Preview of Award 1560862 - Annual Project Report

Cover

Federal Agency and Organization Element to Which Report is Submitted:	4900
Federal Grant or Other Identifying Number Assigned by Agency:	1560862
Project Title:	RCN: Transformative Research in Geography Education
PD/PI Name:	Michael N Solem, Principal Investigator Richard G Boehm, Co-Principal Investigator
Recipient Organization:	Association of American Geographers
Project/Grant Period:	06/01/2016 - 05/31/2021
Reporting Period:	06/01/2016 - 05/31/2017
Submitting Official (if other than PD\PI):	Michael N Solem Principal Investigator
Submission Date:	05/13/2017
Signature of Submitting Official (signature shall be submitted in accordance with agency specific instructions)	Michael N Solem

Accomplishments

* What are the major goals of the project?

This RCN project has six major goals:

1. Catalyze research planning with strong potential to result in transformative research projects in geography education.
2. Facilitate collaborative research among geographers and STEM education researchers.
3. Attract more diverse cohorts of graduate students to Ph.D. programs in Geography Education.
4. Increase research productivity and the knowledge base in geography education.
5. Secure the long-term growth and stability of the RCN.
6. Promote the use of research to improve practice in geography education.

The primary mechanism for pursuing the goals under this project is a grant program administered by the National Center for Research in Geography Education (NCRGE). This grant program is designed to catalyze the formation of research groups working in different thematic areas of geography education research. Their research planning activities are intended to position them for long-term work connected to the Road Map Project's agenda for transformative research. See appended group reports for details.

* What was accomplished under these goals (you must provide information for at least one of the 4 categories below)?

Major Activities: In the first year of the project, NCRGE awarded three grants to support research groups in the areas of 1) Learning Progressions, 2) Project-based Learning, and 3) Spatial Thinking Assessment. Their activities and accomplishments in relation to the six major project goals are summarized below.

Spatial thinking assessment. One research group, originating with Geographic Alliances in Maine, New Hampshire, and Colorado, received an NCRGE grant to develop a line of research in the area of assessment, with a specific focus on maps and spatial thinking in elementary school classrooms. Research on spatial thinking is relatively deep, with intriguing connections to learning processes in math and science. Building further on that literature, this group developed a framework for analyzing how students learn fundamental mathematics and spatial analysis skills using giant floor maps of each state. The primary goal of their research planning was to formulate procedures for interacting with teachers, researchers, and Geographic Alliance Coordinators in order to prepare for future research investigating how experience on giant maps impacts students' understanding of space and mathematical thinking. The transformative potential of this project is evident in the capacity building afforded by developing and testing research instruments and procedures capable of replication in multiple types of classrooms, schools, and districts. Geography faculty, education faculty, mathematics faculty, graduate students, and elementary school teachers all participated in these development and assessment activities.

Geography learning progressions. A second research group, based at Kansas State University and the Kansas Geographic Alliance, received funding to expand the learning progressions research of NCRGE's GeoProgressions project. The Road Map project identified learning progressions as a significant area of research pioneered in math and science education. One of the key outcomes of GeoProgressions was the publication of a research handbook on learning progressions for maps, geospatial technology, and spatial thinking that was collaboratively developed by geographers and STEM education researchers (Solem, Huynh, and Boehm 2015). The Kansas State-led research group is building upon this prior work by researching learning progressions in the context of national geography standards for teaching and learning about places and regions. Whereas the literature on spatial cognition is relatively deep and interdisciplinary, much less is known about the ways children develop successively more complex and sophisticated knowledge of the geographic concepts of place and region. To evince a path forward, this research group convened a workshop in fall of

2016 that brought together established learning progressions scholars, geography education and cognitive psychology researchers, early career geography education specialists, and teachers affiliated with the Kansas Geographic Alliance. The workshop addressed the current state of knowledge related to K-12 teaching about places and regions, as a prelude to research that enables the development of learning progressions that capture the complexity and contested nature of places and regions. Following the workshop, the research group will collaboratively write a manuscript based on the workshop proceedings. This publication will be contributed to the existing GeoProgressions research clearinghouse as a resource to support future proposals and activities of this research group. Over time, their research has potential to challenge assumptions about how children comprehend the concept of place and how this influences their understanding of geographic processes related to climate change, migration, national identity, and other relevant topics.

