

List of Suggested Reviewers or Reviewers Not To Include (optional)

SUGGESTED REVIEWERS:

Not Listed

REVIEWERS NOT TO INCLUDE:

Not Listed

COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

| | | | | | |
|--|--|---|---|---|--------------------------|
| PROGRAM ANNOUNCEMENT/SOLICITATION NO./DUE DATE NSF 16-544 04/15/16 | | <input type="checkbox"/> Special Exception to Deadline Date Policy | | FOR NSF USE ONLY | |
| FOR CONSIDERATION BY NSF ORGANIZATION UNIT(S) (Indicate the most specific unit known, i.e. program, division, etc.) HRD - NSF INCLUDES | | | | NSF PROPOSAL NUMBER 1641619 | |
| DATE RECEIVED | NUMBER OF COPIES | DIVISION ASSIGNED | FUND CODE | DUNS# (Data Universal Numbering System) | FILE LOCATION |
| 04/15/2016 | 1 | 11060000 HRD | 032Y | 068184449 | 04/15/2016 2:19pm |
| EMPLOYER IDENTIFICATION NUMBER (EIN) OR TAXPAYER IDENTIFICATION NUMBER (TIN) 410694747 | | SHOW PREVIOUS AWARD NO. IF THIS IS <input type="checkbox"/> A RENEWAL <input type="checkbox"/> AN ACCOMPLISHMENT-BASED RENEWAL | | IS THIS PROPOSAL BEING SUBMITTED TO ANOTHER FEDERAL AGENCY? YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> IF YES, LIST ACRONYM(S) | |
| NAME OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE Carleton College | | ADDRESS OF AWARDEE ORGANIZATION, INCLUDING 9 DIGIT ZIP CODE Carleton College One North College Street Northfield, MN. 550574001 | | | |
| AWARDEE ORGANIZATION CODE (IF KNOWN) 0023408000 | | | | | |
| NAME OF PRIMARY PLACE OF PERF Carleton College | | ADDRESS OF PRIMARY PLACE OF PERF, INCLUDING 9 DIGIT ZIP CODE Carleton College One North College Street Northfield ,MN ,550574001 ,US. | | | |
| IS AWARDEE ORGANIZATION (Check All That Apply) (See GPG II.C For Definitions) | | <input type="checkbox"/> SMALL BUSINESS <input type="checkbox"/> FOR-PROFIT ORGANIZATION | | <input type="checkbox"/> MINORITY BUSINESS <input type="checkbox"/> WOMAN-OWNED BUSINESS | |
| | | | | <input checked="" type="checkbox"/> IF THIS IS A PRELIMINARY PROPOSAL THEN CHECK HERE | |
| TITLE OF PROPOSED PROJECT Preliminary Proposal NSF INCLUDES: Engaging Local Communities in Geoscience Pathways | | | | | |
| REQUESTED AMOUNT \$ 0 | PROPOSED DURATION (1-60 MONTHS) 0 months | REQUESTED STARTING DATE | SHOW RELATED PRELIMINARY PROPOSAL NO. IF APPLICABLE | | |
| THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW | | | | | |
| <input type="checkbox"/> BEGINNING INVESTIGATOR (GPG I.G.2) | | <input type="checkbox"/> HUMAN SUBJECTS (GPG II.D.7) Human Subjects Assurance Number _____ Exemption Subsection _____ or IRB App. Date _____ | | | |
| <input type="checkbox"/> DISCLOSURE OF LOBBYING ACTIVITIES (GPG II.C.1.e) | | <input type="checkbox"/> INTERNATIONAL ACTIVITIES: COUNTRY/COUNTRIES INVOLVED (GPG II.C.2.j) | | | |
| <input type="checkbox"/> PROPRIETARY & PRIVILEGED INFORMATION (GPG I.D, II.C.1.d) | | | | | |
| <input type="checkbox"/> HISTORIC PLACES (GPG II.C.2.j) | | | | | |
| <input type="checkbox"/> VERTEBRATE ANIMALS (GPG II.D.6) IACUC App. Date _____ PHS Animal Welfare Assurance Number _____ | | <input checked="" type="checkbox"/> COLLABORATIVE STATUS | | | |
| <input checked="" type="checkbox"/> FUNDING MECHANISM Research - other than RAPID or EAGER | | A collaborative proposal from one organization (GPG II.D.4.a) | | | |
| PI/PD DEPARTMENT Department of Geology | | PI/PD POSTAL ADDRESS 1 N. College Street Carleton College Northfield, MN 55057 United States | | | |
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CERTIFICATION PAGE

Certification for Authorized Organizational Representative (or Equivalent) or Individual Applicant

By electronically signing and submitting this proposal, the Authorized Organizational Representative (AOR) or Individual Applicant is: (1) certifying that statements made herein are true and complete to the best of his/her knowledge; and (2) agreeing to accept the obligation to comply with NSF award terms and conditions if an award is made as a result of this application. Further, the applicant is hereby providing certifications regarding conflict of interest (when applicable), drug-free workplace, debarment and suspension, lobbying activities (see below), nondiscrimination, flood hazard insurance (when applicable), responsible conduct of research, organizational support, Federal tax obligations, unpaid Federal tax liability, and criminal convictions as set forth in the NSF Proposal & Award Policies & Procedures Guide, Part I: the Grant Proposal Guide (GPG). Willful provision of false information in this application and its supporting documents or in reports required under an ensuing award is a criminal offense (U.S. Code, Title 18, Section 1001).

Certification Regarding Conflict of Interest

The AOR is required to complete certifications stating that the organization has implemented and is enforcing a written policy on conflicts of interest (COI), consistent with the provisions of AAG Chapter IV.A.; that, to the best of his/her knowledge, all financial disclosures required by the conflict of interest policy were made; and that conflicts of interest, if any, were, or prior to the organization's expenditure of any funds under the award, will be, satisfactorily managed, reduced or eliminated in accordance with the organization's conflict of interest policy. Conflicts that cannot be satisfactorily managed, reduced or eliminated and research that proceeds without the imposition of conditions or restrictions when a conflict of interest exists, must be disclosed to NSF via use of the Notifications and Requests Module in FastLane.

Drug Free Work Place Certification

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent), is providing the Drug Free Work Place Certification contained in Exhibit II-3 of the Grant Proposal Guide.

Debarment and Suspension Certification

(If answer "yes", please provide explanation.)

Is the organization or its principals presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency?

Yes

No

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) or Individual Applicant is providing the Debarment and Suspension Certification contained in Exhibit II-4 of the Grant Proposal Guide.

Certification Regarding Lobbying

This certification is required for an award of a Federal contract, grant, or cooperative agreement exceeding \$100,000 and for an award of a Federal loan or a commitment providing for the United States to insure or guarantee a loan exceeding \$150,000.

Certification for Contracts, Grants, Loans and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:

- (1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- (2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.
- (3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

Certification Regarding Nondiscrimination

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) is providing the Certification Regarding Nondiscrimination contained in Exhibit II-6 of the Grant Proposal Guide.

Certification Regarding Flood Hazard Insurance

Two sections of the National Flood Insurance Act of 1968 (42 USC §4012a and §4106) bar Federal agencies from giving financial assistance for acquisition or construction purposes in any area identified by the Federal Emergency Management Agency (FEMA) as having special flood hazards unless the:

- (1) community in which that area is located participates in the national flood insurance program; and
- (2) building (and any related equipment) is covered by adequate flood insurance.

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) or Individual Applicant located in FEMA-designated special flood hazard areas is certifying that adequate flood insurance has been or will be obtained in the following situations:

- (1) for NSF grants for the construction of a building or facility, regardless of the dollar amount of the grant; and
- (2) for other NSF grants when more than \$25,000 has been budgeted in the proposal for repair, alteration or improvement (construction) of a building or facility.

Certification Regarding Responsible Conduct of Research (RCR)

(This certification is not applicable to proposals for conferences, symposia, and workshops.)

By electronically signing the Certification Pages, the Authorized Organizational Representative is certifying that, in accordance with the NSF Proposal & Award Policies & Procedures Guide, Part II, Award & Administration Guide (AAG) Chapter IV.B., the institution has a plan in place to provide appropriate training and oversight in the responsible and ethical conduct of research to undergraduates, graduate students and postdoctoral researchers who will be supported by NSF to conduct research. The AOR shall require that the language of this certification be included in any award documents for all subawards at all tiers.

CERTIFICATION PAGE - CONTINUED**Certification Regarding Organizational Support**

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) is certifying that there is organizational support for the proposal as required by Section 526 of the America COMPETES Reauthorization Act of 2010. This support extends to the portion of the proposal developed to satisfy the Broader Impacts Review Criterion as well as the Intellectual Merit Review Criterion, and any additional review criteria specified in the solicitation. Organizational support will be made available, as described in the proposal, in order to address the broader impacts and intellectual merit activities to be undertaken.

Certification Regarding Federal Tax Obligations

When the proposal exceeds \$5,000,000, the Authorized Organizational Representative (or equivalent) is required to complete the following certification regarding Federal tax obligations. By electronically signing the Certification pages, the Authorized Organizational Representative is certifying that, to the best of their knowledge and belief, the proposing organization:

- (1) has filed all Federal tax returns required during the three years preceding this certification;
- (2) has not been convicted of a criminal offense under the Internal Revenue Code of 1986; and
- (3) has not, more than 90 days prior to this certification, been notified of any unpaid Federal tax assessment for which the liability remains unsatisfied, unless the assessment is the subject of an installment agreement or offer in compromise that has been approved by the Internal Revenue Service and is not in default, or the assessment is the subject of a non-frivolous administrative or judicial proceeding.

Certification Regarding Unpaid Federal Tax Liability

When the proposing organization is a corporation, the Authorized Organizational Representative (or equivalent) is required to complete the following certification regarding Federal Tax Liability:

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) is certifying that the corporation has no unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.

Certification Regarding Criminal Convictions

When the proposing organization is a corporation, the Authorized Organizational Representative (or equivalent) is required to complete the following certification regarding Criminal Convictions:

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) is certifying that the corporation has not been convicted of a felony criminal violation under any Federal law within the 24 months preceding the date on which the certification is signed.

