

2017 Annual Report

Faculty as Change Agents: Transforming Geoscience Education in Two-year Colleges

Debra Bragg & Heather McCambly
Bragg & Associates, Inc.

August 18, 2017

TABLE OF CONTENTS

Project Overview, Goals, and Strategies	1
Research and Evaluation Questions	3
Action Plan Review and Analysis	4
Outcomes Assessment Process	7
Social Network Analysis	9
Related Research and Evaluation	10
Future Evaluation/Research.....	11
References	13
Appendix A	14

Project Overview, Goals and Strategies

The “Faculty as Change Agents: Transforming Geoscience Education in Two-year Colleges” project is a 4-year funding commitment of the National Science Foundation’s Division of Undergraduate Education, offered through SAGE 2YC (Supporting and Advancing Geoscience Education in Two-year Colleges). The project focuses on effecting change and improvement within 2YC geoscience courses, programs, and departments. An overarching goal of the project is to develop a cohort of 2YC faculty, referred to as “change agents,” who are trained and expected to catalyze and implement change in geosciences education. The project’s leadership team consists of Heather Macdonald, College of William and Mary (PI); Eric Baer, Highline Community College (PI); Norlene Emerson, University of Wisconsin – Richland (PI); Jan Hodder, Oregon Institute of Marine Biology, University of Oregon (PI); and Carol Ormand, Science Education Resource Center (SERC), Carleton College (Program Manager), each of whom brings deep experience and perspectives to the project.

With the support of SERC and a 3-member evaluation/research team, the project seeks to provide evidence-based professional development, leadership development, and community support to assist the change agents to scale change, starting in their own classrooms and expanding to their colleges, especially the geosciences programs within their college, and to other colleges in their regions. The three project goals are:

- Build a **national network** of self-sustaining local communities of 2YC geoscience faculty and administrators led by a network of 2YC leaders, called Change Agents, who catalyze change at multiple levels, from their courses and departments to institutions in their local regions and within the community of practice
- Implement **high-impact, evidence-based, instructional and co-curricular practices that:**
 - support the academic success of all students
 - broaden participation, and
 - facilitate professional pathways into geoscience for students.

A graphic representation of this critical aspect of the project appears in Figure 1 below, and a more fully developed logic model illustrating the relationships between the three project goals and selected strategies to achieve those goals appears in Appendix A.

- **Investigate professional development models** for full-time and adjunct 2YC geoscience faculty that promote the cycle of innovation, where faculty learn from the research of others, make changes in their own practice, and share what they have learned with the education community.

A webinar conducted in January 2016 introduced these project goals to 2YC Change Agents, and a series of webinars on a host of topics related to the project occurred since that time.

The authors wish to acknowledge three other members of the SAGE 2YC research and evaluation team who contributed to this annual report. Special thanks go to Dr. Pameley Eddy and Ms. Yi Hao, College of William and Mary, and Dr. Ellen Iverson, Carleton College, for making this project such a productive, meaningful and fulfilling endeavor. This report would not have been possible without you.

High-impact, Evidence-based, Instructional and Co-curricular Practices through:

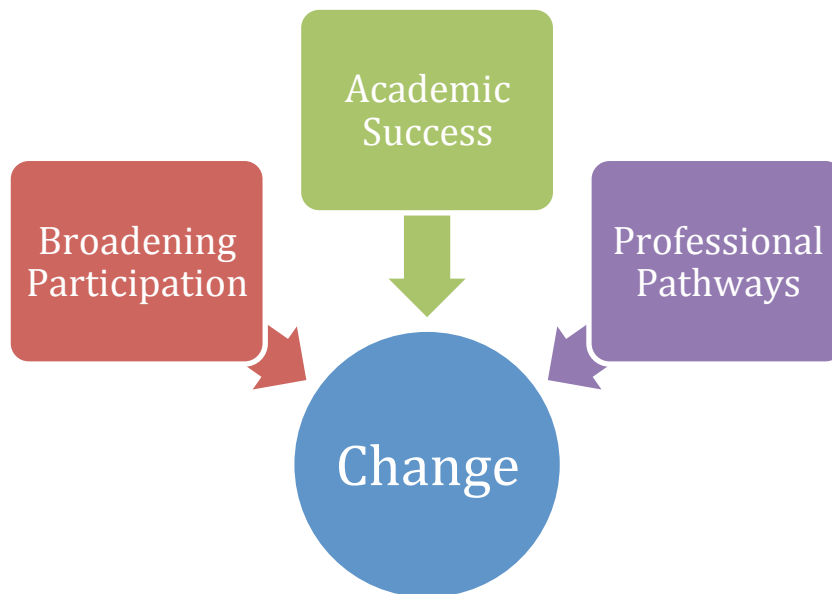


Figure 1. Graphic representation of the SAGE 2YC grant.

