Preview of Award 1560862 - Annual Project Report

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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:	06/01/2017 - 05/31/2018
Submitting Official (if other than PD\PI):	Michael N Solem Principal Investigator
Submission Date:	05/18/2018
Signature of Submitting Official (signature shall be submitted in accordance with agency specific instructions)	Michael N Solem

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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 second year of the project, NCRGE awarded three grants to support research groups in the areas of 1) Pedagogical Content Knowledge, 2) Technological Pedagogical Content Knowledge, and 3) High school/University service personnel. Their activities and accomplishments in relation to the six major project goals are summarized below.

1. Pedagogical Content Knowledge

One research group, under the direction of Jung Eun Hong (University of West Georgia) and Injeong Jo (Texas State University), worked to develop a conceptual model of pedagogical content knowledge (PCK) for geography teachers. PCK refers to the ability of teachers to represent specialized types of knowledge so that it is understandable by students. An early prototype of the PCK model was tested empirically through case studies with five expert geography teachers. Classroom observations, lesson recordings, teacher interviews, teachers' lesson plans and reflections, and student work samples were compiled and analyzed quantitatively and qualitatively. The findings will inform the revision of the conceptual PCK model, which the group then plans to share with other researchers through the NCRGE research clearinghouse. This process will expand empirical testing of the model and provide new opportunities for expanding research into the characteristics of effective geography teaching and ways of enhancing the preparation of effective geography teachers.

2. Technological Pedagogical Content Knowledge

A second group, led by Katsuhiko Oda (University of Southern California), focused on a closely-related concept known as Technological Pedagogical Content Knowledge (TPACK), which deals specifically with teachers' self-efficacy for incorporating technology into their instruction. The group explored the value of TPACK for organizing coherent professional development experiences for teachers seeking to use geospatial technology in different subject areas. Through a series of sessions with middle school teachers, the group collected and analyzed reflective journals, lesson plans, and classroom demonstrations to identify the components of a TPACK model for geospatial technology. Once their provisional TPACK model becomes available in the NCRGE research clearinghouse, the group will invite others to join the network for further empirical studies in a larger number of sites.

3. High school/University service personnel

Jamie Winders and Anne Mosher (Syracuse University) initiated a group to explore where, when, and how student services professionals recommend pathways to college and careers for students who express an interest in geography. The group organized focus groups and interviews with high school guidance counselors, college admissions representatives, and college general advising staff in three different states to identify

difficulties that students, particularly young women and other underrepresented groups, face in continuing their studies of geography in college. By opening a line of research focused on non-instructional personnel, this group hopes to develop a new collaborative methodology for investigating the information provided to students on choices of college to attend, careers to target, specific courses to take, and majors to declare. Having such information is critical to implementing strategies aimed at escorting a more diverse and inclusive flow of students from high school to college.

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. When we started the RCN (prior to funding) we had 30 national locations and 10 international locations. In year 1 we added 27 national and 7 international locations. In year 2 we added 4 international and 9 national locations, for a total of 21 international locations and 66 national locations.

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 2017 Transformative Research in Geography Education program.

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

For the 2018 AAG Annual Meeting in New Orleans, the National Center for Research in Geography Education organized session proposals for a special track of sessions on Transformative Research in Geography Education. This was the second 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 2017 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 2018. The RFP is available at www.ncrge.org/funding with a submission deadline of May 15, 2018.

Supporting Files

Filename	Description	Uploaded By	Uploaded On
NCRGE Transformative Research Session Track_AAG 2018.pdf	1. NCRGE session track at 2018 AAG Annual Meeting	Michael Solem	05/18/2018
Hong Jo RCN report.pdf	1. Pedagogical content knowledge report	Michael Solem	05/18/2018
Oda_RCNresearchSummary.pdf	1. Technological pedagogical content knowledge report	Michael Solem	05/18/2018
RCN Report for Mosher Winders et al.pdf	1. School/university service personnel report	Michael Solem	05/18/2018

Products

Books

Book Chapters

Inventions

Journals or Juried Conference Papers

Michael Solem Richard Boehm (2017). Transformative Research in Geography Education: The Role of a Research Coordination Network. *The Professional Geographer*. . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Patricia Solis and Niem Tu Huynh (2017). Exploring Impacts of an Overdetermined Adaptive Design on U.S. High School Girls' Technology Confidence. *Journal of Research in Science Teaching*. . Status = UNDER_REVIEW; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Thomas Larsen and John A. Harrington, Jr. (2018). Developing a Learning Progression for Place.. *Journal of Geography*. . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Licenses

Other Conference Presentations / Papers

Other Products

Other Publications

Patents

Technologies or Techniques

Thesis/Dissertations

Websites

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@txstate.edu
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?
Nothing to report

Impacts

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

Each of the three research groups established in 2017 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.