Geospatially-enabled project-based learning. The third research group that received funding in 2016 focused its activities in the area of project-based learning (PBL) with geospatial technology. The group is led by researchers at Texas Tech University and Concordia University, with additional collaborators in Panama. They are working to support research recommendations in the Road Map Project by examining field-based learning in a virtual setting and the need for data collection in other natural learning environments, including laboratory settings. Through a series of research meetings, the group designed a pilot study to analyze how authentic project-based learning classrooms can be connected internationally to support geographic and geospatial learning. U.S. secondary school students engaged remotely with Panamanian peers to populate an OpenStreetMap of areas in Panama's Azuero Peninsula. Through observations of these learning spaces and interactions, the project identified the key mechanisms and assessments of project-based learning environments using geospatial technologies. As one of the most transformative movements in 21st century education, PBL shows broad promise for effective teaching and learning of geography with geospatial technologies. There is a paucity of research that investigates the value of an international component to PBL for transforming geography learning, particularly content linked to national standards and geospatial competencies. By analyzing how students think geographically through international interactions, the project is pioneering work on the notion that there is a scalar dimension to how people learn and think about local-to-global environmental connections and processes.

Specific Objectives: One of the major goals of this RCN project is to nuture the growth of an interdisciplinary and international network of researchers in geography education. See attached RCN member overview for data on the current membership and areas of expertise within the RCN.

Significant Results:

Key outcomes or Other achievements:

* What opportunities for training and professional development has the project provided?

Refer to attached individual reports from the three research groups funded by the 2016 Transformative Research in Geography Education program.

* How have the results been disseminated to communities of interest?

For the 2017 AAG Annual Meeting in Boston, the National Center for Research in Geography Education is welcoming abstracts and organized session proposals for a special track of sessions on *Transformative Research in Geography Education*. This is the first of a planned series of activities at the AAG Annual Meeting to raise the visibility of research in geography education, grow the research network, and provide productive spaces for discussion about geography education research and the notion of what makes research in the field potentially transformative.

Additional dissemination is reported in the attached individual reports from the three research groups funded by the 2016 Transformative Research in Geography Education program.

* What do you plan to do during the next reporting period to accomplish the goals?

NCRGE will award a second round of Transformative Research grants in the summer of 2017. The RFP is available at www.ncrge.org/funding with a submission deadline of May 15, 2017.

Supporting Files

Filename	Description	Uploaded By	Uploaded On
2017 NCRGE Transformative Research RFP.pdf	Transformative Research in Geography Education 2017 RFP	Michael Solem	04/26/2017
NCRGE Transformative Research Session Track.pdf	NCRGE Transformative Research sessions at 2017 AAG Annual Meeting	Michael Solem	04/26/2017
RCN network member overview.pdf	RCN membership overview	Michael Solem	04/26/2017
2016 RCN group reports.pdf	2016 RCN group reports	Michael Solem	05/13/2017

Products

Books

Book Chapters
Dario Solís Caballero and Patricia Bennett Solís (2016). Innovation-based Strategies for International Partnership Building in Higher Education: The Panama Model.. *Global Perspectives on Strategic International Partnerships.* IIE/DAAD. New York. 187. Status = PUBLISHED; Acknowledgement of Federal Support = Yes ; Peer Reviewed = Yes

Inventions

Journals or Juried Conference Papers
Michael Solem Richard Boehm (). Transformative Research in Geography Education: The Role of a Research Coordination Network. *The Professional Geographer.* . Status = UNDER_REVIEW; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Niem Tu Huynh, Patricia Solis, Nwasi Menkiti, and Philippe Huot (). Does International Experience make Students Better

Scientists?. *International Journal of STEM Education*. . Status = SUBMITTED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Patricia Solis and Niem Tu Huynh (). Exploring Impacts of an Overdetermined Adaptive Design on U.S. High School Girls' Technology Confidence. *Journal of Research in Science Teaching.* . Status = SUBMITTED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Thomas Larsen and John A. Harrington, Jr. (). Developing a Learning Progression for Place.. *Journal of Geography.* . Status = ACCEPTED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Licenses

Other Conference Presentations / Papers

Other Products

Other Publications

Patents

Technologies or Techniques

Thesis/Dissertations

Websites
National Center for Research in Geography Education RCN Social Network
http://ncrge-rcn.ning.com/

This site is intended to facilitate communications across the entire research coordination network. All RCN members are invited to:

View and contact the current **Members** of the RCN, invite someone to join a research project, or suggest a collaboration.
Contribute to **Forums** on Events, Publications, Grants, Graduate Research Opportunities, and Projects.
Use the **RCN Blog** for general discussions about issues of interest to members.