Certification Dual Use Research of Concern

By electronically signing the certification pages, the Authorized Organizational Representative is certifying that the organization will be or is in compliance with all aspects of the United States Government Policy for Institutional Oversight of Life Sciences Dual Use Research of Concern.

| | | | | |
|--|---|-----------------------------------|--|---------------------------|
| AUTHORIZED ORGANIZATIONAL REPRESENTATIVE | | SIGNATURE | | DATE |
| NAME Diane A Menning | | Electronic Signature | | Apr 15 2016 2:18PM |
| TELEPHONE NUMBER 507-222-4441 | EMAIL ADDRESS dmenning@carleton.edu | FAX NUMBER 507-222-5442 | | |

PROJECT SUMMARY

Overview:

The geosciences lag behind most other STEM disciplines in diversity and are also projected to have a deficit in the workforce in the coming years. We need more geoscientists who come from communities that are more vulnerable to geoscience-related hazards, but there are many gaps in the pathways that could bring middle and high school students from those communities to college and beyond in a way that inspires, maintains, and grows their interests. This project brings together partners who have led successful national efforts addressing pieces of this problem with three regional partnerships to create integrated pathways from middle and high school into college. These pathways will focus on opportunities for students to learn about and address regional environmental hazards while learning geoscience. Experience gained by initial program partners and regional pilots will be used to create national support structures for developing integrated geoscience pathways and a collective action framework for expanded partnerships.

Intellectual Merit :

The project addresses several known barriers to persistence of underrepresented minorities in STEM: 1) low interest in studying geoscience due to lack of perceived relevance to their lives and/or perceived employment opportunities; 2) abstract science instruction devoid of meaningful context delivered with poor pedagogy; 3) lack of continuous pathways and support across transition points.

The project capitalizes on practices that are known from research to enhance persistence and learning: 1) hands-on work with real scientific problems in the classroom, through service-learning, and in undergraduate research programs; 2) effective mentoring, coaching, and support (and professional development of mentors, teachers, and faculty); and 3) opportunities to learn about, prepare for, and envision participation in the workforce. The project will contribute to the research base by studying the impact of integrated pathways rooted in local context that incorporate these practices on entry and persistence in STEM.

Broader Impacts :

In addition to directly increasing inclusion of underrepresented populations in STEM, this project will address two additional national challenges of broad impact: implementation of the NRC Framework for Science Education, and regional capacity to address pressing environmental and resource challenges.

The Framework for K-12 Science Education and the associated Next Generation Science Standards (NGSS) science instruction integrates science knowledge, science and engineering practices, and cross-cutting concepts with a new emphasis on social relevance. Performance expectations in the NGSS at middle and high school levels emphasize the connections between humans and Earth, and will require significant revisions of existing curricula, professional development for in-service teachers, and changes to teacher preparation programs in institutes of higher education.

Many of the socioscientific issues we face today have unequal impacts across society, with greater vulnerability for minority, low socio-economic status, and under-served groups. Marginalized communities are mobilizing: looking for scientific partners to help them address issues related to environmental justice, sustainability, and resilience. This project will serve these communities by engaging citizens, students, and scientific and educational experts in addressing local challenges.

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| References Cited | 2 | _____ |
| Biographical Sketches (Not to exceed 2 pages each) | 18 | _____ |
| Budget (Plus up to 3 pages of budget justification) | 0 | _____ |
| Current and Pending Support | 1 | _____ |
| Facilities, Equipment and Other Resources | 1 | _____ |
| Special Information/Supplementary Documents (Data Management Plan, Mentoring Plan and Other Supplementary Documents) | 1 | _____ |
| Appendix (List below.) (Include only if allowed by a specific program announcement/ solicitation or if approved in advance by the appropriate NSF Assistant Director or designee) | _____ | _____ |
| Appendix Items: | | |

*Proposers may select any numbering mechanism for the proposal. The entire proposal however, must be paginated. Complete both columns only if the proposal is numbered consecutively.

Project Description

I. PERSONNEL

PI and co-PIs

Cathy Manduca (*Director, SERC, Carleton College*) PI

will manage the overall project, lead development of shared vision and metrics, and provide backbone organizational and infrastructure support.

Donna Charlevoix (*Director, Education and Community Engagement, UNAVCO*) coPI

will lead development of mentoring and career preparation aspects of pilots and facilitate use of geodetic data, teaching materials, and research experiences in pilots.

Anne Egger (*Director, Office of Undergraduate Research, Central Washington University*) coPI

will co-lead development of project interactions and facilitate development of undergraduate and teacher preparation aspects of pathways.

Barbara Nagle (*Director, SEPUP {Science Education for Public Understanding Program}, Lawrence Hall of Science, University of California, Berkeley*) coPI

will lead development of K-12 aspects of pathways, including middle and high school curricula and teacher professional development.

Raj Pandya (*Program Director, Thriving Earth Exchange, American Geophysical Union*) coPI

will facilitate development of service learning and community-based science aspects of pathways.

Other senior personnel:

Mark Benthien (*Director for Communication, Education and Outreach, SCEC {Southern California Earthquake Center}, University of Southern California*)

will lead development of the Southern California Inland Empire pilot and facilitate engagement via national earthquake drills.

Felicia Davis (*Director, Building Green Initiative, Clark Atlanta University*)

will lead development of the Atlanta regional pilot and consult on increasing the capacity of all programs and pilots to serve African American students.

Norma Neely (*Director, American Indian Institute, University of Oklahoma*)

will lead development of the Oklahoma tribal nations pilot and consult on increasing the capacity of all programs to serve Native American Students.

John Taber (*Director, Education and Public Outreach, Incorporated Research Institutions for Seismology {IRIS}*)

will lead development of undergraduate research aspects of pilots and facilitate use of seismic data, teaching materials and research experiences in pilots.

To be named: Senior Personnel from pilot programs and evaluation and research leadership

II. PROJECT

Intellectual Merit: Many of the socioscientific issues we face today—such as understanding, predicting, and adapting to the effects of sea level rise on coastal communities—have unequal impacts across society, with greater vulnerability for minority, low socio-economic status, and under-served groups (e.g., Blaikie et al., 2014; Cutter, 2006). These issues require the knowledge, insight, and skills of geoscientists.

Unfortunately, the geosciences lag behind most other STEM disciplines in diversity and are also projected to have a deficit in the workforce in the coming years (BLS, 2016-17; Gonzales and Keane, 2010; NAS et al., 2011; NSF/NCSES, 2015). We need more geoscientists who come from communities that are more vulnerable to geoscience-related hazards, but there are many gaps in the pathways that could bring middle and high school students from those communities to college and beyond in a way that inspires, maintains, and grows their interests. Specifically, those gaps include

- Current middle school Earth science curricula are largely disconnected from societal issues and lack relevance for most students;
- Few high schools offer Earth science courses, and those that do typically offer them as alternative science courses for non-college-bound students;
- As a result, few students arrive at college seeing the relevance of geoscience to them and their communities; this lack of relevance is reinforced in most introductory courses in the geosciences that focus on “traditional” geoscience;
- Introductory students (and even students who major in the geosciences) have few opportunities to engage in research that shows how geoscience can help address problems in their communities;
- Communities face pressing challenges related to climate change, vulnerability to natural hazards, and natural resources, but many don’t have trusted, local, culturally-competent expertise they can work with to address these challenges;
- Undergraduate and graduate students in the geosciences have a limited view of options in the workforce, don’t see ways that geoscience research and skills have relevance to themselves and their community, and have few opportunities to develop the skills necessary to work at the community-science interface—even though this is projected to be a growth area for new jobs.

The proposed project brings together partners who have expertise and success in filling one or more of these gaps through engaging local communities around socioscientific issues, but have not previously worked to connect all of the steps along the pathway together.

Goals and measurable objectives

The goals of the proposed work, Engaging Local Communities in Geoscience Pathways, are to

- Create more opportunities for students in geoscience to work on real problems of importance to their community throughout their education and beyond;
- Develop and test pathways rooted in local contexts that lead from early exposure to societally-relevant geoscience through deeper exploration in high school and college to careers where they can use their geoscience expertise to support their communities;
- Develop a scalable model that supports customization of pathways for local relevance and needs;
- Create a community of practice that grows through engagement of individuals and groups engaged in addressing parts of this system;
- Create a national support system that exploits economies of scale while honoring the importance of local context.

To achieve these goals, we will address six objectives, shown as activities in the logic model (Fig. 1):

1. Bring together partners with demonstrated success in connecting geoscience and society at different steps along the pathway with teams from three regional systems to develop a shared vision for geoscience academic pathways that are connected to local goals and aspirations, and develop metrics for measuring successful implementation of those pathways;

2. Design the pathways based on the shared vision and an initial set of socioscientific issues: earthquake hazards, freshwater availability, and coastal hazards, which we have selected because of the availability of data, data tools, and expertise of our research partners;
3. Revise and adapt existing resources and design new ones as necessary to complete the pathways;
4. Test the pathways through implementation in the three regions using the success metrics;
5. Determine the essential components of the pathway support structure and tools needed for other regions to implement pathways locally;
6. Develop scalable ways to support development and implementation of pathways in other regions.

