Project POKE

Developing a STEM Community to Offset Learning Loss amidst the COVID-19 Pandemic through Aerospace Technologies and Project-Based Learning in Hawaii's K-12 Classrooms

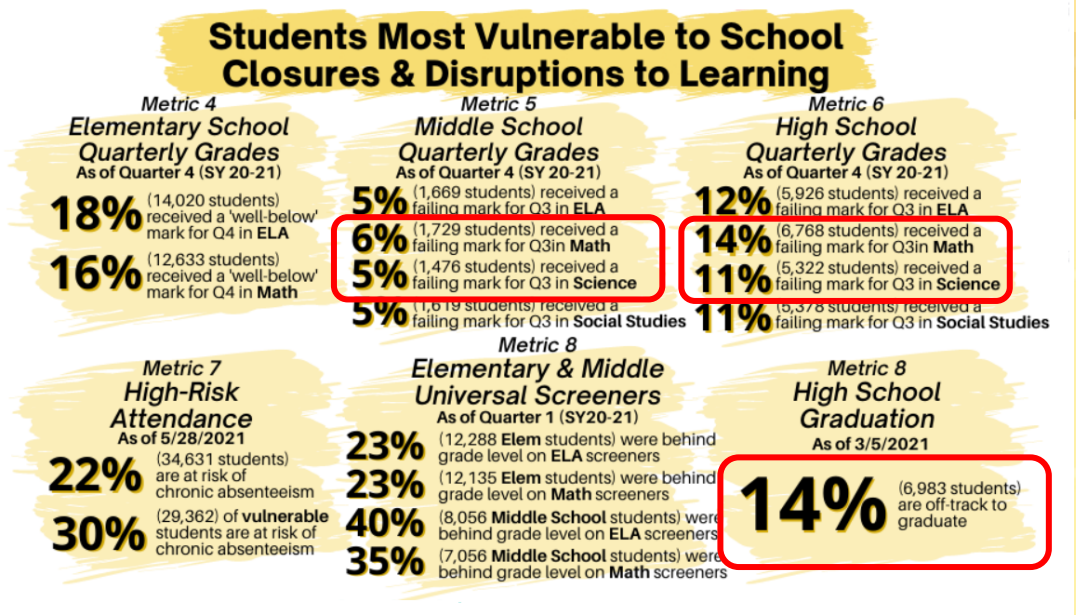
Hawaii space flight laboratory

Kelly Ngo, Aksel Sloan, Chris Amendola, Luke Clements, Amber Imai-Hong, Dr. Frances Zhu

Motivation: Offset Learning Loss Amidst Covid-19 pandemic

Educational challenges:

1. Low student engagement
2. Lack of physical lab spaces
3. Lack of advanced hands-on STEM activities



State of Hawaii Department of Education
2020 - 2021 Board of Education (BoE) Metrics

Project POKE Goals

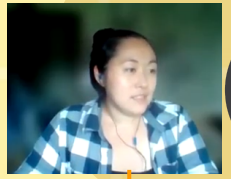
- Normalize the aerospace field in Hawaii
- Encourage students to pursue STEM
- Build aerospace opportunities and workforce in Hawaii
- Build students' confidence in their STEM journey

Students performing vibration test on CubeSat hardware

Hawaii Space Flight Laboratory
Ohana ("Family" in Hawaiian)

Geared Audience

- Middle & high school teachers interested in project-based learning
- Students are on receiving end
- No technical background required!
- Program free of cost