Supporting Files

Filename	Description	Uploaded By	Uploaded On
PG article_Transformative Research in Geography Education 042017.pdf	Journal manuscript under review for The Professional Geographer (submitted April 20, 2017).	Michael Solem	04/25/2017

Participants/Organizations

What individuals have worked on the project?

Name	Most Senior Project Role	Nearest Person Month Worked
Solem, Michael	PD/PI	1

Boehm, Richard	Co PD/PI	1
Zadrozny, Joanna	Graduate Student (research assistant)	1

Full details of individuals who have worked on the project:

Michael N Solem
Email: msolem@aag.org
Most Senior Project Role: PD/PI
Nearest Person Month Worked: 1

Contribution to the Project: AAG Co-Director of the National Center for Research in Geography Education.

Funding Support: N/A

International Collaboration: No
International Travel: No

Richard G Boehm
Email: rb03@txstate.edu
Most Senior Project Role: Co PD/PI
Nearest Person Month Worked: 1

Contribution to the Project: Texas State University Co-Director of the National Center for Research in Geography Education.

Funding Support: N/A

International Collaboration: No
International Travel: No

Joanna Zadrozny
Email: J_z37@txstate.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 1

Contribution to the Project: Provided research assistance to the project directors.

Funding Support: Grosvenor Center for Geographic Education, Texas State University.

International Collaboration: No
International Travel: No

What other organizations have been involved as partners?
Nothing to report.

What other collaborators or contacts have been involved?

See attached list of participating collaborators in the three 2016 research groups.

Impacts

What is the impact on the development of the principal discipline(s) of the project?

Each of the three research groups established in 2016 are pursuing activities that have significant potential to have transformative impacts on geography education, including new theories of geography learning and approaches to curriculum development, teacher education, and assessment practices.

What is the impact on other disciplines?

This RCN is forging research collaborations between geographers and STEM educational researchers, thereby opening opportunities for interdisciplinary insights on critical educational research questions and challenges. Refer to appended journal manuscript for additional commentary on the RCN's likely impact on other disciplines.

What is the impact on the development of human resources?

RCN projects engage students and practitioners in research training activities. NCRGE will extend the work of the RCN by sponsoring additional research workshops and conferences for early career scholars and graduate students. Refer to appended journal manuscript for additional commentary on the RCN's likely impact on human resources.

What is the impact on physical resources that form infrastructure?
Nothing to report.

What is the impact on institutional resources that form infrastructure?
Nothing to report.

What is the impact on information resources that form infrastructure?
Nothing to report.

What is the impact on technology transfer?
Nothing to report.

What is the impact on society beyond science and technology?
Nothing to report.

Changes/Problems

Changes in approach and reason for change
Nothing to report.

Actual or Anticipated problems or delays and actions or plans to resolve them
Nothing to report.

Changes that have a significant impact on expenditures
Nothing to report.

Significant changes in use or care of human subjects
Nothing to report.

Significant changes in use or care of vertebrate animals
Nothing to report.

Significant changes in use or care of biohazards
Nothing to report.

J. Harrington, Jr.
Thomas Larsen

Learning Progressions for Place and Region

NSF Report Information

1. Facilitate collaborative research among geographers and STEM education researchers.

Please send us a list of individuals who are participating in your project: Name, Title, Affiliation, Location, Area of Research Expertise.

Name	Title	Affiliation	Location	Area of Expertise
Lisa Millsaps	Assistant Professor of Geography	University of Northern Iowa	Cedar Falls, IA	Geography Education
Alex Oberle	Assistant Professor of Geography	Northern Iowa University	Cedar Falls, IA	Geography Education
Brad Burenheide	Associate Professor of Education	Kansas State University	Manhattan, KS	Social Studies Education
John Harrington Jr	Professor of Geography	Kansas State University	Manhattan, KS	Geography Education, Climatology, Geographic Thought
Thomas Larsen	PhD Student of Geography	Kansas State University	Manhattan, KS	Geography Education, Human-Environment Relationship
David Uttal	Professor of Psychology and Education	Northwestern University	Evanston, IL	Psychology, Education
Sarah Bednarz	Professor Emerita of Geography	Texas A&M University	College Station, TX	Geography Education, Spatial Thinking
Kristin Gunckel	Professor of Teaching, Learning, and Sociocultural Studies	University of Arizona	Tucson, AZ	Learning Progressions, Science Education
Phil Gersmehl	Michigan Geographic Alliance, Central Michigan University	Michigan Geographic Alliance, Central Michigan University	Mount Pleasant, MI	Neuroscience, Geography Education
Tom Herman	Alliance Coordinator of the California Geographic Alliance, Faculty at San Diego State University	San Diego State University, Center for Interdisciplinary Studies of Youth and Space, California Geographic Alliance	San Diego, CA	Children's Geographies, Geography Education
Paul Phillips	Professor Emeritus of Geosciences	Fort Hays State University	Hays, KS	Cultural and Historical Geography
Deborah Hann	Assistant Professor of Geography	Emporia State University	Emporia, KS	Children's Geographies, Geography Education

