Minority University Research and Education Program (MUREP)
NASA Innovations in Climate Education (NICE)
FY 2013 Annual Report (10/1/2012 – 9/30/2013)

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Project Description

NASA Innovations in Climate Education (NICE) is an activity element within the Minority University Research and Education Project (MUREP). MUREP enhances the research, academic, and technology capabilities of Historically Black Colleges and Universities (HBCUs), Hispanic Serving Institutions (HSIs), Tribal Colleges and Universities (TCUs), Asian American and Native American Pacific Islander-Serving Institutions (AANAPISIs), and other Minority Serving Institutions (MSIs). Multiyear grants awarded to MSIs assist faculty and students in research pertinent to NASA missions.

NICE**,** formerly Innovations in Global Climate Change Education (IGCCE), continues the activities that started under a Congressional directive in 2008. NICE is designed to meet the recommendations of the National Research Council's report *Earth Science and Applications from Space: National Imperatives for the Next Decade and Beyond,* and the report by the National Academies*, Rising Above the Gathering Storm.* These reports highlight the need to continually advance our understanding of our Earth system, utilizing Earth observation data when available, and to enhance our science and technology capabilities through research and K-12 science and mathematics education, respectively.

NICE is designed to strengthen the skills of teachers and provide innovative scientific research and learning opportunities for K-16 students. NICE contributes to NASA's effort to utilize its unique mission, workforce, facilities, research, innovations and other assets to inspire interest in science, technology, engineering, and mathematics (STEM). All NICE activities (and those funded under IGCCE and the previous incarnation, GCCE) are required to make use of NASA's unique contributions to climate and Earth system science, including the use of NASA Earth observation data, basic to more complex interactive Earth system models, and/or simulations.

FY 2013 represents two full years of activities after IGCCE's FY 2011 transition into the NASA Minority University Research and Education Program (MUREP) under the new alignment for the NASA Education Office. Through competitive awards as well as strategic collaborations, MUREP NICE focuses on rapidly and significantly increasing the participation of underserved and underrepresented communities in STEM. In 2011, as IGCCE, MUREP NICE solicited proposals from US minority-serving higher education institutions, community colleges, public school districts with high underrepresented/underserved enrollment, and non-profit organizations with a demonstrated history of working with underrepresented communities. Cooperative agreements valued at $7.2 million were awarded to 14 organizations. These

innovative activities support elementary, secondary, and undergraduate teaching and learning.

The FY 2013 report reflects the unique and significant contribution of the awardees to MUREP NICE, NASA/MUREP's goals, and to the national landscape of climate-related STEM education (no new awards were made in FY 2012 or FY2013). The winning proposals illustrated innovative approaches using NASA content to support elementary, secondary, undergraduate, and graduate teaching and learning. Although no new awards were made in FY 2013, accomplishment of significant work continues through FY 2014 and is expected beyond FY 2015.

Project Goals

The goals of NASA's MUREP NICE activity are to increase the climate literacy and level of engagement of the United States public and to create a diverse, highly skilled, and motivated future workforce in climate-related sciences.

To achieve these goals, the activity has three objectives:

- Increase the number of underrepresented/underserved students prepared to teach climate change content within STEM subjects;
- Increase the number of underrepresented/underserved undergraduate students prepared for employment and/or to enter graduate school in technical fields relevant to global climate change; and
- Advance the understanding of how to effectively teach global climate change concepts.

MUREP NICE seeks to improve the teaching and learning about global climate change in elementary and secondary schools, on college campuses, and throughout lifelong learning. Key principles of the activity include utilization of NASA's unique contributions to climate and Earth system science and collaboration with minority institutions in order to improve the quality of the Nation's STEM education.

Project Benefit to Outcomes 1 and 2

MUREP NICE, and its portfolio of funded initiatives, directly support the NASA Strategic Plan and the Office of Education's Outcomes. Specifically, MUREP NICE aligns with Outcome 1 to "*contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals through a portfolio of investments"* and to Outcome 2 to *"attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty.*"

MUREP NICE partners include the NASA Science Mission Directorate (SMD), National Science Foundation (NSF), and National Oceanic and Atmospheric Administration (NOAA). The goals of this multi-agency partnership are to minimize duplicate efforts, leverage existing

resources, develop common evaluation metrics, and facilitate communications among this emergent community of scientists and educators. Other partners include the institutions represented by 71 awards (GCCE, IGCCE, and MUREP NICE; 41 of which are still currently active) and the Virginia Space Grant Consortium (VSGC).

