabulary tool, experimental design could be redone. Have two groups a true experimental group and a control group.

Journal of Border Educational Research

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