List of Appendices

This Appendix includes all of the original IRB stamped measures described in the Methods section of this dissertation.

Appendix I. Adapted Engineering is Elementary Assessment

Appendix II. Solve-Its Assessment Scripts

Appendix III. Gender & Technology Attitudes Assessment

Appendix I. Adapted Engineering is Elementary Assessment

Engineering and Science Attitudes Assessment: Instructions for Implementation

Please read these instructions BEFORE administering the "Engineering is Elementary: Engineering and Science Attitudes Assessment"

Instructions for implementation in kindergarten, first grade or among any students who have difficulty reading or understanding the assessment:

Overview:

The Engineering and Science Attitudes Assessment is used to gain insight into students' opinions about science and engineering. For kindergarteners, first graders or any student who has difficulty reading or understanding the assessment as it is presented in written form; the implementer should proceed in an oral interview format. For these younger students, the individual giving the assessment should read the following instructions aloud to the student, ensuring that they understand the directions:

Directions:

"I am interested in finding out some of your opinions on science and engineering. To get a better idea of your opinions, I am going to ask you to show me how much you agree or disagree with some statements about those topics. So, I am going to read a sentence out aloud, and then I'd like you to show me how much you agree or disagree with the statement by pointing to one of the five faces I have here"

"If you point to the first face (the one that looks very sad) that means you *strongly disagree* with what I just said. You don't agree AT ALL. If you point to the next one (the one that looks pretty sad) that means you're telling me that you *kind of disagree* with what I've just said. If you choose the middle face, that means you're *not sure.* The fourth face, which looks pretty happy, means that you *kind of agree* with what

I've said, and if you point to the last one, which looks the most happy, you're telling me that you *really, really, agree* with what I've said."

"Let's practice! So if I said, 'I love dogs' how much would you agree? Which face would you point to?"

"Let's try a couple of more practice ones. What if I said, I LOVE eating green beans. Is that true for you or not? Which face will you point to?"

Continue practicing until the child feels comfortable.

"Okay let's begin. Remember, you can always skip or say you're not sure for any of the questions"

Instructions for implementation among second graders or students who are capable of reading and understanding the assessment in print:

- If the student is able to read and understand the assessment as it is printed, he or she should simply be instructed to respond to each statement honestly and to refer to the facial expression scale at the top of the sheet (along with the accompanying words, such as, "strongly disagree") to make it easier to decide how they feel about each statement.

- Be sure to have the child answer some practice questions on the scale and that they are comfortable with the process before beginning the assessment.

- Remind the child that they can always skip a question or choose "not sure" on the scale.

We are interested in your opinions about science and engineering in this survey. Please answer each question honestly. Mark how strongly you agree or disagree after each statement. Thank you very much!

	Strongly Disagree	Disagree Somewhat	Not Sure	Agree Somewhat	Strongly Agree
1. I would enjoy being a scientist when I grow up.					
2. I would enjoy being an engineer when I grow up.					
3. I would like a job where I could invent things.					
4. I would like to help plan bridges, skyscrapers, and tunnels.					
5. I would like a job that lets me design cars.					
6. I would like to build and test machines that could help people walk.					
7. I would enjoy a job helping to make new medicines.					
8. I would enjoy a job helping to protect the environment.					
9. Science has nothing to do with real life.					
10. Math has nothing to do with real life.					
11. I would like a job that lets me figure out how things work.					
12. I like thinking of new and better ways of doing things.					
13. I like knowing how things work.					
14. I am good at putting things together.					
15. Scientists cause problems in the world.					
16. Engineers cause problems in the world.					
17. Scientists help make people's lives better.					
18. Engineers help make people's lives better.					
19. I think I know what scientists do for their jobs.					
20. I think I know what engineers do for their jobs.					
	Strongly Disagree	Disagree Somewhat	Not Sure	Agree Somewhat	Strongly Agree

Appendix II. Solve-Its Assessment Scripts

Assessment

School: _____   Researcher:_____

Child's Name: _____   Date: _____   Class: _____

Comprehension Assessment

Solve-Its – Can the child write a program with a specific goal in mind?

Children are asked to play a game with the researcher, in which the researcher tells a story about a robot performing an action, and then give the children paper icons of programming blocks. Using the given blocks, on a separate sheet of paper children will arrange icons into a program that will cause a robot to act the way described in the story. The Solve-It tasks will range from easier to more difficult, and challenge children to use a variety of programming concepts developed through the class curriculum. Use some of the following scripts as a starting point, but can be adapted to target a range of programming skills.

