Front-end Characterization Study of GLOBE Field Campaigns and the Role of NASA Partners

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EVALUATION STUDY REPORT: **NASA EARTH SCIENCE EDUCATION COLLABORATIVE (NESEC)**

FRONT-END CHARACTERIZATION STUDY OF **GLOBE FIELD CAMPAIGNS** AND THE ROLE OF NASA PARTNERS

Context

The NASA Earth Science Education Collaborative (NESEC) is one of 27 projects selected in September 2015 by NASA's Science Mission Directorate (SMD) as part of a competitive announcement. NESEC is a partnership between the Institute for Global Environmental Strategies (IGES) and the NASA Earth science divisions at three NASA Centers: Goddard Space Flight Center, Jet Propulsion Laboratory, and Langley Research Center.

NESEC leverages GLOBE resources and activities to connect educators and students to NASA-infused authentic STEM experiences. NESEC's contributions to GLOBE and leveraging activities include GLOBE Observer citizen science efforts, authentic engagement with NASA science (including ongoing GLOBE Field Campaigns: ENSO Student Research Campaign/Water in our Environment and the Air Quality Student Research Campaign), and revised GLOBE Clouds with new satellite matching.

This memo reflects the findings from a front-end evaluation study designed to inform the NESEC project's efforts that leverage GLOBE. These findings may also be useful or informative for the GLOBE community, as they draw from educator and scientists' experiences in NASA-focused GLOBE activities.

NESEC's internal evaluator focused on characterizing GLOBE Field Campaigns for the purposes of planning NESEC's activities, identifying positive attributes indicative of successful Field Campaigns, assessing the needs and interests of educators who participate in Field Campaigns, **and exploring NASA partners' objectives and roles in these and other NASA-infused GLOBE offerings.**

Data Source & Methodology

- One-on-one, in-depth, structured interviews with "key informants" who had experience with field campaigns; also provided written option for respondents who preferred that option.
- Included 31 educator participants/non-participants, and 11 personnel, facilitators, or scientists.
- Included recent Field Campaigns with and without a NASA component; primarily focused on United States Field Campaigns but included campaigns, participants, scientists, and insights from outside the United States.
- Interview protocol addressed areas related to NESEC's information needs for planning NASA-related field campaigns and other NASA opportunities through the GLOBE program.

Timeline

- Evaluation approach and preliminary findings discussed with GLOBE-related NASA SMD awardees and partners (January 2016 kickoff meeting), GLOBE Evaluation Working Group (June 2016), and members of the GLOBE community at the July 2016 GLOBE Annual meeting.
- Interviews complete and preliminary findings prepared (November 2016).
- Ongoing observation of the ENSO and Air Quality Student Research Campaigns (2016-2017).
- Preliminary findings shared with GLOBE Program Office and Implementation Office leadership at the 2016 Science Mission Directorate CAN Review (November 2016), with the NESEC Field Campaigns team (July 2017) and at the 21st Annual GLOBE Meeting (July/August 2017).

Summary of Key Insights

NESEC, including teams at NASA Centers, intends to leverage The GLOBE Program's infrastructure, community, and program model to engage educators (and their students) in authentic STEM experiences. This characterization study thus takes a broad look at Field Campaigns, their components, and the positive attributes that key informants suggest may lead to achievement of outcomes. For those reasons, these findings are applicable to The GLOBE Program's approaches to field campaigns beyond those undertaken by NESEC or infused with NASA-specific content and partnerships.
However, the findings also focus on the **particular goals of NESEC and NESEC's NASA partners**. NESEC's funding through NASA's Science Mission Directorate is targeted on NASA-related science assets within the United States. Thus, in some cases, NESEC's goals and priorities **differ or diverge from** those of The GLOBE Program or the GLOBE Implementation Office.

NESEC Vision, Goals, and Intended Outcomes for Field Campaigns

- Vision of using GLOBE to connect students to NASA research; extension of the standard GLOBE Program offerings that can build on NASA-specific assets
- Focused on educational outcomes rather than science or data collection outcomes; interested in sharing the real scientific research process and authentic STEM skills related to questioning, collaborating, sharing, and reporting out
- Interested in helping teachers to understand "real science" and share that with their students
- Field campaigns support teachers and classrooms, which requires connection and focused time from personnel. Teachers are interested in taking data to the next level, but are in need of support (and confidence building!) to implement in the classroom; "stretch goals" vary from teacher to teacher, so "meeting them where they are" is key
- Student research projects are typically a stretch goal for a teacher, not a basic or short-term objective

