Image 1: Playing Friends with Different Abilities Game





# **Purpose, Hypotheses and Background**

The researcher has friends who have or have family members with disabilities who have been bullied. The researcher wanted to make a difference in how people with disabilities are treated. About 13% of U.S. public school students have a disability, and 91% of kids play computer/video games. Last year, the researcher made an educational computer game called Friends with Different Abilities (FwDA) with GameMaker 8.1 Lite. The game has 12 rooms and was shown to be effective in teaching about 7 disabilities (see Table 1; 69 people from 12-69 years old; see Table 1 and Image 7). The subjects got 59% on the pretest and 87% on the posttest for a statistically significant difference. The game is the first educational computer game to teach about disabilities. It is published and available to download and run on Windows-based PCs at www.EducationalComputerGaming.com.

### The purposes of this second year project were to see if

- Friends with Different Abilities can be made better to present concepts about disabilities for increased player understanding.
- Subjects can retain the information that they learned about disabilities. • Subjects would report a difference in attitude/behavior towards

someone with a disability after playing the game. This year, subjects were selected by ages 12-22 to reduce pre-knowledge. **Hypothesis 1**: (see H1 – Game Modifications and Table 2)

The educational computer game Friends with Different abilities can be modified to be more understandable for people compared to last year. Null Hypothesis 1:

The educational computer game Friends with Different Abilities cannot be modified to be more understandable for people compared to last year. Hypothesis 2: (see H2 – Table 3 and Table 4)

People can retain information about disabilities from playing Friends with Different Abilities for at least 2 weeks

Null Hypothesis 2:

People cannot retain information about disabilities from playing Friends with Different Abilities for at least 2 weeks.

**Hypothesis 3**: (see H3 – Surveys & Post-Survey Results)

After playing Friends with Different Abilities, people will report that they will be more considerate and understanding towards someone with a disability Null Hypothesis 3:

After playing Friends with Different Abilities, people will report that they will not be more considerate and understanding towards someone with a disability.

# **Materials and Procedure**

Materials used for this project include

• Laptop computer with Microsoft (MS) Windows and

- MS Word
  - edit pretest and posttest
  - write pre-survey, post-survey, and report
  - MS **Excel** for data collection and analysis
- **GameMaker** (GM) 8.1 to edit the FwDA game
- Google Forms for post-survey and 2<sup>nd</sup> posttest
- USB flash drive
- Various laptop computers at many school locations to run the game

The steps performed to complete the project this year were

- 1. Modify the game based on last year's feedback (10 changes; 7 were in facts) 2. Develop a pre- and post- survey about attitudes and behaviors
- 3. Put the post-survey and posttest into an online form

- Give potential participants informed consent (given to over 300 people)
- 5. Administer to 83 people (who were 12 to 22 years old) at camps and schools answer pretest and pre-survey
  - play the game
  - take post-test
- 6. Send an email two weeks later with a link to the post-test and the post-survey to complete online
- . Grade tests & analyze results by making tables and using Excel tools
- 8. Write report and presentations

