

The Effectiveness of a Game about Learning Disabilities

Carol Luckhardt Redfield, PhD
St. Mary's University, San Antonio, Texas
CRedfield@stmarytx.edu

Crystal Redfield
John Jay Science and Engineering Academy, San Antonio, Texas
RedfieldCrystal@gmail.com

Abstract: Friends with Different Abilities is an educational computer game developed with GameMaker that simulates an orientation of a school with information about 7 disabilities in 12 rooms. During two years, 152 subjects took a pre-test, played the game, and took a post-test. Some took a survey about their attitudes toward people with disabilities. On average, the subjects got 65% correct on the pre-test and 88% correct on the post-test. Forty-two participants of 83 in the second year took an online second post-test and another survey about their attitudes. There was significant difference in the pre-test of 74% to the second post-test of 87% showing they retained the information 2-4 weeks later. Over 90% said that they would be more understanding, considerate and accommodating of someone with a disability. The game can be downloaded from www.EducationalComputerGaming.com, and it may help to reduce bullying and increase understanding of different abilities.

Background & Motivation

Education is key to altering any kind of view and making a difference in reducing bullying in particular. Computer games could be used for this purpose, and they are very popular. Educational computer games are readily available although most have not been tested to show effectiveness of what they are intended to teach while a few games have been shown to result in learning (Ferdig, 2009; Ke, 2009). There have been other general benefits shown from playing games such as gamers can keep track of more resources (Holz, 2012).

The educational computer game Friends with Different Abilities (FwDA) was made to teach about learning disabilities in hopes that participants will be more accepting of people with different abilities. No other games have been found to teach about disabilities. The game play in FwDA is an orientation of a school, going around to each classroom of a schedule, learning about different kinds of issues someone in each type of classroom might be dealing with and suggests a way that can help with the issue. The game is intended to help people learn and get a small sense of how it is for people with certain disabilities.

The authors know a number of people either with disabilities or who have family members with disabilities, and some said that they have been bullied. About 13% of public school students in the United States has some sort of disability. We hope that if more people know some things about disabilities and how it might be for someone with a disability, the less likely a person with disabilities will be bullied, and may even be understood and appreciated.

Design, Development and Play of the Game

The detail of developing the game was presented at a previous AACE SITE conference (Redfield and Redfield, 2017). In summary, Friends with Different Abilities presents 14 facts that are questioned before and after playing the game. The facts are about distinguishing or defining the disability and doing something to help someone with that disability, as well as the fact that about 13% of public school students have some sort of disability. The player in the game is a new student at a high school going to orientation and is welcomed in the office with a course schedule. The player goes to each of the classrooms that follows the schedule. Each of the disabilities is presented in a room that is related to the subject type. By moving with the arrow keys, reading, and dragging or selecting items in rooms, the player is presented each of the facts list in Table 1 (Disability World, 2016; Learning Disabilities Association of America, 2016). The goal for the player is to visit each classroom, complete an activity in the room,

and head to the bus at the end. At the bus, the player moves the mustang to the bus while an animation of other mustangs moving around plays.

<u>Disability</u> (classroom)	<u>Characteristic</u>	<u>What Can Help</u>
ADHD (Science)	Has difficulty focusing and is easily distracted	Chunk information and take lots of breaks
Aspergers (Computer)	Has trouble in social situations but may do well with computers	Keep things routine and visual
Autism (Library)	May act out of turn or not respond to a question	Have rituals and a space to calm down
Dyscalculia (Math)	Has difficulty memorizing and understanding math facts	Use a calculator and graph paper
Dysgraphia (Social studies)	Has trouble writing including spelling, grammar, and usage issues	Write in smaller chunks and use a word processor
Dyslexia (English)	Mixes up letters and has difficulty reading	Have auditory support such as reading out loud
Physical (Gym/PE)	Physical disabilities may be caused such things as spinal cord injuries, scoliosis, or cerebral palsy	Ask if you can help and how you can help

