AEROKATS and ROVER Education Network (AREN)
Wayne RESA, Wayne MI - 2019 Annual Report

Programmatics

PI/Institution: David Bydlowski / Wayne RESA PI
Email: davidbydlowski@me.com
Total Value: 5 Year - $2,498,590; 2019 - $638,645
Period of Performance: January, 2019 - December, 2019

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: http://globe.gov/web/aren-project

Current Partnerships Team Members and Institutions

- 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 -- Shannon Dosemagen, Mimi Spahn Sattler, Jeffrey Warren
- University of Maryland Eastern Shore -- Willie Brown, Christopher Hartman, Xavier Henry, Abhijit Nagchaudhuri
- University of South Florida -- Jonathan Gaines
- Washington College -- Jemima Clark, Doug Levin
- Wayne RESA -- David Bydlowski, Andy Henry

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Evaluators: Kayla C. Wingard / Eric R. Banilower

The AREN project brings together a diverse and dedicated team of collaborating organizations, each of which contributes unique expertise to the project's work. Team members range from NASA engineers to STEM educators to Earth scientists. Interviews with team members indicate they have a tremendous amount of enthusiasm to work cross-organizationally toward the project's goals.

The AREN project has accomplished a great deal in its first four years. Progress has been made in developing and refining the AREN technologies, gaining interest among a variety of audience types, and generating enthusiasm among participants. The project has also learned from its work, refining its vision and making adjustments as needed.

Recommendations:

1. Continue to use the theory of action to reflect on what he project has accomplished thus far, determine what still needs to be done, and prioritize future efforts.
2. The project should be strategic about prioritizing which user supports to develop first.
3. In developing its new website, the project should think carefully about the needs of each intended user audience and work to ensure there is a clear and intuitive path through the website for each.

Measurable Achievement

Completion of the first GLOBE –AREN Measuring Wind Speed Challenge

Publications:
NISENET Publication – Pop-Up Science with NASA at the Michigan Science Center in Detroit, MI
Video Showcases
Acquire – Analyze – Apply (A3) – John Moore, Palmyra Cove
Mapping the Invisible: Practicing STEM Literacies – Betsy Stefany: The SABENS Group

Project Goal 1 -- Enabling STEM Education Project Outcome: Increased the number of STEM experiences to 9000 through 2019 with the project goal of over 10,000 by 2020. There were approximately 100 learners in 2016, 4000 in 2017, 2000 in 2018 and over 3,000 to total the 9000 through 2019.

Project Goal 4 -- Leverage Through Partnerships Project Outcome: Partner with three organizations by 2020. By the end 2017, the AREN Project had anticipated developing 20 partnerships by the end of 2020. During meetings with NASA Headquarters, the definition of a partnership has become more clearly defined. As partnerships became more clearly defined the AREN Project now anticipates developing three partnerships by 2020.

Areas of Concern

There were two major changes in the AREN Project, during 2019.
1. Dr. Anil Aranha, our evaluator for the first three three years of the project was replaced by Horizon Research, Inc. led by Eric Banilower.
2. One of our Co-I's, John Bognar from Anasphere, Inc. in Belgrade, Montana decided to leave the AREN Project.

There will be one major change taking place in 2020. The AREN Management Team has asked for David Bydlowski, PI of the AREN Project to be replaced by Andy Henry, presently a Co-I. David will take on the role of a Co-I and remain with the project as a GLOBE partner.

Opportunities

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

- Integrating the outreach plan for AREN technology to the STEM/STEAM community
- Pursuing career opportunities after AREN experiences
- Contributing to the MakerSpace community
- Student research through Science Symposia
- Aligning and Implementing the Next Generation Science Standards
- Developing meaningful partnerships

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SME Connections and Cross-Collaborations

The AREN Project continues it partnerships with 11 SMD co-collaborators. The three that we are most actively involved with are:

- Institute for Global Environmental Strategies -- ”NASA Earth Science Education Collaborative”"
- University of Alaska, Fairbanks -- "Arctic and Earth Signs"
- University of Toledo -- "Mission Earth: Fusing GLOBE with NASA Assets to Build Systemic Innovation in STEM Education"

Cross-Collaboration Activities, with these three, have included:

- Collaboration on Presentations for the AGU Conference
- Celebration of the 50th Anniversary of the Apollo Landing
- Citizen Science and the Lewis and Clark Trail
- Workshops Implementing the GLOBE Observer App
- Consultation at Planning at GLOBE Annual Meeting and GLOBE NARM
- University of Toledo – GME Satellites Student Conference
- Odyssey of the Mind at Michigan State University
- Kite Flying at the University of Alaska, Fairbanks
- University of Toledo – Engineering Team Meeting
- University of Alaska Participation in Weekly Phone Conferences
- Pop Up Science at the Michigan Science Center

Look Ahead

The AREN Project is looking forward to the future in 2020. Below is a list of the major plans for 2020:

