



June 2017 Newsletter Volume 3 Number 1

“Purposeful Alternatives to Protest” by Suzanne Traub-Metlay, TED President

NAGT members take seriously our responsibility to advocate for science and science education, especially geoscience education. Proudly wearing NAGT T-shirts, many participated in the April 2017 March for Science nationally or at the local level. Political protest, for some, has become a defining feature of personal time and NAGT is an active partner with the on-going nonpartisan March for Science movement (1).

Not everyone is comfortable taking a public role. Many science educators find it more effective to win hearts and minds by representing the benefits of science literacy throughout the year, through fun public events or more long-term community service. These are not exclusive – one can publicly march and privately volunteer. It is wise to remember that there are purposeful alternatives to protest.

In the short-term, give the public positive experiences – for example, take advantage of the upcoming “All-American” eclipse on 21 August 2017 to talk about astronomy education, the importance of dark-sky sites, or the relevance of public parks. At other times, engage seniors as well as students in community participation events & citizen science opportunities. Make public presentations. Volunteer in K-12 classrooms or afterschool STEM clubs.

Whenever possible, emphasize common ground with the larger community. Ranchers & farmers care about their land; hunters and fishers pay through licensing fees for more pristine natural environments. For those of progressive religious faith, “creation care” means environmental stewardship. Millennials and post-millennials, meaning anyone born after 1985, care deeply about the global commons as well as their own local communities.

In the long-term, they want to see scientists and science educators serve their (our) communities. Whether you get out in front of your neighbors or quietly blog from home, advocate for science education or support pro-science candidates. 2018 is an election year – contribute with time or money or volunteer effort in campaigns from local school board to Congress. Social media may be attributable or anonymous – use posts, chats, retweets, etc. to further your message.

NAGT reminds us to act *“in ways that are inclusive of all people and respectful of different political viewpoints. Our goal is to build strong support for science and science education across all people and political parties”* (2).

Avoid lobbying in the name of NAGT – as a 501(c)(3) organization, there are limits to political activities, especially for or against particular candidates, elected officials, or legislation. NAGT must stay nonpartisan and non-specific to preserve its tax-exempt status. As an individual, however, you are free to lobby or otherwise participate in the political process.

Please follow the “NAGT Code of Conduct:

1. *Treat all people with respect regardless of whether or not you agree with their point of view — listen and be kind.*
2. *Obey the law and respond immediately to any requests by officials.*
3. *Use your best skills as an educator when discussing science and science education with others:*
 - *Support learning and active inquiry - engage, don't tell*
 - *Start from others' current understandings and draw on their life experiences - listen first*
 - *Be respectful of others' emotions - fear and anger inhibit learning” (3).*

Remind your listeners that geoscientists and geoscience educators are generally not anti-religious or always politically liberal; we are all over the faith and political spectrum. You are not trying to convert or defend science as the only “right” way to think. Reassure that science provides critical thinking skills that help discern reality from fake news. Intellectual diversity is valued while unsupported arguments in science must be let go. Science is a human endeavor; scientists and science educators strive to understand and enrich the human experience.

If you must disagree, please do so civilly in person and online. Karin Kirk noted in an investigation for Yale Climate Connections that “... *it's possible to disagree while still maintaining basic social order.... it's also possible to agree in an uncivil way*” (4). Show the benefits of your point of view. Don't just knock down others' arguments – build up. Be concrete, not vague – use specific examples relevant to your local area.

In January 2017, James Delingpole on Breitbart.com quoted an unnamed source as saying, “*If you dig up stuff, if you make stuff, if you grow stuff then for the first time since Reagan you have a president who has actually got your back*” (5). That's a great opportunity to point out that those who “*dig up stuff... make stuff... [and] grow stuff*” are employed in mining, manufacturing and farming – all dependent on responsible natural resource management and healthy ecosystems. Conserve is at the heart of conservative - preserving land heritage and legacy (such as maintaining public lands against private encroachment) empowers future economic growth.