Table 1. Disability Facts and Classroom Subject

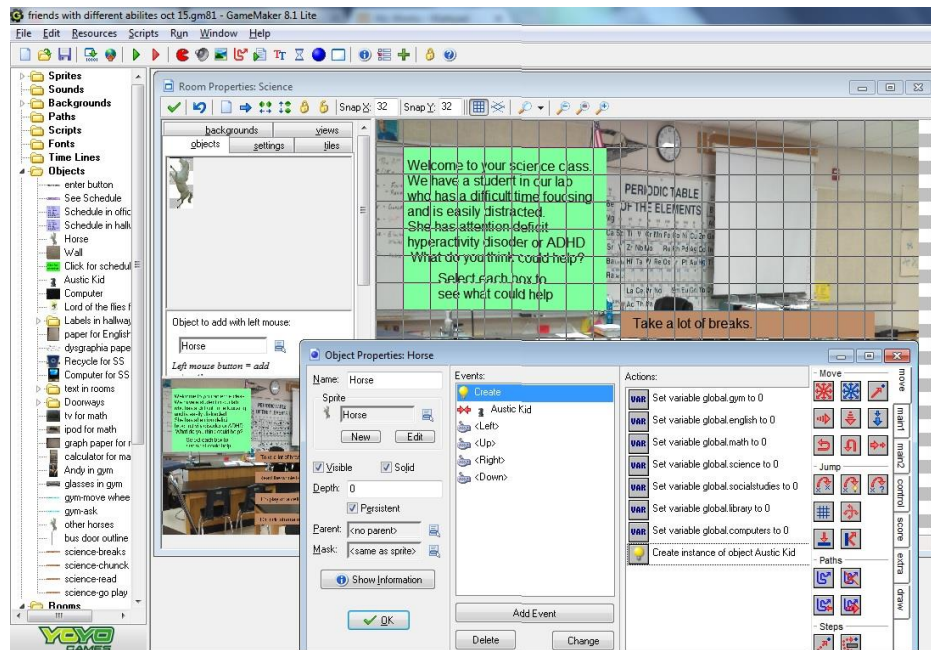


Figure 1. GameMaker with a room and object of FwDA

All the backgrounds and most of the images in the game are from pictures at a local high school. GameMaker Lite 8.1 was used for its ease of use and the ability to create a useful game in a relatively short amount of time, and the games run on Windows platforms (Yoyo Games, 2013). In GameMaker, objects are made by attaching sprites/images and adding behaviors with actions and code. Rooms are created with backgrounds and placing objects in it. FwDA has 12 rooms, 11 background images, 57 objects, and 54 sprites. The game development took about 120 person hours to design, create and test. Figure 1 shows the GameMaker interface with a list of many of the objects on the left, the science room, and the mustang player piece. A few of the rooms in the game and flow of the player between them are shown in Figure 2. The game takes about 25 minutes to play.