Significant strides are being made in strengthening the climate change education skills of teachers and providing innovative climate science research and learning opportunities for students. As a higher education-focused activity within MUREP, NICE is responsible for reporting data from the previous year, FY 2012, during this reporting call. Data collection for the end of FY 2013 is ongoing and activities reported by our awardees for the last quarter of the fiscal year are continually being added and reported within OEPM. This report therefore reflects finalized data for FY 2012.

- FY 2012: 70 new or revised higher education courses targeted at climate change-related STEM skills were offered to students at four-year institutions and community college.
    - This indicates a *significant increase (67%)* in the number of higher education courses offered through NICE funding this year over last.
    - *Reach extended to 32 different states*, as well as the District of Columbia.

- FY 2012: 7,693 higher education students (four-year and community college undergraduates) participated in the above courses.
    - This indicates a *tremendous increase (448%)* since MUREP NICE has more than quadrupled the number of higher education students over last year, with 6951 undergraduate students participating in MUREP NICE educational opportunities. These opportunities include higher education courses as well as research experiences and outreach opportunities. The majority of these participants were students at four-year colleges and universities. Additionally, 469 post-graduate trainees (graduate students, pre-service teachers, and postdoctoral researchers), as well as 273 community college students participated in MUREP NICE activities in FY 2012.

- FY 2012: 3,800 elementary and secondary educators participated in long and short duration MUREP NICE professional development (PD) opportunities. Specifically, 1898 participated in short duration activities, and 1902 participated in long duration activities. These educators will play a significant role in increasing climate literacy of thousands of students across the nation, and in preparing the 21st century workforce in climate-related sciences. Teachers benefiting from MUREP NICE educator professional development will also share with their own professional communities, extending the reach of MUREP NICE activities, as many of these EPD workshops are conducted in a train-the-trainer format

    - This data indicates *significant participation (only 4% less than last year)* in long duration professional development activities, which have a greater likelihood of resulting in increased teacher content knowledge and enhanced pedagogical practice. Additionally, in FY 2012, MUREP NICE activities reached 207 informal educators. Given the increased focus of MUREP NICE on partnering with minority-serving higher education institutions and in developing the capability of institutions to prepare undergraduate students for the STEM workforce, it is also notable that activities reached 1145 higher education faculty members. These faculty teach primarily at 4-year institutions, participating in faculty development, research, and teaching opportunities via NICE.
- In FY 2012: Over 11,275 elementary and secondary students participated in NASA climate-related educational activities.
    - This is a *tremendous increase* (182%) in the number of students participating in MUREP NICE activities (51% high school, 45% K5-8, and 4% K-4).

- Additionally, from 2008 through the 2011 awards, a total of 11 activities have been awarded to institutions in Experimental Program to Stimulate Competitive Research (EPSCoR) states.

Project Accomplishments

As an activity within MUREP, a key priority of NICE is collaborating with Minority-Serving Institutions (MSIs) to improve the quality of the Nation's STEM education. All MUREP awardees were located at minority-serving institutions, non-profit organizations with a strong record of serving underrepresented populations, or high-need school districts. The MUREP NICE management team works in collaboration with our partners at the Virginia Space Grant Consortium (VSGC). Awardees from the states of California, Colorado, Delaware, Louisiana, Massachusetts, North Carolina, New York, Texas, Virginia, Washington D.C., and Wisconsin participate in this activity. Throughout FY 2013, MUREP NICE focused on integrating these awardees with earlier IGCCE/GCCE funded activities, as well as developing stronger collaborations within the Native American/Tribal K-12 and higher education communities. A NICE-T (Tribal) Solicitation (in which a Tribal College or University had to be the lead in the proposal) was presented and closed in July 2013, and is expected to be awarded in the first or second quarter of FY 2014.