For those who personally remember President Ronald Reagan, remind them that in his 1984 State of the Union address he famously said, “*Preservation of our environment is not a liberal or conservative challenge, it's common sense.*” He then went on to request “*for EPA one of the largest percentage budget increases of any agency*” and a range of other federal actions to preserve vital natural resources. (6). Reagan considered his 1988 ratification of the Montreal Protocol to avoid destruction of the world's ozone layer to be “*a monumental achievement*” based on scientific study (7).

A recent Cornell university study reported that “*74.4 percent of respondents who identified as Republicans said they believed that climate change is really happening*” (8). Climate conscious conservatives use websites like <http://www.republican.org/alerts>. On 20 June 2017, the conservative-leaning Climate Leadership Council ran a full page ad in the *Wall Street Journal* calling for “*a consensus climate solution that bridges partisan divides, strengthens our economy and protects our shared environment*” – founding members range from ExxonMobil to the Nature Conservancy (9).

Americans will gather this summer for many community events such as 4th of July picnics and August eclipse parties. Use your expertise and experience as geoscientists and geoscience educators to join your neighbors in celebrating the wonders of our shared environment - teach them why they are worth

preserving. Sometimes we need to march and shout. Other times, it may be more effective to be a quiet but consistent voice advocating for science education and environmental conservation.

References:

- (1) NAGT (2017). March for Science page retrieved from https://nagt.org/nagt/policy/march_science.html
- (2) Ibid.
- (3) Ibid.
- (4) Kirk, K. (2017). "Contrasting Styles in Online Climate Change Posts". Retrieved from <http://www.yaleclimateconnections.org/2017/03/contrasting-styles-in-online-climate-change-posts-pt-2/>
- (5) Delingpole, J. (2017). "Trump Versus the Green Blob—Here's How We Know He Means Business". Retrieved from <http://www.breitbart.com/big-government/2017/01/03/delingpole-trump-versus-the-green-blob-heres-how-we-know-he-means-business/>
- (6) Reagan, R. (1984). "Address Before a Joint Session of the Congress on the State of the Union: January 25, 1984". Retrieved from *The American Presidency Project*, compiled by Gerhard Peters and John T. Woolley, at <http://www.presidency.ucsb.edu/ws/?pid=40205>
- (7) Reagan, R. (1988). ""Statement on Signing the Montreal Protocol on Ozone-Depleting Substances: April 5, 1988". Retrieved from *The American Presidency Project*, compiled by Gerhard Peters and John T. Woolley, at <http://www.presidency.ucsb.edu/ws/?pid=35639>
- (8) Kelley, S. (2017). "Saying 'climate change' instead of 'global warming' decreases partisan gap by 30 percent in U.S." Retrieved from <https://phys.org/news/2017-06-climate-global-decreases-partisan-gap.html>
- (9) Climate Leadership Council (2017). Paid advertisement in *Wall Street Journal*, page A6B, dated 20 June 2017. Retrieved from https://www.clcouncil.org/wp-content/uploads/2017/06/Climate_Leadership_Council_WSJ_Ad.pdf

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2. High school earth and space science should be taught by geoscientists

Elizabeth B. Lewis

A recent survey of U.S. science teachers' understanding, perspectives and teaching of climate change — an important earth and space science (ESS) standard included in the new Next Generation Science Standards (NGSS) — revealed that teachers spend an average of only one to two hours per year teaching students about climate change. However, the authors did not distinguish between qualified ESS teachers and other teachers, like biology, physics or chemistry teachers who might be charged with teaching ESS topics. This, and other similar studies, suggest that many secondary teachers currently teaching climate change do not have sufficient content knowledge to teach the topic accurately, although they do not explain why teachers are teaching ESS out-of-field, or how we might improve the situation.

Because of its multifaceted nature, teaching ESS takes expertise and time. Secondary science teachers tend to have particular expertise in one of three domains — life sciences, physical sciences or ESS — each of which has its own theories, concepts and disciplinary core ideas. Effective ESS teaching requires that teachers adopt a systemic approach to build students' knowledge of all Earth systems (geosphere/hydrosphere/atmosphere), ideally, in well-developed curricular units. However, this teaching model has not been adopted consistently. Content knowledge matters in successful teaching. It may seem to be common sense to assume that ESS is taught by qualified teachers, but, unfortunately, this is not the case in every state.