Project POKE Team

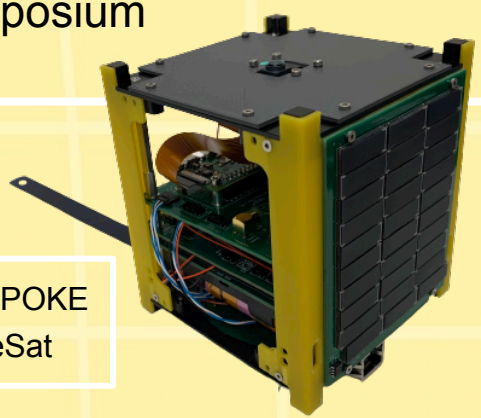
MS, HS Teachers

MS, HS Students

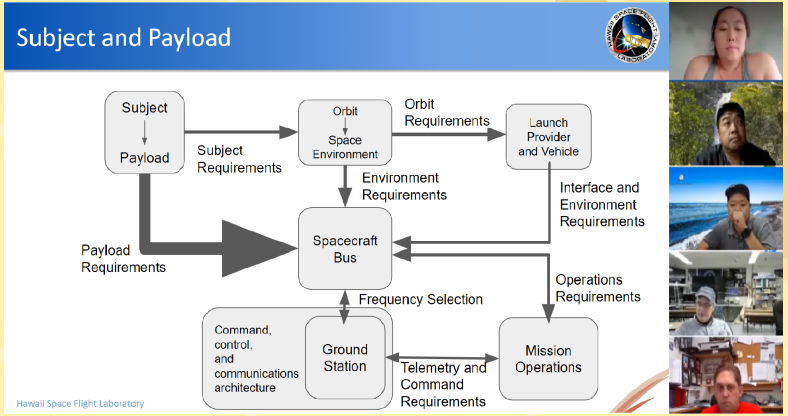
5 Features of Project POKE

1. Educator Course
2. 1U CubeSat
3. Collaborative Digital Space
4. Design Challenge
5. Symposium

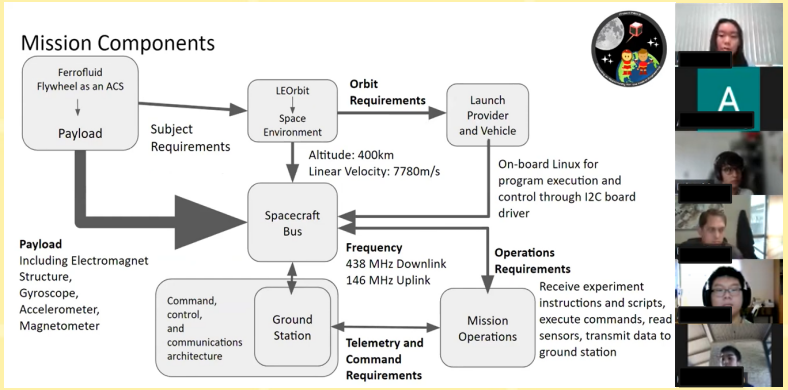
Project POKE CubeSat



Educator Course



Symposium



Educator Course

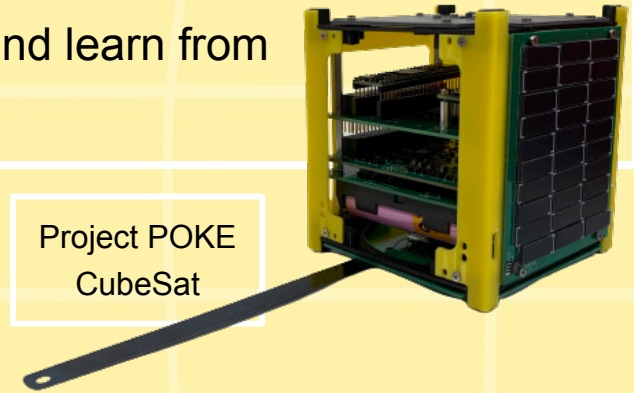
- Free, three-credit, online course with PD credit
- Gives educators confidence in teaching spacecraft mission design and subsystems
- Educators learn alongside their students
- Educators have the freedom to teach course material as they see fit