NICE has also strengthened its collaboration with the NASA Digital Learning Network (DLN) in order to extend the activity's virtual presence and digital reach, while significantly reducing both travel costs and the carbon footprint. A major focus of the DLN activity has involved expanding NICE Educator Professional Development (EPD), working more closely with American Indian Higher Education Consortium, Native American undergraduate students, the Tribal community,

and the Hispanic community via the NICE EPD Manager/DLN Coordinator. These are some major accomplishments via the NASA DLN for FY 2013:

- A four-part NICE Teacher Professional Development Workshop Series was held in April 2013 highlighting several of the NICE PIs and their projects. The workshop series featured climate literacy content and classroom resources from NASA and NICE Earth Systems Scientists, and was open to all Science, Technology, Engineering, and Math (STEM) K-12 teachers. 10 educators attended on-site, 9 attended as virtual participants via the DLN. This workshop allowed presenters to participate in the workshop without needing to travel to the site, thus saving money and lowering the carbon footprint of the workshop. It further allowed educators from diverse geographic areas to share observations and engage in discussion of local issues Selected participants explored several topics, from the greenhouse effect to Earth's rising temperatures and resulting impacts on plants, bugs, and birds. Onsite participants enjoyed the highly interactive experience, including a tour of the DLN studio, as well as virtual participants, who provided positive feedback for the series. Pictures of each session, and the resources shared in the workshop are listed on the NICE website **(https://nice.larc.nasa.gov/).**

- The MUREP NICE project presented a Virtual Principle Investigator (PI) Meeting April 23-26, 2013. This was the first time the meeting was designed to occur totally virtually, utilizing elements of presentation via the DLN, teleconferencing, and WEBEX. The four-part meeting series was presented in partnership with the Virginia Space Grant Consortium (VSCG), and allowed online participants from throughout the nation to present and interact with each other during each two hour meeting session. The workshop featured topics on best practices for using large data sets in education, 508 Compliance, as well as an overview of NICE reporting mechanisms and usage in annual reports to NASA Headquarters. One of the premier chief scientists from NASA Langley's Science Directorate (SD) was a featured keynote speaker via the DLN on April 24th, and presented a thought provoking view of the economic value and impact of climate science. NICE Activity Scientists Dr. Lin Chambers and Dr. Margaret Pippin were extremely instrumental in designing the workshop

- To facilitate working more closely with American Indian Higher Education Consortium (AIHEC), Native American undergraduate students, the Tribal community, and the Hispanic community, the NICE EPD Manager/DLN Coordinator has initiated conversations with representatives of AIHEC, to explore possible collaboration opportunities and work toward options for virtual delivery of NICE content to tribal institutions. Also, several of the sites participating directly in the Ask NICE" GooglePlus Hangouts are strategically located in areas with a high density of tribal populations.

The tri-agency climate change education partnership was highlighted through a poster and presentation at the 2012 American Geophysical Union (AGU) Annual Meeting (which attracts over 20,000 participants in the climate change and scientific community), along with many poster presentations and oral sessions affiliated with NICE and other tri-agency projects. Posters

are a critical tool used in the scientific community to convey the relevance of the program in a simple, graphical format.

- MUREP NICE will be well represented as it returns to the 2013 AGU meeting to be held in San Francisco, California in December 2013. The NICE EPD Manager Bonnie Murray will present on the topic "*NASA Innovations in Climate Education Connects Audiences Coast-to-Coast for Climate Literacy via the NASA Digital Learning Network"* (the NICE Management Team is co-author). This is a major accomplishment since the abstract was selected for oral presentation at AGU from over 20,000 submitted abstracts. Additionally, the NICE Activity Evaluator Dr. Ann Martin will convene an AGU session surrounding evaluation, and present her award-winning poster *"What and How Are We Evaluating? Meta-Evaluation of Climate Education Projects Funded by NASA."* (#1 Poster at the 2013 American Evaluation Association Conference) focused on the evaluation of MUREP NICE and the TrACE catalog. The TrACE catalog will also be the subject of an in-booth presentation at NASA's AGU booth. Through the efforts of members of the Tri-agency partnership, 8 oral and 6 poster presentation sessions focused on Climate Literacy were highlighted at the 2012 AGU Meeting. This included 6 oral and 4 poster sessions co-convened by NICE-funded initiatives and by the NICE management team, for a total of 26 poster presentations and 17 oral presentations focused on NICE.

Through the NASA Postdoctoral Program (NPP), the MUREP NICE Activity Evaluator continues to contribute to the team's goal of understanding the effectiveness of the project and its portfolio. Each NICE-funded project activity has its own, unique evaluation component, and the evaluation thus incorporates a "meta-evaluation" approach. The evaluator provides a "bird's-eye" perspective on the implementation, outputs, and impact of NICE's investments in climate education.

