

AREN Project -- October 31, 2017



Programmatics

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Total Value: 5 Year - \$2,498,590; 2017 - \$638,645

Period of Performance: January, 2017 - December, 2017

Summary Description: The AEROKATS and ROVER Education Network (AREN) introduces NASA technologies and practices in authentic, experiential learning environments. Low-cost instrumented systems for in-situ and remotely sensed Earth observations include kite-based "AEROKATS", and remotely controlled aquatic and land-based "ROVERS".

Science Focus: Earth Science

Audience(s): Middle School, High School, College, Life-Long Learners

Region(s) Served: United States

Website(s) if any: <http://globe.gov/web/aren-project>

Current Partnerships

- American Museum of Natural History -- "OpenSpace: An Engine for Dynamic Visualization of Earth and Space Science for Informal Education and Beyond"
- Institute for Global Environmental Strategies -- "NASA Earth Science Education Collaborative"
- Maine / Gulf of Maine Research Institute -- "Real World, Real Science: Using NASA Data to Explore Weather and Climate"
- NSO / Association of Universities for Research in Astronomy, Inc. -- "TE 2017: Geographically Distributed Citizen Scientist Training for the 2017 Citizen CATE Experiment"
- Southwestern Community College -- "TE: Smoky Mountains STEM Collaborative: Bridging the Gaps in the K-12 to Postsecondary Education Pathway"
- University of Alaska, Fairbanks -- "Arctic and Earth Signs"
- University of Colorado, Boulder -- "Enhancement of Astronomy and Earth Science Teaching Using High Resolution Immersive Environments"
- University of Toledo -- "Mission Earth: Fusing GLOBE with NASA Assets to Build Systemic Innovation in STEM Education"
- University of Washington, Seattle -- "Northwest Earth and Space Sciences Pipeline" (NESSP)

Team Members and Institutions

- Anasphere, Inc. - John Bognar
- Chesapeake Bay Environmental Center - Vicki Paulas, Alissa Quinton, Judy Wink
- Goddard Space Flight Center -- Geoff Bland, Brian Campbell, Patrick Coronado, Ted Miles, Kay Rufty, Sallie Smith
- Montana State University -- Kelly Boyce, Jamie Cornish, Kim Obbink, Suzi Taylor
- Public Lab -- Liz Barry, Shannon Dosemagen, Jeffrey Warren
- University of Maryland Eastern Shore -- Willie Brown, Chris Hartman, Xavier Henry, Abhijit Nagchaudhuri
- University of South Florida -- Jonathan Gaines
- Washington College -- Jemima Clark, Doug Levin
- Wayne RESA -- David Bydlowski, Andy Henry



Evaluator

AREN Project Evaluation - *Anil Aranha, PhD*, AREN Project Evaluator

The AREN Project has been operational for a total of 20 months. Given the diverse nature of the 9 partner institutions and the efforts of the Project Leadership Team in directing and streamlining project implementation, the accomplishments of the AREN Project Partnership Group towards SMD's stated Project goals are noteworthy. The 2017 AREN Project Impact Indicators are summarized below:

- Societal: 3,400 individuals (General Public) at 14 Eclipse and 2 Earth Day/Kite Flying Events.
- Education: i) *School Level* - 1,100 Students/Adult Learners, Parents and Teachers participated in GLOBE Science Symposia, Water Quality Testing and AEROKATS, providing course satisfaction evaluations; ii) *University Level* - 2 Undergraduate Aviation/Engineering Courses developed and offered to 40 Students, providing excellent course evaluations, 200 Science/Engineering students participated in presentations related to AEROKATS, TerraKites Productions, and ROVERS; 4 Students participated as Flight Crew of 5-day unmanned flight of Vanilla Aircraft; iii) *Training* - 100 Educators trained, in classroom or virtually, on AEROKATS and GLOBE program implementation.
- Product Development: i) Two Undergraduate Aviation/Engineering Courses; ii) AEROKATS Launch Video and Check-List; iii) Prototypes for AeroPods (Profilers, MonoCams, TwinCams, ThermoPods, MiniPods, VideoPods, AlbedoPods, ThermoCams, Anasonde Profiler) and ROVERS (X-5s, X-6s).

