Sensory Board for Adam’s Adventure Playground

Danielle Napoli
Alyssa Smith
Christine Wakefield

Sponsor – Dr. John Enderle
TA – Sarah Brittain
Client - Brian Schwarz
schwarz@engr.uconn.edu
191 Auditorium Road U3187
Storrs, CT 06269
860-486-3245
Statement of Need

Playgrounds are typically a place for children to relax, have fun and enjoy their youth. However, for children with special needs, this can be challenging. Disorders such as autism, mobility impairments, deafness, blindness and many others can greatly affect a child's quality of life by limiting their ability to interact with other children and the world around them. Children with autism, for example, may be overly sensitive to bright colors and loud sounds, have trouble with proprioception, and often require greater time to process information, while children with mobility impairments may have trouble gripping objects or reaching surfaces.

A playground designed for children with disabilities will allow them to have fun, as well as give the parents, guardians and caretakers of these children some well-deserved relaxation time. An important part of this playground would be a sensory board. This would both stimulate the children’s senses and cater to their needs. Although the other playground equipment may be designed in order for the children to be capable to play on them, the purpose of the sensory board is to stimulate their minds and bodies in an interactive way that they may not be able to access anywhere else. On this device, it is necessary to include colors, lights, and sounds, as well as some engaging games or activities which children will be able to enjoy. Thus, the objective of this project is to build a sensory board for the Adam’s Adventure Playground in Tolland, CT that will stimulate the senses of special needs children and allow them to have fun.

Introduction and Overview

Adam’s Adventure is a playground for special needs children of all ages, which was inspired by the story of Adam Młodziński. This 7-year-old boy loved his teachers, enjoyed playing with friends, had loving relationships with his sisters and his dog, and was a soccer star. However, what was originally thought to be a simple ear infection escalated until he had to be airlifted to Connecticut Children’s Medical Center. The ear infection had become Bacterial Meningitis, and he remained at the hospital in a coma for several months. After months of praying and hoping, he woke from the coma. However, he will never be quite the same as he was before as the illness left him without sight and with learning disabilities caused by brain damage from the disease. Despite being blind and having to relearn basic skills such as walking, Adam has been able to resume his childhood and continues to bring joy to those around him. This inspiring young man has made a difference in so many lives that many residents in the town of Tolland have dedicated many hours of their free time to build a playground in Adam’s name to make all children, regardless of any disabilities that they might have, feel welcome in the playground.

This project entails the creation of a sensory board for the playground, so that children with disabilities are able to have fun just like any other child. This sensory board is necessary to stimulate the senses of those missing a sense or those with other disorders, both mental and
physical, and it will do this by containing several interactive games and activities for the children to play. A normal playground does not facilitate the needs of children with disabilities, making it difficult for them to enjoy their time there; thus, the purpose of this board will be to cater to their specific needs. While the Adam’s Adventure board of directors is the official client, these children are the true clientele of this project.

It will have Braille instructions for all games on it, bright colors to catch the attention of the children and to cater to those who may be hearing-impaired, sounds for children who are visually impaired, and it will be aimed to be simple and versatile to make sure that we are able to create a great board in the given amount of time. It will be also be accessible to those with mobility impairments, who use wheelchairs of some sort, in addition to those without mobility issues. This will be done by making sure there are places for the children to roll under and reach all the games without having to reach over or stretch uncomfortably. It will include some simple games that the children can play both individually and with others, and some more complex games to cover all age groups. The range of children that will be using this sensory board is very broad, with an age group from toddler to teenager and all different disabilities (autism, ADD, ADHD, mobility, visual, and auditory impairments). Because of this range, there will be games appropriate for children who may still be going through basic learning processes, and some more complex games that deal with memory and cognition.

Some possible activities are Tic Tac Toe, musical chimes, memory games, matching games, a flip-up mural, and puzzles. Music tends to calm autistic and other children, and even Adam himself loves music. Making and listening to music would be great for all age groups, as well as many disabilities. Memory games would help improve children’s cognitive abilities, a critical part of a child’s mental development. Tic Tac Toe is something which can be fun for all age groups and can help create new friendships. Additionally, autistic children tend to enjoy figuring out puzzles. A mural with some flip-up pieces, with, for instance, an owl underneath and making the sound “who who” is something which younger children, and possibly cognitively impaired children, would greatly enjoy. Another possible activity for a younger child is a matching game, where they can match a person’s face with an upper body and a lower body. All these activities are solutions to the problem of finding playground activities for physically or mentally impaired children.

Because the client wishes the sensory board to have some electrical components to it, it is necessary to power the board. It will be powered using sustainable materials, likely solar panels. If necessary, another method of generating power can be used as well, such as a game that will include the child using a hand-crank to light up a screen. Using the mechanical energy of a child turning a hand-crank could provide and making it into a game is a great way to have sustainable energy.
Realistic Constraints

One of the main constraints in this project is the environment; the device will be outside, and thus subject to weather every day of the year. That means it must be able to withstand more than extreme weather conditions. This includes all types of precipitation, wind, temperatures ranging from approximately 0-100 degrees F, and more. It is necessary that the environment does not cause any wear over time. Another constraint is that this device requires power which should be supplied by a solar panel. However, since solar panels are not very efficient (only around 11%-15% efficient), the amount of power the sensory board can use is limited. This means that the design will not only have to be creative and insightful, but simple, versatile and most importantly, efficient. The sensory board will most likely have another source of renewable energy since the solar panel alone won’t provide the necessary power needed.