David Rutherford	Associate Professor of Public Policy Leadership	University of Mississippi	Oxford, MS	Geography Education, Public Policy
Rhonda Lefferd	K-6 Special Education Teacher	Shawnee Heights Middle School	Tecumseh, KS	K-6 Education
Jinhee Lee	PhD Student of Geography	Texas State University	San Marcos, TX	Spatial Thinking, Geography Education in Korea and U.S.
Jenny Dauer	Assistant Professor in Science Literacy	University of Nebraska Lincoln	Lincoln, NE	Learning Progressions, Science Education
Eleanor Rawling	Research Fellow of Geography	University of Oxford	Oxford, UK	UK Geography Education, GeoHumanities
Michael Solem	Research Professor and Lecturer of Geography	Texas State University	San Marcos, TX	Geography Education, Transformative Research
Richard Boehm	Professor and Jesse H. Jones Distinguished Chair in Geographic Education	Texas State University	San Marcos, TX	Geography Education, Economic Geography, Applied Geography

2. Attract more diverse cohorts of graduate students to Ph.D. programs in Geography Education.

- Thomas Larsen, graduate student of geography, Kansas State University, Caucasian
- Jinhee Lee, graduate student of geography, Texas State University, Korean

3. Increase research productivity and the knowledge base in geography education.

Publications

2017   (Accepted with revisions) Larsen, T., and J.A. Harrington, Jr. Developing a Learning Progression for Place. Journal of Geography.

2017   (Forthcoming) Larsen, T., and J.A. Harrington, Jr. Transformative Research in Geographic Education. Research in Geographic Education.

Conference Presentations

2017   Harrington, J.A., Jr., T. Larsen, S.W. Bednarz, D.J. Rutherford, A. Mohan, and E.M. Rawling. Place and Region in Geography Education. 2017 American Association of Geographers Annual Meeting. Boston, MA. Panel.

2017   Solem, M.N., T. Larsen, P.A. Solís, N. Huynh, R. Theobald, and R.G. Boehm. Transformative Research in Geography Education. 2017 American Association of Geographers Annual Meeting. Boston, MA. Panel.

2016   Larsen, T., and J.A. Harrington, Jr. Learning Progressions for Places and Regions: Building a Research Coordination Network. GPRM Regional Meeting. Colorado Springs, CO. Poster.

Proposals to Be Submitted

 NSF EHR Core Research (ECR) Grant. National Science Foundation. J.A. Harrington, Jr & T. Larsen. Deadline: 14 September 2017. https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=504924, last accessed 7 May 2017.

Contributions to NCRGE Research Clearinghouse

Eight members have attained membership on the Learning Progressions (Places & Regions) RCN group webpage.

4. Long-term growth and stability of the RCN.

We have most of the data we need to address this goal. However, we would like to know what external organizations (e.g., professional societies, teacher organizations, etc.) you may have worked with under your project, or plan to work with in the future.

Thus far, our RCN group has begun to work with the National Geographic Network of Alliances for Geographic Education and teachers in the Kansas Geographic Alliance. The group plans to work closely with the state alliance network and interested teachers on future research projects.

5. Promote the use of research to improve practice in geography education.

Provide a brief statement of how you see the longer term implications of your work in terms of broader impacts on geography standards, teacher training programs, curriculum development, assessment development, etc.

RCN research on how students learn place and region has at least three future implications. First, this research will contribute toward a better understanding of how K-12 students develop their knowledge of multi-dimensional, yet foundational, geographic concepts like place and region. That knowledge, in turn, may add to the efforts in learning progressions research in science and mathematics.   Second, empirical findings from the RCN will be able to provide a basis for critically evaluating and revising the concepts of place and region in the National Geography Standards. Third, we wish to broaden our understanding of how students learn place and region by diversifying the RCN. We intend to expand the RCN to include more scholars from other disciplines and nationalities, In addition, we hope to engage K-12 teachers within and beyond the social studies and administrators from around the United States to get them using place and region as a format for cross-cutting idea development. Through these objectives, we plan to transform how place and region are taught in K-12 education.