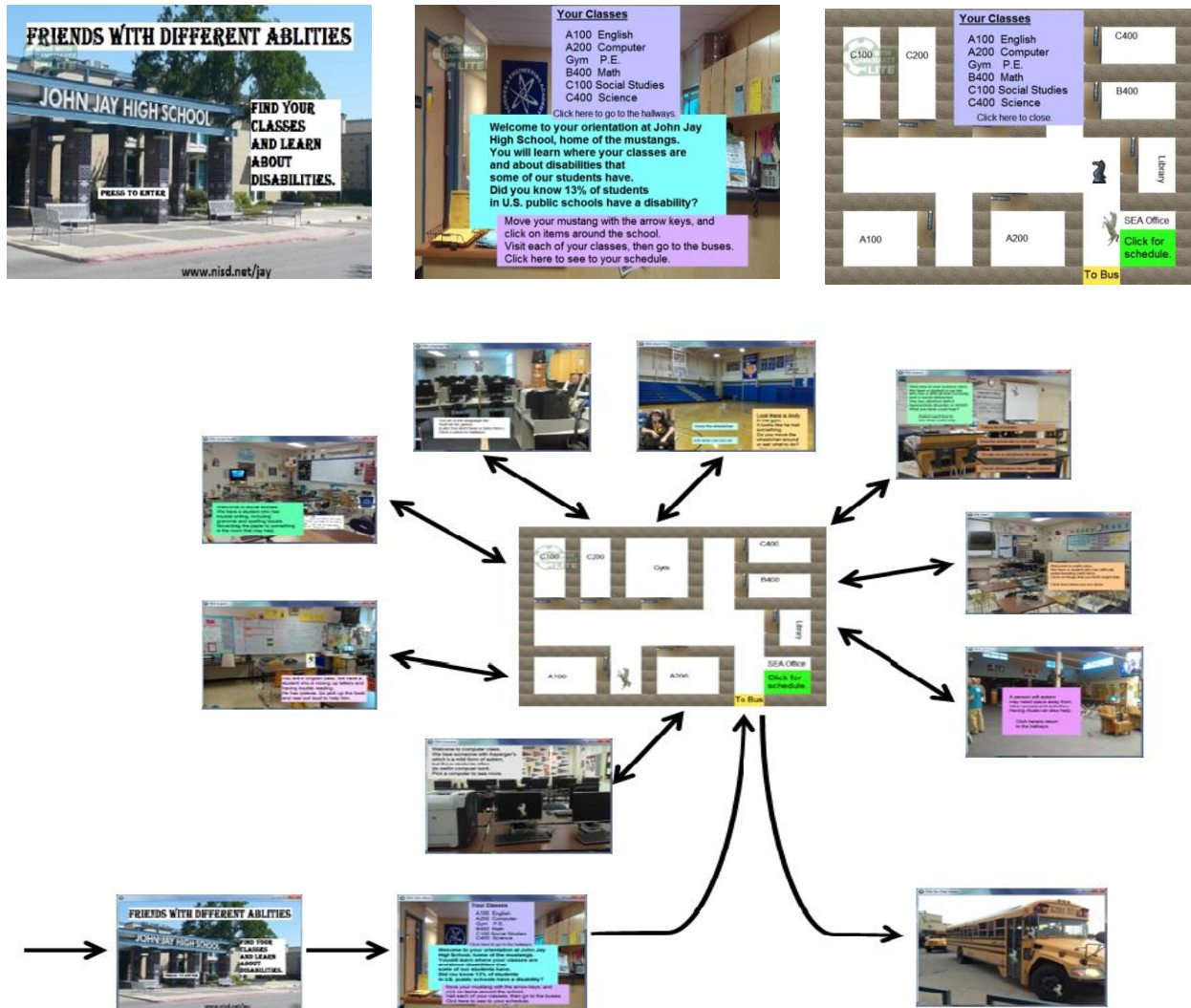


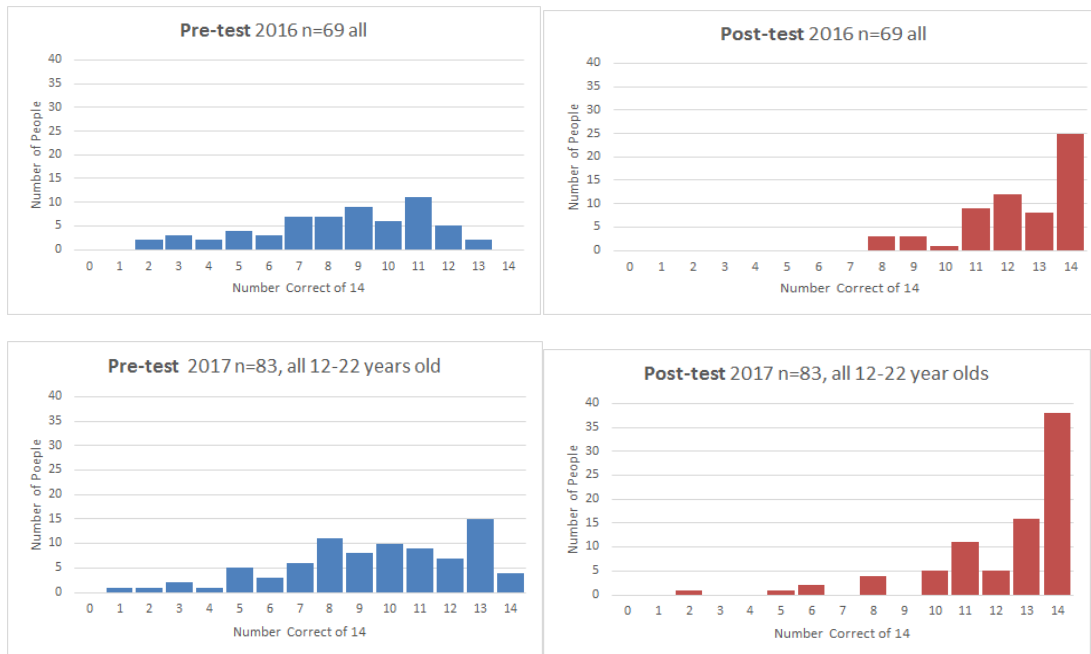
Figure 2. FwDA Rooms and Game Flow

Data and Analysis

Sixty-nine subjects took a pre-test, played the game, and took a post-test in November of 2016. Eighty-three subjects took a pre-test and pre-survey, played the game, and took a post-test between June and October of 2017. The tests consisted of 14 multiple-choice questions. The 83 subjects from 2017 were asked to fill out an online post-test and survey about 2 weeks after having played the game. Of the 83, just over half did the post-test and survey, 51% of the subjects without any extra credit or other incentive. Most of the subjects were between 12 and 22 years old in order to prevent pre-knowledge about disabilities. The subjects came from science camps for middle and high school students, students at a high school, and college freshman classes.

Subjects improved most in knowing the fact that about 13% of US public school students have some sort of disability. About 95% of participants already knew that someone who has ADHD has a difficult time focusing and is easily distracted. The fact least known by the participants was that someone who has dysgraphia could be helped by writing in small chunks and using a word processor.

The histograms in Figure 3 represent the participants' scores and how many participants received each score. The scale is the same for all, from 0-40 subjects on the left side to the number of answers correct along the bottom. The first two histograms are for the 69 subjects in 2016. The participants' scores went from 59% on the pre-test to 87% on the post-test. The next two histograms show this year's scores of 83 participants going from 68% to 87%. These two sets of histograms showed that participants' scores improved after playing the game. The next two histograms show 42 participants who did the online post-test and survey. The last histogram shows the second posttest of the 42 participants showing that they improved from the pre-test. Although the participants could have looked up the answers online, one of the facts showed that the second post-test scores decreased by 28% suggesting that the participants may not have looked up any answers.



