

EPICS KIDS PLAY GYM BLOOMINGTON, INDIANA

PURDUE UNIVERSITY DANCE MARATHON WEST LAFAYETTE, INDIANA

WORK HARD, PLAY HARD: Engineering Designs for Playing and Learning

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Source: Erin Blasingame, Nov. 2022
PLAY Team members at Kids Play Gym

PLAY TEAM and PROJECT PARTNER INTRODUCTION

Purdue's Engineering Projects in Community Service (EPICS) program's PLAY team partners with both Kids Play Gym and Purdue University Dance Marathon (PUDM) to create or improve projects that encourage, growth, readiness goals, and childhood enjoyment for the kids within these organizations. Over the course of this academic year (Fall 2023 – Spring 2023), the PLAY team has been working on three different projects. The Bubble Tube and Bench projects are partnered with Kids Play Gym, and the Wheelchair Lift team is partnered with PUDM.

Kids Play Gym is an organization located in Bloomington, Indiana that strives to provide young children with autism an environment and resources to grow their life skills and encourage development. Kids Play Gym provides Applied Behavioral Analysis to improve fine motor control, social skills, coordination, and more (*Aba therapy. ABA Therapy : Kids Play Gym*).

PUDM is an organization that hosts a dance marathon to raise money for Riley Hospital for Children. The donations benefit programs that help kids better understand their treatment while still playing and having fun. The PUDM is an event where boilermakers stand for 18 hours, listen to Riley families' stories, learn a dance, and much more in support of Riley Hospital (*Our Cause – Purdue University Dance Marathon*).

The **Bubble Tube** project was created in Fall of 2021 with the intent to solve overheating issues and add two modes of interactivity to an existing bubble tube at Kids Play Gym. The **Bench** project was created in Fall 2023 for the purpose of providing maintenance on benches for a stage and theatre area outside where the kids can express themselves through play and imagination. The **Wheelchair Lift** project was created in Fall 2023 to design a ramp or lift for children in wheelchairs participating in the PUDM, so that volunteers don't need to lift them onto stage.



Source: Justin Yasumi, Nov. 2023
Bubble Tube Cabinet with Sensor and Touchscreen



Source: Rouguiatou Kaba, Feb. 2024
Current CAD design for the Bench Project



Source: DAYTON Scissor Lift Table
Granger Scissor Lift the Lift team will modify

OBJECTIVES

- Bubble Tube**
 - Reduce circuit overheating
 - Add 2 modes of interactivity (Touchscreen and Sensor)
 - Touchscreen buttons and block sensor
 - Prioritize safety and hide electronics
 - 6 colors for Touchscreen (ROYGBV) and 3 for sensor (RGB)
- Bench**
 - Improve the lifespan of stage seating
 - Able to withstand outdoor elements
 - Provide benches for both children and adult heights
- Wheelchair Lift**
 - Provide a method for wheelchair users to access the stage – Lift or Ramp
 - Must be portable for storage
 - Must hold both child and assistant
 - Must meet ADA and local regulations

REFERENCES:



PLAY LinkedIn:



METHODOLOGY

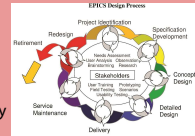
Team Methods

Because this is an EPICS project, our overall team utilizes the EPICS design process, as seen below, to format our project steps and timeline. Additionally, each of the different project teams had slightly different methods based on the type of goal they were addressing, but there were also several team-wide efforts we adopted to ensure quick accurate solutions to these design challenges.

- Frequent partner meetings for feedback
- Weekly Progress, Issues, and Goals meetings to work through obstacles
- A goal of 3 hours of work outside of class to keep progress moving quickly

Bubble Tube Methods

- Break up into sub-teams to accomplish work quickly
- Start with initial code functionality before building onto more complex details
- Begin with CAD designs to assess dimensions
- Use multiple working prototypes to test functionality



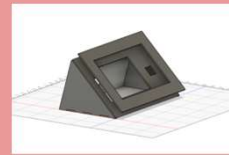
Infographic describing the EPICS design process (EPICS design cycle).