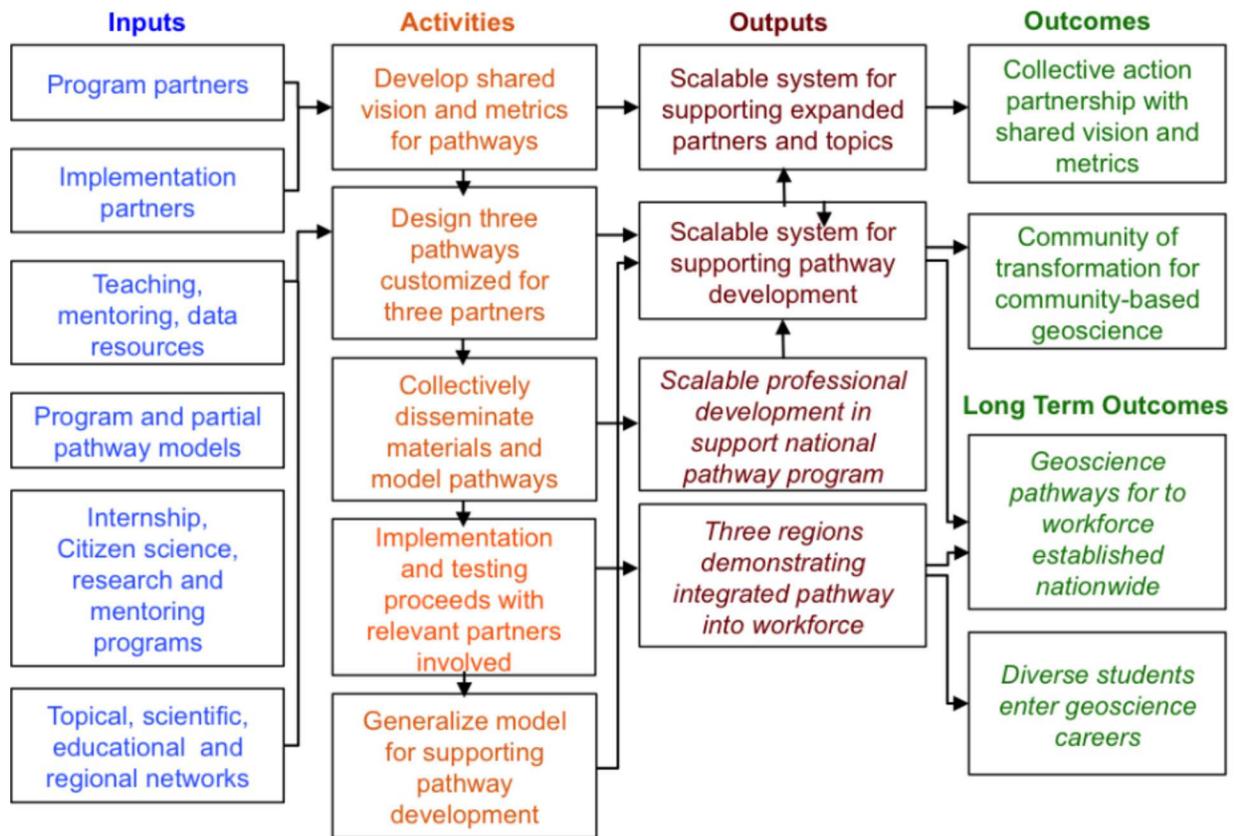


Figure 1. Logic model for Engaging Local Communities in Geoscience Pathways.

In the two-year pilot project, we will complete objectives 1, 2, make initial progress on objectives 3, 4, and 5, and develop an initial scalable model (6). Funding will bring the partners together with the regional teams 3 to 4 times: initially to establish the shared vision, and then to complete the work of designing the pathways. As shown in the list below, the initial partners have experience in scaling their individual projects and bring national networks that support expansion of the program. We will use our experiences with the regional systems to develop a scalable model for increasing partners and topics, supporting the creation of new regional pathways using a collective impact model (Kania and Kramer, 2011).

The proposed regional pilots are chosen for diversity in local populations and impact of natural hazards. They capitalize on existing collaborations and networks among the project leadership and match regional issues to topical program strengths. The diversity of the regional pilots provides the breadth needed to design a generalizable scale up strategy and provides a strong basis for the evaluation of our success metrics (Objectives 5 and 6). In an INCLUDES Alliance, we would anticipate adding additional program partners, regional partners, and expanding the types of data and issues that can be addressed.

Proposed regional pilots

- A team in the **Inland Empire** of California that includes leaders from K-12 school district(s), community college(s), local CSU and UC campuses, informal education institutions, and workforce representatives (*lead: Benthien; primary underrepresented population: Hispanic*).
- A team of a selected tribal nations in **Oklahoma** that have strong relationship with school districts, participates in science camps, have linkages to one or more tribal colleges, the University of Oklahoma, and workforce representatives (*lead: Neely, primary underrepresented population: Native American*).
- A team from the **Atlanta Metro area** that includes K-12 school districts, historically black colleges, a natural history museum, other colleges and universities, several STEM enrichment programs, and workforce representatives (*lead: Davis, primary under-represented population: African American*).

List of partners

- **SERC/InTeGrate:** The InTeGrate STEP Center in the Geosciences increases opportunities for undergraduate students to learn about the Earth in the context of resource and environmental issues, both within geoscience programs and across the undergraduate curriculum. Teaching materials developed by inter-institutional teams of faculty have been used in courses enrolling more than 9,500 students and 16 pilot programs are testing models for effective practices in supporting the success of diverse students. InTeGrate developed a community of transformation that extends the one developed by On the Cutting Edge (Manduca et al., 2010), which includes over 2,000 geoscience faculty and graduate students from over 850 institutions and has produced measurable shifts in teaching practice (Manduca et al., in revision; Teasdale et al., in revision). InTeGrate uses a complex social system approach to the design, implementation, and evaluation of the project (Kastens and Manduca, 2016).
- **Lawrence Hall of Science/SEPUP:** The Science Education for Public Understanding Program (SEPUP) is a secondary science curriculum development group. SEPUP materials integrate disciplinary concepts with science and engineering practices in the context of personal and social issues related to science. Scott (2000) found that students in Los Angeles Unified School District who used a two-year high school sequence of Integrated/Coordinated Science classes that were substantially based on SEPUP's *Science and Sustainability* course showed significant gains on the SAT9 (Stanford Achievement Test) science test, and that higher numbers of students, and in particular underrepresented minority students, enrolled in advanced science courses after taking ICS.
- **Southern California Earthquake Center (SCEC):** SCEC coordinates research on earthquake science at more than 70 research institutions nationwide. SCEC leads California's Earthquake Country Alliance (ECA), a public-private partnership that created the Great California ShakeOut. With support from FEMA, SCEC has expanded ShakeOut across the country and worldwide (43.5 million participants in 2015). SCEC/ECA coordinate the EPICenter (Education and Public Information Center) Network of museums, parks, and other venues that host ShakeOut activities, develop educational materials, and share best practices. SCEC also provides educator professional development, installs Quake Catcher Network (QCN) sensors in schools and museums, develops curricular resources, and coordinates two undergraduate intern programs with more than 30 students each summer.
- **UNAVCO:** UNAVCO supports geodesy workforce development and education (Bartel and Charlevoix, 2015; Phillips et al., 2015; Wdowinski and Eriksson, 2009), including the development of curricular materials for 6-12 educators and higher education. The GETSI (GEodesy Tools for Societal Issues) project provides curriculum at both the geology-majors and introductory levels (Douglas et al., 2014; Pratt-Sitaula et al., 2015). UNAVCO prepares and propels under-represented minority undergraduate students into geoscience careers and graduate programs through a combination of work and research experiences along with professional development and training through intentional mentoring (Charlevoix and Morris, 2014, 2015; Fifolt and Searby, 2010; Morris and Charlevoix, 2014).
- **IRIS:** The IRIS (Incorporated Research Institutions for Seismology) Consortium, with over 120 university members and 20 educational affiliates, provides educational resources, workforce development support, and access to seismic data and equipment for a wide range of audiences (Taber et al., 2015), including citizen science (Cochran et al., 2009). IRIS' commitment to workforce

development includes a distributed REU program which has provided mentored research experiences for over 155 undergraduates (Hubenthal and Taber, 2014); introducing underrepresented minorities to geophysics via a field experiences program; developing data-rich activities for the undergraduate classroom (Taber et al., 2014); and supporting early career investigators via mentoring, webinars, and workshops (Colella et al., 2015; Hubenthal et al., 2015).

- **Thriving Earth Exchange (TEX):** This program helps all communities, including historically underserved communities, leverage relevant science and work with scientists to advance their priorities and address their challenges related to climate change, natural hazards, and natural resources. TEX has established over 20 collaborative local partnerships and working relationships with groups such as the International County/City Managers Association to develop strategies for project identification, team building and collaboration, and scaling science-community interaction.
- **American Indian Institute:** The American Indian Institute (Aii) at the University of Oklahoma is a nonprofit American Indian training, research, and service organization. Aii's primary goals include promotion and support of Indian education; health promotion and disease prevention; art, culture, and language preservation; and tribal leadership and organizational development. Aii offers workshops, seminars, conferences, onsite training, and consultation on tribal, state, regional, and international levels on a variety of topics and issues that affect the Indigenous peoples of North America.

Broader Impacts: Improving inclusion in STEM

The design of the pathways will build on opportunities to catalyze changes that are in alignment with effective practices while providing opportunities for further research. First, the Next Generation Science Standards (NGSS Lead States, 2013) and the Framework for K-12 Science Education (NRC, 2012) have been adopted by 16 states, with many more likely to follow. Performance expectations in the NGSS at middle and high school levels emphasize the connections between humans and Earth, and will require significant revisions of existing curricula, professional development for in-service teachers, and changes to teacher preparation programs in institutes of higher education (e.g., Wyssession, 2014). We will address this need and facilitate local implementation, strengthening geoscience early in students' education.

Societally-relevant geoscience curricular materials are being adopted in introductory undergraduate geoscience courses across the country (e.g., Gosselin et al., 2015; O'Connell et al., 2015). The contextualization of science instruction is believed to increase interest and learning particularly for students from underrepresented groups (Scott, 2000) and instructors report that students are more engaged when they use these materials than they are with other content (Kastens et al., 2014). We will extend the contextualization of science by creating *multiple* opportunities for students to engage in addressing real-world local problems throughout their education, an unstudied extension of the established best practice.

Outside of academia, marginalized communities are mobilizing, looking for scientific partners to help them address issues related to environmental justice, sustainability, and resilience. They are looking for partners who can share relevant knowledge and work with them to advance their capacity to integrate science into planning and decision-making, and open career pathways related to science and technology. We will capitalize on this need by engaging students in locally-based real-world problem solving that brings together principles of community-based science, citizen science, and service learning.

Effects on the nation's geoscience workforce

If we are successful in our efforts, we expect to see (1) more qualified middle and high school teachers who are prepared to teach geoscience in the context of societal issues of relevance to diverse communities while meeting the spirit of the three-dimensional framework of the NGSS (e.g., Ellins and Olson, 2012; Ellins et al., 2013); (2) increased matriculation into geoscience programs and persistence to degree moving geoscience demographics toward national averages; (3) more and more diverse graduates who enter the workforce to use their geoscience skills and expertise, within and beyond what is traditionally considered the "geoscience workforce"; and (4) more and more communities, including historically underserved communities, who are actively using geoscience to become more resilient and sustainable.