Pre/post-test for Friends with Diffe	Image 3: <b>FIER</b>	Projoest for Friends with Differen	LESL
IE: DATE:	TIME:	NAME· DATE·	TIME-
GE: SCHOOL:	GENDER: M F	AGE: SCHOOL:	GENDER: M F
et the best answer for each question by circling the letter u do not know the answer, you can leave it blank.	a, b, c ord.	Select the best answer for each question by circling the letter a, I If you do not know the answer, you can leave it blank.	b, c ord.
<ol> <li>About what percent of public school students in the U.         <ol> <li>8%</li> <li>13%</li> <li>18%</li> <li>25%</li> </ol> </li> <li>A person with dyslexia         <ol> <li>mixes up letters and has trouble reading.</li> <li>has trouble writing including spelling gramms</li> <li>has difficulty memorizing and understanding</li> <li>ig moving around a lot and not focusing.</li> </ol> </li> <li>A person with dyslexia can be helped by         <ol> <li>watching television.</li> <li>using graph paper and calculator.</li> <li>have auditory support such as reading out lo</li> <li>reading a book silently.</li> </ol> </li> <li>A person with dysgraphia         <ol> <li>has a difficult time focusing and is easily dist</li> <li>cannot graph points and equations.</li> <li>has trouble writing including spelling gramms</li> <li>mixes up letters and has trouble reading.</li> </ol> </li> <li>A person with dysgraphia can be helped by         <ol> <li>using graph paper and calculator.</li> <li>having auditory support such as reading out</li> <li>watching videos and television.</li> <li>writing in small chunks and using a word pro</li> <li>A person with dyscalculia             <ol> <li>mixes up letters and has trouble reading.</li> <li>has difficulty memorizing and understanding</li> <li>has difficulty focusing and is easily distracted</li> <li>has difficulty focusing and is easily distracted</li> <li>has trouble writing including spelling, gramm</li> </ol> </li> </ol></li></ol>	<ul> <li>S. have a disability?</li> <li>7. A person with dyscalculia can be helped by <ul> <li>using graph paper and calculator.</li> <li>using the Internet.</li> <li>listening to music while doing assignments.</li> <li>watching television.</li> </ul> </li> <li>8. A person with ADHD <ul> <li>mixes up letters and has trouble reading.</li> <li>cannot graph points and equations.</li> <li>has difficulty focusing and is easily distracted.</li> <li>has trouble writing including grammar, spellin</li> </ul> </li> <li>9. A person with ADHD can be helped by <ul> <li>watching television.</li> <li>chunking information and taking breaks.</li> <li>reading out loud.</li> <li>using graph paper and a calculator.</li> </ul> </li> <li>10. A person with ASperger's <ul> <li>will stare at you.</li> <li>wants to work in a group.</li> <li>has trouble reading and writing.</li> </ul> </li> <li>11. A person with Asperger's can be helped by <ul> <li>watching the person closely.</li> <li>reading out loud.</li> <li>hugging and touching the person.</li> <li>keeping things routine and visual.</li> </ul> </li> <li>12. A person with autism <ul> <li>may act out of turn or not respond when askeed</li> <li>mixes up letters and has trouble reading.</li> <li>cannot graph points or equations.</li> </ul> </li> <li>13. A person with autism can be helped by <ul> <li>a. may act out of turn or not respond when askeed</li> <li>mixes up letters and has trouble reading.</li> <li>cannot graph points or equations.</li> </ul> </li> <li>13. A person with autism can be helped by <ul> <li>a. hugging and touching the person.</li> <li>b. allowing the person to have rituals and space</li> <li>working in a group in an open area.</li> <li>d. reading out loud.</li> </ul> </li> </ul>	<ol> <li>A person in a wheelchair can be best supported by         <ul> <li>asking if you can help and how you can help.</li> <li>b. telling them what to do.</li> <li>always pushing the wheelchair.</li> <li>hugging and touching the person.</li> </ul> </li> <li>Someone who mixes up letters and has trouble reading         <ul> <li>ADHD</li> <li>dyslexia</li> <li>Asperger's.</li> <li>dyslexia.</li> <li>autism.</li> <li>dyslexia.</li> <li>autism.</li> <li>dyslexia.</li> <li>ADHD.</li> <li>Someone who has trouble in social situations may have</li></ul></li></ol>	<ol> <li>Someone who acts out of turn and does not respond when asked something may have         <ul> <li>a sutism.</li> <li>ADHD.</li> <li>dysgraphia.</li> <li>dyslexia.</li> </ul> </li> <li>Having auditory support such as reading out loud can best help someone with         <ul> <li>autism.</li> <li>dyscalculia.</li> <li>dysgraphia.</li> <li>dyscalculia.</li> <li>dysgraphia.</li> <li>dyslexia.</li> </ul> </li> <li>Writing in smaller chunks and using a word processor program can most help someone with         <ul> <li>ayslexia.</li> <li>writing in smaller chunks and using a word processor program can most help someone with</li> <li>a dyslexia.</li> <li>autism.</li> <li>dyslexia.</li> </ul> </li> <li>Writing in smaller chunks and using a word processor program can most help someone with         <ul> <li>ayslexia.</li> <li>autism.</li> <li>dyslexia.</li> <li>autism.</li> <li>dyslexia.</li> </ul> </li> <li>Using graph paper and a calculator can best help someone with         <ul> <li>autism.</li> <li>ADHD.</li> </ul> </li> <li>Using graph paper and a calculator can best help someone with         <ul> <li>autism.</li> <li>dyscalculia.</li> <li>dyscalculia.</li> <li>dyscalculia.</li> <li>dyscalculia.</li> <li>dyscalculia.</li> <li>dyscalculia.</li> </ul> </li> <li>Apperger's.         <ul> <li>dyscalculia.</li> <li>Allowing a person to have rituals and space to calm down can help someone with</li></ul></li></ol>