Furthermore, the sensory board must be heavy enough that it will not become unstable on a windy day, but light enough to be able to be transported to the site. It must also be able to be bolted to the ground in a safe way to keep the device stable. This could alter design aspects because there will need to be room on the sensory board for bolts to go through. Additionally, the device should be short enough so that all children can reach it, whether standing or in a wheelchair. The board will also need to be long enough that multiple children are able to utilize its many components at a single time. The whole point of the sensory board is for all children to enjoy it. To do this, children from all different backgrounds and disabilities must be considered.

One other concern is that the board will need to be soft enough to prevent any serious injury (since it will be aimed towards a younger age group), but hard enough to withstand any serious damage. Safety is a major issue, especially since children with disabilities and disorders will be using this playground. It must go above and beyond any safety concerns that caretakers, parents and guardians may have. The material that the board is made of must also be scratch resistant and UV stable for outdoor use to prevent damage to the board over time, thus preventing constant maintenance. In addition, the board should be resistant to vandalism and graffiti.

Other than these engineering or environmental constraints, the size and complexity of this project is restricted by the budget. Ideally the budget for this project could be around $5,000; however, without this budget confirmed no assumptions can be made. Thus, throughout the project, it is important to plan and keep track of the finances going into the sensory board and make priorities and goals for the board apparent from the very beginning. In doing so, the budget will be used properly according to both the client and the design team.
Other Information

Since this board will be in a public place (Tolland, CT), appearances are important and will need to be considered in the design aspect of this project. It will be on a playground so it will have to look whimsical with plenty of bright colors. The client’s priorities are to make sure that the sensory board is fun, sustainable, colorful, looks appropriate and, of course, is functional. The board may also need to be able to be assembled on site because of the large suggested size. To get a better understanding of the disorders on which to focus, an expert will be available to supply more information on what the disorders entail. Children with disabilities and their caretakers will also be consulted in order to get a clear picture as to what types of activities and components should be included on the board. Several special needs playgrounds already exist in Connecticut, and thus can be used as references or models for this project.

Questions

What other power sources are available to be utilized for the board?
Is there training necessary to build a sensory board, or will one be bought and gutted?
How will the sensory board be attached to the ground?
How will the solar panel be attached to the sensory board?
How much input and output voltage is needed?
How much input and output current is needed?
What is our exact budget?

Specifications

Material Specifications

<table>
<thead>
<tr>
<th>Physical:</th>
<th>High-Density Polyethylene (HDPE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical:</td>
<td></td>
</tr>
<tr>
<td>Size:</td>
<td>12 ft x 4 ft x 8 in</td>
</tr>
<tr>
<td>Weight:</td>
<td>300 lbs</td>
</tr>
<tr>
<td>Sections:</td>
<td>Built in three 4 ft wide sections for ease of transportation to site</td>
</tr>
<tr>
<td>Electrical:</td>
<td></td>
</tr>
<tr>
<td>Maximum Input Voltage:</td>
<td>138 Volts DC</td>
</tr>
<tr>
<td>Maximum Input Current:</td>
<td>38 Amps (A)</td>
</tr>
<tr>
<td>Maximum Output Voltage:</td>
<td>18 Volts</td>
</tr>
<tr>
<td>Maximum Output Current</td>
<td>5 Amps</td>
</tr>
</tbody>
</table>
Battery Life: Minimum of 12 Hours

Environmental:
Operating Temperature: 0 - 100 degrees F
Operating Environment: Outdoors. Must withstand extreme sunshine, as well as all types of precipitation, including hail, high winds, rain, and snow.

Additional Stresses: Children will be playing with this all day, and they naturally put stress on their toys by hitting them, pressing buttons hard, touching everywhere, possibly biting parts, carelessly moving and dropping movable pieces, etc. Furthermore, there is a possibility of vandalism, so the inside electrical components and solar panel must be protected well, and the materials used must be scratch resistant.

Software:
User Interfaces: The sensory board as a whole is the user interface. More specifically, there will be musical chimes, simulated piano keys, tic tac toe, flip panels, a hand-crank, push buttons, and braille on the interface. The interface must be colorful, appealing, simple, easy-to-understand, and must have braille directions for the activities.

Hardware Interfaces: Chimes, Tic Tac Toe Spinners, hand-crank, push buttons, simulated piano keys.

Computer Requirements: We will need to do programing to put games into the sensory board, however when delivering the sensory board we will not need to include a physical computer.

Safety:
No sharp corners
No wires or other electrical components sticking out
Must be securely fastened to ground
Must not have any moving parts which could become dangerous to the user
Must be completely sealed to guard electrical components from weather

Maintenance:

Ideally, the sensory board will not require any maintenance and will be completely self-sustainable. There may be a possible replacement of a battery after a couple decades because after being rechargesed multiple times, the battery life may be depleted. The board should be composed of scratch resistant and graffiti resistant material to prevent replacement of the equipment.