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Biographical Sketch

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Professional Preparation

| | | |
|--|---------|-------------|
| Williams College, Williamstown, MA | Geology | B.A., 1980 |
| California Institute of Technology, Pasadena, CA | Geology | M.S., 1982 |
| California Institute of Technology, Pasadena, CA | Geology | Ph.D., 1988 |

Appointments

| | |
|-----------|---|
| 2007- | Executive Director, National Association of Geoscience Teachers |
| 2002 - | Director, Science Education Resource Center, Carleton College, Northfield, MN |
| 1999-2001 | DLESE Outreach Coordinator |
| 1995-1997 | Asst. Prof. of Science, Rochester Community College |
| 1994 | Asst. Prof. of Physics, St. Olaf College |
| 1992-2001 | Research Associate in Geology, Carleton College |
| 1989-1992 | Asst. Prof. of Geology, Carleton |

Products *Related to this project*

- Kastens, K. A., and Manduca, C. A. (2016). Using Systems Thinking to Design, Implement and Evaluate the InTeGrate Project: InTeGrate White Paper. <http://serc.carleton.edu/integrate/about/pubs.html>
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Other significant

- Condon W., Iverson E.R., Manduca, C.A., Rutz, C. and Willet, G. (2016). *Faculty Development and Student Learning: Assessing the Connections*, Indiana University Press, Bloomington, IN, 156 p.
- Gross, D, Iverson, E., Willett, G., Manduca, C. (2015). Broadening Access to Science With Support for the Whole Student in a Residential Liberal Arts College Environment, *Journal of College Science Teacher*, v 44, no 8, p. 99-107.
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- Manduca, C.A., S. Fox, and E.R. Iverson (2006). Digital Library as Network and Community Center. D-Lib, 12(12) [<http://www.dlib.org/dlib/december06/manduca/12manduca.html>].

Synergistic Activities

- 1) **Supporting inclusive excellence in undergraduate education**: As Executive Director of the National Association of Geoscience Teachers, PI of the On the Cutting Edge professional development program for

geoscience faculty, and PI of the InTeGrate STEP Center in the Geosciences, I have developed professional development programs that allow faculty, department leaders, K-12 teachers, and others to learn from each other and from experts about research, principles, and practices that support effective inclusive education; led development of materials teaching about the Earth in a societal context; and managed pilot programs fostering improvement in success for all students by focusing on mentoring, a sense of community, and motivation to succeed. These activities have led to: the development of an extensive collection of on-line resources used by more than 4 million visitors per year, and measurable impacts on teaching in the geosciences. I have worked with consortia of undergraduate liberal arts colleges to document and share effective program models and to initiate collaborations or collective action. I have overseen the evaluation of Carleton's programs to broaden participation in science.

2) *Developing large scale communities of transformation:* The Cutting Edge program successfully engages geoscience faculty in professional development activities with more than 850 institutions participating and with measurable impact on teaching practices. The program is now self-sustaining moving from stand alone workshops to an annual conference with multiple workshops and a travelling workshop program. The four-year old InTeGrate STEP Center now involves more than 1000 educators in teaching science in a societal context, and has produced more than 1000 pages of online content supporting this goal. Materials published by the project have been used in courses enrolling more than 9500 students to date. This community was developed using principles for design, implementation, and evaluation of complex social systems to produce a desired emergent phenomenon, in this case an increase in the number and diversity of students studying about the Earth and prepared to engage in interdisciplinary activities to address resource and environmental challenges for a sustainable global society.

3) *Supporting STEM-wide transformation:* I am a member of the Board on Science Education of the National Academies of Sciences, Engineering and Medicine, and former President of the AAAS Education Section. I developed the Pedagogies in Action website linking research on effective pedagogy to examples of its use across the disciplines, and have engaged in research on effective professional development practices and their impact on teaching and learning. SERC supports the For Higher Ed resource portal, the Accelerating Systemic Change Network focused on bringing DBER into use, the Network of STEM Education Centers, and the Integration of Strategies that Support Undergraduate Education in STEM (ISSUES) profiling the work of STEM professional societies in this arena.

4) *Managing large projects with backbone infrastructure:* I have managed large grants for national consortia since 1991. I oversaw the development of SERCkit, a platform for distributed website authoring, workshop support and project management. Used by more than 100 projects to produce over 31,000 pages of content, SERCkit combines digital library content management and discovery tools with wiki-like collaboration tools. As PI for InTeGrate, the NSF STEP Center for the Geosciences, I put in place a management system that scaled to support project leadership distributed across 14 institutions; authoring, collection of student data from pilots, and publication of teaching materials developed by over 40 teams involving 100 faculty; and support for 16 implementation pilots.

5) *Participating in professional society activities:* NAS: Board on Science Education (2015-2017); AAAS: Retiring-Chair Education Section (2013-2016) Education Section Nominating Committee (2007-2010), Fellow (2009), Education Program Review Committee (2015). American Geophysical Union: Excellence in Geophysical Education Prize (2004), Committee on Education and Human Resources (1998-2002, Chair 2004-2008), Outreach Committee (2011-2012) Council (2013-2015). American Institute of Physics: Physics Resource Center Policy Committee (2012-2014); Advisory Committee on Physics Education (2006-2012), Chair (2008-2010). National Association of Geoscience Teachers: Executive Director (2007-), Distinguished Lecturer (2000-2001), National Officer (2001-2005), President (2003), Web master (2004-2006). National Numeracy Network: Board of Directors (2010-). Project Kaleidoscope: Networking Advisory Board (2002-2004). Sigma Xi: Education Committee (2004-2007), Executive Committee (2000-2001, 1997-1998), Long Range Planning Committee (1996-1999). Geological Society of America: Fellow, (2010).

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A. PROFESSIONAL PREPARATION

| | | | |
|--------------------------|---------------|----------------------|------------|
| University of Wisconsin | Milwaukee, WI | Atmospheric Sciences | B.S. 1993 |
| University of California | Davis, CA | Atmospheric Sciences | M.S. 1996 |
| University of Illinois | Urbana, IL | Science Education | Ph.D. 2008 |

B. APPOINTMENTS

| | | |
|--|--|----------------------------|
| UNAVCO Boulder, Colorado | Director, Education and Community Engagement | 2012 - present |
| University of Illinois Urbana, Illinois | Adjunct Professor, Dept. Atmos. Sciences | 2009 – present |
| The GLOBE Program Boulder, Colorado | Director, Science & Education Division | 2009 – 2012 |
| University of Illinois Urbana, Illinois | Director of Introductory Courses Lecturer, Dept. Atmospheric Sciences | 2004 – 2009 1997 – 2009 |
| San Francisco State Univ. San Francisco, California | Lecturer, Dept. Geosciences | 1996 – 1997 |

C. PRODUCTS

(i) Closely related

Charlevoix, D.J. & A.R. Morris. (2015). Developing Research-Ready Skills: Preparing Early Academic Students for Participation in Research Experiences. *AGU Fall Meeting*.
<https://agu.confex.com/agu/fm15/webprogram/Paper86108.html>

Charlevoix, D. J., and A. R. Morris (2014), Increasing Diversity in Geoscience Through Research Internships, *Eos, Transactions American Geophysical Union*, 95(8), 69-70,
doi:10.1002/2014EO080001. <http://onlinelibrary.wiley.com/doi/10.1002/2014EO080001/full>

Tomkin, J.H., & Charlevoix, D.J (2014). Do Professors Matter? Using an A/B Test to Evaluate the Impact of Instructor Involvement on MOOC Student Outcomes, *ACM: Learning @ Scale*, Atlanta, GA. <http://dl.acm.org/citation.cfm?id=2566245>

Charlevoix, D.J., Strey, S., & Mills, C.M. (2009). Design and Implementation of Inquiry-Based, Technology-Rich Learning Activities in a Large-Enrollment Blended Learning Course, *J. Research Center for Educ. Tech.* 5(3), 15-28.
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Charlevoix, D.J. 2008. Improving Teaching and Learning through Classroom Research, *Bull. Amer. Meteorological Soc.*, 89(6), 1659-1664.
<http://search.proquest.com/openview/e378f8e63b010eaf814c20f75fd86d67/1?pq-origsite=gscholar&cbl=31345>

(ii) Other Significant

R. Rauber, J. Walsh, and D.J. Charlevoix. (2012) (Ed 4). *Severe and Hazardous Weather: An Introduction to High Impact Meteorology*, Kendall/Hunt Pub. Dubuque, IA

Charlevoix, D.J. and Stanitski, D. 2008. A Synopsis of Academic Members of the American Meteorological Society. *Bull. Amer. Met. Soc.*, 89(6), 896-900.

Stanitski, D.M., and Charlevoix, D.J. (2008). The 2005 Membership Survey: Who Are the Student Members of the American Meteorological Society. *Bull. Amer. Met. Soc.*, 89(6), 892-895. <http://journals.ametsoc.org/doi/pdf/10.1175/2008BAMS2534.1>

Kahl, J. D., D. J. Charlevoix, N.A. Zaitseva, R.C. Schnell, M.C. Serreze. (1993). Absence of Evidence for Greenhouse Warming Over the Arctic Ocean in the Past Forty Years. *Nature*, 361(6410):335-337. https://pantherfile.uwm.edu/kahl/www/Research/Kahl_Nature_1993.pdf

D. SYNERGISTIC ACTIVITIES

Professional leadership and service. American Meteorological Society (AMS). Education Editor for Bulletin of the American Meteorological Society (BAMS) (2016-present), Co-chair and member of Symposium on Education for (AMS); responsible for leading and organizing community-focused symposium at the Annual Meeting (1999-2016; chair 2012-2016). Board member: Board on Women and Minorities (2013-present) and Awards Nominating Committee (2014-present), Board on Higher Education (2004-2009). Cool Girls Science and Art Club, non-profit, Board member, Chairwoman 2011. Colorado Cooperative for Girls in STEM, Leadership Team member (2011-2014).

Authorship. College Textbook. Co-author of introductory textbook *Severe and Hazardous Weather: An Introduction to High Impact Meteorology* currently in fourth edition and adopted by over 150 colleges and universities in the U.S. and Canada. Lead on pedagogical structure, ancillary materials, and online content; contributor to science updates including case studies of significant severe weather events and natural hazards with special emphasis to impacts on society. Policy statement co-author AMS: Earth System Science, Technology, Engineering, and Mathematics Education. Adopted by the AMS Council 19 May 2014. <https://www2.ametsoc.org/ams/index.cfm/about-ams/ams-statements/statements-of-the-ams-in-force/earth-system-science-technology-engineering-and-mathematics-education/>

Curriculum and Instruction. Developed first large-lecture (>200 students) hybrid/blended learning course at the University of Illinois serving as a model for the Provost's office and large-scale campus implementation (2007). Inaugural member of faculty of Online Global Campus Initiative, Environmental Sustainability major (now online certificate in Environmental Sustainability) and developer and instructor of Societal Impacts of Weather and Climate (2006). Creator of the Hands-On, Minds-On Meteorology curriculum integrating interactive technologies into introductory courses resulting in enrollments increasing ten-fold (2003).

