**Homework 9: Team Final Design Decision Matrix**

a) **Children’s Motor Skills Toy:** Create a therapeutic toy for children with fine or gross motor skills and coordination issues. You will research a few specific pediatric disorders that involve fine or gross motor skill limitations of children and design and build a prototype of an innovative therapeutic toy to help build the particular motor skills for that population of children.

b) **Design A: Handwriting Whiteboard- Final design title tbd**

The Handwriting Whiteboard helps children with fine motor skill issues learn how to write, which is an important skill that many of them struggle with. Buttons beneath the board sense when a child presses too hard, causing an LED to light up. An included marker handgrip can be attached to an Expo marker to train children how to hold a writing utensil and improve their handwriting form. Since a lot of younger children press too hard when writing, this will improve the weight they use while handwriting since a push button sensor will be triggered when pressed too hard. This will set off a buzzer sound and red light, signaling to the child that they need to write lighter. A green light will be lit at all times that the child is writing correctly for encouragement. This device is meant to be used in classrooms, in order to improve handwriting (a very important fine motor skill).

The Arduino components to be used include an Arduino, a breadboard, LEDs, and pushbuttons. The marker grip will be 3D printed. Other materials include a whiteboard and Expo marker.

c) **Design B: Smart Cup Stacker**

The “Smart Cup Stacking Toy” is a toy designed to help children with dyspraxia and issues with stacking items. Dyspraxia causes issues with motor skills and coordination, so practicing stacking cups with built-in assistance would help develop these skills. Basically, the Smart Cup Stacking Toy is a that allows a child to stack cups like they normally would, but has extra assistance that helps keep the cups in place and provides feedback if a cup is placed correctly. This uses an Arduinoi and LEDs. The base is a platform that has four slots for four “cups” to go into. Once a cup is inserted into a slot correctly, a green light turns on. Once the four base cups are stacked, the child can keep adding cups on top of it to create a pyramid. Unlike how people usually stack cups, where they all fall if one gets knocked over, these cups have special indents on the top of them that help keep the cups in place once they are stacked on top of each other. It is kind of like lego bricks clicking in place, but in a slightly looser fashion so that the cup can be easily removed. The cups can also have fun designs on them that younger children can interact with. There are not many safety hazards, just the base and LEDs possibly being broken.

**Decision Matrix:**

| **Attributes** | **Attribute Weights** | **“Handwriting Whiteboard”**  **(out of 10)** | **Weighted**  **Score** | **“Smart Cup Stacker”**  **(out of 10)** | **Weighted Score** |
| --- | --- | --- | --- | --- | --- |
| Safety | 0.1 | 6 | 0.6 | 8 | 0.8 |
| Effectiveness | 0.4 | 10 | 4.0 | 9 | 3.6 |
| Low-Cost | 0.1 | 9 | 0.9 | 8 | 0.8 |
| Durability | 0.2 | 8 | 1.6 | 9 | 1.8 |
| Ease of Use | 0.2 | 10 | 2.0 | 8 | 1.6 |
| **Total** | 1.00 |  | 9.1 |  | 8.6 |

**Decision Matrix Discussion and Final Idea Selection:**

We decided on the Handwriting Whiteboard idea because we feel like this design has the most potential and is the most unique, as in this does not already exist in the real world. Additionally, we know that this is an actual problem that many school teachers struggle with in early grade school. By implementing a special hand grip for children to use will encourage proper handwriting position (hold) and the whiteboard signals will encourage lighter writing. Most younger children think they have to press down on their pencils super hard in order to write on a paper. However, this board will teach them to write with less weight and encourage lighter writings. This idea could be implemented in the classroom as a learning station to teach a fine motor skill and encourage proper handwriting. We also thought that effectiveness of our design was the most important in our decision process because we wanted the design to be useful for all children and help solve a common problem in the classroom. We asked a first grade teacher what a common issue was with her first graders and hanwriting was the number one issue. We hope this idea will be easy to use and solve a very common problem.