Bench Methods

- Analyze previous semesters design and its failures
- Research applicable materials
- Create a CAD design to refine dimensions
- Build prototypes to assess functionality

Lift Methods

- Research ADA regulations
- Create small scale prototypes and CAD models
- Assess commercial option's integrations and their feasibility



Source: Erin Blasingame, Feb. 2024
Touchscreen Stand Prototype 1

IMPACTS: KIDS PLAY GYM

Both projects for Kids Play Gym, Bubble Tube and Bench, are tentatively aiming to deliver their project at the end of this semester. These projects aim to provide various types of enrichment and development to the 14 children Kids Play Gym serves everyday. Each kid, is typically at the facility for 6 – 8 hours a day for 1 – 3 years on average, and while the kids will not be using the PLAY team's projects for the entirety of this time, our projects will contribute to the 42 hours of Applied Behavioral Analysis (ABA) Therapy a child receives each week.

ABA therapy at Kids Play Gym partners each kid with a therapist one-on-one to implement a personalized behavior plan. ABA therapy strives to help kids learn in a natural environment to enhance their social behavior, language, and daily living skills (*Aba therapy. ABA Therapy : Kids Play Gym*).

Our projects combine the use of shapes, colors, and imaginative play that appeal to these children and provide enrichment that supports the goals of ABA therapy (Wang, 2021).

In previous semesters, the PLAY team has delivered 3 different projects to Kids Play Gym: Water Table Filtration, a new Memory Game, and a Backyard stage. Both the staff and children have used these EPICS projects in their therapy and expressed their joy while using the project.



Infographic describing the attributes of ABA therapy (Aba: Our Special Story: Singapore)

IMPACTS: PURDUE UNIVERISTY DANCE MARATHON

The PUDM raises tens of thousands of dollars every year. The first \$100,000 raised is donated towards child life programs. Child life programs help children better understand their treatment and reduce treatment anxiety all while incorporating play and fun along the way. The rest of the money is donated to the Herman B. Wells Center for Pediatric Research to help discover cures for life threatening diseases.

Each year at the PUDM Riley families are invited to share their stories and participate in the PUDM to help the other participants understand the true impact of their donations. By providing a wheelchair lift, PLAY can give Riley families and PUDM volunteers peace of mind by ensuring that children in wheelchairs can safely access the stage. Additionally, this design will reduce the strain and liability that current PUDM volunteers have while lifting students onto the stage (*Our Cause – Purdue University Dance Marathon*).



Source: Our Cause – Purdue University Dance Marathon
A Riley Kid at speaking on stage at the PUDM



Source: Erin Blasingame, Nov. 2022
PLAY Team members with owners, Andy and Kat



Source: Freestanding Lift Assembly
Lift railings similar to the design the lift team is planning on adding



Source: Justin Yasumi, Feb. 2024
Bubble Tube members gluing to first touchscreen stand prototype

REFLECTION & CONCLUSION

Some challenges our team faced includes time management, knowing the right questions to ask, and a lack of technical skills. Balancing our courses and the 3 hours of out of class work that our team expected is not an easy task. Additionally, our team consists of many first year engineering majors, which has advanced technical knowledge in most cases. Lastly, we have a great relationship with our partners, but we didn't always recognize which questions were most valuable to ask. Similarly, understanding safety regulations and conducting structural analysis is something that many of our members were unfamiliar with. To overcome these challenges, we implemented extensive planning and weekly goals to keep us on track, reached out to EPICS TA's to teach us new skills, discussed partner feedback with our advisors, and spoke to other experts, such as the fire department help us understand what gaps we might have in our design. This process taught me, and my teammates the importance of partner-oriented design.

Future Plans

Going forward, our teams plan to continue refining their designs and prototypes. Both the Bubble Tube and Bench projects plan to deliver their project by the end of the semester, and the Lift project hopes to deliver by November 9th, 2024.

ACKNOWLEDGEMENTS

The EPICS PLAY team would like to thank our Project Partners, Kat and Andy, from Kids Play Gym and all of PUDM for their support and feedback. We would also like to thank our advisors Haley Cutler, Xiaoyun Fu, and our TA Vishnu Pookat for all their advice and support! Lastly, a huge thank you to our sponsors the Charles and Anna Mae Miller for their sponsorship of PLAY!



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