Measureable Achievements

Eclipse 2017 Outreach

- 13 Individual Events - 3000 Learners
- AREN at PARI -- 150+ participants

University of Maryland Eastern Shore

- Aviation AVSC 310 and Engineering ENGE 150 course with 40 students total
- TerraKites Productions summer activity with 5 students
- Flight Crew (four students) for Vanilla Aircraft five day flight of unmanned aircraft

Wayne RESA

- AREN Presentations (13 presentations, 500 participants)
- Water Quality Testing of Rouge River (10 schools, 300 students, 15 teachers)
- Midwest GLOBE Science Symposia (20 students, 5 teachers, 2 parents)
- Odyssey of the Mind Event (45 students, 30 adults)
- Online GLOBE Training (15 pre-service educators)

Goddard Space Flight Facility

- Kite Building/Flying - "*Reach for the Stars*" (1 presentation/activity 20 students)
- AREN Presentations/Activities at UMES (multiple, 40+ students, 4 faculty)
- Student Presentations at UMES (21 students)
- Line Handling Challenge (multiple, 15 students)
- AEROKATS Prototyping, Tests and Training (multiple)
- AEROKATS Hardware dissemination (updates, 5 new early adopters)
- ROVER Field Tests at Anacostia River (X-5/X-6, 6 team members)
- Eclipse 2017 Presentation at Pisgah Astronomical Research Institute (100+ participants)

Montana State University (3 events, 45 educators)

Chesapeake Bay Environmental Center (6 schools/events, 80 students)

University of South Florida

- Earth Day/Kite Flying Day (1 event, 30 participants)
- Summer AEROKATS Program (15 pre-engineers, 30 students)

Public Lab

- Online Presentation (18 educators), Online Lens Barrel Distortion Tool

Washington College

- Buoy Installation
- Lending Library Development

Collaborative - 3D Printing designs and files (.stl) are now available for *MonoCam*, *ProCam*, *Profiler*, *TwinCam*, *AlbedoPod*, *MicroPod*, *VideoPod*. (*ThermoCam*, *AnasondeProfiler* are still in prototype form.)

Opportunities

SMD is providing opportunities, through cross collaboration for AREN to reach a much larger audience by collaborating with others in the area of:

- Integrating the outreach plan for AREN technology to the STEM community
- Contributing to the MakerSpace community
- Developing evaluation tools with the entire SMD community
- Student Research through Science Symposia
- Media tools for project distribution

Risks/Areas of Concern

The AREN Project does not see any factors that are causing risk to the project or are areas of concern.



Need(s) or Areas to Watch

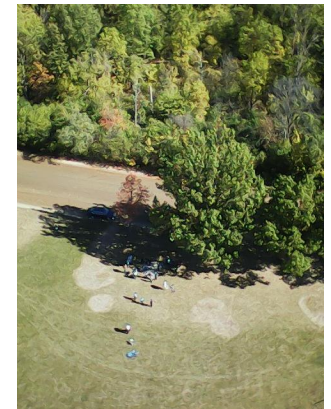
- AREN Protocol Development with GLOBE - Aerial Imaging
- Training of end- users (teachers and students)
- Commercially sourced hardware changes
- Data collection and analysis of video, photo, and field data.
- Development of evaluation tools to effectively measure success of AREN
- Continue to review and assess AREN timeline



Updates/Changes

The staffs of some of our partners have changed. Staff changes have taken place at:

- Chesapeake Bay Environmental Center
- Goddard Space Flight Center
- Public Lab





Look Ahead

- Emphasis on Evaluation Development
- ROVER Implementation for 2018: X-7 Aqua ROVER Prototypes underway, Terra ROVERS under development
- Hosting the 2018 Midwest GLOBE Student Science Symposia at Wayne State University in Detroit.
- Assisting with the 2018 Northwest GLOBE Student Science Symposia at Montana State University in Bozeman, MT
- Development of 3D printing capabilities and programing - integration of makerspace concepts (design and engineering) into AREN project - work with Makerspace collaborators
- Anasonde Profiler and Thermocam Development
- Implementation of Kite Physics
- New training cohorts -- Phase II
- Integration of AREN atmospheric data with weather stations, weather websites and the GLOBE database
- New technology tools -- Wind Tunnels, Lens Distortion Tools
- Development of AREN "Challenges"
- Increased partnership with WGBH to bring the "hands on of AREN" to the virtual world of WGBH.
- Earth Science Online Course for Educators will debut in 2018.

Cross-Collaboration Status

- AREN Team attended the 2017 GLOBE Annual Conference -- Quarterly Meeting with GLOBE Liaisons, and regular GLOBE phone conferences. Regular meetings with "Mission Earth" and "Arctic and Earth Signs"
- Monthly "Earthlings" Phone Conferences, including all of the Earth Science and GLOBE collaborating CAN Awardees
- SMD MakerSpace Group Developing
- Extensive work during 2017 during the Eclipse Collaborations
- Connecting NASA Wavelength resources with AREN and "NASA Earth Science Education Collaborative"
- Distribution of 30 Earth Science Week Toolkits through SMD collaboration
- AREN "Engineering Challenges" for the SMD community and beyond
- Multiple conference presentations were made in 2017, with Mission Earth and Arctic and Earth Signs
- Preliminary meetings with WGBH to integrate AREN