Scaling State Maps research group report

Facilitate collaborative research among geographers and STEM education researchers.

- List of individuals who are participating in the project: Name, Title, Affiliation, Location, Area of Research Expertise.
    - Peter Anthamatten, Associate Professor, Department of Geography and Environmental Studies, University of Colorado Denver, Spatial Thinking
    - Lara Bryant, Associate Professor, Geography Department, Keene State College, NH, Geographic Education
    - Grant Clayton, Assistant Professor, College of Education, University of Colorado Colorado Springs, Curriculum and Instruction
    - Beverly Ferrucci, Professor, Mathematics Department, Keene State College, NH, Math Education
    - Steven Jennings, Associate Professor, Department of Geography and Environmental Studies, University of Colorado Colorado Springs, Geography
    - Cathleen McAnneny, Professor, Department of Geography, University of Maine Farmington, GIS Education
    - Rebecca Theobald, Assistant Research Professor, Department of Geography and Environmental Studies, University of Colorado Colorado Springs, Geography Education

Attract more diverse cohorts of graduate students to Ph.D. programs in Geography Education.

    - Tirzha Zabarauskas, female graduate student at UCDenver
    - Heather Wittmer, Alexandra White, and Megan Wendolowski, undergraduate female Caucasian students at Keene State College

Increase research productivity and the knowledge base in geography education.

    - Publications (all pending)
        - Transformative research article in the RGE
        - Pilot study results will be submitted to the Journal of Geography
        - An article based on the undergraduate seminar study related to teacher attitudes about the giant map will be submitted to a math journal
    - Conference presentations
        - "Scaling Giant Traveling State Maps", New England – St. Lawrence Valley Geographical Society Annual Fall Conference, Quebec, Canada, October 15, 2016
        - "Transformative Research in Geography Education" and "Strategies for Integrating Spatial Skills across Pedagogies and Disciplines" AAG Annual Meeting Boston, MA April 8, 2017
        - "Scaling State Maps", National Conference on Geography Education, Albuquerque, NM July 27-30, 2017

- ▪ "Integrating Mathematics and Geography with a Giant State Floor Map: Fun, Comprehensive, and Engaging!", Conference of the Association of Teachers of Mathematics in New England, Marlborough, MA November 2-3, 2017.
  - o Proposals submitted, awarded, declined
    - ▪ In progress
  - o Contributions to NCRGE research clearinghouse
    - ▪ Research group has been created
    - ▪ Giant Map Math Curriculum
    - ▪ Sample piloted Assessment
    - ▪ Sample data collection forms and surveys
    - ▪ Lessons learned from the IRB process and working with schools
    - ▪ Pilot Study pending

Long-term growth and stability of the RCN.

- o National Network of Geographic Alliances
  - ▪ presented a lightning round regarding our curriculum to solicit interest in the next stage of research and data collection.
- o State Councils for the Social Studies
  - ▪ Maps and curriculum were shared at local conferences
- o Association of Teachers of Mathematics in New England

6. Promote the use of research to improve practice in geography education.

The interdisciplinary nature of the research has been very positive. Alliance Coordinators were immediately interested in obtaining information about the math lessons we demonstrated. While coordinating data collection in the schools we have noted that not only are teachers and administrators excited about the opportunity to use the giant map, they are equally excited that they can use it during math time, which is a critical and significant portion of the day. Preliminary teacher surveys indicated that geography teachers were more likely to see and understand connections to math than math teachers were to see and understand connections to geography. The use of this medium and direct connection to math skills will have significant implications in both fields of education in regards to curriculum, materials and teacher training.

Project Based Learning and Authentic International Experiences for Open Geospatial Education in Secondary Settings
ANNUAL REPORT: SOLIS & HUYNH

<u>INDIVIDUALS</u> *who are participating in our project: Name, Title, Affiliation, Location, Area of Research Expertise, Role:*

Patricia Solís, PhD
Co-Director, Center for Geographic Technologies, Texas Tech University, Dallas, Texas
Areas of expertise: youth participation, open mapping, Latin America, geospatial technologies;
Role: PI, site visits coordinator and proposal development lead; contributor to publications

Niem Tu Huynh, PhD
Manager, Graduate Student Recruitment, Concordia University, Montreal, Quebec, Canada
Areas of expertise: geospatial thinking assessment, geography education,
Role: Co-PI; leader on the assessment framework; contributor to publications