"Why NASA?": Our Value and Role in Field Campaigns

- Credibility
- Excitement, interest, and engagement – the NASA "brand" is a big draw to educators and administrators, as well as to students and their parents
- Access to SMEs - if SMEs are interested in using the GLOBE data, that is a bonus
    - Excellent examples: SMAP; U.S. Aerosols campaign
    - Primary SME role and value does not require using the data, but sharing the story, serving as role models, and helping teachers and students see the human side of science
- Access to big questions and investigation areas in Earth science
- Global perspective, and connection to what's local and in the backyard of a GLOBE classroom
- Give a "meaning" or context to GLOBE protocols and real-world relevance to GLOBE activities

Considerations from The GLOBE Program

- Number of campaigns, frequency of communications, and community input for large projects
- Interest in differentiating different types of campaigns and activities
- Data collection as a key metric for consistency across protocols, and a highly accessible metric
- Variety of potential outcomes, such as those related to science content knowledge, scientific research process, local action or environmental stewardship, data collection, and contributions to virtual and in-person student symposia

Core Elements of Field Campaigns

These attributes may not be strictly required in order for a GLOBE activity to be defined as a field campaign, but **they make up the "core"** of how participants and leaders see this type of activity:

- Data collection according to predetermined GLOBE protocols
- Defined period of time
- Defined scope in a content area or a scientific question (applies to goals, content, and/or support activities)
- Staff (points-of-contact) and programming dedicated to support the campaign and participants
- Community of multiple GLOBE classrooms, working simultaneously
- Communication, recruitment, promotion, and retention through appropriate GLOBE channels

Some campaigns have goals related to data analysis or collaboration, and these types of outcomes are possible specifically because of the simultaneous, time-limited scope of a campaign. Otherwise, it is difficult within GLOBE to be sure that data exists for use in that kind of project.

Positive Attributes of Field Campaigns

These attributes, highlighted by key informants who participated in interviews, **bring value to Field Campaigns** and to participants, but **are not actual requirements** for this type of activity. From another perspective, **many of NESEC and NASA's goals that are currently achieved through Field Campaigns could be pursued and directly achieved through non-Field Campaign approaches.**

- Protocol training
- Various types of support offered to educators and students to assist them in participation (e.g., protocol refreshers, data entry and analysis assistance)
- Scientist need for data (but not always present or necessary!)
- Opportunities to identify and/or work with other classrooms focused on the same protocol, content, or research question
- Sustained, proactive, and reactive support opportunities for educators and students, such as protocol trainings, refreshers or question-and-answer, and connections with subject matter experts
- Focus on analysis and research projects
- Explicit connections between GLOBE protocols and Earth system phenomena or research questions
- Web content created and distributed for campaigns can focus on careers, subject matter experts, connections to real-world science questions, and current events relevance
- Events like webinars, class visits, and student presentations
- Points of contact and personnel/staff time for leading and energizing activity in these areas
- NASA educational goals in tying GLOBE experiences to research areas, missions, and careers
- Learning outcomes (for educators and students) related to data collection, quality, and interpretation

Challenges for NESEC

The characterization study has highlighted some potential areas of difficulty that the NESEC team faces when developed NASA-centered experiences within GLOBE:

- Identifying, labeling, and implementing program ideas for a "NASA presence" within GLOBE that is differentiated from Field Campaigns but helps achieve our goals
- Educator recruitment is an ongoing challenge for Field Campaigns
- GLOBE and GLOBE Observer have some differences as well as synergies, and it's important to find a balance between supporting classroom educators and non-school facilitators/educators
- To date, there is not a large, ready-made community of U.S. scientists within GLOBE who are willing to use, or interested in, GLOBE data for scientific research purposes
- NESEC staff time is at a premium, but the desired outcomes and vision for field campaigns involve supporting educators in a variety of ways throughout the year and over the long term
- Identifying cross-cutting themes and opportunities to co-support Field Campaigns with other projects, like the Mission Earth CAN award
- Difficulties in data entry, visualization, and retrieval on GLOBE website
- Need for greater student skill development activities related to data analysis and interpretation
- Field Campaigns concept is particularly attractive due to difficulty in collecting protocol data on an ongoing, consistent basis, without a clear guiding goal or structure
- Timing of Field Campaigns and similar activities is difficult; participants benefit both from a long lead time (to aid in planning and to enable alignment with curriculum pacing guide) and from a short period of activity (to not increase demands on classroom time); these goals may be in conflict, but may be partially addressed by new approaches to and models for Field Campaigns and associated activities