- The evaluator continues to work with the individual project evaluators to build a community of practice in the area of climate change education evaluation. Quarterly evaluation webinars are led by the NICE team at LaRC and focus on challenges, lessons learned, and best practices.

- NICE has also developed a library of evaluation and assessment tools and resources, to allow this community to adopt and respond to common measures and constructs in assessing student as well as educator learning. In order to strengthen this community of practice focused on evaluation, NICE has had a presence at the 2011, 2012, and 2013 American Evaluation Association (AEA) annual meetings (drawing attendance of more than 2,500), the Astronomical Society of the Pacific 2012 and 2013 conference focused on science communication (drawing attendance of more than 200), and the 2012 and 2013 Geological Society of America (GSA) Annual Meeting & Exposition (drawing attendance around 7,000).

To strategically meet the challenge of building a community of practice that stretches across the nation, MUREP NICE PI Community Discussions (CDs) are held monthly, working in partnership with VSGC. PIs use this opportunity to highlight their progress, solicit ideas from other projects, hear from Subject Matter Experts (SME), and share their lessons learned. Guest speakers/SMEs are also invited on occasion to discuss related activities within or outside NASA that may be of interest to the PIs.

In the area of project management, NICE has made significant progress in the deployment and use of a web-based quarterly and project activity reporting system that has been significantly modified to reflect the new 2013 changes in OEPM.

- The PIs use this system to report on milestones, activities, metrics, accomplishments, challenges, and publications.
- On the project management side, custom-built reports allow us to review and reconcile our data for further reporting within MUREP, OEPM, and the NASA Education Office.
- This system also plays a critical role in the reporting process; as Project Activity Forms (PAFs) are submitted, a member of the MUREP NICE team reviews each form and verifies participant information with the PI. This vetted and validated data is then transferred into OEPM. The use of this web-based system has greatly improved the NICE Management Team's ability to monitor the NICE portfolio and the ability of PIs to accurately report their project activities in a timely fashion.

Through the U.S. Global Change Research Program (USGCRP) and the affiliated Interagency Communication and Education Team (ICE-T) focused on climate education and communication, this tri-agency collaboration currently has plans to extend to other relevant education programs at Federal agencies. The tri-agency partnership was featured in the FY 2012 report of the USGCRP as an example of a successful cross-agency partnership.

NICE has continued to strengthen its strategic partnership with the NASA Science Mission Directorate (SMD) and its cross-agency collaboration with sister projects at the National Science Foundation (NSF) and the National Oceanic and Atmospheric Administration (NOAA). NSF's Climate Change Education Partnerships (CCEP) Phase I and Phase II, and NOAA's Environmental Literacy Grants (ELG), when combined with the 71 NICE projects, comprise an extensive national network of climate change educators. The goals of this tri-agency partnership are to leverage existing resources, develop common evaluation frameworks, minimize duplication of effort in the portfolios, and facilitate communications among this emergent community of scientists and educators. In FY 2013, this collaborative effort saw many major accomplishments in supporting this community and climate-related STEM education initiatives nationwide:

- Last year the NICE team took a leadership role in the formation of a tri-agency Working Group focused on the development of a common evaluation framework. This group of

more than 40 agency representatives, project PIs, and project evaluators met virtually in advance of the 4th Annual PI Meeting and also gathered face-to-face during the meeting itself. A draft logic model that can be applied across the NASA, NOAA & NSF portfolios was developed over two days of intense working sessions by a cross-section of climate change educators and evaluators. Subgroups moved this draft into adoption by the tri-agency community.

The NICE team and Web Designers also led the development of the Tri-Agency Climate Education (TrACE) catalog, a comprehensive online catalog of educational resources developed by members of the tri-agency community. TrACE is an interactive, searchable web interface that contains a wide spectrum of project information to help users find relevant resources. The dataset includes, but is not limited to, target audience, grade level, type of resource (e.g., curriculum modules, museum exhibits, etc.) and geographic location. TrACE was beta-tested with NOAA and NSF staff and tri-agency PIs in September 2012, and launched with a public release on October 1, 2012. Currently, the TrACE catalog contains over 200 climate education resources, submitted by over 80 tri-agency funded projects. TrACE can be viewed at **https://nice.larc.nasa.gov/trace/trace_catalog.php.**

- The tri-agency team planned a strategic contingency plan in the event of a government shutdown so that the 2013 Climate Change Principal Investigator meeting could be held in October 2013. This took a tremendous amount of collaboration, insight, planning, and execution with our partners and PIs throughout the tri-agency community. Because of our efforts, many already expended resources and travel funding were salvaged during the furlough.