The activities associated with these three project goals focus on promoting program, institutional, and professional transformation through increased application of evidence-based STEM teaching methods that will lead to increased access and success for all learners, including students of color, first-generation, low-income and other historically underserved learner groups. Application of the SAGE 2YC model begins with the selected change agents (introduced to readers below) who have engaged in the project from the beginning and extends to additional 2YC faculty who join the project as learners and leaders in years three and four. The theory of change (shown in Figure 1 above) builds the transfer and propagation of change from start to finish of the project, with outcomes envisioned at the different levels (i.e., individual, program, own college, and other colleges).

By year 2, implementation of the SAGE 2YC grant has led to unanticipated developments that align with the original theory of change graphic (shown in Appendix A), such as the new connections among Change Agents and the optimization of professional conferences as locations to bring Change Agents, PIs and others together to enhance relationships and learn from one another. From the beginning, the actions taken by all stakeholders in the grant, including the Principal Investigators (PIs), the evaluation and research (ER) team, as well as the change agents (CAs), are being documented, analyzed, and shared. Also, wider dissemination of the project's activities and accomplishments are being disseminated on the SAGE 2YC website maintained by Carleton College's Science Education Research Center (SERC), geoscience conferences,

education research conferences, etc. The website is located at: <https://serc.carleton.edu/sage2yc/index.html>.

Research and Evaluation Questions

The research and evaluation process associated with the SAGE 2YC project is very comprehensive. The team conducting this aspect of the project includes Dr. Pamela Eddy, Professor and Department Chair at the College of William and Mary, who is leading research; Dr. Ellen Iverson, Evaluation Director at SERC, Carleton College, who is leading the internal evaluation, and Dr. Debra Bragg, President, Bragg & Associates, Inc. and Director of Community College Research Initiatives at the University of Washington-Seattle and who is leading the external evaluation. Dr. Eddy is assisted by Ms. Yi Hao who is a PhD student and her graduate research assistant at the College of William and Mary, and Dr. Bragg works with Ms. Heather McCambly who is an independent contractor with Bragg & Associates, Inc. and a PhD student at Northwestern University.

Figure 2 provides a visual depiction of the major areas of research and evaluation for the SAGE 2YC project, including the internal evaluation, the external evaluation, and the research. This figure shows the major questions associated with each component of the research and evaluation function. Sub-questions have been identified in conjunction with the project leadership team and these detailed questions may be made available by request.

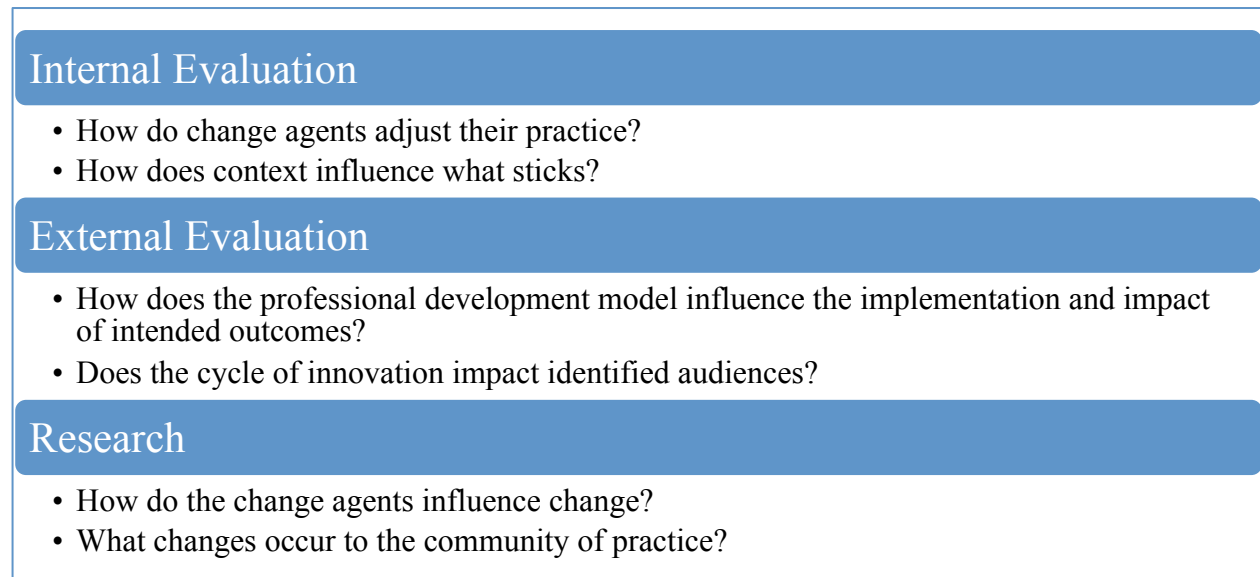


Figure 2. Key evaluation and research questions aligned to project goals.