Project POKE Team → MS, HS Teachers → MS, HS Students

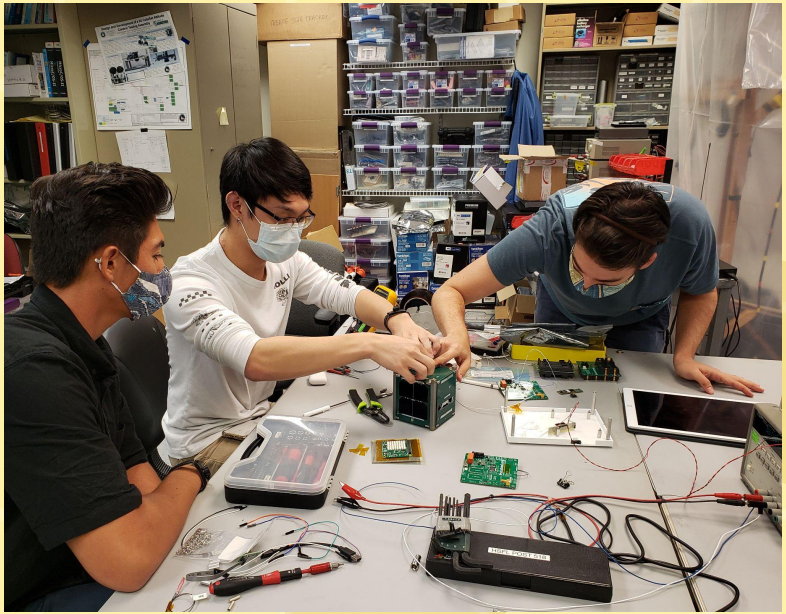
Project POKE Educator Course Class on *The Space Environment* during First Program Iteration in Spring 2022

1U CubeSat

- Based on Artemis Cubesat Kit
- Not spaceflight-ready (reduces cost)
- Engages students in hands-on learning
- Accessible remotely, which minimizes need for lab space
- Work with and learn from hardware



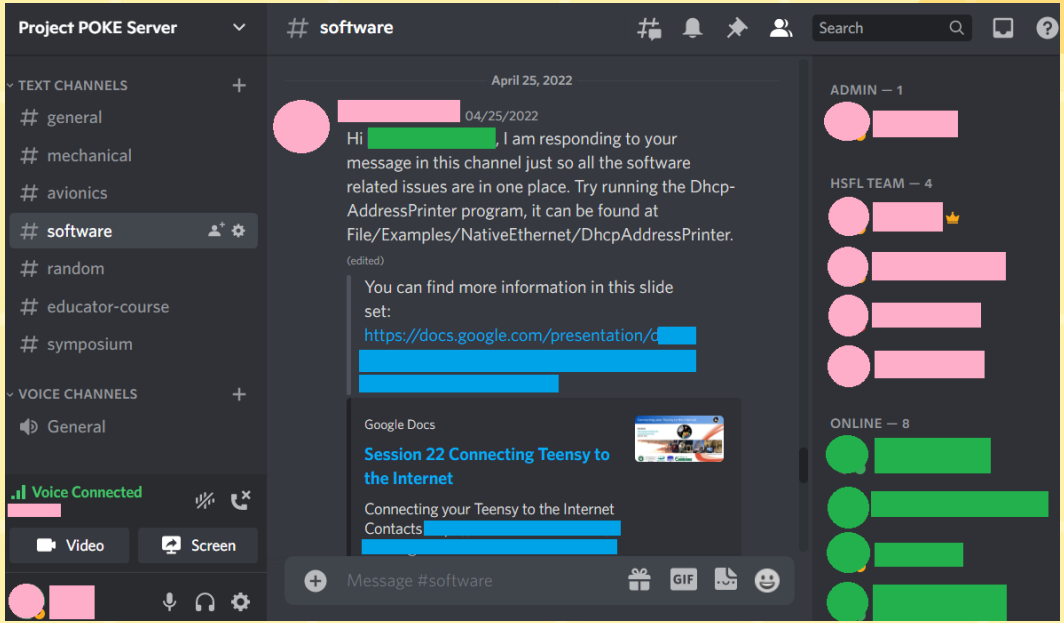
Project POKE CubeSat



Students testing CubeSat Hardware

Collaborative digital space

- Build a strong, inclusive, and collaborative STEM community among those engaged
- Hosted via Discord (Slack-like tool)
- Project POKE team available to provide assistance



The Project POKE Team Aiding Educators in Collaborative Digital Space (Discord)