Project Contributions to Annual Performance Goal (APG) Measures

Data collection for the end of FY 2013 is ongoing and activities reported by awardees for the last quarter of the fiscal year are continually being added and reported within OEPM. As a higher education-focused activity within MUREP, NICE reports data through OEPM one year behind the calendar year. This report therefore reflects finalized data for FY 2012.

APG 5.1.2.1: ED-12-1: Achieve 40% participation of underserved and underrepresented (in race and/or ethnicity) students in NASA higher education projects.

- Because of ethical and logistical restrictions in the collection of potentially sensitive student demographic data, NICE is unable to measure APG ED-12-1.

APG 5.1.2.1: ED-12-2: Achieve 45% participation of women in NASA higher education projects.

- As in the annual performance goal above, because of ethical and logistical restrictions in the collection of individual demographic data, NICE is unable to measure APG ED-12-2.

APG 6.1.2.1: ED-12-4: 20,000 undergraduate and graduate students participate in NASA education opportunities.

- In FY 2011, over 1,405 undergraduate students participated in NICE project activities.
- In FY 2012, over 7,693 (6,951 undergraduate plus 273 community college students, and 469 post-graduate trainees - graduate students and postdoctoral researchers) participated in NICE project activities. This is a tremendous increase (448%) over last year.

APG 6.1.1.1: ED-12-3: 35,000 educators participate in NASA education programs.

- In FY 2011, 3,953 elementary and secondary educators participated in NICE project activities.
- In FY 2012, 3,800 elementary and secondary and 207 informal educators participated in NICE project activities.

APG 6.1.2.2: ED-12-5: 200,000 elementary and secondary students participate in NASA instructional and enrichment activities.

- In FY 2011, over 4,000 elementary and secondary students participated in NICE project activities.
- In FY 2012, 11,275 elementary and secondary students participated in NICE project activities. This is a tremendous increase (182%) over the number of students from last year.

APG 6.1.2.2: ED-12-6: 85% of elementary and secondary students express interest in STEM careers following their involvement in NASA education programs.

- As previously stated, because of ethical and logistical restrictions in the collection of relevant survey data, NICE is unable to measure APG ED-12-6. Because the OEPM survey instruments relevant to this APG have not been cleared by the Office of Management and Budget (OMB) in accordance with the Paperwork Reduction Act, NICE did not collect any survey responses.

APG 6.2.1.1: ED-12-7: 50% of educators use NASA resources in their curricula after participating in NASA professional development as measured by survey responses.

- As previously stated, because of ethical and logistical restrictions in the collection of relevant survey data, NICE is unable to measure APG ED-12-6. Because the OEPM survey instruments relevant to this APG have not been cleared by the Office of Management and Budget (OMB) in accordance with the Paperwork Reduction Act, NICE did not collect any survey responses.

APG 6.4.1.1: ED-12-9: 420 museums and science centers across the country actively engage the public in major NASA events.

- APG ED-12-9 is not applicable to the goals and/or activities of MUREP NICE.

Improvements Made in the Past Year

MUREP NICE implemented a significant expansion of MUREP NICE via NASA's Digital Learning Network, educator professional development efforts, improved the reporting and data reconciliation processes, and provided major contributions to the successful mission accomplishment NASA/MUREP goals, and to the tri-agency collaboration with NOAA and NSF. Other improvements include:

- **Leveraging strategic collaborations,** including an ongoing collaboration with Virginia Space Grant Consortium and MUREP NICE Team Contractors/Webmasters, NASA's Digital Learning Network (DLN), AIHEC, and the Geoscience Alliance, in order to increase awareness of NICE activities and opportunities. These collaborations advance NICE's reach to MSIs and, in particular, to institutions that serve Native American/Tribal and Hispanic communities.

- **Strengthening the evaluation component of MUREP NICE**, to further ensure that activities and outcomes are strongly aligned to NICE objectives. Evaluation activities carried out in FY 2012-2013 range from the development of a project logic model to our contributions in leading the tri-agency common evaluation working group.