Lynn Ojeda
Principal, Plano Independent School District Academy High School, Dallas, Texas
Areas of expertise: PBL innovation; teacher professional development; curriculum; pedagogy and assessment
Role: keynote speaker in Panama event; contributor to proposals and publications; NCRGE RCN Fellow

Daniel Carpenter, Ph.D
Director of STEM Education and Co-director of the Ph.D. in STEM Education and Assistant Professor, Texas Tech, Lubbock, Texas
Areas of expertise: specializes in science education, place based learning models, and assessment of learning in place based science projects.
Role: NCRGE RCN Fellow

Manuel Quintero
Consultant; Former Geospatial Advisor in the Panamanian national institution, Authority for Governmental Innovation; Panama City, Panama
Areas of expertise: supports the research team connect end-use cases and data needs of decision makers in the international pilot site Panama
Role: training of Panamanian students in geospatial tools for project; youth-based volunteer mapping and hacking initiatives; NCRGE RCN Fellow

Other collaborators on closely related proposals/publications/events:

M. Duane Nellis, Ph.D
Past President of Texas Tech University, Outgoing Professor, Honors College and
Department of Geosciences, Incoming President of Ohio University; Athens, Ohio
Areas of expertise: specializes in integrative sciences, physical geography, geo-spatial
technologies, and leadership, education, diversity, remote sensing

Guofeng Cao, Ph.D
Co-Director, GIS Center, Assistant Professor at Texas Tech, Lubbock, Texas
Areas of expertise: specializes in geo-spatial technologies, including geographic
information systems (GIS) and interfaces with social networks; place-based cyber
learning environment design

May Yuan, PhD
Ashbel Smith Professor of Geospatial Information Sciences in the School of Economic,
Political, and Policy Sciences at the University of Texas at Dallas, Dallas, Texas
Areas of expertise: geospatial technologies, temporal GIS; GIScience; womens'
participation in geography and GIScience

Maria Adames de Newbill, PhD
Professor of Geography, University of Panama, Panama City, Panama
Areas of expertise: geography, geographic education; study abroad; ecotourism; student
mapping; YouthMappers chapter advisor in Panama

STUDENTS
Nwasi Menkitti, Doctoral Graduate Student in Interdisciplinary Studies, College of
Landscape Architecture, Texas Tech University
Gender/Ethnicity: Female, African

Julia Kleine, Undergraduate Student in Geosciences, College of Arts & Sciences, Texas
Tech University and President of TTU YouthMappers chapter
Gender/Ethnicity: Female, Caucasian

Halle Miller, High School student, International Baccalaureate Program, Plano East High
School
Gender/Ethnicity: Female, Black

PUBLICATIONS

Solís Caballero, Dario and Patricia Bennett Solís. 2016. Innovation-based Strategies for
    International Partnership Building in Higher Education: The Panama Model. In *Global
    Perspectives on Strategic International Partnerships*. New York: IIE/DAAD, pp. 187-
    201.

In submission

Huynh, Niem Tu, Patricia Solís, Nwasi Menkiti, and Philippe Huot. "Does International Experience make Students Better Scientists?" *International Journal of STEM Education.*

Solís, Patricia and Niem Tu Huynh. Exploring Impacts of an Overdetermined Adaptive Design on U.S. High School Girls' Technology Confidence. *Journal of Research in Science Teaching.*

In preparation

Solís, Patricia, Nama Budhathoki, and Nuala Cowan. Learning by Open Mapping: Best Practices using Inquiry Based Volunteer Approaches for Empowering University Students. Manuscript in preparation for the *Journal of Studies in International Education.*

CONFERENCES & WORKSHOPS

SOLIS & HUYNH:

2017   "Transformative Research in Geography Education." Panelists; National Center for Research in Geography Education Symposium, April 9, Boston, Massachusetts.

2017   Best Practices in Project Based Learning and Authentic Experiences for Open Geospatial Education in Secondary Settings, Workshop Organizers and Facilitators, AAG Annual Meeting, April 8, Boston, Massachusetts.

SOLIS:

2017   "Creando jóvenes mapeadores, no sólo mapas," Keynote Speaker, Conference Theme on Geography Education, Encuentro de la Geografía en America Latina, April 27, La Paz, Bolivia.

2017   "Building mappers not just maps: challenges and opportunities from YouthMappers on scaling up the crowd in crowd-sourced open mapping for development." Paper presenter. AAG Mapathon; AAG Annual Meeting, April 7, Boston, Massachusetts.

2017   "Open Mapping for Resilience: YouthMappers in Latin Amercia." Paper presentation, Conference of Latin Americanist Geographers, January, New Orleans, LA.