Nature of Pedagogical Content Knowledge for Geography Teaching

1. Catalyze research planning with strong potential to result in transformative research projects in geography education.

We will prepare summaries of each RCN project funded in 2017. No additional information from you is needed.

2. 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
Jung Eun Hong	Associate Professor	University of West Georgia	Carrollton, GA	Geography Education
Injeong Jo	Assistant Professor	Texas State University	San Marcos, TX	Geography Education
Judith B. Harris	Professor	College of William & Mary	Williamsburg, VA	Teacher Education
Kenneth H. Keller	Teacher	George Walton Comprehensive High School	Marietta, GA	AP Human Geography

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

Please send us a list of any undergraduate and graduate students who participated in your project, and include gender, race/ethnicity if known.

NA

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

Please send us a list of the following outcomes of your projects, including any pending material:

<u>Publications</u>

Hong, J. E., I. Jo, J. Harris, and K. Keller. Nature of pedagogical content knowledge for geography teaching. *Research in Geographic Education*. (In progress)

Conference presentations

Hong, J. E., and J. Harris. Transformative Research in Geography Education. Annual Meeting of the Association of American Geographers. April 10-14, 2018. New Orleans, LA.

Hong, J. E., and I. Jo. The Knowledge Base for Geography Teaching. Commission on Geographical Education International Conference. August 3-5, 2018. Quebec City, Canada.

Proposals submitted, awarded, declined

In progress

Contributions to NCRGE research clearinghouse

- Research group, PCK for Geography Teaching, has been created.
- Research core meeting minutes
- The project presentation file at AAG

5. 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.

With help of Cobb County School District in Marietta, GA, four expert geography teachers in Cobb County participated in this project. In the future, we would like to work with the Georgia and Texas state geographic alliance networks to recruit larger numbers of geography teachers to participate in future research studies.

6. 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.

The primary focus of this stage of our research is to construct a working model of teachers' geographical knowledge base, then test and refine the model with expert practicing geography teachers. Once the model is finalized, we will share it with other geography education researchers and teacher educators, with hopes that it can inform their future work. Understanding and being able to describe the specific components of teachers' geography knowledge, plus how the components are interrelated, will help researchers to better conceptualize how effective geography teaching is planned, and teacher educators to better design and offer targeted professional learning opportunities for geography teachers.

After the model of teachers' geography knowledge is finalized, our next steps will include exploring the nature and use of teachers' Geo-TPCK, or technological pedagogical content

knowledge in geography teaching. This work will help to broaden and deepen educational uses of GIS technologies with students. Overall, this ongoing research is designed to improve the depth and breadth of teachers' geography comprehension and instruction, and teacher educators' efficacy in assisting geography teachers' professional learning and performance.

Geo-TPACK Professional Development Research Project

Annual Report: Katsuhiko Oda

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.

- Katsuhiko Oda, Assistant Professor (Teaching), Spatial Sciences Institute, the University of Southern California, GIS education
- Laila Hasan, Associate Professor of Clinical Education, Rossier School, the University of Southern California, STEM education
- Thomas Herman, Director, California Geographic Alliance, geography education

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

Please send us a list of any undergraduate and graduate students who participated in your project, and include gender, race/ethnicity if known.

- Our RCN group does not include any cohorts of graduate students, though we plan to use our developed professional development (PD) materials for a teaching credential program in Rossier School at the University of Southern California.