- **Revising the quarterly reporting system based on 2013 changes in OEPM and custom reports** for project management, along with a workflow process for verifying and validating all data in preparation for timely entry into OEPM.

- **Additional enhancement of the MUREP NICE website** to include improved site navigation, strategic opportunities, communication, modern interfaces, migration to DRUPAL (upgraded flexibility and maintenance), and a streamlined set of resources for PIs, evaluators, educators, and the general public.

- **Inviting Minority Serving Institutions to participate in the tri-agency PI meetings**, expanding the breadth of the tri-agency community collaboration and its reach to students from underrepresented and underserved backgrounds. By cultivating diversity in our partnerships and community, MUREP NICE contributes to the Agency's core values.

- **Continuing to focus on higher education, particularly at minority serving institutions**, resulting in an increase in the number of climate-infused higher education courses added or improved through MUREP NICE funding. In FY 2011, 42 new or revised higher education courses were offered, with this number rising to 70 in FY 2012.

Project Partners and Role of Partners in Project Execution

The 71 awardees (including 41 currently-active projects) are partners in MUREP NICE. Under their grants and cooperative agreements, they create new courses, provide teacher professional development workshops and research internships, create new curricula and online courses for undergraduates and K-12 students, and provide research experiences for K-12 and undergraduate students.

Other MUREP NICE partners include the NASA Science Mission Directorate (SMD), and the NSF and NOAA climate change education programs. By leveraging and working with this vast community of climate scientists and educators, MUREP NICE and our awardees are connected into a powerful national network.

Virginia Space Grant Consortium (VSGC), in partnership with NASA Langley Research Center, provides educational outreach and support to NICE and plays a key role in integrating the tri-agency PIs and evaluators into a community of practice. The have increased their role in support of the NICE Management Team in supporting the EPD expansion efforts.

The NASA Digital Learning Network (DLN) has the potential of expanding to hundreds of thousands of students and educators throughout the nation. By collaborating and leveraging DLN's existing network of educators across the nation, NICE can expand its reach into classrooms in primary, secondary, and higher education institutions. Additionally, this relationship will enable NICE funded PIs to better accomplish their activities, by allowing project activities to include teachers and students beyond their local area. They will also be able to obtain expanded EPD opportunities and save limited travel resources. Because DLN allows NICE and the PIs to overcome logistical difficulties associated with physical proximity, this ongoing partnership has already had a major impact and is anticipated to provide an even greater potential for NICE.

Presentations & Dissemination (FY 2013-MUREP NICE team members are listed in **BOLD**)

Martin, A.M., Chambers, L.H., Pippin, M.R., & Baek, J.Y. "Plans, Approaches, Needs, Context, and Reality: Meta-Evaluation of a Portfolio of External Climate Education Projects Funded by the National Aeronautics and Space Administration (NASA)." Poster. American Evaluation Association, 2013 (Washington, DC).

Martin, A.M., Chambers, L.H., Pippin, M.R., Baek, J.Y., Fraser, J., Kelly, K., & Smith, C., on behalf of the Tri-Agency Common Evaluation Working Group. "Tri-Agency Common Evaluation Working Group: Coordinating a Grassroots Group of Evaluators." Oral. American Evaluation Association, 2013 (Washington, DC).

Martin, A.M. "Grassroots Efforts to Coordinate Evaluation of Climate Education Initiatives Across Three Federal Agencies: Perspectives and Lessons Learned from Agencies, Program Officers, and Project Evaluators." Multi-presentation panel. American Evaluation Association, 2013 (Washington, DC).

Martin, A.M., Chambers, L.H., & Pippin, M.R. "What and How Are We Evaluating? Meta-Evaluation of Climate Education Projects Funded by NASA." Oral. 125th Annual Meeting of the Astronomical Society of the Pacific, 2013 (San Jose, CA).

Low, R., Mandryk, C., & **Martin, A.M.** "Extreme Evaluation: Beyond Pre-Post Content Knowledge Assessments to Put Evaluation to Work for You." 2 hour special workshop session. 125th Annual Meeting of the Astronomical Society of the Pacific, 2013 (San Jose, CA).

Martin, A.M., Chambers, L.H., Pippin, M.R., & Spruill, K. "Maximizing the Impact of the NASA Innovations in Climate Education (NICE) Project: Building a Community of Project Evaluators, Collaborating Across Agencies, and Evaluating a 71-Project Portfolio." Poster. American Geophysical Union Fall Meeting, 2012 (San Francisco, CA).