Assessment Scripts

Solve-It #1: Car Horn
In an animated voice: "This game is about a robot that is a car. Have you ever heard a car honk its horn? Can you make the 'BEEP BEEP' sound? [*Wait a moment*] I want my car robot to turn on – start the engine, vroom! Next, I want to honk the horn – Beep Beep! – to warn people that I'm about to move. Then I want my car to drive straight ahead, and then stop! And turn off." *Repeat explanation once more.* "Can you imagine the program my car needs? Are you ready to try to make the program for my robot?"

Solve-It #2: Birthday Party
In an animated voice: "In this game, my robot is attending a birthday party! First I want my robot to turn on. Next, I want it to move straight ahead into the birthday party room – but the robot has to be very quiet! It's a surprise birthday party! After the robot moves straight ahead into the room, I want it to sing the Happy Birthday song! Last, I want the robot to turn off." *Repeat explanation once more.* "Can you imagine the program my robot needs? Are you ready to try to make the program for my robot?"

Solve-It #3: Baking a Cake
In an animated voice: "This is a game about I First I want my robot to turn on. Next, I want it to move straight ahead into the birthday party room – but the robot has to be very quiet! It's a surprise birthday party! After the robot moves straight ahead into the room, I want it to sing the Happy Birthday song! Last, I want the robot to turn off." *Repeat explanation once more.* "Can you imagine the program my robot needs? Are you ready to try to make the program for my robot?"

Solve-It #4: Puddle
In an animated voice: "This story is called Puddle. Do you know what a puddle is? Sometimes a puddle is made of water, or mud. Do robots like water? [*Wait a moment*] No, usually water can break a robot, which is not good at all! I want to make a program that lets my robot dry itself off after it accidentally moves into a puddle. First, my robot will turn on, and then it will move straight ahead – but OOPS! My robot is in a puddle! It's going to make a noise – Beep! – as if it is saying 'Oh no!' Then I want it to move backwards, out of the water. Then, I want the robot to shake itself dry – shake shake shake! – and finally, turn off!" *Repeat explanation once more.* "Can you imagine the program my robot needs? Are you ready to try to make the program for my robot?"

Solve-It #5: Wheels on the Bus
In an animated voice: "Do you know the song, the Wheels on the Bus? [*Wait a moment*] I know when we sing that song, the wheels spin around on the bus so many times! Let's sing the song, and count how

Assessment

many times the wheels spin!" [With child(ren), sing one verse of song, while holding up one finger to count each time "round and round" is sung] The wheels on the bus spin round and round four times! I want to make a robot that is a bus, and I want my wheels to spin around four times, just like in the song. How would I do that? First, I want the robot bus to turn on. Next, I want the robot to spin its wheels, and to keep doing it four times. Then, I want the bus to stop spinning its wheels, and last, to turn off." Repeat explanation once more. "Can you imagine the program my robot needs? Are you ready to try to make the program for my robot?"

Solve-It #6: Goodnight

In an animated voice: "In this game, my robot is going to sleep. I want my robot to say goodnight to everyone in the house. I have a brother, and a sister, and a mommy. First, I want my robot to turn on. Next, I want the robot to make a noise – Beep! – when it is telling us 'Goodnight!' I want the robot to say goodnight to three people, so it has to keep beeping three times. Then, I want the robot to stop beeping, and last, to turn off." Repeat explanation once more. "Can you imagine the program my robot needs? Are you ready to try to make the program for my robot?"

Solve-It #7: Washing Machine

In an animated voice: "In this game, my robot is actually a washing machine! Have you ever seen a washing machine shake the clothes to make them clean? Shake shake shake! First, I want my washing machine to turn on. Then I want it to shake and wash the clothes, and keep doing it for four minutes. Then, I want the robot to stop shaking when the clothes are clean, and to make a noise – Beep! – to let me know that it is done! Last, I want the washing machine robot to turn off." Repeat explanation once more. "Can you imagine the program my robot needs? Are you ready to try to make the program for my robot?"

Solve-It #8: Microwave

In an animated voice: "In this game, my robot is actually a microwave! Have you ever seen a microwave spin food around to heat it up? First, I want my microwave to turn on. Then I want it to spin and heat up my food, and keep doing it for four seconds. After four seconds, I want the robot to stop spinning, and to make a noise – Beep! – to let me know that my food is ready! Last, I want the microwave robot to turn off." Repeat explanation once more. "Can you imagine the program my robot needs? Are you ready to try to make the program for my robot?"