- Prioritizing the incorporation of AREN work into GLOBE through specific learning activities such as the capturing of wind direction at various altitudes
- Introduction of the AEROKATS.org website
- Increased ROVER implementation/ROVER 10.x kit with DIY sensor package
- Exploration of increased use of kites in cold weather climates
- Refinements and improvements to Mapknitter software
- Aeropod licensing agreement with UCAR/GIO
- Aeropod licensing agreements under a possible open source license
- Refinements and improvements to Infragram Pi kit
- Dissemination of activities and engineering practices to classrooms
- Continuation of wind tunnel design
- Development of a global network and science user community
- Continued expansion of AREN user community
- Additional flights added to the AREN Mission Mapper database
- Mission Mapper updates. Additional data types
- Continued work with GLOBE on three dimensional data integration
- Continue to pursue potential partnerships with local, regional and national networks

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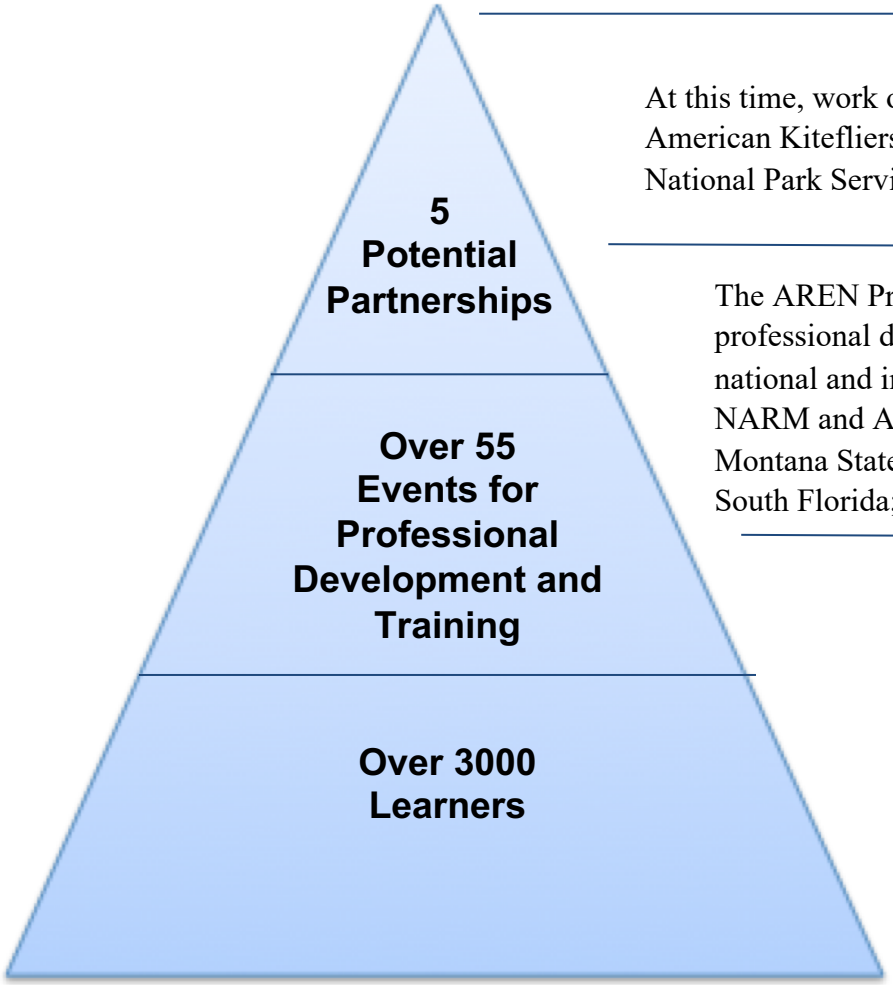
The AREN Project Increased the number of STEM experiences and content from less than 100 learners in 2016, to over 4000 by 2017, over 6000 by 2018, and to over 9,000 by 2019, with the goal of over 10,000 by 2020. Over 3000 Learners participated in the AREN Project at various levels of instruction and participation in 2019. By developing partnerships, the potential for AREN Learners is increased.



At this time, work on partnerships is taking place with Earth Force, MI STEM, American Kitefliers Association, Society of Aeronautics and Rocketry, and the National Park Service.

The AREN Project is involved in many activities and events to promote professional development and AREN training. Events took place at: local, state, national and international conferences, such as AGU, NSTA, GLOBE; GLOBE NARM and Annual Meeting; GSFC; Chesapeake Bay Environmental Center; Montana State University; University of Maryland Eastern Shore; University of South Florida; Washington College; Wayne County, MI; Individual Meetings; etc.

Over 3000 Learners participated in the AREN Project at various levels of instruction and participation in 2019.

- Chesapeake Bay Environmental Center – 1350 Learners
- Montana State University – 730 Learners
- Wayne RESA – 580 Learners
- Goddard Space Flight Center – 110 Learners
- University of Maryland Eastern Shore – 80 Learners
- Washington College – 35 Learners
- AREN Groups -- 180