**General Process for Running Subjects through**

**Virtual Keyboard Prototyping for Multistep Algebreic Problem Tutors on Tablet Devices**

# Setup / Introduction

1. Before the subject arrives, make sure that all of the prepared materials are ready for use. Make sure that you have recorded the Subject ID and Date marked at the top.
2. Take the parent and child to the room where the study will take place. Close the door, so it is quiet.
3. Briefly introduce yourself. Next, tell them that you need to read the following instructions about the study verbatim. Better to read this word-for-word for consistency sake across subjects. **See Appendix A**.
4. Inform the child and parent that for this study we will be recording audio and video
5. Ask the parent and child to **read and sign the consent form**. Be sure to hold onto the signed form!
6. Tell the parent and child that you will now start the study process. As mentioned above, the parent cannot remain in the room where the study takes place, although they are free to sit and wait some place close by, if they would like.
7. Introduce and explain the thinkaloud method **SEE PILOT**
8. Show the child the study materials and explain the physical setup **SEE PILOT**
9. Show the child the worked example in the tutor interface
10. Do a 5 to 10 minute trial run of the thinkaloud method **SEE PILOT**
11. Start audio recording

# Pilot

* **Thinkaloud:** “We will be using the thinkaloud method while we work with the paper version of the algebra tutor today. The thinkaloud method is simply a way of working through a problem so that other people know how you think while you work through that problem.”
* “While you work through the problem, whatever the problem is, simply speak every step or idea that you think. Say anything that comes to mind about the problem.”
* “To give you a better idea, let’s work through an example.”
* Provide the child with the thinkaloud worksheet.
* “Here are four addition and subtraction problems that designed to get you used to the method. While working through these problems, please speak aloud what you are thinking and how you solve the problems.”

1. Tell the subject: “We have a few questions for you before we start.” Read the Preliminary Questions to the subject and indicate the subject’s answers:
   1. “Have you worked algebraic problems solving for one variable?”
   2. Show example
   3. “Have you worked on a tablet device before?”
   4. If not, demonstrate that the device receives responses by touch on the paper mockup
2. **PHYSICAL SETUP:** Show the child the example problem.
   1. Explain that he/she should work the left side of the equation first, then the right side.
   2. There will be list boxes that will appear allowing him/her to select what he/she just did: distribute, combine etc. There may be a third box that appears where he/she must input exactly what was subtracted/added/multiplied.
   3. There is a hint button down at the bottom of the interface ALWAYS available to help the child to the next step if he/she gets confused or lost.
   4. Tell him/her after something is entered into a textbox that such input will be graded, if the input is incorrect, he/she cannot continue working the problem until that step is correct: again, this isn’t a test so if something is wrong, I’ll tell you, we can fix it
   5. Finally, when the problem is complete, tell him/her to put answer in solution box and tap “Done”
3. Explain:
   1. “We will have you work with a paper version of the algebra tutor because it is easier for us to use your feedback and responses to fix our designs.”
   2. “Because this process allows us to work through issues in designing the keyboard much faster, we will pretend that this is an actual tablet screen and that this is an actual problem.”
   3. “When you touch the tutor interface (screen) and the buttons on the keyboard, I will handle the paper representations accordingly so that it will be very much like what you would experience with an actual tablet.”
   4. “When you touch the buttons on the keyboard, please speak aloud every number, button, or symbol that you press so that I can write it down on the tutor interface (screen).”
   5. “This is not a test of your math skills. We simply want to know what it is like for you to work with this pretend version of a keyboard and the tablet interface so that we can better design the real version.”
   6. “Again, I ask that you please speak aloud every action that you make. Whenever you want to move something or scroll something, please speak this aloud. Whatever you think about the interface (including the screen or keyboard) please speak this aloud. Whatever you think about the algebra problem as it relates to the keyboard or the interface, please speak aloud.”
4. Layout/Agency run-through – make sure to ask them if anything is confusing at all as you walk through the interface, and take notes.
5. Set up the first problem for the child: 1+2(x+1)
6. Speak: “Please complete this problem. Let me know if anything does not make sense or you need help.”
7. Ask the child to work the problem using
   1. **landscape version w/LONG**
   2. **ask to zoom on landscape**
   3. **ask to use at least one hint on zoomed an noZoom**
   4. **landscape w/COMPENDIOUS : ZOOMS; movable in and out**
   5. **landscape w/NUMPADS : ZOOMS; movable in and out; DRAG N DROP**
   6. **Portrait version w/COMPENDIOUS : ZOOMS**
   7. **Portrait w/NUMPADS: ZOOMS; DRAG N DROP**

# Wrap-up

1. Wait for or meet the child’s parent, whatever has been arranged.
2. **Pay the parent and child for their participation**, $10 if they finished all of the materials, or the entire amount if they quit before completing all of the materials. Ask the parent to read and sign the payment receipt form. Be sure to hold onto the signed receipt form!
3. Thank the parent and child for their participation.

# Appendix A.

* 1. “This study is intended to test web-based math materials for learning multistep algebraic expressions. Our goal is design a usable virtual keyboard and interface for the tutor. Your (son / daughter) will work on the materials for up to 1 hour. We are not sure of the precise time it will take to finish all of the materials, but please note that it is more likely (he / she) will finish in less rather than more than 1 hour, so please factor this into your plans for picking up and taking your child home. You are welcome to stay at CMU or leave your child with us during this time period. However, please understand that you won’t be able to sit in the room where the study will be conducted.”
  2. “Your (son / daughter) will receive up to $10 for their participation. If they complete all of the materials, he/she will receive the full $10. If he/she does not complete all of the materials, he/she will still receive the full$10.”
  3. “Your child is free to quit at any time and for any reason during the process. He/she just needs to let me know that he/she wishes to stop.”
  4. “Do you have any questions at this time?” (Answer questions to the best of your knowledge. If they ask anything that you can’t answer, or don’t feel qualified to answer, tell them that you will contact the Principal Investigator, Dr. Vincent Aleven, and get back to them with an answer as soon as possible.)