Solve-It #9: Extra Blocks Forward

In an animated voice: "This game is a little bit tricky. I have a robot, and I just want it to move forward four times. It needs to turn on first, and then keep going straight ahead four times. After that, the robot needs to stop moving straight ahead, and then turn off. BUT! There are extra blocks that I am about to give you. You do not need to use all of these pieces of paper, and some of them will not help you make a program to move my robot forward four times." Repeat explanation once more. "Can you imagine the program my robot needs? Are you ready to try to make the program for my robot?"

Solve-it #10: Extra Blocks Beep

In an animated voice: "This game is a little bit tricky. I have a robot, and I just want it to make a noise four times. It needs to turn on first, and then beep four times. After that, the robot needs to stop beeping, and then turn off. BUT! There are extra blocks that I am about to give you. You do not need to use all of these pieces of paper, and some of them will not help you make a program to move my robot forward four times." Repeat explanation once more. "Can you imagine the program my robot needs? Are you ready to try to make the program for my robot?"

Appendix III. Gender & Technology Attitudes Assessment

Technology Attitudes Assessment

Directions:

Sit down with the child and follow the script below as closely as possible. The purpose of this interview is to gather information about the child's attitudes, opinions, and gender associations with different forms of technology. You will be showing them a variety of different tech tools to determine whether they associate them with girls or boys. Record their answers on the attached sheet. Use the suggested follow-up questions to help gain more information about the child's rationale.

Script:

Interviewer: "I got all these toys mixed up and I need your help! I want to know which toys you think the girls in your class would choose to play with and which toys the boys in your class would choose to play with. I have these different signs..." [Show the signs to the child]. "You'll put the toys that the girls would play with the most under the girl sign, the toys the boys would play with the most under the boy sign, and the ones you think both boys and girls would play with equally under the sign for boys and girls"

Use large versions of the following symbols for the signs:

Girls: **Boys:**

Girls and Boys:
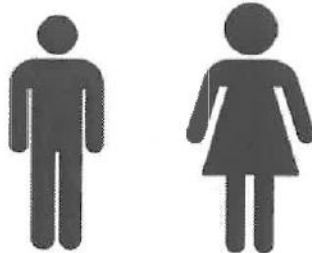
Interviewer: "Do you think you can help me with this? Okay, I'll start showing you some toys."

Interviewer shows each group of toys and asks the child to decide where they think each toy belongs: under the girls sign (meaning girls would play with it the most), under the boys sign (meaning boys would play with it the most), or under the boys and girls sign (meaning boys and girls would play with this toy equally). Show toys in the following five groupings:

1) **Traditional toys:** Barbie, Toy Car, Small football, Jump Rope

2) **Building Materials:** LEGOS, Craft/Art Materials, Building Blocks, Play-Doh

3) **Robotic/Engineering Materials:** Wedo Robot Built, KIWI Robot Built, Rcx Robot

4) **Digital:** Ipad and Computer

5) **Image-Making:** Digital Camera, Sketchpad w/ crayons

Interviewer: "Place each toy underneath the sign that shows who you think would play with that toy the most: girls, boys, or both exactly the same. It's okay to have more than one toy under the same sign."

Interviewer uses follow-up prompts to get more information about why the child categorizes the toys the way they have chosen. Prompts such as the following can be used:

"What makes you say girls would like this toy more than boys?"

"Do you ever see boys using this toy?"

"Have you ever used this kind of toy?"

"If you could choose one of these toys to play with, which one would you choose?"

Record responses on the following sheet

TECHNOLOGY ATTITUDES ASSESSMENT

CHILD'S NAME:_____

SCHOOL:_____

CLASS:_____

DATE:_____   PRE or POST:_____

Place checkmark under "Boy" "Girl" or "Boy/Girl" depending on the child's choice for each toy. Use the final column for notes as necessary.

Item	Boy	Girl	Boy/Girl	Rationale/Notes
Barbie				
Car				
Football				
Jump-rope				
Legos				
Arts/Crafts				

Building Blocks				
Play-Doh				
Wedo Robot				
KIWI Robot				
RcX Robot				
Ipad				
Computer				
Camera				
Sketchpad				

Child's Top Three Toys
Interviewer should circle the child's choices

Barbie	WeDo Robot
Car	KIWI robot
Football	Rcx Robot
Jump- rope	Ipad
Legos	Computer
Arts/Crafts	Camera
Building Blocks	Sketchpad
Play-Doh	

Child's Favorite Robot
The interviewer should also ask the child to select his or her favorite of those 3. Circle that choice below:

WeDo Robot   KIWI Robot   RcX Robot