International collaborations. Created GLOBE International Scientist Network, a network of scientists engaged in Earth System Science research interested in enhancing K-12 education and engaging directly with teachers and students; Within 6 months the network grew to over 55 scientists from Greece, India, The Netherlands, Tanzania, Thailand, and the United States. (2010-12). *GLOBE representative to:* WMO (World Meteorological Organization, Education and Training) International GEO (Group on Earth Observations), ACRE (Atmospheric Circulation Reconstructions Over the Earth), and ASTC (Association of Science & Technology Centers) (2009-2012).

Mentoring. Mentor and science education researcher for UCAR, SOARS and (former) H.I.R.O programs. Mentored graduate student in science education and researched effectiveness of pre-college internship programs in terms of science self-efficacy. (2010-11)

Biographical Sketch

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Professional preparation

| | | | |
|---------------------|---------------|-------------------------------------|----------|
| Yale University | New Haven, CT | Geology and Geophysics | BA 1995 |
| Stanford University | Stanford, CA | Geological & Environmental Sciences | MS 2001 |
| Stanford University | Stanford, CA | Geological & Environmental Sciences | PhD 2010 |

Appointments

| | |
|--------------|---|
| 2011-present | Assistant Professor, <i>Central Washington University</i> |
| 2004-2011 | Undergraduate Program Coordinator, <i>School of Earth Sciences, Stanford University</i> |
| 2004-2011 | Lecturer, Geological and Environmental Sciences, <i>Stanford University</i> |
| 2002-2004 | Instructor of Geology and Geography, <i>San Juan College, Farmington, NM</i> |

Products

Most relevant

- Steer, D., Iverson, E., Egger, A., Kastens, K., Manduca, C., and McConnell, D., *in review*, Multi-institutional college curriculum development using a peer-to-peer auditing and coaching system: Lessons from the InTeGrate project. *Science Educator*.
- Egger, A. E. and Carpi, A., 2013, Revealing data in science: Using and teaching about data-based graphics for analysis and display, in Finson, K. D. and Pederson, J., eds., Visual Data and Their Use in Science Education; Charlotte, NC: Information Age Publishing (INVITED).
- Egger, A. E., 2012, Engaging Students in Earthquakes via Real-Time Data and Decisions: *Science*, v. 336, no. 6089, p. 1654-1655, doi: 10.1126/science.1214293 (INVITED).
- Egger, A.E. and Klemperer, S.L., 2011, Recruiting Students into the Earth Sciences through Undergraduate Research: *CUR Quarterly*, v. 32, no. 2, p. 22-31.
- Carpi, A. and Egger, A.E., 2011, [The Process of Science](#). Visionlearning, Inc.: New Canaan, CT.

Additional products

- Athens, N.D., Glen, J.M.G., Klemperer, S.L., Egger, A.E., and Fontiveros, V.C., 2015. Hidden intrabasin extension: Evidence for dike-fault interaction from magnetic, gravity, and seismic reflection data in Surprise Valley, NE California: *Geosphere*. doi: 10.1130/ges01173.1
- Ibarra, D.E., Egger, A.E., Weaver, K.L., Harris, C.R., Maher, K., 2014. Rise and fall of late Pleistocene pluvial lakes in response to reduced evaporation and precipitation: Evidence from Lake Surprise, California. *Geological Society of America Bulletin* B31014.1, 30 p.
- Egger, A.E.; Glen, J.M.G.; and McPhee, D.K., 2014, Structural controls on geothermal circulation in Surprise Valley, CA: A re-evaluation of the Lake City fault zone, *GSA Bulletin*. doi: 10.1130/B30785.1
- Egger, A.E. and Miller, E.L., 2011, Evolution of the northwestern margin of the Basin and Range: The geology and extensional history of the Warner Range and environs, northeastern California: *Geosphere*, v. 7, no. 3, p. 756-773. doi: 10.1130/GES00620.1
- Colgan, J.P., Egger, A.E., John, D.A., Cousens, B., Fleck, R.J., Henry, C.D., 2011, Oligocene and Miocene arc volcanism in northeastern California: Evidence for post-Eocene segmentation of the subducting Farallon plate: *Geosphere*, v. 7, no. 3, p. 733-755. doi: 10.1130/GES00650.1

Synergistic activities

- 1. Leading professional development activities:** I serve in a leadership capacity in the National Association of Geoscience Teachers (NAGT), both in the presidential line and as chair of the Professional Development Planning Committee, and I am co-PI on the InTeGrate project, NSF's STEP Center in the Geosciences. Much of my work in NAGT and InTeGrate has focused on leading workshops for faculty and graduate students, including a series of workshops on teaching introductory courses. In the past two years, I've offered a full-length workshop and several webinars entirely online for the first time. I am currently one of the leaders of NAGT's Traveling Workshop program, which solicits applications for us to travel to institutions to offer a workshop on improving student learning. I am particularly interested in understanding how these workshops affect faculty in their teaching, and have developed a survey to be administered one year after the workshop.
- 2. Facilitating, expanding, and supporting undergraduate participation in research:** I am the Director of the Office of Undergraduate Research (OUR) at CWU, focused on expanding the reach of the OUR and growing the program through providing more opportunities for preparation for, support during, and pathways throughout the research process. Previously, as the Undergraduate Program Coordinator in Earth Sciences at Stanford University, I grew a small, departmental undergraduate research program that funded about 6 students a year into a school-wide, interdisciplinary program that funded about 30 students a year. I served as a Geoscience Councilor on the Council on Undergraduate Research from 2011 to 2013, and am currently PI on an interdisciplinary REU Site: Hazards and Risks of Climate Change in the Pacific Northwest (EAR 1559862), which will bring students from regional community colleges to CWU to conduct research projects related to regional climate change while also working collaboratively to communicate those hazards and risks to their communities.
- 3. Interdisciplinary teaching relating geoscience and societal issues:** I co-teach an interdisciplinary course in the Douglas Honors College called *Hazards, Risk, and Resilience in the Pacific Northwest*. Through this course, students conducted an earthquake risk assessment of Ellensburg through developing a survey about risk perception and screening hundreds of buildings in town with a FEMA-approved procedure. They analyzed all of their results and made a presentation to the Ellensburg city council with several recommendations for improving earthquake preparedness. I will modify this course for teaching in the REU program. This course is an ideal example of research that was (1) interdisciplinary, (2) integrated into regular classroom teaching, and (3) beneficial to the community.
- 4. Developing high-quality, freely available resources for teaching and learning:** As an author, editor, and co-project director for Visionlearning (<http://www.visionlearning.com>), my focus is on developing peer-reviewed readings for learning about science in a way that focuses on how we know what we know, the data that support our scientific explanations, and the people behind the science. Our recent work has involved developing profiles of practicing scientists who are from under-represented groups and readings about math in science, helping students transfer what they've learned in math classes and use math in scientific applications. We also work with literacy specialists to ensure that these readings are accessible. Through InTeGrate, I've led the development of teaching materials that highlight the role of Earth literacy in societal issues in teacher preparation and interdisciplinary settings.
- 5. Facilitating curricular improvement:** At CWU, I led efforts to revise three undergraduate degree programs in Geological Sciences and one in Science Education; this work followed on my experience leading curriculum revision efforts at both Stanford University and Nanyang Technical University. In Geological Sciences, I helped develop and implement programmatic assessment through use of the Geoscience Literacy Exam and a revised quantitative skills test. At the university level, I am a member of the General Education Committee, which has been in the process of fully revising the Gen Ed program.

Biographical Sketch

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A. PROFESSIONAL PREPARATION

| | | | |
|-----------------------------|------------------|---------------------|-------------|
| Wellesley College | Wellesley, MA | Molecular Biology | A.B., 1972 |
| University of Pennsylvania | Philadelphia, PA | Biology | Ph.D., 1977 |
| University of California | Berkeley, CA | Cell Biology | 1977–1981 |
| California State University | Hayward, CA | Teaching Credential | 1986 |

B. APPOINTMENTS

- 1/2003-present Director, Science Education for Public Understanding Program (SEPUP), Lawrence Hall of Science, Berkeley, CA
- 7/1996-12/2003 Co-Director, Science Education for Public Understanding Program (SEPUP), Lawrence Hall of Science, Berkeley, CA
- 9/1990-6/1996 Teacher Associate, Science Education for Public Understanding Program (SEPUP), Lawrence Hall of Science, Berkeley, CA (On loan from the Oakland Unified School District)
- 9/1985-8/1991 Chemistry Teacher, Science Department, Fremont High School, 4610 Foothill Boulevard, Oakland, CA 94610
- 7/1981-8/1985 Assistant Research Physiologist, Department of Physiology-Anatomy, University of California, Berkeley, CA

C. PRODUCTS

Related Products

1. Bellantoni, J., Hariani, M., Seaver, D., **Nagle, B.**, Cuff, K., & Dombkowski, S. (2012). *Issues and earth science. Second Edition*. The Science Education for Public Understanding Program, Lawrence Hall of Science, University of California, Berkeley. Produced by Lab-Aids, Inc., Ronkonkoma, NY. <http://sepuplhs.org/middle/iaes/>
2. **Nagle, B.**, Hariani, M., Markey, D., Thier, H. D., Davison, A., Boudreau, S. K., Seaver, D., & Baumgartner, L. (2012). *Issues and life science. Second Edition*. The Science Education for Public Understanding Program, Lawrence Hall of Science, University of California, Berkeley. Produced by Lab-Aids, Inc., Ronkonkoma, NY. Print ISBN 978-1-60301-496-0. <http://www.sepuplhs.org/middle/ials/index.html>
3. **SEPUP**. (2011). *Science and Global Issues: Biology*. The Science Education for Public Understanding Program, Lawrence Hall of Science, University of California, Berkeley. Produced by Lab-Aids, Inc., Ronkonkoma, NY. <http://www.sepuplhs.org/high/sgi/index.html>
4. **Nagle, B.**, Hariani, M., & Siegel, M. (2006). Achieving a vision of inquiry: Rigorous, engaging curriculum and instruction. In R. Yager, Ed. *Exemplary science in grades 5–8: Standards-based success stories*. Arlington, Virginia: NSTA Press. <http://static.nsta.org/files/PB192X2web.pdf>

5. Siegel, M.A., Hynds, P., Siciliano, M., & Nagle, B. (2006). Using rubrics to foster meaningful learning. *Assessment in Science: Practical Experiences and Education Research*. Arlington, VA: National Science Teachers Association Press, 89-106.