# **Friends with Different Abilities:** The Effectiveness of an Educational Computer Game about Disabilities

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### Game Modifications (H1)

### Image 4: GameMaker Development Tool

outside school	PIESS> CIICK
hallway	added instruction to move with
	arrow keys & how to see schedule
computer lab	message boxes> larger text boxes
hallway	message boxes> larger text boxes
English	message boxes> larger text boxes
gym	message boxes> larger text boxes
math	message boxes> larger text boxes
science	message boxes> larger text boxes
social studies	message boxes> larger text boxes
bus	added text to go to the bus door

# Image 5: Example Game Modification



Disability	Class	Characteris-	Activity	'16	'16	ʻ17	'17 1st	ʻ17	'17 1st	'17 2nd	Disability	ʻ17	ʻ17 <b>1st</b>	ʻ17 <b>2nd</b>				Disabilitv	Characteristic/	'16 Pretest	'16	'16	'17	'17 1st	ʻ17	Differenc
_	-room	tic	_	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest	Posttest		Pretest	Posttest	Posttest	Pre to 1st	Pre to 2nd	Posttest		helped by	% n=55	Posttest	Percent	Pretest %	Posttest	Percent	e of
		/ helped by		%	%	%	%	%	%	%		%	%	%	Posttest	Posttest	Difference				% n=55	Increase	n=83	% n=83	Increase	Increase
				n=55	n=55	n=83	n=83	n=42	n=42	n=42		n=42	n=42	n=42												
ADHD	Science	Hard to focus; Easily distracted	Read	97	93	82	94	88	95	98	ADHD	88	95	98	7	10	3	ADHD	Chunk information, take breaks	76	93	22	69	81	17	-5
		Chunk information, take breaks	Select 4 boxes	76	93	57	83	69	81	81		69	81	81	12	12	0	Asperger's	Keep routine, visual	62	83	34	36	81	125	91
Asperger's	Compu-	Trouble in social	Read	76	93	51	94	60	100	90	Asperger's	60	100	90	40	30	-10	Autism	Act out of turn, not respond	93	83	-11	90	90	0	11
		situations Keep	Select	62	83	22	86	36	81	83		36	81	83	45	47	2	Dyscalculia	Use calculator, graphing paper	45	79	76	45	74	64	-12
Autions		routine, visual	compute r															Dysgraphia	Write small	21	52	148	21	62	195	47
Autism	Library	Act out of turn, not respond	object	93	83	83	89	90	90	98	Autism	90	90	98	0	8	8	Dyslexia	chunks, Word Use auditory	93	72	-23	90	76	-16	7
		Have	Read	70	02	60	07	76	96	05		76	96	05	10	10	0		support		/ 2	25	50	/0	10	•
		rituals, space to		79	32	00	0/	70	00	95		70	00	22	10	19	9	Physical	Wheelchair- ask if can help	76	97	28	88	100	14	-14
Dyscalculia	Math	Difficulty with math facts	Read	69	76	46	93	55	93	95	Dyscalculia	55	93	95	38	40	2		-				Image	e 7: <b>His</b> t	ograms	s of 4 P
		Use calculator, graphing paper	Select 2- 4 objects	45	79	37	80	45	74	76		45	74	76	29	31	2		- What would you attitude is about s	Question I say your vie someone wit	<b>IS</b> ew or h a	40 35	Pre-te	rst 2016 n=69	all	
Dysgraphia	Social studies	Trouble writing, spelling, grammar, usage	Read	21	66	20	77	17	69	74	Dysgraphia	17	69	74	52	57	5		disability? - Do you know so people with learn disabilities? - If yes and you	omeone or m ing or other 1 know,	ultiple	Mumber of Propis	_	_		
		Write small chunks, Word	Drag paper	21	52	24	76	21	62	67		21	62	67	41	46	5		what disabilitie - Do you see you	es? rself behavir	ng or	0 1	2 3 4	5 6 7 8 Number Correct o	9 30 11 11 14	13 14
Dyslexia	English	Mixes up letters, reading troubles	Read	86	90	94	93	98	95	100	Dyslexia	98	95	100	-3	2	5		acting differently a disability compa without any know - If yes, how do	with someon ared to some n disability? o you	e with one	40	Pre-test 201	6 n=55, 12-22	years old	
		Use auditory support	Collide with book	93	72	86	87	90	76	93		90	76	93	-14	3	17		act or behave -Have you seen a someone with a c	e differently? any bullying d disability?	of	a of People				
Physical	Gym/PE	Wheelchair- ask if can help	Find glasses	76	97	80	100	88	100	100	Physical	88	100	100	92	12	0		<ul> <li>How do you t be stopped?</li> </ul>	hink it might		4940TM 20				
% in schools with disabilities	Office	About 13% US public school	Read	14	97	20	94	31	95	67	% in schools with disabilities	31	95	67	64	36	-28					0 0 1	2 3 4	5 6 7 8 Number Correct o	9 20 31 2 14	2 13 34
	1	1	1				1												Deet Cumue							