In high school ESS education, there is a history of marginalization nationally that reveals a desperate shortage of qualified ESS teachers to teach issues critical to society. And geoscience education scholars have reported minimal success of, and sometimes political resistance to, ESS education in the last 40 years. Many factors are involved, but some have been more difficult to overcome than others, including perceptions of geoscience as a lesser science, stalled attempts to include ESS in high school curricula, and insufficient numbers of qualified ESS teachers.

The National Association of Geoscience Teachers (NAGT) reports that 8th grade is often the last time American students study ESS. High school students' access to the subject in classes varies widely from state to state, but, on average, just 11 percent take an ESS course. Finally, there have never been enough highly qualified ESS teachers. In 1966, it was estimated that there were about 6,000 to 7,000 earth science teachers in the U.S., but the Earth Science Curriculum Project staff predicted a need for 20,000 teachers by 1970. Fifty years later, the number of ESS teachers (15,611) still falls far short of the number of biology teachers (52,697), who teach the 88 percent of all high school students nationwide who take one biology course. If ESS is to be taught at the same frequency and quality as biology courses, many more competent ESS teachers must be prepared and hired.

It is not surprising that all science teachers do not understand climate change or how to teach it; this shouldn't necessarily be an expectation, as we need teachers with expertise across many fields. But, in general, out-of-field teachers are simply not as effective at teaching what they do not know themselves. By requiring initial ESS teacher certification to be more rigorous and content-specific, we can improve secondary ESS education through policy and practice. Better teacher preparation will also help us achieve scientific literacy nationwide and facilitate citizens' understanding of long-term environmental sustainability, global climate change and natural disasters. Ultimately, for future generations to understand the complex planet they live on, we will need more geoscientists to serve as qualified ESS teachers and advocates for ESS education.



Elizabeth Lewis is an associate professor of science education at the University of Nebraska-Lincoln where she prepares secondary science teachers. Her research interests include novice-to-expert science teacher learning and geoscience education issues. She holds a bachelor of science in geology, a master of science in geoscience, and a doctorate in curriculum and instruction. She taught 9th-grade ESS for seven years. The views expressed are her own. She can be reached at: elewis3@unl.edu.

Summarized excerpt from commentary published in Earth magazine (January 2017 issue) and used with permission of American Geological Institute.

Full article can be found at: <http://digitalcommons.unl.edu/teachlearnfacpub/235/>

3. See You at the Rendezvous, Albuquerque, July 17-21, 2017

Registration is open for the Earth Educators' Rendezvous in Albuquerque, July 17-21, 2017. The program, descriptions of workshops, and additional details are available at http://serc.carleton.edu/earth_rendezvous/2017/index.html

4. IAGD Offers Professional Development

Inclusion in the Geosciences-Instructional Approaches to Access and Accommodation

This mini-workshop will be held on Wednesday, 19 July, from 1:30 - 4:00 PM as part of the Earth Educators Rendezvous 2017 in Albuquerque, NM (see http://serc.carleton.edu/earth_rendezvous/2017/). We will use interactive techniques to address:

- * Barriers to the Geoscience Curriculum
- * Introduction to Universal Design for Learning (UDL)
- * Highlight Accommodations for Limited Mobility and Physical Disabilities
- * Highlight Accommodations for Sensory and Non-Apparent Disabilities

5. NAGT-TED Sponsors Three Sessions at GSA-Seattle 2017: Which One is Best for You?

Suzanne Metlay, NAGT-TED Vice President

GSA-Seattle 2017 is going to be great! Arrive on Saturday 21 October for the Icebreaker, join our NAGT-TED meeting on Sunday evening, and stay for the sessions and symposia during **22-25 October 2017** at the Washington State Convention Center. **Abstracts are due on Tuesday 1 August at 11:59pm Pacific Time** but don't wait until then to submit. Start thinking now about which session is best for your presentation and networking. Contact the session chairs for details – see below for full session rationales and contact info.