2016   "El Reto y la Oportunidad del Mapeo Abierto." Invited Speaker, Directing Council
        Meeting of the PanAmerican Institute for Geography and History of the OAS,
        November, Asunción, Paraguay.

2016   "We don't just build maps. We build mappers." Keynote Speaker, GeoWeek and
        International Education Week, Monroe Community College, November,
        Rochester, NY.

2016   "Local Capacity Building in Open Mapping for Resilience in Colombia, Kenya,
        Uganda, Ghana, and Bangladesh," Invited Speaker, US Agency for International
        Development GeoCenter GIS Specialists Conference, October, Washington, DC.

2016   "YouthMappers: Open Mapping for Resilience Network of Universities," Invited
        Speaker, Humanitarian OpenStreetMap Summit, September, Brussels, Belgium.

2016   Mapping to fight Malaria in Kenya, Workshop Instructor, training and career
        awareness session for ~120 secondary students, September 30, Academy High
        School, Plano, Texas.

2016   "Aprendizaje basado en Proyectos," Invited Speaker, Ministry of Education
        (MEDUCA), Panama; August, City of Knowledge, Clayton, Panama.

SOLIS: Teaching with PBL & GIS as a Service Learning Faculty Fellow (sponsored by the
TTU Teaching, Learning and Professional Development Center)
- Spring 2017 *Special Topics in Geography: Open Mapping for Resilience,*
  GEOG4320/5130-S*,* undergraduate and graduate hybrid online course with
  Service-Learning designation, Spring Semester, 15 students and wiki-coauthors
  for projects in Uganda, Colombia, Nigeria, Philippines, with USAID GeoCenter,
  Missing Maps, Red Cross, USAID Office of Foreign Disaster Assistance, presented
  via StoryMap, Department of Geosciences, Texas Tech University
- Fall 2016 *Special Topics in Geography: Open Mapping for Resilience,*
  GEOG4320/5130-S*,* undergraduate and graduate hybrid online course with
  Service-Learning designation, Fall Semester, 18 students and wiki-coauthors for
  projects with USAID GeoCenter in Kenya, Colombia, Ghana, Indonesia, presented
  via StoryMap, Department of Geosciences, Texas Tech University

PROPOSALS

NSF EAR, GP-IMPACT: Bringing Innovation into the Equation through a Place-Based
Pathway, DECLINED (10/10/2016); $408,852

NSF IIS EXP: GeoPlaceBased-Cyberlearning Communities for Cross-Boundary (G-C3)
Learning Advances, PENDING (02/10/2017); $549,971

TTU Internal Quality Enhancement Plan, Center for Global Communication, "Story Maps of Humanitarian Projects around the World." PENDING (04/12/2017); $80,000

*CONTRIBUTIONS* to NCRGE research clearinghouse
- 17 members thus far in the PBL Research Group
- Forum is active and has ~30 images
- Annotated Bibliography of over two dozen highly relevant articles/books/resources related to PBL

STATEMENT
Long-term implications of your work in terms of broader impacts on geography standards, teacher training programs, curriculum development, assessment development, etc.:

By explicitly linking project-based-learning to national standards, intercultural and geospatial competencies, we hope to build a body of work that can shape, justify, and provide a foundational capacity for research in PBL-GIS that is supportive of geography learning. We also believe the international component adds much value to this RCN. The authenticity of the experiences connected to real-world situations, especially international experiences, is expected to provide a tested model transcending current frameworks. We also see that the complexity of assessing learning outcomes relative to national standards and competency based rubrics for real-world PBL, particularly assessments which are gender-sensitive are in short supply and much needed in the current STEM/STEAM pathway research.

When we started the RCN (prior to NSF funding) we had 30 national locations and 10 international. Since then we have added 27 national and 7 international locations.