### Friends with Different Abilities (FwDA) Game Play Flow Image 6:



All pictures, images, figures, charts, and graphs were taken or made by the researcher or mentor unless noted. Acknowledgements: The researcher is thankful to the JJ SEA teachers, St. Mary's University, and all the people who played the game.



### Post-Survey Questio

- Do you think your view has changed about people with disabilities?

- If yes, how do you think it has changed? Do you think you have or will behave in a different way than

before? - If yes, in what way? - Would you be more understanding? -Would you be more considerate?

- Would you be more accommodating? - Would you report or try to stop any bullying of someone with a disability?

# Post-Survey Results (H3)

93% reported that they would be more considerate

what they go through.

what can be done to assist them.

with disabilities. - I can help them now.

> Hypothesis 1 to see if Friends with Different Abilities could be modified to be more understandable is rejected (see Table 2) given that  $\circ$  only 4 of the 7 altered facts were improved on (with an average of +18%) **Hypothesis 2** to see if someone can retain information about disabilities from playing Friends with Different Abilities at least 2 weeks later is accepted (see Tables 3 & 4) since • 71% on the pretest to 87% 2<sup>nd</sup> posttest for a statistically significant difference o some fact percents decreased, so it is not likely that they looked up answers Hypothesis 3 to see if someone's attitude or behavior can be altered to be more understanding towards someone with a disability is accepted (see Post-Survey) since o on average, 94% of the 42 responding said they would be more understanding, considerate and accommodating.

> Further studies could include trying to observe behaviors in a controlled situation and take further posttests. The game could be expanded to include Downs syndrome, physical disabilities, and mental disorders. Simulations of disabilities could be added to the game.

This year's project affirms last year's results and showed that **someone can retain the** information learned about disabilities by playing the game Friends with Different Abilities. Those who responded to the online form reported that *they would be more understanding* and considerate towards someone with a disability. Hopefully, less bullying can result from more people knowing about disabilities.



### Image 2: Taking pre-test, Playing game, Taking post-test









Table 4:	Score	es an	a I-te	Sts (nz)
Description	Ν	Pre	Post	P-value
		%	%	
All 2016	69	59	87	1.3x10 <sup>-16</sup>
12-22	55	61	88	8.1x10 <sup>-13</sup>
years old				
in 2016				
All 2017	83	68	88	6.2x10 <sup>-15</sup>
(12-22)				
Pre-1 <sup>st</sup>	42	71	91	1.1x10 <sup>-3</sup>
post				
Pre-2 <sup>nd</sup>	42	71	87	9.9x10 <sup>-8</sup>
post				
All 2016	152	65	88	4.4x10 <sup>-26</sup>
+ 2017				

7 8 9 50 53

Number Correct of Li

### retest and 5 Posttests (H2) Post-test 2016 n=69 all



- Three questions with some responses on the **post-survey** of interest:
- 90% reported that they would be more understandin
- 98% reported that they would be more accommodating
- Do you think your view has changed about people with disabilities?
- It has taught me to be more accepting and understand
- I now understand how these individuals are affected and
- I have more respect towards them and I'm more understanding. Do you think you have or would behave in a different way than before? - I would be more accommodating to their needs and be more patient.
- I learned really good tips regarding how to treat people

### Data Analysis

### Further Studies and Conclusions

### **References**

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