McDougall, C., **Martin, A.M., Givens, S.M.,** Yue, S., Wilson, C., & Karsten, J.L. "The Tri-Agency Climate Education (TrACE) Catalog: Promoting Collaboration, Effective Practice, and a Robust Portfolio by Sharing Educational Resources Developed Across NASA, NOAA & NSF Climate Education Initiatives." Poster. American Geophysical Union Fall Meeting, 2012 (San Francisco, CA).

Martin, A.M., Givens, S.M., & Chambers, L.H. "Climate Education Resources in the Tri-Agency Climate Education (TrACE) Catalog." In-booth NASA presentation in exhibit hall. American Geophysical Union Fall Meeting, 2012 (San Francisco, CA).

Martin, A.M., Chambers, L.H., Pippin, M.R., Geyer, A., Karsten, J., Baek, J., & Yue, S. "Measuring and Maximizing the Impact of a Federally-Funded Climate Education Portfolio via Strategic Partnerships and Collaboration." Invited Oral. Geological Society of America Annual Meeting and Exposition, 2012 (Charlotte, NC).

Kelly, K., **Martin, A.M.,** Smith, C., Baek, J., Farr, B., & Fraser, J. "Tri-Agency Efforts Toward a Common Evaluation Framework for Climate Change Education Projects: Discussion in the Context of 2012 Recommendations for the Evaluation of Federally Funded STEM Education Initiatives." Facilitated discussion. American Evaluation Association, 2012 (Minneapolis, MN).

Martin, A.M., Chambers, L.H., Pippin, M.R., & Spruill, K. "Balancing Evaluation Ideals Against Government Agency Realities: Internally Evaluating a Multi-Site, NASA-Funded Climate Education Initiative." Poster. American Evaluation Association, 2012 (Minneapolis, MN).

Martin, A.M., Chambers, L.H., Pippin, M.R., & Spruill, K. "NASA Innovations in Climate Education (NICE): Maximizing and Measuring Impact." Poster. 124th Annual Meeting of the Astronomical Society of the Pacific, 2012 (Tucson, AZ).

Martin, A.M. "Dipping Your Toes Into Evaluation in 5 Easy Steps: Tips, Tricks and Lessons Learned." Oral. 124th Annual Meeting of the Astronomical Society of the Pacific, 2012 (Tucson, AZ).

McDougall, C., Wilson, C., **Martin, A.M.**, & Knippenberg, L. "The Matrix: Facilitating Collaboration, Sharing Effective Practice, and Assessing the Portfolio Diversity Across 120 Federally Funded Climate Change Education Projects." Poster. American Geophysical Union Fall Meeting, 2011 (San Francisco, CA).

Martin, A.M. "Evaluation." Oral presentation. NASA Innovations in Climate Education New PI Meeting, 2011 (Raleigh, NC).

Non-Refereed Conference Proceedings

Martin, A.M., Chambers, L.H., & Pippin, M.R. "What and How Are We Evaluating? Meta-Evaluation of Climate Education Projects Funded by NASA." *Ensuring STEM Literacy: 125th Annual Meeting of the Astronomical Society of the Pacific,* 2013. To be published in Proceedings of the Astronomical Society of the Pacific.

Low, R., Mandryk, C., & **Martin, A.M.** "Extreme Evaluation: Beyond Pre-Post Content Knowledge Assessments to Put Evaluation to Work for You." *Ensuring STEM Literacy: 125th Annual Meeting of the Astronomical Society of the Pacific,* 2013. To be published in Proceedings of the Astronomical Society of the Pacific.

Martin, A.M., Chambers, L.H., Pippin, M.R., & Spruill, K. "NASA Innovations in Climate Education (NICE): Maximizing and Measuring Impact." *Communicating Science: A National Conference on Science Education and Public Outreach,* 2013. Proceedings of the Astronomical Society of the Pacific, Vol. CS473.

Martin, A.M. "Dipping Your Toes Into Evaluation in 5 Easy Steps: Tips, Tricks and Lessons Learned." *Communicating Science: A National Conference on Science Education and Public Outreach,* 2013. Proceedings of the Astronomical Society of the Pacific, Vol. CS473.