Design challenge

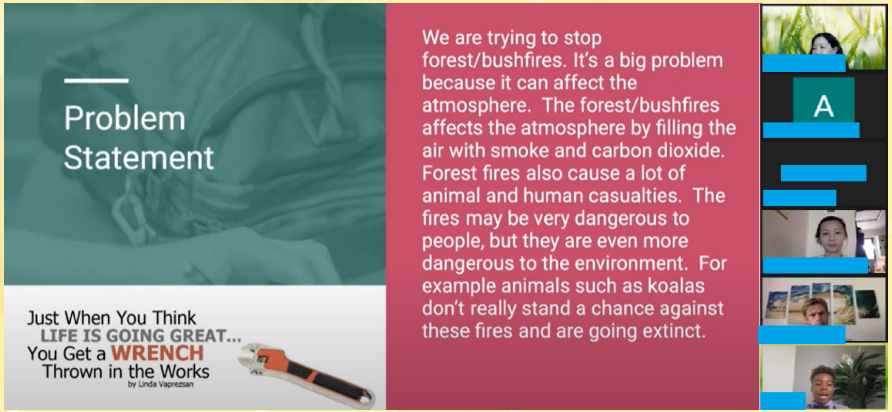
- Students develop a mission to solve or study a real world problem
- The 1U CubeSat used as a foundation for the mission
- Ownership of future and role in community
- Encourages learning STEM approaches to community issues
- Mimics capstone activity; teaches technical and lifelong skills

Defined Community Problem	CubeSat Application
Wildfires in Waianae	Take images of Waianae frequently to detect and prevent wildfires at their beginning stages
Coral reef bleaching at Hanauma Bay	Take images of Hanauma Bay's coral reefs frequently to collect timespan of changes
Beach erosion in Hawaii	Take images of Hawaii beaches' coastline frequently to collect timespan of changes
Rapid ohia death (ROD) in Hawaii	Take images of Hawaii forests to map and prevent spreading of ROD
Search and rescue in Hawaii	Take video and thermal images of Hawaii oceans to search and rescue people lost at sea

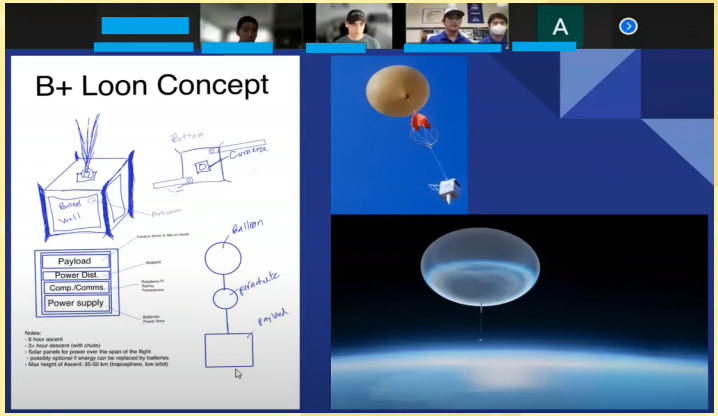
Examples of Student Teams' Selected Community Problems and CubeSat Applications for First Program Iteration (Earth Observation Theme)

Symposium

- Motivates students to conduct quality work
- Student teams present design challenge results to each other and STEM professionals at the culminating one-day online event
- STEM professionals provide feedback and suggest future work