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

Please send us a list of the following outcomes of your projects, including any pending material:

- Publications:
    - (In preparation) Oda, K, T. Herman, and A, Hasan. *Teachers' self-efficacy on teaching with GIS through professional development based on TPACK*. International Research in Geographical and Environmental Education
    - (Forthcoming) Oda, K, T. Herman, and A, Hasan. Transformative Research in Geographic Education. Research in Geographic Education.
- Conference presentations
    - Oda, K. (2018) "GeoMentors: A Showcase of Volunteer Efforts in K-12 Geography Outreach." Panel at Association of American Geographers Annual Meeting, New Orleans, Louisiana. April 11th.
    - Oda, K. (2018) "Transformative Research in Geography Education: GIS Teacher Professional Development." Association of American Geographers Annual Meeting, New Orleans, Louisiana. April 12th.
    - Oda, K. (2018) "Analysis of TPACK: Implications for Designing Effective In-Service Professional Development." Association of American Geographers Annual Meeting, New Orleans, Louisiana. April 13th.

    - (Forthcoming) Herman, T and K. Oda. (2018) "Teaching with Geospatial Technology in K-12" GIS-Pro & CalGIS 2018, Palm Springs, California. October 11th.
- Proposals submitted, awarded, declined
    - In progress
- Contributions to NCRGE research clearinghouse
    - Our RCN group will add a link to a website developed for our five PD sessions. The website includes documents, slides, homework, videos, tutorials, and geospatial datasets. The URL of the website is as follows: https://sites.google.com/view/geo-teaching.
        - The website is organized by the following monthly PD sessions: 1) Teaching with Geospatial Technology: Tools for Inquiry-based Instruction in Science and Social Science, Grades 6-12, 2) Map Making is for Everyone!, 3) Geographic Data Acquisition for Map Making, 4) Storytelling and Sciencetelling with Maps, and 5) Effective Instruction with Geospatial Technologies in the Classroom.

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

- Our RCN group worked with Los Angeles County Office of Education (LACOE) to recruit teachers and provide them with our first onsite PD session.
- Twenty-four middle- or high-school teachers attended our PD sessions. The participants' school unified school districts or organizations are as follows: Centinela Valley Union High School District, Chaffey Joint Union High School District, Downey Unified School District, Duarte Unified School District, El Monte City School District, Long Beach Unified School District, Los Angeles County Office of Education, Los Angeles Unified School District, Manhattan Beach Unified School District, Redondo Beach Unified School District, San Gabriel Unified School District, and West Covina Unified School District.
- Our RCN group will regularly contact the teachers who enthusiastically participated in our PD sessions and seek for further collaborative work.

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

- Our RCN group has sought for a better way to train K-12 educators to integrate geospatial technologies (GST) meaningfully into their teaching. The research has three long-term implications. First, our research may contribute to knowledge accumulation through the Technological Pedagogical Content Knowledge (TPACK) theoretical framework, which has widely been used in an education research community. There is little research on the effectiveness of TPACK-based PD relevant to GST. We hope our findings and implications provide a better understanding of if the TPACK approach can be applied to the geography and GST domains. Second, our research may broaden our understanding of how PD can effectively be delivered for K-12 educators. Our RCN group adopted a hybrid program, which would shed light on the benefits and challenges of traditional and online instruction methods. Third, empirical findings from the RCN would be a basis for incorporating geographic knowledge and skills into the classes of multiple subjects in K-12 education. We intended to expand our PD to solidify

teachers' self-efficacy on teaching with GST in science and social science. By suggesting the three implications discussed above, we wish to build the capacity of making geography more prevalent across the U.S. K-12 schools.

Anne Mosher
Jamie Winders

Minding the Gap, Tending the Bridge:
Reevaluating the Relationship between High School and College Geography Education

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

Name	Title	Affiliation	Location	Area of Expertise	Role
Anne Mosher	Associate Professor of Geography	Syracuse University	Syracuse, NY	Geography Education, Higher Ed Administrative Operations	Co-PI
Jamie Winders	Professor of Geography	Syracuse University	Syracuse, NY	Geography Education, Higher Ed Administrative Operations and K-12 Administrative Operations	Co-PI
Amy Lutz	Associate Professor of Sociology	Syracuse University	Syracuse, NY	Sociology of American Education	Survey Instruments, Data Analysis
Jodi Vender	Director, Peter R. Gould Center for Geography Education and Outreach	Penn State University	University Park, PA	Geography education	AP Human Geography Expertise, PA Networking
Roger M. Downs	Professor of Geography	Penn State University	University Park, PA	Geography Education, Behavioral Geography	Geography Learning Progressions
Maurice Harris	Dean, Office of Admissions	Syracuse University	Syracuse, NY	Higher Education Administration	Admissions Counseling Expertise
Kandice Solomone (has left team for position at another university that does not have	Associate Dean, College of Arts and Sciences	Syracuse University	Syracuse, NY	College Academic Advising, Higher Education Administration	Academic Advising Expertise

