

Survey of Electronic Games That Teach

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Abstract: The Survey Electronic Games that Teach paper reports on the finding of a survey of a wide selection of computer game titles resulting in over 1000 entries in our database. Course subjects range across all areas from mathematics and science to visual arts and social studies. The teaching methods of the software ranged from simple presentation to complex simulation. Grade levels range from pre-kindergarten to college level. This paper shows a statistical analysis of our collection of game data.

Introduction

Games have been used for centuries to fulfill on different learning outcomes. Games, like musical chairs, counting fingers and toes, or any number of other games, have been used with children to provide a measurable learning result. Today is no different. Today's games, however, have expanded to include electronic games and, more specifically, computer games. Computer games for math, science, social studies, and language arts are just a few of the games that are available today. The age groups of the students have expanded to include pre-kindergarten all the way through college level and beyond.

The computer gaming industry surpasses the movie industry in annual income, bringing in more than \$16 billion a year as of 2004. In this paper, we identify the games that are offered for the purpose of education, determine what age or grade level that the games are made for, and examine what courses or topic areas are being taught.

The Study

We performed a survey of computer games and selected games that stated that it teaches or supports the learning in some academic discipline. The Summer Undergraduate Research Fellowship grant awarded by St. Mary's University in San Antonio, Texas (www.stmarytx.edu) made this survey possible. We collected a wide selection of titles resulting in over 1000 game entries input into a database. We gathered the data from CD-ROMs of several personal collections, from many retail stores, as well as from the Internet such as the Educational Software Preview Guide (Dahl 2005). The subjects emphasized range from mathematics and science to visual arts and social studies. The teaching methods of the software range from simple presentation to complex simulation. In some cases the game data indicated it could assist those children who have special needs, so this characteristic was noted in the learning notes field of our website listings. The data collected for each game includes the

name of the game,
the publisher's name,
a description of the game,
the website, if any, of the publisher,
the learning area the product says it teaches,

sub areas that are emphasized in the learning, method in which the game approaches teaching or presenting the material, and the system platform that the game is available on.

The picture below shows the website where we have the survey and results of our study. This screen shows how the above characteristics are arranged.

The screenshot displays a website interface for game details. At the top, there is a navigation bar with buttons for HOME, FAQ, HELP, and SITE MAP. Below this is a secondary navigation bar with buttons for ABOUT US, SEARCH, LINKS, and CONTACT US. The main content area is titled "GAME DETAILS" and contains the following information:

- Title:** Carmen Sandiego - Math Detective
- Publisher:** [The Learning Company](#)
- Website:** <http://www.learningcompany.com>
- Subject:** Mathematics
- Sub Areas:** Decimals, Fractions, Percents, Numerators, Denominators, Length & Width, Area & Diameter, Geometry
- Age Level:** 8 - 14
- Grade Level:** 3 - 9
- Description:** Thrilling Missions for Math Success Embark on 12 worldly adventures and pick up essential math and problem solving skills along the way.
- Objective:**
- Method:** Scenario Based
- Platform:** WIN & MAC
- Price:** \$ 29.99
- Currently Available For Purchase?** Yes
- Learning Notes:**
- Usability Notes:**
- Other Notes:**

At the bottom of the page, there is a footer with a navigation menu (Home, About Us, Search, Links, Contact Us, Help, FAQ) and a copyright notice: Copyright ©2005 www.wingz2fly.com

We spent several hours accumulating the data of games presently on store shelves. We found some games in educational co-operatives that support home schooling as well as traditional schooling. We also searched on websites for educational game listings. An observation that is most intriguing is that, as of the time of this survey, no distinctly educational games have been created for the latest console-based systems including the Nintendo GameCube, Sony Playstation 2, Microsoft XBox, and GameBoy DS. In a society that promotes game play on the latest and greatest game consoles, the fact that no educational games have been created for the latest game systems was a bit shocking. Instead, we found a large number of electronic games that teach for the PC and Macintosh computers as well as on the Internet. The Internet has many sites that either are set up as educational games for the entire site or have games as components of the site. A couple of fun and remarkable sites we enjoyed are www.funbrain.com and www.funschool.com.

