AACE SITE Austin March 2017

# Friends with Different Abilities: An Educational Computer Game

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2016-17 Science Fair (who did or judged??)

All pictures, images, figures, charts, tables, were taken or made by the researcher or mentor.



## **Purposes/Hypotheses**

### Two tested purposes

• To see if an educational computer game can be made to present concepts about disabilities and Hypothesis #1 (H1):

A computer game can be made

to present information about disabilities.

 To see if people can learn about disabilities from playing the game

### Hypothesis #2 (H2):

A person can learn from an educational computer game about people with disabilities.

So that people might have a better understanding and acceptance of people with different disabilities



## **Background Information**

- About 13% of public school students in the United States have some sort of **disability**.
- Most of the disabilities in schools are about learning.
- A game/computer game has
  - environment, players, rules, feedback, and goals
- People bringing what works about gaming into learning situations is called **gamification**.
- Many benefits of computer games have been shown.
- No computer games about disabilities were found. www.EducationalComputerGaming.com - search
- The researchers have friends with disabilities and friends with family members who have disabilities
- The game may help people learn about disabilities so that there could be more understanding and less bullying.



## **Materials** – Science fair requirement

- Laptop computer with
  - Microsoft (MS)
  - Windows
  - MS Word

made pre-test made post-test made design wrote report

- MS Excel
- MS Paint
- GameMaker made FwDA game
- Camera/phone
- USB flash drive

and various computers to run the game







### **Procedure** – Science fair requirement

- 1. The Special Education Coordinator at John Jay High School (in San Antonio) was interviewed about disabilities.
- 2. Background information was gathered about disabilities and educational games.
- 3. Pre-test and post-test were developed.
- 4. Pictures were taken of classrooms, halls, and objects.
- 5. The storyboard design of the game was made to present information about people with disabilities (Sep. 2016).
- 6. The game was developed in GameMaker (Oct. 2016).
- 7.100+ people were invited to participate.
- 8. Students were given informed consent forms to sign. 9.69 participants (12-63 years old) took a pre-test, played the game, and then took the post-test (Nov. 6 - Nov. 22, 2016). 10.Pre- and post-test results were graded and analyzed. 11. A report was written and presentation created.

## **Sample Test Questions**

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- 14 multiple choice questions on the tests
- Different wording for some questions
  - A person with dyslexia...
    - a. mixes up letters and has trouble reading.
    - b. has trouble writing including grammar, spelling and usage issues.
    - c. has difficulty memorizing and understanding math facts.
    - d. is moving around a lot and not focusing.
  - Someone who mixes up letters and has trouble reading probably has...
    - a. ADHD.
    - b. dyslexia.
    - c. Asperger's.
    - d. dysgraphia.
- On both pre- and post-tests
  - About what percent of public school students in the U.S. have a disability?
    - a. 8% b. **13%** c. 18% d 25%



### **Game Design**

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- Storyboard pages  $\circ$  Dialogue, images, activities
- Rooms:
  - Social Studies-

Dysgraphia

- Computer- Asperger's
- P.E./Gym- Physical
- Math-Dyscalculia
- English- Dyslexia Ο
- **ADHD** • Science-
- Library-Autism
- Language Lab Ο
- Bus
- Pictures and images:



Andy for gym.png



lab IMAG0191.jpg

studies

ipod for

math.png

lord of the

flies.png



class -library IMAG0152.jpg IMAG0181.jpg











Dysgraphia

writing.jpg

JJ front 9-17-16.jpg



Recycle bin small for SS.png

Jj door horz.jpg

bus IMG 7113.JPG















English.png





Calculator for

math.png



class - math

IMAG0180.jpg it heaved . CE



class - computer

IMAG0197.jpg







class - English IMAG0182.jpg



class - SEA IMAG0177.jpg



class - gym IMAG0185.jpg



class - SEA IMAG0179.jpg



graph paper for math.png



Glasses for gym

small.png

JJ Hallways.jpg



tv for math.png



### Game Development

There was shown from the first the first the

25 min. to play Solid Solid Depth: 0
<ul> <li>11 Backgrove</li> <li>54 Sprites</li> <li>57 Objects many with events and actions to give behaviors</li> <li>12 Rooms</li> <li>7 of them have a disability presented</li> <li>We have a disability pr</li></ul>

	Actions:
	Execute a piece of code
and	🖹 Execute Code
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ased	✓   🔂   ↓ ⑤   ½
	1 if drag=true
	2 {
	3 x=mouse_x-16
	4 y=mouse_y-16
	5 }

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### Game Flow play game or show next slides





### **First Three Rooms**

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Your Classes

A100 English A200 Computer Gym P.E. B400 Math C100 Social Studies C400 Science

Click here to go to the hallways. Welcome to your orientation at John Jay High School, home of the mustangs. You will learn where your classes are and about disabilities that some of our students have. Did you know 13% of students in U.S. public schools have a disability?