a geography department)					
Matthew Twomey-Smith	History and Geography Teacher	Manlius Pebble Hill School	DeWitt, NY	Social Studies Education, American Political History	AP History Expertise, Secondary Education Expert
April Lynch	Associate Director of Admissions	Syracuse University	Based in St. Charles, IL	Higher Education Administration, College Admissions	Illinois Networking, Admissions Operations
Amy Belstra	College Counselor	Libertyville High School	Libertyville, IL	School Counselor, College Advising	Illinois Networking, College and Career Counseling

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

Attracting students to geography education and helping them persist through undergraduate and graduate education is a major goal of this project.

- Madison Kovach, female Caucasian undeclared social science undergraduate student at Syracuse University
- Sarah Buell, female Caucasian undergraduate student at Syracuse University, now matriculated into the MAIR program at Syracuse University

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

Publications (pending)

- 'Geographic and Spatial Competencies Required for College Admissions Work' (targeted toward *The Professional Geographer)*
- 'Constructing Student Pipelines from High Schools to Your Geography Department' (targeted toward the *Journal of Geography in Higher Education*)

Conference Presentation

- "Minding the Gap, Tending the Bridge: Reevaluating the Relationship between High School and College Geography Education." April 2018. Invited Presentation, Special Session on "Transformative Research in Geography Education" Sponsored by the National Council for Research on Geography Education. Annual Meeting of the American Association of Geographers, New Orleans, LA. Co-authored with Jamie Winders.

Proposals submitted, declined, awarded

- In Progress

Contributions to NCRGE research clearinghouse

- Core research group mostly created; still being assembled due to loss of college advising partner
- Collaborative research interviews conducted with high school counselors, admissions, and advising partners in advance of pilot survey construction
- Pilot Qualtrix Surveys under construction for distribution to high school counselors, territorial and regional admissions counselors, and AP Human Geography teachers
- Lessons learned regarding the volatile geographies of student service professionals and their work
- Target marketing playbook for Geography Departments (pending)

Long-term growth and stability of the RCN

- Mosher (Syracuse) and Vender (Penn State) met to discuss next steps, based on preliminary findings about the unintended consequences of the AP Human Geography exam as a barrier to student persistence in geography learning progressions; will be meeting again on this issue during Summer 2018

<u>Statement</u>

Many geographers believe that there is a "gap" between high school and college-level geography education. Instead of looking solely at this gap as curriculum disjuncture, we have been focusing on the gap as a barrier to persistent exposure to geography learning. To assess this "progression" gap, we have consulted with high school teachers, school counselors, college admissions counselors, and college academic advisors to learn about their perceptions of it. Through our collaboration (in preparation for a more formal mixed-methods survey-based study), we have also started assessing the degree to which these professions can encourage geography learners to attend one of the small number of colleges and universities that offer geography as a major and take more courses in the field. From these discussions, our Admissions partners have encouraged us to stop thinking about the problem as a gap, but to conceptualize it as a narrowing colander-like funnel. They have also urged us to consider the poor ROI (return on investment) that scattershot marketing campaigns generate and to take an analytic-driven target-marketing approach that will take identifying high-probability high school origins for potential college geography majors. Our high school-level partners have also suggested that we pay close attention to the role of that AP Human Geography exam plays in some districts—as the "gateway drug" to AP Exams. This district-level utilization of APHG could be exposing our small discipline to risks that our national organizations and college-level departments will need to mitigate. Our team's survey of high school counselors in Illinois, Pennsylvania and New York will assess the extent to which this utilization of APHG is widespread and try to gauge what the long-term consequences of 9th and 10th grade administration of APHG might be on geography learner persistence in the field.