Findings

The objective of our research was to determine what games are available that teach or practice some academic content area. We accumulated, reviewed, and analyzed the data of over 1000 games. As a result, we have found that approximately **88%** (878/1003) of the games gathered could be used for children ages 1 to 10 years old, elementary school ages. About **53%** (530/1003) of our games could be used to teaching 11 – 13 year olds, middle school ages. And approximately **23%** (234/1003) of our games gathered could be used to teach ages 14 and above, typical high school ages and above (ages 14-18+; maximum age \geq 14). We found it interesting that such a high percentage of the games were for younger ages.

The subjects taught to the **elementary** level students profoundly filled the spectrum of educational courseware. The subjects with the largest number of titles in the elementary level are language arts (247 out of 878), mathematics (289 out of 878) and science (175 out of 878).

Each of these areas (language arts, mathematics, and science) has about 20% of the number of games in the total database of 1003 entries. The following numbers indicate the games available to middle school students from our database:

- language arts (6 out of 86)
- mathematics (24 out of 86)
- science (38 out of 86)

For high school students, the number of games for the same subjects, language arts, mathematics and science are

- language arts (18 out of 234)
- mathematics (46 out of 234)
- science (74 out of 234)

A shift is evident in course concentration from language arts and mathematics in elementary school to science in middle school and high school.

Without regard to age or grade grouping, what is being taught? The list of categories of what the games say they teach or enhance learning is as follows:

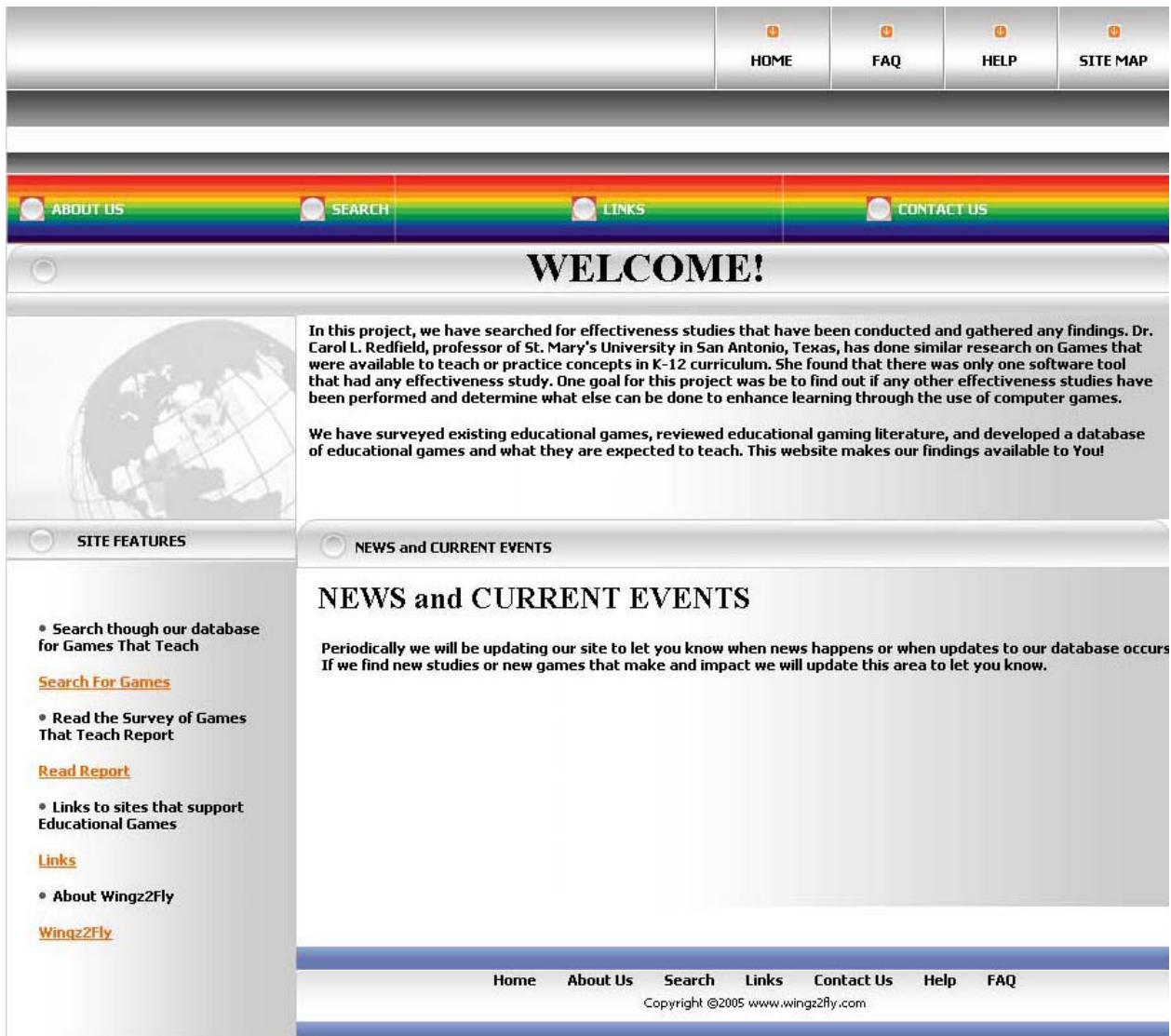
- 29 critical thinking skills
- 11 computer literacy
- 25 early childhood development
- 8 foreign language
- 13 physical health and wellness
- 60 history
- 46 logic
- 28 music
- 101 social studies
- 10 typing skills
- 18 visual arts
- 258 language arts
- 322 mathematics
- 241 science
- 141 cross curricular.