Move your mustang with the arrow keys, and click on items around the school. Visit each of your classes, then go to the buses. Click here to see to your schedule.



The player goes back to the hallway after completing an activity in each classroom.



# Library- Autism

FDA: Library

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A person with autism may need space away from other people and activities. Having rituals can also help.

Click here to return to the hallways.



# Math- Dyscalculia

and the first first

FDA: Math

Welcome to math class. We have a student who has difficulty understanding math facts. Click on things that you think might help.

Click here when you are done.



## **Science-ADHD**



# **Computer Lab- Asperger's**

G FDA: Computer

15

Welcome to computer class. We have someone with Asperger's which is a mild form of autism, but those students often do well in computer work. Click on a computer to see more.







# **Gym- Physical**

**IORY 14** 

RASKETBAL

Gym P.E.)

move the wheelchair

ask what can you do

Look there is Andy in the gym. It looks like he lost something. Do you move the wheelchair around or ask what to do? Click on your answer.



# English- Dyslexia



# Social Studies- Dsygraphia

G FDA: Social Studies

Welcome to social studies. We have a student who has trouble writing, including grammar and spelling issues. Move/drag the paper to something in the room that may help.

HERE GASHARLE OF AN HUMAN WHICH I AN GIVEN OD TO LOOK AT WI LIKE AND TO THINK AGOIT OIF MANNER.





### Data - 69 Subjects

Took a pretest (14 questions)
Played the game (15-25 minutes)
Took a posttest (14 questions)





### Data Summary

	Average	Range	Histogram - Pre-Te
Age - years	21.72	12-63	
Pre-test /14	<u>8.32</u>	1-13	
Pre-test %	<u>59.42</u>	7-93%	Scores on Pre-Test
Post-test /14	<u>12.19</u>	4-14	Histogram - Post-Te
Post-test %	<u>86.65</u>	29-100	25 - 20 - 215 -
Raw difference	3.87	0-12	
% increase	77.36%	0 - 600%	Scores on Post-Test

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14 More

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### Frequency

Frequency

Com	par	ina Ques	tion	s/Fa	octs
Disability	Class-room	Characteristic/ helped by	Activity	Pretest % correct	Posttest % correct
ADHD	Science	Hard to focus; Easily distracted	Read	95	97
		Chunk information, take breaks	Select 4 boxes	61	97
Asperger's	Computer	Trouble in social situations	Read	79	97
		Keep routine, visual	Select computer	62	89
Autism	Library	Act out of turn, not respond	Collide object	81	89
		Have rituals, space to calm	Read	67	93
Dyscalculia	Math	Difficulty with math facts	Read	61	89
		Use calculator, graphing paper	Select 2-4 objects	48	87
Dysgraphia	Social studies	Trouble writing, spelling, grammar, usage	Read	30	61
		Write small chunks, Word	Drag paper	18	57
Dyslexia	English	Mixes up letters, reading troubles	Read	90	91
		Use auditory support	Collide with book	79	80
Physical	Gym/PE	Wheelchair- ask if can help	Find glasses	85	97
% in schools with disabilities	Office	About 13% US public school	Read	21	98

## **Data Analysis**

- Average scores went from 8.32/14 (59%) on the pre-test to 12.19/14 (87%) on the post-test.
- The difference of the participants scores was statistically significant

• Paired t-test one-tail **P-value of 1.3 x 10<sup>-16</sup>.** 

Item Analysis

The fact that participants <u>most improved</u> on

- ~ 13% of U.S. public school students have some disability (from <u>21%</u> correct on the pre to <u>98%</u> on post).
- The fact least known by subjects
  - ~ someone with dysgraphia can be helped by writing in small chunks and using a word processor (18% correct on pre).
- The fact that was most known already
  - ~ someone who has ADHD has a difficult time focusing and is easily distracted (95% correct on pre)

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## Conclusion

- There is less than one in a trillion chance that the null hypothesis (H2) is true.
  - Null hypothesis (H2): People cannot learn about disabilities from playing an educational computer game.
- The hypotheses were correct that
  - (H1) An educational computer game can be made to present information about disabilities.
  - (H2) People can learn from playing an educational computer game about disabilities.

### Issues

- Some teachers and psychology students knew too much already. We did not use subjects who were teachers or psychology majors.
- Some subjects seemed not to be taking the tests seriously although their test results were included.

# **Further Studies/Applications**

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- Expand on the computer game with more activities that the participants can do to be more fun and go deeper • Simulate
  - ADHD, autism, dyscalculia, dysgraphia, dyslexia
- Give another post-test days or weeks later
- Add to the computer game
  - Mental disorders
  - Physical disabilities
  - Other settings/environments
  - Additional game goals
  - Sounds
- Participants may be able to
  - Take what they have learned and apply it to the real world
    - Help someone with a learning disability
    - Be more understanding towards someone with a disability



## **References / Questions?**

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