Other Significant Products

1. Nagle, B. (2015). Engineering Design in SEPUP's Middle School Issue-Oriented Science Program. In C. Sneider, Ed. *The Go-To Guide For Engineering Curricula, Grades 6–8*. Corwin Press: Thousand Oaks, CA. <http://www.corwin.com/books/Book241762 - tabview=toc>
2. Bellantoni, J., Nagle, B., Dombkowski, S., Seaver, D., Hariani, M., Lenz, L., Markey, D., Howarth, J., Amosslee, L., & Davison, A. (2012). *Issues and physical science. Second Edition*. Commercial Edition. The Science Education for Public Understanding Program, Lawrence Hall of Science, University of California, Berkeley. Produced by Lab-Aids, Inc., Ronkonkoma, NY. <http://www.sepuplhs.org/middle/iaps/index.html>
3. Nagle, B., Siegel, M.A., & Barter, A. (2004). Evolution of life science assessments for middle school. Paper presented at the annual meeting of the National Association for Research in Science Teaching, Vancouver, BC. <http://sepuplhs.org/pdfs/NagleSiegelBarterNARST.pdf>
4. Wilson, M., Thier, H., Sloane, K., & Nagle, B. (1996, April). What have we learned from developing an embedded assessment system? Paper presented at the annual meeting of the American Educational Research Association, New York.

D. SYNERGISTIC ACTIVITIES

1. Contributor to science curriculum and teacher professional development for NGSS

Is currently Co-PI for NSF-funded *Moving Next Generation Science Standards into Practice: A Middle School Ecology Unit and Teacher Professional Development Model* (NSF DRL-1418235, \$1,728,035, 9/1/14–8/31/18, PI James Short, Co-PI Suzanne Wilson.). For this project, Nagle leads the curriculum team, which has completed development of the first field-test edition of *Disruptions in Ecosystems: Ecosystem Interactions, Energy, and Dynamics*, a middle school curriculum unit to support the NGSS. This course was field-tested in New York City during the 2015–2016 school year, and will be revised based on feedback from teachers and an expert panel and tested again in 2016–2017. Nagle also contributed to professional development for the field test teachers.

2. Developer of SEPUP secondary science curricular materials and professional development

Contributed to proposal development, leadership, and authoring teams for SEPUP's NSF-funded three-year issue-oriented middle school program (*Issues and Earth Science, Issues and Life Science, and Issues and Physical Science*) and high school courses (*Science & Sustainability* and *Science and Global Issues: Biology*). Served as the PI for NSF-funded grant that developed *Science in Global Issues* (NSF DRK–12 0352453, \$2,668,188, 3/1/04–11/30/11). This project produced a yearlong high school biology curriculum. Each *Science and Global Issues* unit uses a socioscientific issue related to sustainability as the context for high school biology. Served as PI and co-author for U.S. Department of Energy-funded *Hydrogen Technology and Energy* (HyTEC) curriculum (DE-FG36-04-GO14277, 9/1/04–8/31/12). This project produced and disseminated a high school curriculum unit titled *Investigating Alternative Energy: Hydrogen & Fuel Cells*. Has also delivered numerous professional development sessions to support these programs and related to a variety of topics in science education, including science instructional materials, the NGSS, assessment, inquiry, differentiated instruction, and literacy in science.

Biographical Sketch

Rajul E. Pandya

Thriving Earth Exchange • American Geophysical Union (AGU), Washington, DC • rpandya@agu.org

Professional preparation

| | | | |
|--------------------------|-------------|----------------------|----------|
| University of Illinois | Urbana, IL | Physics | BS 1991 |
| University of Washington | Seattle, WA | Atmospheric Sciences | PhD 1996 |

Appointments

| | |
|----------------|---|
| 2013 - Present | Program Director, Thriving Earth Exchange, <i>American Geophysical Union</i> |
| 2011-2013 | Director, Spark: UCAR Office of Education, <i>University Corporation for Atmospheric Research</i> |
| 2004-2011 | Director, Significant Opportunities in Atmospheric Research and Science, <i>University Corporation for Atmospheric Research</i> |
| 2002-2004 | Outreach and Community Relations Liaison, Digital Library for Earth Science Education (<i>DLESE</i>) Program Center |
| 1999-2002 | Assistant Professor of Meteorology, <i>West Chester State University</i> |
| 1996-1998 | Post-Doctoral Fellow, <i>National Center for Atmospheric Research</i> |

Products **Most Relevant**

Pandya, R., J. Galkiewicz, B. Williams, H. Furukawa, K. Berry, 2014: Using the Thriving Earth Exchange to advance community science. *The Leading Edge* **33**, 12, 1330-1334. DOI: 10.1190/tle33121330.1

Pandya, R. E., 2014: Community-Driven Research in the Anthropocene. *Future Earth--Advancing Civic Understanding of the Anthropocene*, Diana Dalbotten, Ed., American Geophysical Union, 53-66.

Maldonado, J.K., Colombi, B. and Pandya, R. Eds., 2014: *Climate Change and Indigenous Peoples in the United States*. Springer International Publishing.

Porticella, N., Bonfield, S., DeFalco, T., Fumarolo, A., Garibay, C., Jolly, E., Huerta Migus, L., Pandya, R., Purcell, K., Rowden, J., Stevenson, F., and Switzer, A., 2013: *Promising Practices for Community Partnerships: A Call to Support More Inclusive Approaches to Public Participation in Scientific Research*. (Available at <http://www.birds.cornell.edu/citscitolkit/promisingpractices>)

Pandya, R. E., 2012: A framework for engaging diverse communities in citizen science in the US. *Frontiers in Ecology and the Environment* 10: 314–317. DOI: 10.1890/120007

Additional products

Soleri, D., J. W. Long, M. Ramirez-Andreotta, R. Eitemiller, and R. Pandya, 2016: Finding Pathways to More Equitable and Productive Public-Scientist Partnerships, *Citizen Science: Theory and Practice* (in press).

Pandya, R., A. Hodgson, M. Hayden, P. Akweongo, T. Hopson, A.A. Forgor, T. Yoksas, M.A. Dalaba, V. Dukic, R. Mera, A. Dumont, K. McCormack, D. Anaseba, T. Awine, J.M. Boehnert, G. Nyaaba, A. Laing, and F. Semazzi, 2015: Using Weather Forecasts to Help Manage Meningitis in the Sahel, *Bulletin of the American Meteorological Society*, **96**, 103–115. DOI: 10.1175/BAMS-D-13-00121.1

Charlevoix, D., R. Pandya, A. Bridger, T. Gill, E. Hampton, R. Herman, J. Knox, W.W. Lee, Diane Stanitski, 2014: New Directions for the Education Symposium, accepted for publication in the *Bulletin of the American Meteorological Society*. DOI: 10.1175/BAMS-D-13-00121.1

García-Pando, Carlos Pérez, M. C. Thomson, M. C. Stanton, P. J. Diggle, T. Hopson, R. Pandya, R. L. Miller, and Stéphane Hugonnet, 2014: Meningitis and climate: from science to practice. *Earth Perspectives* **1**, 1-15. DOI: 10.1186/2194-6434-1-14

National Research Council, 2010: *NOAA's Education Program: Review and Critique*. J. W. Farrington and M. A. Feder, Editors, The National Academies Press, 169 pp. DOI: 10.17226/12867

Synergistic activities

1. Advancing community science. Community science is a participatory approach to science research and education that emphasizes close collaboration between scientist and community leaders in all scientific

processes -from identifying scientific questions that are community relevant through collecting and analyzing data together to applying results to produce local impact. As Program Director for AGU's Thriving Earth Exchange, Pandya uses community science to leverage geoscience, produce impact, and support AGU's mission of discovery for the benefit of humanity. Under Pandya's leadership, TEX has developed and implemented a model for launching and advancing locally-focused community science partnerships that produce impactful solutions, built partnerships with a diverse set of community-serving organizations, created and refined processes for matching scientists and community leaders, and mined knowledge from a variety of disciplines to coach and mentor community-science project teams. TEX has launched nearly 30 unique projects, which range in scope from a pilot project to help 20 residents in a diverse low-income Denver neighborhood pilot new low-cost sensors to identify harmful chemicals entering their home to an international project to work with villagers in Afghanistan to adapt their traditional agricultural calendars to a rapidly changing climate.

2. Growing a community of practice around community science. In the geosciences, community science connects with geoscience education and outreach, citizen science, actionable science, service learning, efforts to broaden participation, and environmental justice. Pandya is active participant in these communities and has held leadership positions in some of those communities. He has developed and led sessions, workshops, and symposia exploring how community science connects to these topics at professional society meetings and for smaller groups, and authored articles or given invited talks on community science. As part of TEX's long term plan, it will convene and advance a community of practice around community science, this proposal is one of several efforts toward that end.

3. Launching and leading multidisciplinary research. Pandya assembled, led, and secured funding for a multidisciplinary and multinational team that developed new tools to inform the distribution and timing of meningitis vaccines in sub-Saharan Africa. This project, funded by google.org, used community input and new data to uncover the link between meningitis transmission and relative humidity and worked with public health workers to design a straightforward tool to provide relative humidity predictions that was used to inform vaccination production. In addition, over 15 papers were published based on this research, which was also part of the graduate work of 3 students: 1 from the US and 1 from Africa. This work was also a springboard for additional work in the region, funded by NSF and other agencies.

4. Broadening participation in the geosciences. As part of DLESE, Pandya was part of several efforts to engage diverse communities as partners in developing the digital library. As director of SOARS, he expanded the program to recruit and support LBGTO students and students with disabilities and introduced collaborative research with communities. He led the UCAR Africa Initiative, which increased scientific collaborations between African scientists and UCAR, and introduced "listening conferences" that launched several productive collaborations between UCAR scientists and educators and indigenous leaders. Working with schools in Denver and Puerto Rico, he launched a summer internship program for high-school students at NCAR. With AMS, Pandya facilitated the launch of an organization for LBGTO members, led the team that drafted the first policy on harassment and professional conduct at meetings, and created numerous venues for people to learn about and tackle issues of disability, gender, and diversity. As a board member for the Citizen Science Association, he helped guide the establishment of the Integrity, Diversity and Equity Working Group. The Thriving Earth Exchange uses community science to advance the priorities of diverse and historically underserved communities.