*Are you a member of NESTA or in a state that has not yet adopted NGSS? Then consider **T124. Practical Advice for In-Service and Pre-Service K-12 Earth Science Teacher Preparation and Professional Development.** This session emphasizes teacher needs resulting from revised state science standards and implementation of the *Framework for K-12 Science Education*. Discuss how your teacher preparation programs are successfully evolving as the educational landscape shifts. K-12 Earth Science teachers, informal educators, and anyone involved in geoscience professional development are encouraged to showcase effective collaborations between teachers and teacher educators.*

*Are you engaged in teacher education research? Then try **T125. Preparing the Next Generation of Geoscience Educators: Research on Teacher Education.** This session highlights research on current and future geoscience teacher attitudes, beliefs, knowledge, and practices across K-12 and higher education, including research on the preparation of teaching assistants and future faculty. It is co-sponsored (and co-hosted) by the National Association of Geoscience Teachers (NAGT) Teacher Education Division (TED) and the Geoscience Education Research (GER) Division.*

*Are you implementing NGSS in your classroom or teacher preparation program? Then ponder **T130. The Other Two Dimensions of NGSS: Science and Engineering Practices and Cross-Cutting Concepts in Support of Earth Science Teacher Education.** This session highlights how these dimensions reinforce disciplinary content through active learning and development of critical thinking skills. Present how you incorporate methods and practices of Earth Science such as hypothesis testing, measurement, and observation into 3-dimensional teacher preparation and professional development.*

Looking forward to seeing you in Seattle!

6. Additional Geoscience Education Sessions at GSA-Seattle 2017

Time to start thinking about your presentation for the 2017 GSA National Meeting, October 22-25 in Seattle, WA! This year boasts a wide array of education-focused sessions, with many specific to teacher education. Please consider submitting an abstract and joining your colleagues in Seattle – abstract are due August 1.

Below is a sample of sessions related to teacher education and/or sponsored by NAGT. For a full listing of sessions, see: <http://community.geosociety.org/gsa2017/science-careers/sessions/topical>

T114. Getting It Done: Experiences of Implementing the Framework and NGSS in Earth and Space Science

Aida Awad, Ed C. Robeck, Susan Sullivan

The geoscience education community has taken action to implement the Framework for K-12 Science Education and the NGSS. This session will share case studies, lessons learned, and personal reflections of implementation efforts, even unvarnished ones.

T116. How to Engage Pre-Service Teachers in Authentic NGSS-Aligned Learning in Undergraduate Geology Classrooms

Susan M. DeBari

GSA Geoscience Education Division

This session seeks to explore the ways that 2- and 4-year colleges and universities provide learning experiences in geoscience classrooms for future teachers. We seek presentations that provide best practices and can share measurable outcomes.

T126. Professional Development Locally to Achieve Earth Science Literacy Globally: Successful Models of K–12 Teacher Professional Development Ready for Emulation in New Environments (Posters)

Sadredin C. Moosavi

GSA Geoscience Education Division; National Association of Geoscience Teachers; National Earth Science Teachers Association; American Geophysical Institute

This session seeks to show case successful K–12 earth science teacher professional development programs that can serve as models for use in new, underserved environments using local GSA members' talents and community/industry resources.

Other NAGT-sponsored sessions:

T99. Augmented and Virtual Reality in Geoscience Education

Rachel M. Atkins, Christine M. Clark, Shelley J. Whitmeyer

GSA Geoscience Education Division; National Association of Geoscience Teachers; GSA Geoinformatics Division

Handheld and immersive augmented and virtual reality experiences make it easier to bring more realistic, engaging experiences into our classrooms. This session will explore teaching and research applications using augmented reality (AR) and virtual reality (VR).

Geoscience Education | Geoscience Information/Communication | Geoinformatics

T100. Barriers, Misconceptions, and Progress in Improving Climate Literacy and Strategies for Communicating about Climate Change

Anne U. Gold, Mona Behl, Bonnie Murray

GSA Geoscience Education Division; National Association of Geoscience Teachers, Division of Geoscience Education Research; National Association of Geoscience Teachers; Climate Literacy Network (CLEAN); GSA Geology and Society Division

The session will focus on research and evaluation of climate literacy efforts, effective ways of communicating about climate change in general, but also in culturally relevant contexts.

