Marie Ferro PDI Studio V

October 13, 2012 Ethnography #2

**Hypothesis**

On our second visit to the Ark Charter School we brought with us a homemade device to give the children an introduction into electrical circuits. The main idea that we planned to test with this device was whether the children would be more likely to use mathematical methods to solve the problems given to them or whether they would prefer the guess and check method. Personally, I felt that the students would lean more towards the rapid fire guess and check option as opposed to the “practical” solution. My prior knowledge and experience with children of these ages led me to believe that with something so new and novel such as this toy, the kids would be much more apt to try it out in any method they saw fit as opposed to strictly listening to our math-based directions.

**The Device**

Prior to our visit to the school, we put together a device with three different circuits and three different resulting outcomes. The first example required the kids to build a circuit using resistors and connectors to create a value of 200. When the correct resistance was created and applied a motor with an action figure attached to it would spin at a moderate speed. The second circuit was slightly harder and, at a value of 50, would require the students to use their newly learned knowledge of parallel vs. series circuits. The correct result would lead to a very fast spinning motor also with an action figure attached. The final circuit was designed to be the most difficult, requiring a value of 350 to make a speaker play a series of beeps to note the successful completion of the game. All electrical components were housed in a makeshift cardboard box.

**Field Testing**

We took our device to a 6th grade classroom where we had about an hour to rotate it through 4 groups of around 4 children. Each group responded to the device in a slightly different manner but each proved our hypothesis to be more or less correct and our device to be, for the most part, a success.

**Group 1**

This group consisted mostly of boys with one jumping out at the very beginning as the most interested in the device. This child was quick to understand our brief introduction on how to calculate resistance and when to use the two different connectors that we had brought (parallel vs. series circuits). We decided, on the fly, to use the whiteboard that each child had in their desks as a teaching tool. I believe that this was helpful for the students because although we were introducing a concept that was quite new and different, the whiteboards were something that they were comfortable with using to learn new concepts. This made them more comfortable with the information that we were presenting to them. With this first group we made sure to keep the device in our hands, in our control, until we were ready for them to take a look. This proved to be very important and successful because it allowed us to retain their attention while attempting to explain the concepts for the first few minutes of the interaction. In other groups we failed to establish this initial control and it was much more difficult, right off the bat, to keep them interested and engaged with what we were telling them.

Moving the focus back to the group dynamic, the presence of one child who was very much into our device proved both to be quite helpful as well as a deterrent at the same time. This child was quite willing, when prompted, to explain how he reached an answer. However, it definitely took probing on our end “how did you know that?” for him to explain himself. While the children enjoyed learning from him and the toy gained credibility due to his interest, it was also intimidating at times and 2 of the kids were much more reserved as a result. It is interesting to note that no matter what the age, group dynamics remain largely constant—in this case, a leader, close follower, and two much more reserved but still contributing individuals. While this dynamic differed throughout each of the four groups that we saw, the skeleton remained largely intact.

It is interesting also to note what motivated children of this age range. In this group the students were very focused on achieving the second circuit because we had told them ahead of time what the result would be- a very quick-spinning action figure! Because they were so motivated to see this for themselves, they were able to complete the circuit in only a minute or two with minimal guidance. Humans are naturally more willing to solve a problem when the outcome is in their favor. Whether it be in getting a promotion or simply watching an action figure spin in circles, a promising incentive is a very useful motivating tactic.

**Group 2**

The second group that we tested our device on was quite opposite from the former. The group was much more reserved and perhaps a bit intimidated by something that they had never seen and knew very little about. Additionally, I got the vibe that no one in the group was overly enthused by the idea of electricity which made it much more difficult to retain their attention for the first 5 “teaching” minutes. However, once we gave them free reign of the device they slowly began to open up and even work together to understand the device.

I noticed that each student seemed to understand a different piece of how the toy worked, whether it be the resistors, different methods of connecting, math aspect etc. they were able to connect the information to solve the first two circuits fairly quickly. The group used a combination of the math that we taught them as well as the guess and check method. Color coding the resistors was definitely a good idea because it gave them something that was easily understandable to work with instead the foreign idea of “resistance”. However, in hindsight we should have chosen different colors (instead of red and black) because the resistor housings were also red which led to some confusion between what was what.

As with the previous group, the third and final circuit was, in retrospect, too difficult for the students to grasp at their first introduction to these electrical concepts. We were able to finally make the correct resistance but it took much more probing and assistance than they (and we) would have liked. I think that it was partially upsetting for the children to achieve the first two circuits with relative ease (after applying teamwork) and then sort of be beat down by the last one. In hindsight it would have been better to have three simple circuits for this introductory course to build up their confidence and enjoyment before moving onto something more challenging.