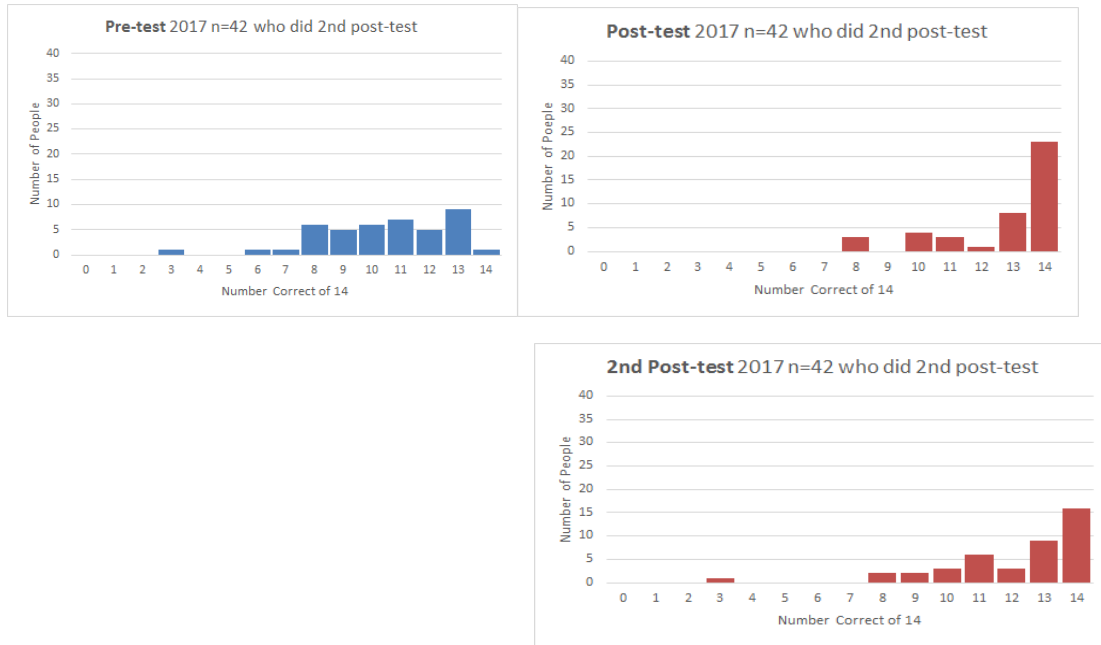


Figure 3. Histograms for Pre-and Post-tests

The p-values of paired two tailed t-tests for each combination of the pre- and post-tests are given in Table 2. Each p-value implies a statistically significant difference since they are quite a bit less than .05.

Number of Participants	% Correct Pre- to Post-	P value	Subject Group
69	59% to 87%	1.3×10^{-16}	Players from 2016
83	68% to 87%	6.2×10^{-15}	Players from 2017
42	74% to 91%	1.1×10^{-3}	Pre to 1st posttest for online
42	74% to 87%	9.9×10^{-8}	Pre to 2nd posttest for online
152	65% to 88%	4.4×10^{-26}	All players from both years

Table 2. Significance of Subject Groups

The most interesting results from the surveys was that in the post-survey 91% reported that they would be more understanding, 93% more considerate, and 98% more accommodating of someone with a disability. Many of the subjects wrote in comments similar to the idea that the game taught them to be more accepting and understanding of someone with a disability and have an idea of what the person might go through.

Conclusions

The educational computer game Friends with Different Abilities has been shown to be effective for players to learn about disabilities from playing the game both directly after playing and in retaining the information 2-4 weeks later. There may even be a better appreciation that people have varying and different abilities that could result in less bullying. It would be great to find out. Anyone can get and play Friends with Different Abilities on a Windows-based personal computer by downloading the game from www.EducationalComputerGaming.com, selecting the image in the lower left corner of the home page. The more people play and learn, the more understanding and appreciation there may be in the world.

References

Disabled World (2016). "Disability: Definition, Types & Models." *Disabled World*. Retrieved Sep 10, 2016 from <http://www.disabled-world.com/disability/types>.

Ferdig, Richard (Ed.) (2009). *Handbook of Research on Effective Electronic Gaming in Education*. Hersey, PA: IGI Global.

Holz, Robert (2012, March 5). When Gaming is Good for You, *The Wall Street Journal*. Retrieved May 26, 2013 from <http://online.wsj.com/article/SB10001424052970203458604577263273943183932.html>.

Ke, Fengfeng (2009). A Qualitative Meta-Analysis of Computer Games as Learning Tools. In Ferdig, R. (Ed.), *Handbook of Research on Effective Electronic Gaming in Education* (pp. 1-32). Hersey, PA: IGI Global.

Learning Disabilities Association of America (2016). "Support and Resources for Parents." *Learning Disabilities Association of America*. Retrieved Sep 10, 2016 from <https://ldaamerica.org/>.

Redfield, C. and Redfield, C. (2017). *Friends with Different Abilities: An Educational Computer Game*. Austin: AACE SITE March 2017.

United States (2018). *Bullying and Youth with Disabilities and Special Health Needs*. Retrieved Feb 10, 2019 from www.stopbullying.gov/at-risk/groups/special-needs/index.html.

YoYo Games (2013). *GameMaker for Windows*. Retrieved May 27, 2013 from www.yoyogames.com/gamemaker/windows.