5 Management experience. Pandya has managed large grants and programs since 2004 when he became the director of the SOARS Program, a multi-year REU program with comprehensive mentoring that broadens participation in the geoscience. As director of Spark, Pandya managed a staff of 20, provided strategic leadership on NCAR and UCAR's education portfolio, and led teams that produced teacher educations, student internships, and educational and curricular materials for formal and informal education. Pandya has served on the board of the "I Have a Dream Foundation of Boulder," including 5 years as chair, which helps children in underserved communities advance academically - from 2nd grade to college - through mentoring, scholarships, and academic enrichment. He is also on the board of Directors of the Citizen Science Association and serves as the Commissioner for Human Resources with the American Meteorological Society, where he manages 3 boards and numerous committees.

Mark Lee Benthien

Southern California Earthquake Center, University of Southern California,
Los Angeles, CA 90089 benthien@usc.edu

PROFESSIONAL PREPARATION

| | | | |
|---------------------------------------|-----------------|---------------|-----------|
| University of California, Los Angeles | Los Angeles, CA | Geophysics | BS, 1995a |
| University of Southern California | Los Angeles, CA | Public Policy | MPP, 2003 |

APPOINTMENTS

2001–present Director for Communication, Education, and Outreach, *Southern California Earthquake Center, University of Southern California, Los Angeles, CA*

1999–2001 Assoc. Director for Outreach, *Southern California Earthquake Center, University of Southern California, Los Angeles, CA*

1996–1999 Outreach Specialist, *Southern California Earthquake Center, University of Southern California, Los Angeles, CA*

1995–1996 Graduate Research Assistant, *California Institute of Technology, Pasadena CAa*

PRODUCTS RELATED TO THIS PROJECT

Jones L.M. and **Benthien, M.L.** *Preparing for a "Big One": The Great Southern California ShakeOut*, EERI Spectra, 27, no. 2, pp 575-595, 2011

Jones L.M. and **Benthien, M.L.** *Putting Down Roots in Earthquake Country*, Special Publication of the Southern California Earthquake Center, University of Southern California, 32 pages, 2011 (available online at www.earthquakecountry.org/roots)

Benthien, M.L. and Pearce, I., *Seven Steps to an Earthquake-Resilient Business*, Special Publication of the Southern California Earthquake Center, University of Southern California, 16 pages, 2008 (available online at www.earthquakecountry.org/roots)

Benthien, M.L. and L.A.'s 'Puente Hills' Earthquake, *One Week Later*, Natural Hazards Observer, 28, no. 3, p. 1-3, 2004

Benthien, M.L. and Andrews, J.H., *Development and Implementation of the SCEC Communication, Education and Outreach Program*, Seismological Research Letters, 74, no. 5, p. 511-515, 2003.

OTHER SIGNIFICANT PRODUCTS

Field, N., L. Jones, T. Jordan, **M.L. Benthien**, and L. Wald, *Earthquake shaking; finding the "hotspots"* USGS Fact Sheet 001-01, 2001

Heneyey, T.L., G.S. Fuis, **M.L. Benthien**, T.R. Burdette, S.A. Christofferson, E.E. Criley, R.W. Clayton, P.M. Davis, J.W. Hendley II, M.D. Kohler, W.J. L., *The "LARSE" Project—Working Toward A Safer Future For Los Angeles*, USGS Fact Sheet 111-99, 1999.

Forrest, M., T. Rockwell, T. Heneyey, and **M.L. Benthien**, *Shattered Crust Series #2: The Palos Verdes Fault Guide*, Edited by Jill Andrews, Southern California Earthquake Center, 1996.

Fuis, G. S., D. A. Okaya, R. W. Clayton, W. J. Lutter, T. Ryberg, T. M. Brocher, T. L. Heneyey, **M. L. Benthien**, P. M. Davis, J. Mori, R. D. Catchings, U. S. ten Brink, M. D. Kohler, K. D. Klitgord and R. G. Bohannon, *Images of Crust Beneath Southern California Will Aid Study of Earthquakes and Their Effects*, EOS, Transactions of the American Geophysical Union, 77, no. 18, pp. 173-176, 1996.

Kohler, M. D., P. M. Davis, H. Liu, **M. L. Benthien**, S. Gao, G. S. Fuis, R. W. Clayton, D. Okaya and J. Mori, *Data Report for the 1993 Los Angeles Region Seismic Experiment (LARSE93)*, *Southern California: A Passive Study from Seal Beach Northeastward through the Mojave Desert*, U. S. Geological Survey, Open- File Report, 96-85, p.82, 1996.

SYNERGISTIC ACTIVITIES

2008–present Great ShakeOut Earthquake Drills, *Global Coordinator*
2003–present Earthquake Country Alliance, California, *Executive Director*
2006–2007 Network for Earthquake Engineering Simulation, *EOT Committee Member*
2004–2010 Earthquakes and Megacities Initiative, *Los Angeles Academic Representative*
2004–2011 Emergency Survival Program, *Coordinating Council Member*

Biographical Sketch

Felicia M. Davis

a. Professional Preparation

| | | | |
|-------------------|----------------|-------------------|---------|
| Howard University | Washington, DC | Political Science | BA 1980 |
| Howard University | Washington, DC | HUD Grad Fellow | 1980-82 |

b. Appointments

| | |
|--------------|--|
| 2013-present | Director, Building Green Initiative at Clark Atlanta University, Atlanta, GA |
| 2010-2013 | Director, UNCF Building Green Initiative, Atlanta, GA |
| 2006-2010 | Vice President, Women Flying High LLC, Atlanta, GA |
| 2004-2006 | Director, Mothers & Others for Clean Air, Atlanta, GA |
| 2000-2006 | Director, GA Airkeepers, Atlanta, GA |

c. Products

Most Closely Related

1. Davis, Felicia, Director, Building Green Initiative; Andrea Harris, President & CEO, North Carolina Institute for Minority Economic Development; Henry Lancaster, Project Manager; Kerra Bolton, Author; Maranatha Wall, Senior Research Associate; Vanessa Nicholas, Graphic Design; Edrea Davis, Media. *HBCU Green Report* (2014). http://buildinggreennetwork.org/wp-content/uploads/2014/08/HBCU_Green_Report_2014.pdf
2. Daley, Melissa, Editor in Chief; in collaboration with Michael Lomax, Karl W. Reid, Louis Barbash, Clarissa Myrick-Harris, Felicia Davis, Darryl Ann Lai-Fang. *Sustainable Campuses Building Green at Minority-Serving Institutions* (2012). Published by Kyoto Publishing Suite L200 560 Beatty Street Vancouver, BC Canada, V6B 2L3 ISBN [978-0-9813326-4-2](http://buildinggreennetwork.org/GreenReport/PDF/Sustainable_Campuses.pdf). http://buildinggreennetwork.org/GreenReport/PDF/Sustainable_Campuses.pdf
3. Felicia M. Davis, Director; Rick Horowitz, Editor; Rebecca Caine, Editor. *MSI Green Report* in collaboration with Mark Orłowski & Sustainable Endowment Institute (2010). <http://icb.uncf.org/LinkClick.aspx?fileticket=BAPXRJwYa8I%3D&tabid=160&mid=511>

Other Significant Products

1. Martha H. Keating, Clean Air Task Force for Clear The Air, and Felicia Davis, Georgia Coalition for the Peoples' Agenda. *Air of Injustice* (2002). Designed by Patricia Gunn. Printed by: LaBerge Printers, Inc, Orlando, FL. http://www.energyjustice.net/files/coal/Air_of_Injustice.pdf

d. Synergistic Activities

1. As the Director of the HBCU Green Ambassador Program, I *trained and supported student sustainability leaders* on 27 HBCU campuses providing introduction to climate science, environmental justice, and campus stewardship. Ambassadors were nominated by faculty members that served as mentors or advisors. Students worked in teams to foster collaboration across campuses. A team effort was essential to successfully complete the training curriculum. Strong team bonds were formed and over time students increasingly turned to their colleagues for support. This was significant because teams were comprised of students from a range of majors each representing a different major. They met in person only once and communicated via Internet and conference call after the training. A collaborative

learning model was key to the success of the Green Ambassador program with enhanced student achievement based on grades, retention, and student-driven green activity on campus.

2. As Director of the Building Green Initiative I ***promote campus-wide sustainability*** (buildings and infrastructure, curriculum development, renewable energy, and student engagement for Historically Black, Hispanic Serving and Tribal colleges and universities. Since transitioning from UNCF to Clark Atlanta University the focus has narrowed to HBCUs while maintaining relationships with other MSIs. The program provided small grants to a range of institutions to implement innovative projects with an energy reduction and educational requirement. The Initiative is credited with increasing and supporting environmental sustainability on diverse MSI campuses and building a vibrant network of faculty and administrators committed to sustainability goals. We conducted the first MSI campus sustainability surveys with participation from more than 50 institutions, provided training for faculty to advance interdisciplinary environmental studies, and coordinated sustainability conferences targeting minority-serving institutions.

3. As a national director of Project Preserve designed to ***rescue engineering and computer science students*** performing poorly in the most competitive universities (collaboration between CUNY, CSUN and Xavier-New Orleans), I identified and recruited Black and Latino engineering and computer science students that were failing in the nation's most competitive engineering and computer science programs. These students had comparatively strong backgrounds for the new campus environments and quickly began to thrive. Two additional student success factors were "time on task" and collaborative learning. Mandatory active study sessions and competitive team projects with faculty sponsors helped to transform the culture changing faculty expectations for minority students. It was determined that institutional fit is a critical factor in STEM student success. The program also provided financial aid and we introduced multi-cultural studies in summer bridge programs involving several of the Preserve students as tutors.