There are many methods that can be used to deliver education to a student. The following list shows the different methods that are used for our listing of games:

- 114 creative activities that produce some sort of print copy

- 97 drill and practice approach, encouraging constant repetition of facts
- 471 participatory approach by clicking to participate in the action
- 74 guided practice where characters in the game encourage some action
- 20 role playing method where children take on being in the game
- 89 simulation method providing a simulated environment for study

A website was created to provide the work we did in this survey to anyone who has Internet access. The website is available at www.wingz2fly.com/GameSurvey. This site can be used to query our database of games based on characteristics that we collected and to see details about any of the games. We plan to keep this list growing and further analyze this data to see how games are impacting the educational process. The following picture shows the front page of our game survey website.



An additional objective of our research was to see what effectiveness studies have been done regarding the use of games as tools for teaching. There were some generalizations and anecdotal observations made by teachers who used games in their instruction regarding how well some games have impacted a child's education. However, there were no formal studies with any statistical significance

found. In 1999, research was done on what CD-ROMs were available to teach or practice concepts in K-12 curriculum (Redfield 1999, 2000). This research found that there was only one software tool that had an effectiveness study performed, Reader Rabbit by the Learning Company now owned by Riverdeep..

Conclusion

If effectiveness studies were performed on electronic games that teach, then perhaps the future may reveal that we as a society need to consider using games that teach as a means to increase the educational effectiveness of students. Many studies show that the most effective learning occurs with one-on-one tutoring (Bloom 1984). Computer games provide that kind of one-on-one engagement in addition to the potential collaboration with others in the multiplayer game environments. The training industry is just beginning to come to grips with that fact that future adult students will be expecting a game or simulation environment for learning in many situations. The current entertainment environment of computer games may be the ticket to how children can learn educational facts, skills, and principles efficiently and effectively.

References

Bloom, B.S. (1984). The 2-sigma problem: The search for methods of group instruction as effective as one-to-one tutoring. *Educational Researcher*, 13(6), 4-16.

Dahl, Susan (2005). "Educational Software Preview Guide," Fermi National Accelerator Laboratory: <http://www-ed.fnal.gov/espg>. Updated: June 17, 2005. Accessed: August 1, 2005.

Redfield, C.L. (1999). "Sky's the Limit Charter School: Offering a Tutor-based Curriculum," *Proceedings of the 1999 Society for Information Technology and Teacher Education (SITE) International Conference*, San Antonio, March 1999: Association for the Advancement of Computing in Education.

Redfield, C.L. (2000). "Computer Tutors Fulfilling Curriculum Topics," *WebNet 2000*, San Antonio, November 2000.