Geoscience Education | Geoscience Information/Communication | Geoscience and Public Policy

T101. Better Together: Partnerships That Facilitate or Enhance Experiential Learning in Undergraduate Geoscience Education

Miriam Barquero-Molina, Jonathan W. Mies

GSA Geoscience Education Division; National Association of Geoscience Teachers

A showcase of partnerships, consortiums, and collaborations that help to overcome the challenges of providing experiential learning (student research, student service, and domestic and study-abroad field courses) in geoscience programs.

Geoscience Education | Geoscience Information/Communication

T106. Climate Literacy in Formal and Informal Education, for Policy Makers and the Public

Anne Gold, Don Duggan-Haas, Carey Stanton, Larissa Johnson

GSA Geoscience Education Division; National Association of Geoscience Teachers; Climate Literacy Network (CLEAN); GSA Geology and Society Division

The session will focus on activities in formal and informal education, and engagement with decision makers, networks, and the public that can extend the reach and effectiveness of climate literacy efforts.

Geoscience Education | Geoscience and Public Policy | Geoscience Information/Communication

T108. EarthCache: Engaging Students and the Public in Geoscience Education, Communication, and Outreach

Matthew Dawson, Charles W. Carrigan

National Association of Geoscience Teachers

The EarthCache program is a partnership between GSA and Geocaching.com. This session explores how geoscience educators can use EarthCache sites to engage with students and the public for geoscience education, communication, and outreach.

Geoscience Education | Geoscience Information/Communication | Geoscience and Public Policy

T112. Geoscience Education at Two-Year Colleges

Brett S. Dooley, Callan Bentley, Wendi J.W. Williams

GSA Geoscience Education Division; GSA Geology and Society Division; International Association for Geoscience Diversity; National Association of Geoscience Teachers; National Association of Geoscience Teachers Geo2YC Division; National Earth Science Teachers Association

Two-Year Colleges (2YCs) are important to diverse and inclusive geoscience workforce recruitment and retention of student populations pursuing STEM and teaching degrees. This session will showcase strategies, curriculum, and partnerships.

Geoscience Education | Geoscience Information/Communication | Geoscience and Public Policy

T113. Geoscience Education Research: Implications for Undergraduate Geoscience Teaching and Learning

Kristen St. John, Karen McNeal, Anne Gold, Katherine Ryker

National Association of Geoscience Teachers; GSA Geoscience Education Division; National Association of Geoscience Teachers, Division of Geoscience Education Research

This session highlights how GER findings can be translated into teaching and identifying future directions for research with the broader geoscience community. Specific topics may include active learning, teaching with technology/modeling, diversity, and interdisciplinary collaborations.

Geoscience Education | Geoscience Information/Communication

T115. Hands-On Teaching Demonstrations that Combine Geoscience and Societal Issues: Audience Participation Requested!

Elizabeth A. Nagy-Shadman, Anne E. Egger

National Association of Geoscience Teachers; GSA Geoscience Education Division

This is a geoscience education session that practices what it preaches. Authors present micro-demonstrations of effective teaching activities that integrate geoscience content with societal concerns. Presentations include audience participation, assessment results, and reflections on effectiveness.

Geoscience Education | Environmental Geoscience

T117. Innovation and Collaboration Supporting Undergraduates

Sarah K. Fortner, Elizabeth Heise, Jennifer C. Latimer

Council on Undergraduate Research Geosciences Division; National Association of Geoscience Teachers

We seek broad examples of service learning (e.g., outreach, social media engagement, science advocacy, community-based or campus research, and collaboration with non-profits, artists, and businesses). Approaches that serve diverse students and institutional setting are welcome.