Biographical Sketch

Norma J. Neely, Ed.D.
Director, American Indian Institute

Professional Preparation

| | | | |
|--|-----------------------------|-------|------|
| Central Missouri State University, Warrensburg, MO | Education | B.S. | 1968 |
| Central Missouri State University, Warrensburg, MO | Education, Science emphasis | M.S. | 1973 |
| University of Texas, Austin, TX | Educational Administration | Ed.D. | 2001 |

Appointments

| | |
|-----------------------------|---|
| June, 2012 – Present | Director, American Indian Institute; University of Oklahoma; Norman, OK |
| September, 2011—May, 2012 | Assistant Professor; Oklahoma State University; Stillwater, OK |
| August, 2006 – August, 2011 | Regional Instructional Facilitator for Science; Truman State University; Kirksville, MO |
| November, 2005 – July, 2006 | Science Specialist, Austin ISD; Austin, TX |
| June, 2004 – October, 2005 | Educational Consultant; Designing Success for Educators; Austin, TX |
| June 1999 – June 2004 | Associate Director for Regional Projects; Texas Rural Systemic Initiative; Texas A&M University; Canyon, TX |
| June 1996 – May 1999 | Texas Coordinator of Building a Presence for Science; National Science Teachers Association; University of Texas; Austin, TX |
| June 1994 – May 1996 | Graduate Student/Research Associate; Educational Administration; The University of Texas; Austin, TX |
| September 1993 – May 1994 | District Resource Teacher/Department of Instruction K-12; Kansas City, MO; The School District of Kansas City, MO |
| September 1992 – May 1993 | K-5 Animal Resource teacher; Three Trails Science/Math Magnet School; Kansas City, MO; The School District of Kansas City, MO |
| September 1991 – May 1992 | K-12 District Science Resource Teacher; Kansas City, MO; The School District of Kansas City, MO |
| September 1988 – May 1991 | K-5 Environmental Science Resource Teacher; Academy of Environmental Science; Kansas City, MO; The School District of Kansas City, MO |
| September, 1987 – May 1988 | Language Arts Resource Teacher; Southwest Middle Magnet School; Kansas City, MO; The School District of Kansas City, MO |
| September 1986 – May 1987 | Coordinator of College for Kids and Teens; Longview Community College; Lee’s Summit, MO; Longview Community College |
| September 1968 – May 1973 | Fourth Grade Teacher; Lee’s Summit Elementary, Lee’s Summit, MO; The School District of Lee’s Summit, MO |

c. Products

Most Closely Related

Neely, Norma, co-author of a chapter of the National Science Teachers Association’s (NSTA) *Pathways to the Science Standards: Guidelines for Moving the Vision into Practice* (Elementary School Edition). (2000). ISBN: 978-0-87355-161-8.

https://www.nsta.org/store/product_detail.aspx?id=10.2505/PKEB124X

d. Synergistic Activities

1. Educator and service provider to groups underrepresented in STEM. As a member of the Citizen Potawatomi Nation and Director of the American Indian Institute within the division of Public and Community Services at the University of Oklahoma (OU), Dr. Neely oversees the Institute's goals to support training and research, along with health promotion/disease prevention, art/culture/language preservation, and tribal leadership and organizational development. Prior to coming to OU, Dr. Neely served as Coordinator of "Building a Presence for Science" at the National Science Teachers Association, Associate Director of the NSF-funded Texas Rural Systemic Initiative, Science Instructional Facilitator for the Northeast Regional Professional Development Center at Truman State University. Additionally, she taught science to pre-service teachers at Oklahoma State University. She served as Professional Development Director on the board of the National Science Teachers Association, Education Committee Chair on the Board of SACNAS (Society for the Advancement of Chicanos and Native Americans in Science); and on numerous boards and advisory committees including Science Teachers of MO, American Royal Advisory Committee, MO Governor's Task Force on Environmental Education, Scholastic's Magic School Bus Advisory Council, and EarthScope's Education and Outreach Committee. Previously, Dr. Neely authored a grant to take teachers to the Peruvian Amazon in order to develop curriculum materials. She has also participated in several other grants, including an NSF-funded research expedition to Antarctica, a state-funded learning experience in the Galapagos, and archaeological digs in various locations in the United States and in Zaire. She began her career as an elementary teacher and in 1990 received a Presidential Award for Excellence in Science Teaching.

2. Leader in organizations addressing education needs and education research. Currently Dr. Neely is the district director for Region 13 (TX, OK, NM) of the National Science Teachers Association (NSTA), and chair of the advisory board for AIR's (American Institutes for Research) REL Southwest (Regional Educational Laboratory Southwest).

3. Creator of learning activities and curriculum, including contributions to these publications: "Project Zoo"- a third grade curriculum guide for using the Kansas City Zoo; "Rain Forest Rendezvous"- K-6 Lessons/Activities on tropical rain forests; "Ecosystems Made Elementary"- K-6 Lessons/Activities comparing /contrasting the ecosystems of Missouri and the Galapagos Islands; "Belize Curriculum" for the JASON Project; "Measurement" section of the Math/Science Connection of Summer Interface 1992; Mentoring Handbook for Austin Independent School District. She also wrote copy for two science-related video games produced by Sega/Genesis.

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Biographical Sketch
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FAX: 202-682-0633
E-mail: taber@iris.edu

Professional Preparation

| | | | |
|--------------------------|----------------|------------|------------|
| Swarthmore College | Swarthmore, PA | Physics | B.A. 1977 |
| University of Washington | Seattle, WA | Geophysics | Ph.D. 1983 |

Appointments

2010 – Present Director, IRIS Education and Public Outreach program
2001 – 2010 IRIS Education and Outreach Program Manager
1994 – 2001 Earthquake Commission Fellow in Seismology, Victoria University of Wellington
1991 – 1994 Research Fellow, Victoria University of Wellington
1989 – 1991 Post-doctoral Fellow, Victoria University of Wellington
1984 – 1989 Associate Research Scientist, Lamont-Doherty Geological Observatory of Columbia University

Five Products Related to the Proposal

Taber, J., M. Hubenthal, T. Bravo, P. Dorr, J. Johnson, P. McQuillan, D. F. Sumy, R. Welti, 2015, Seismology Education and Public Outreach Resources For a Spectrum of Audiences, as Provided by the IRIS Consortium, *The Leading Edge*, 34(10), 1178-1184.
Taber, J, M. Hubenthal, and M. Benoit, 2014, Opportunities for Undergraduates to Engage in Research Using Seismic Data and Data Products, AGU Annual Meeting Paper No. ED21D-3478.
Wysession, M.E., N. LaDue, D.A. Budd, K. Campbell, M. Conklin, E. Kappel, G. Lewis, R. Reynolds, R.W. Ridky, R.M. Ross, J. Taber, B. Tewksbury and P. Tuddenham, 2012, Developing and Applying a Set of Earth Science Literacy Principles, *Journal of Geoscience Education*, 60(2), 95-99.
Hubenthal, M., Stein, S., Taber, J., 2011, A Big Squeeze: Examining and modeling causes of intraplate earthquakes in the earth science classroom, *The Earth Scientist*. 27(1), 33-39.
Wysession, M., M. Hubenthal, J. Taber, 2008, Using SeisMac to Turn Your Laptop into a Seismograph for Teaching, *Seismological Research Letters*, 79(5), 723.

Five other Significant Products

Duggan-Haas, D., J. Taber, 2015, Basic Fracking Math, *In the Trenches*, 5(3), 10-12.
Hubenthal, M., O'Brien, T., Taber J., 2011, Posters that foster cognition in the classroom: Multimedia theory applied to educational posters, *Educational Media International*, 48(3), 193-207.
Hubenthal, M., L. Braile, J. Taber, 2008, Redefining earthquakes & the earthquake machine, *The Science Teacher*, 75(1), 32-36.

Smith, M., J. Taber and M. Hubenthal, 2006, Real-Time seismic displays in museums appeal to the public, *EOS, Trans. AGU*, 87, no. 8, 85.

Ansell, R., and J.J. Taber, 1996, Caught in the Crunch: Earthquakes and Volcanoes in New Zealand, HarperCollins, Auckland, 188pp.

Five Synergistic Activities

Earth Science Literacy and workforce development

As Co-PI of the Earth Science Literacy Initiative (2008-2009), helped develop and disseminate a set of Earth science literacy principles that have become widely referenced in Earth science education and outreach and that helped form the basis for the Earth science elements of the Next Generation Science Standards. Co-PI for distributed summer undergraduate research program reaching over 155 students (2002-), Co-PI on workshop to encourage collaboration between early career geoscientists and geoscience education researchers (2015).

Development of educational tools that highlight the use of data

Leadership of software engineers and educational specialists in the development of a range of tools designed to allow students and the general public to explore and interpret seismic data (2002-). Products include software for streaming real-time seismic data into the classroom (*jAmaseis*), Web applications reaching millions of users (*Seismic Monitor*, *IRIS Earthquake Browser and 3D Viewer*, *Seismic Waves*) and public displays in museums with millions of visitors (*Earthquake Channel and its predecessors*, *Active Earth Monitor*).

InTeGrate Leadership team

Led undergraduate curriculum workshop on *Engineering, Sustainability and the Geosciences* (2013), Led teams of undergraduate faculty to develop intro and upper level interdisciplinary classroom modules using geoscience to address societal issues (2013-), Organizing committee for workshop on *Teaching about Risk and Resilience: Sea Level Rise, Flooding, and Earthquakes* (2014).

National and international collaborations

UNAVCO Education and Community Engagement Advisory Committee (2005-), EarthScope Education and Outreach Steering Committee (2005-), Development of international seismographs in schools community (2005-), Deep Earth Academy review panel (2011), E&O program plan creation team for NEES Consortium, (2004).

Professional society activities

National Association of Geoscience Teachers Executive Committee (2013-), Seismological Society of America Communications Committee (2013-), Society of Exploration Geophysicists Youth Education Committee (2014-), Co-chair, IASPEI Commission on Education and Outreach (2003-), American Geophysical Union Committee on Education and Human Resources, IRIS Liaison (2004-2010), Past president: New Zealand Geophysical Society, Quake Trackers advisory board (2007-2009), Management Committee, New Zealand Society for Earthquake Engineering (1999-2001).

Current and Pending Support

This item is ***NOT to be included*** in the NSF INCLUDES *Preliminary Proposal* for Design and Development Launch Pilots.

Facilities, Equipment and Other Resources

This item is ***NOT to be included*** in the NSF INCLUDES *Preliminary Proposal* for Design and Development Launch Pilots.

Data Management Plan

This item is ***NOT to be included*** in the NSF INCLUDES *Preliminary Proposal* for Design and Development Launch Pilots.