THE PAST FOUNDATION

EDUCATOR PROJECTS AND IDEAS

Lift Off: Middle School Students Explore Space with NASA and Transdisciplinary Problem Based Learning

At STEM Middle at Baldwin Road Junior High in Reynoldsburg, OH, teachers used a NASA-funded grant to plan and implement space exploration-themed activities with students. PAST Foundation was there to support the work, and capture the fun!

The Problem

NASA continuously creates rich and robust educational materials, and the challenge is to get this material into classrooms in ways that are meaningful and resonate with kids. To meet this challenge, PAST, NASA, and partner school districts, Perkins Local Schools and Reynoldsburg City Schools developed *Lift Off,* a professional development project that promotes transdisciplinary problem-based learning (TPBL) instructional strategies. Through *Lift Off,* teachers applied TPBL through projects with cultural relevancy for students that drew from NASA's rich educational content for grades 5-8. NASA funded the TPBL training for 20 teachers as they developed a five day immersive Design Challenge for their students. Ongoing PD support enabled module modification in the moment and for future lesson development, helping guide instruction and introduce students to new engaging learning strategies in a low risk environment.

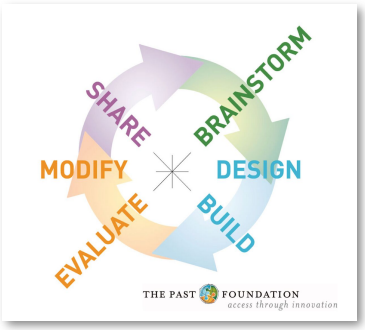
Using Design Thinking

Design thinking is a methodology that emphasizes reasoning and decision-making as part of the problem-solving process. It is a structured framework for identifying challenges, gathering information, generating potential solutions, refining ideas, and testing solution. By intertwining the articulation of design thinking in our classrooms with real-world problems, educators are able to:

Two students work on their vehicle for transportation on Europa

1. Enrich and deepen learning through a relevant application for students
2. Support the development of 21st-century skills
3. Grow responsible global citizens

The principles of design and problem solving can be represented as a cycle. The design cycle is generally defined by four phases: Planning, Implementation, Analysis, and Dissemination—and six principles: Brainstorm, Design, Build, Evaluate, Modify, and Share.



The six principles of the PAST Design Cycle

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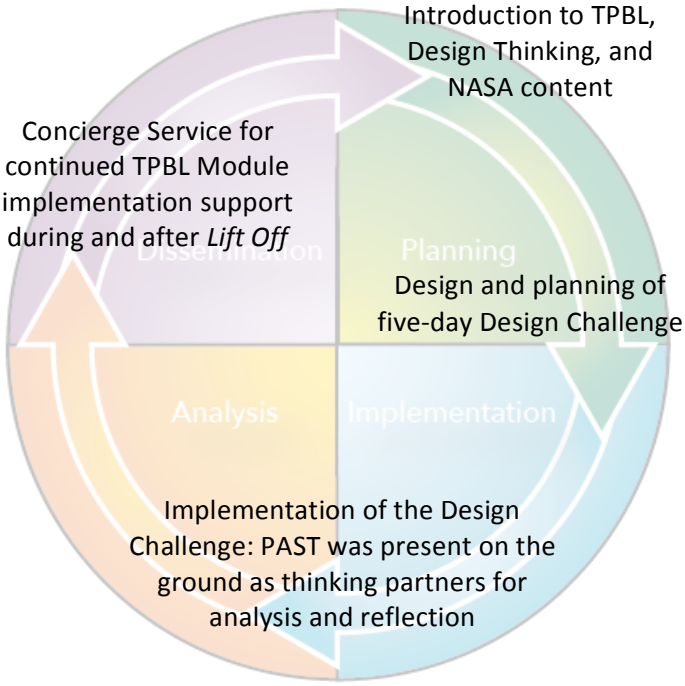
Teacher Professional Development

Lift Off began with a four-week online professional development course to introduce TPBL, Design Thinking, and NASA content. These virtual meetings allowed space and time for teachers to plan the implementation of the five-day intensive Design Challenge and build their TPBL modules. The teacher design team met once per week with the PAST team as thinking partners, and a NASA representative who helped identify suitable NASA activities for particular themes of interest. In addition, PAST provided a concierge service for continued TPBL module implementation support prior to, during implementation, and for future or continued problems, projects, and products using NASA content.



Teacher PD expressed within the Design Cycle

Results

Over 180 middle school students participated in the five-day challenge to answer the question, *How can we survive in an uninhabitable or unknown environment?* Teachers implemented various NASA activities that lead to a culminating project of a large Gallery Walk for students to share their activity design and products. "I never thought about living on other moons before," exclaimed one student during the project. "This was such a great hands-experience for the children—they were so engaged," reflected a teacher, "I definitely want to do this again next year!"

NASA's learning activities can be accessed at https://www.nasa.gov/audience/foreducators/index.html

Design Challenge Question: *How can we survive in an uninhabitable or unknown environment?*

Theme	Problem	NASA Activities
Spacesuit Building	What properties need to be included in a space suit design to survive various environments?	Space Suit Scavenger Hunt, Potato Prototype, Cool Spacesuits
Food and Water	Where would we find the water and food needed to sustain human life?	Cleaning Water Activity, Water Filtration Challenge
Plants	How do graity, biorhythms, and light affect the growth of seeds in space?	How does your space garden grow? Space Life Science, Light Effects on Plant Behavior
Rockets	How do we get to another planet?	Foam Rocket and 3-2-1 Puff! from *Rockets Rock*
Rover Transportation	How do we travel on an uninhabitable planet?	Roving on the Moon
Colonization & Asteroid Drilling	When the Earth's resources are depleted, what location would be best to colonize?	Make asteroids you can eat!
Housing & Life Support Systems	How can we build a pressurized dwelling that can be easily transported and that is also asteroid-, heat-, and radiation-proof?	Space Habitats

Teachers implemented various NASA activities listed above to help answer the Design Challenge Question