**Group 3**

The third group was the first one where we did not have control of the device from the very beginning of the interaction. This was an oversight on our part but it lead to some interesting, if not frustrating, discoveries. The group immediately grabbed the device and began using it in many different ways- mostly just plugging resistors and connectors in anyplace that they saw fit. Interestingly, this entertained the group for a fairly significant amount of time. It was not until we took back control and sternly explained that if they listened, it would actually do “cool things”, that their attention came back to us. I found it to be interesting to observe what the students chose to do with the device when they had no guidance. However, the other two members of my group seemed more put off by this and were more concerned with teaching them the “correct” way to use the toy.

I think that the natural reaction of the students speaks a lot to the “trial and error” society that we have become a part of. Very infrequently do people actually choose to read direction manuals etc. instead we would generally rather figure out how something works by a series of tests. This is something to certainly keep in mind when designing our final product, no matter what it is. Kids have become much more hands on an interactive of late, no longer does the majority enjoy sitting still and learning by reading what will happen before they actually get the chance to try it out.

The group dynamic in this third set of students was slightly different than the past two in that there was a clear ring leader that the other students appeared to be a bit intimidated by. It seemed that they were much more comfortable allowing her to take control of the group and simply watching the results of her reactions. However, when we asked her to please put everything down so that we could begin the lesson, the other 3 chimed in their agreement with us. It would be interesting to know how the groups were divided- whether it was by chance that this dynamic was created or if they were friends and chose to hang out in the group all the time.

Dynamic aside, this group was able to eventually complete the circuits once we regained control. They also had a few good quotes. When asked if they knew what it meant to “close a circuit” they replied “to make something work” Not a bad definition if you ask me! We also found proof that they understood the concept when one child directed another, of her own accord, to “Connect to this and put another y on the end”.

**Group 4**

The final group seemed to be a combination of the previous three, nothing unique or inherently different was noted. We did however observe that they seemed to be more intrigued by making shapes and letters with the flexible resistors than actually putting them together. They were definitely the most interested in the last circuit, the one that made noise, because by this point in the class they had heard it go off three times before and were eager to finally achieve this for themselves! Unfortunately, when they did finally complete the last circuit our program malfunctioned and the sound did not go off ☹

**Conclusion**

After testing our device on 4 quite different groups of 6th grade students, we concluded that the information which we received was mostly positive. Our design seemed to be largely on spot when it came to motivating the children to complete the circuit with a fun result (i.e. spinning action figure or fun noise). If we were to go on with this device I think that it would be important to devise a way to better teach the children the math behind the circuits. I did not walk away feeling that they fully understood the difference between resistors in parallel vs. series etc. Because this was one of our goals, I would certainly not say that the device was a complete success. However, we were able to test our ultimate question of whether they would be more apt to use the math to figure out the circuits or simply use the guess and check method. As predicted, there was a combination of both methods but they definitely leaned towards just plugging in different resistors and connectors until something happened! Not bad though—at least they found our device to be intriguing!

Notes from the ACS Visit, 10/11/12

General Observations

* Generally 1 person comes out as the leader, really gets what is going on and enjoys it
* Sometimes it is interesting to give them free range and see what they try to do without any instruction
	+ “What happens if I plug this here”?
* By the time we got to the last few groups they had heard the noise and were excited to make it happen for their group as well

Group 1

* Using the resistor pieces like Legos
* Hard for the children to understand when to use the y connectors, and when you use the straight connects (parallel vs series)
* 1 kid said- “I just want to see what it does” when asked what he was doing with the resistors
* Spent first 5(ish) minutes explaining concept to children
* Able to achieve first circuit within a few minutes
* Got the second circuit very quickly
* 3rd took much more time and we drew it out to complete
* 1 child was really into it, understood what was going on. He helped teach the others
* Kids really liked the motor that spun extremely fast!—they were motivated to get this one because they knew it was going to be very fast

Group 2

* A little less enthusiastic and much quieter than the first group
* Took them longer to get into the game
* Hard to maintain their attention especially when explaining—very foreign concept for them
	+ Need better analogies (to help the understand what is going on)
* 3rd and final circuit was very hard for them- split it into two parts
	+ Used white boards to do math
	+ Like the music after the 3rd circuit
* Overall finished faster than the first group
* Asked them to figure out how to get 83 but this was much too hard

Group 3

* Started playing with the resistors immediately (had heard the noise/knew what was coming bc of prior groups)
* Guess and check method preferred- not math
* Don’t want any instructions
* 1 child is definitely the leader, more dominant than the rest
* Their definition when asked what it means to “complete the circuit”- “making something work”
* “Connect to this and put another y on the end”🡪 proof that they understand the concept fairly well.

Group 4

* Similar to the rest
* They made letter and shapes with the resistors
* Did not get to finish the last circuit—needed a lot of help to understand what was going on