Middle School Student Team
Presenting Their Problem Statement



High School Student Team
Presenting Their Design Results

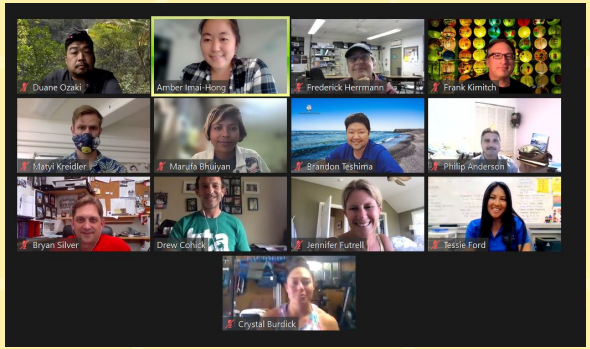
Program format

Phase Focus for
First Program Iteration

Phase	Months	Start	End	Main Focus	Project POKE Team Focus	Educator Focus	Student Focus
1	5	Aug. 2021	Dec. 2021	- Educator recruitment - CubeSat Development	- Recruit educators - Complete paperwork - Prepare CubeSat kits for distribution	- Sign up for program - Enroll in educator course	- None
2	3	Jan. 2022	Mid-Mar. 2022	- Educator Course Begins (Space Mission Design) - Introduce Collaborative Digital Space - CubeSat kits sent out	- Send CubeSat kits to educators - Provide technical support	- Concurrently attend online course and meet with students to disseminate information - Utilize collaborative digital space - Receive then transition to hands-on learning via CubeSat kit	- Learn space mission design concepts from teachers - Utilize collaborative digital space - Develop design challenge
3	2	Mid-Mar. 2022	Apr. 2022	- Educator Course (Spacecraft subsystems) - Design Challenge - Symposium	- Provide technical support - Recruit STEM professionals for symposium	- Concurrently attend online course and meet with students to disseminate information - Utilize collaborative digital space - Implement hands-on learning via CubeSat kit - Attend symposium	- Learn spacecraft subsystem concepts from teachers - Utilize collaborative digital space - Develop design challenge - Present design to STEM professionals at Project POKE symposium

Attendance & Performance Of First Program Iteration

- 14 educators & > 100 students across 11 schools
- 22* student teams (4 MS, 18 HS) & 15 STEM professionals at symposium
- Positive feedback from educator and student surveys
- Implemented feedback encourages educators to participate in future iterations



Screenshot of Educators Participating in First Iteration (Not All Pictured)

Student Team Using HSFL Facilities To Test A Custom Payload

*Representative of only a fraction of actual student outreach

Challenges:

Course Planning
Supply chain
Technical

Main obstacles faced during first iteration:

- Educators found course material was at too high a technical level
- COVID-19-related supply chain issues delayed kits
- Technical issues with software development
- IT restrictions on school computers prevented use of necessary software

Students Troubleshoot a Software-Related Issue During First Program Iteration

Future works & conclusion

- Future Work
  - Expand availability of program outside Hawaii
  - Secure funding to continue offering for free
  - Incorporate student and educator feedback into future iterations of program
- Project POKE hopes to launch a new generation of aerospace engineers

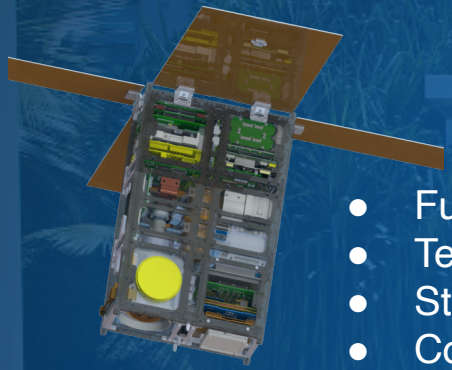
Educational Impacts Through Hands-On Learning via CubeSat

Developing a STEM Community

References

1. State of Hawaii Board of Education, “BOE Metrics Reporting,” Hawaii State Department of Education, June 2021.
2. Ngo, K., Sloan, A., et al. “Project POKE: Developing a STEM Community to Offset Learning Loss amidst the COVID-19 Pandemic through Aerospace Technologies and Project-Based Learning in Hawaii’s K-12 Classrooms,” 36th Annual Small Satellite Conference, June 2022.

Assistant Research Professor Wanted!



- Full Time
- Tenure Track
- Starts ASAP!
- Competitive Salary

Looking for driven individuals ready to research innovative space technologies, teach & advise students, and participate in spacecraft missions

Apply Now!

Qualifications

- Relevant doctorate
- Relevant publication record
- Technical experience in designing, building & launching smallsats.
- Background in collecting external funding
- Experience teaching courses in aerospace engineering

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Thank you! Questions?

For Project POKE Inquiries, please contact:

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36th Annual SmallSat Conference Paper