Where RCN Members are Located
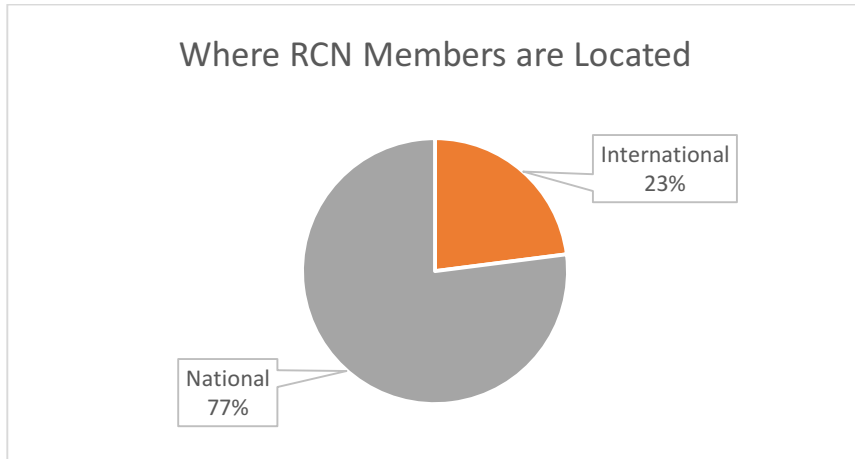
36 of the total 74 RCN locations are accounted for on the social media site.

Interests of the 71 RCN Social Media Members
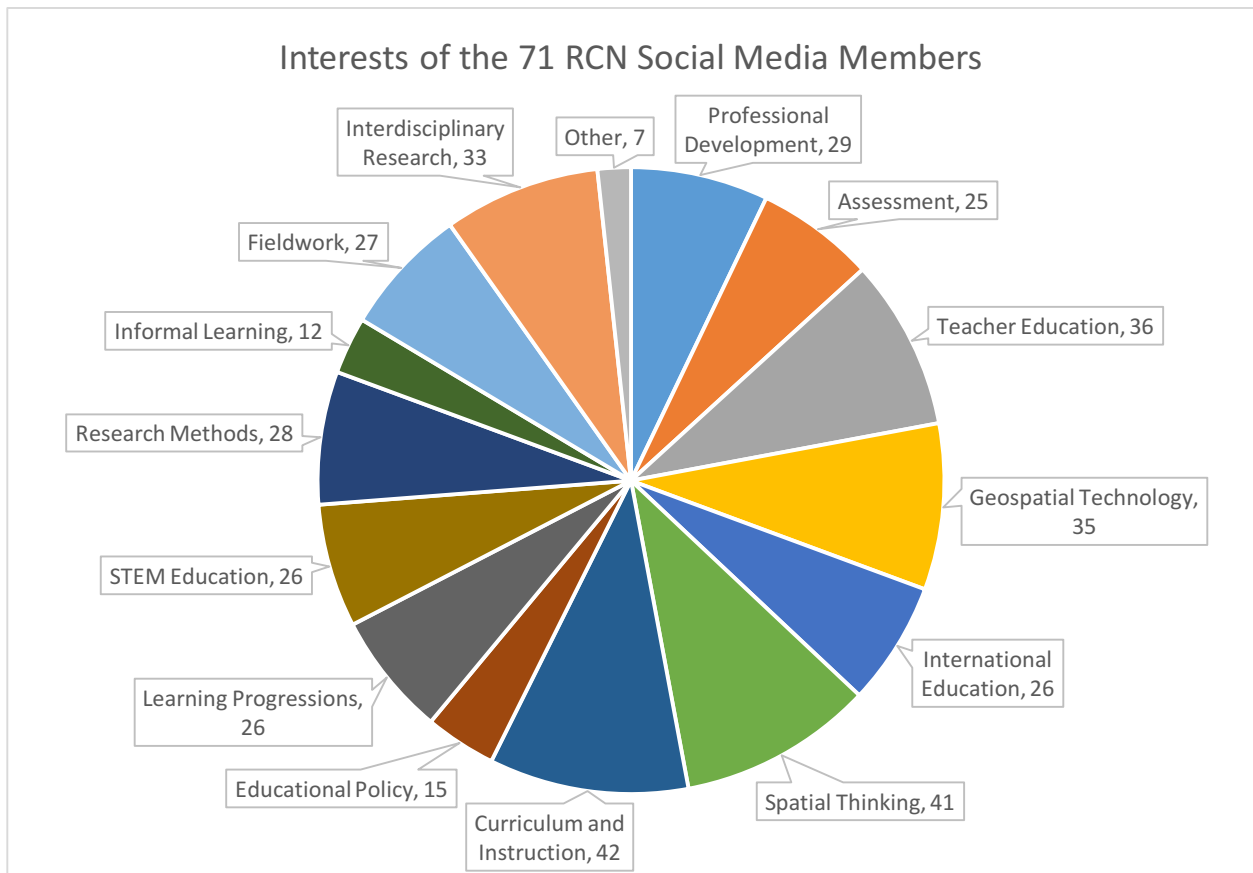
Of the 71 individual members that have joined the RCN social media network, these are their research interests and areas of expertise. 21 of the members are international and 50 are national.