Geoscience Education

T118. Integration of Field and Laboratory-Based Experience toward Designing Pedagogically Sound Curriculum Enhancement Activities in the Geosciences (Posters)

Nazrul I. Khandaker, Arif M. Sikder, Stanley Schleifer

GSA Hydrogeology Division; GSA Sedimentary Geology Division; National Association of Geoscience Teachers; American Institute of Professional Geologists; GSA Environmental and Engineering Geology Division; GSA Geoscience Education Division; National Earth Science Teachers Association; GSA Quaternary Geology and Geomorphology Division; Council on Undergraduate Research Geosciences Division; GSA Geoinformatics Division; GSA Environmental and Engineering Geology Division

Classroom knowledge becomes understandable, relevant, and meaningful through field-and-data-based information obtained through the infusion of technology, in particular, as related to sediment composition, discrete mineral phase, micro-fabric, structural anisotropy, etc. K9–16 students are highly encouraged to share their research experience.

Geoscience Education | Geoscience Information/Communication | Geoscience and Public Policy

T120. Making Thinking Visible: Actions and Expressions of Problem Solving and Decision Making in the Geosciences

Eric M. Riggs, Lauren N. Holder, Angela Van Boening

GSA Geoscience Education Division; National Association of Geoscience Teachers, Division of Geoscience Education Research

This session presents evidence-based studies that aim to make thinking visible in order to understand geologic problem solving. We encourage rigorous research investigating approaches and techniques to externalize, document, and understand geologic thinking and cognition.

Geoscience Education

T122. On the Cutting Edge: Fifteen Years of Impacts on Geoscience Education

David W. Mogk, Heather Macdonald, Michael E. Wysession

GSA Geoscience Education Division; National Association of Geoscience Teachers

This session requests contributions from geoscience educators who contributed to, or benefitted from, the On the Cutting Edge program, with a focus on impacts on faculty professional development, courses and curricula, assessments, student success, and diversity.

Geoscience Education

T127. Supporting Geoscience Student Transfer Between Institutions and Transitions into the Workforce: Pathways to Success

Norlene R. Emerson, Eric M.D. Baer, Allan Ludman

GSA Geology and Society Division; GSA Geoscience Education Division; National Association of Geoscience Teachers; National Association of Geoscience Teachers Geo2YC Division

Topics might include cross-institutional collaborations including recruitment, undergraduate research, field trips, and 2YC–4YCU faculty interactions; GEOPATHS or bridge programs, advising/support strategies; career development and preparation; research on transfer; and/or impact on broadening access.

Geoscience Education | Geoscience and Public Policy | Geoscience Information/Communication

T129. The Challenge of Defining Student Success: Broadening Participation, Measuring Success, and Preparing 2YC and 4YC Students for a Variety of Transitions

Katrien J. van der Hoeven Kraft, Peter J. Berquist, Joshua Villalobos

National Association of Geoscience Teachers; GSA Geoscience Education Division; National Association of Geoscience Teachers Geo2YC Division

"Student success" is a core principle throughout academia, yet there is no one-size-fits-all approach. This session seeks presentations from individuals, institutions, and organizations that have attempted novel approaches to ensure the success of all students.

Geoscience Education

T131. Translating Professional Development Experiences into the Classroom

Megan H. Jones, Jacquelyn Hams, Richard M. Jones

GSA Geoscience Education Division; National Association of Geoscience Teachers

Professional development aims to share knowledge and skills with faculty, expecting that they bring their experiences into their classrooms. We welcome examples of faculty adaptations, new instructional methods, or curriculum inspired by professional development experiences.

Geoscience Education

T132. Undergraduate Research Posters Showcasing Research by 2YC and 4YCU Geoscience Students (Posters)

Gretchen L. Miller, Adrienne A. Leinbach, Stephanie M. Rollins

GSA Geoscience Education Division; National Association of Geoscience Teachers; National Association of Geoscience Teachers Geo2YC Division; International Association for Geoscience Diversity

This session is designed for two-year college (2YC) and four-year college and university (4YCU) students presenting research in any sub-discipline of geoscience. Projects supported by NSF's Improving Undergraduate STEM Education program (IUSE) are encouraged.

Geoscience Education | Geoscience Information/Communication