Analysis of Change Agent Team Action Plans for their Geoscience Program







Table 1 summarizes the action plans that the Change Agent (CA) teams developed and submitted to the SAGE 2YC project leaders in June 2017 and compares these plans to the CA team action plans developed and submitted in June 2016. This analysis compares the overarching goal/need

























driving the CA team’s proposed work, the strategies identified as critical to addressing that CA team’s need, and the project strands (Professional Pathways, Instructional Practices, and Broadening Participation) addressed in the plan. Whereas the identification of outcomes by strategy (i.e. *how* change agents would know if their strategies were successful) was required in the 2016 team action plans, it was not required in the 2017 action planning template and therefore were dropped from this year’s analysis.






















As noted, Table 1 compares the 2016 CA team action plans to the 2017 CA team action plans on the three projects strands (Professional Pathways, Instructional Practices, and Broadening Participation). Numbers were assigned to the plans to document the degree to which they address each strand on a scale of 0-2. (0 = no reference to this strand are shown in the white color, 1 = some, limited, or indirect focus on this strand are shown in the light blue color, and 2 = direct focus on this strand are shown in dark blue color). Changes in these ratings from 2016, are noted between the initial 2016 plan and the update 2017 plan. This assessment documents whether a change was made in the CA team plans but does not rate the quality of the plans. Indeed, some CA teams made deliberate choices to address some strands and not others based on institutional needs. The choice to assign a rating was made only to understand trends across the teams’ planning processes










Results of this analysis demonstrate that most CA teams tend to prioritize instructional practices intended to improve academic success in the classroom, with broadening participation and professional pathways receiving lesser but increasing attention. Professional pathways received the least attention in the CA plan in both years. In nearly all cases, the CA teams strengthened one or more project strand. This finding of maturing project plans (goals and strategies) was triangulated with qualitative data gathered by using “lightening interviews” during the 2017 Change Agent Workshop. At this 3-day meeting, the five members of the research and evaluation (RE) team conducted brief interviews to provide a snapshot of how the CAs are engaging in core activities of the project.

Table 1. *Summary and Analysis of the Initial Plan (June 2016) Compared to the Updated Plan (June 2017) of the Change Agent Teams*




Team	Initial and Updated Plan Goal & Strategy Development	Plan Year	Instruct. Practices	Broaden Part.	Prof. Paths
1	The initial plan calling for “supportive pathways that lead to successful transfer outcomes to 4-year universities and colleges” is maintained in the new plan, but more focus is placed on collaborative teaching and learning (active learning). The updated plan also includes: 1) a larger network of colleagues and students to improve transfer, 2) “work on closing the achievement gap between targeted and non-targeted populations”, and 3) champion team engagement using “frames”. (Some recruitment-related tactics in the initial plan are not mentioned in the updated plan. Follow-up advised.)	Initial			
		Update			

Team	Initial and Updated Plan Goal & Strategy Development	Plan Year	Instruct. Practices	Broaden Part.	Prof. Paths
2	The CAs of one college maintained its initial goals, with the updated plan adding: “increase student awareness of, and preparation for, academic and professional pathways attainable with a 2-year degree, 4-year degree, or certificate in geoscience.” The new plan calls for using data to expand college leadership engagement and offering a CTE certificate to broaden participation. Adjunct faculty are included in delivering this instruction. The second college’s CA maintained the initial goals and strategies in the updated plan, which focuses on using and disseminating instructional practices through a faculty-to-faculty approach.	Initial			
		Update			
3	Reflecting on the initial plan, this CA team noted, “We do not have strategies in place to support recruitment, enrollment, retention or completing in the geoscience pathways”. In response, this college’s updated plan specifies sustainable strategies to address this gap by implementing: recruitment; new orientation for geoscience majors; improved advising; undergraduate research and field courses; mentoring for student support; more active learning; monitoring of job placement; formalized transfer agreements; and improved monitoring of transfer success.	Initial			
		Update			
4	The new plan expands this college’s initial goal to “increase the [student] success rate in geoscience courses as defined by a “C” grade or higher” by strengthening the focus on diversity trainings among colleagues and creating more career opportunities for students. The updated plan also specifies continuing to implement active learning and metacognition, noting how engaging in the outcomes assessment and departmental inventory heightened their focus on this issue. The team also plans to promote career opportunities, develop geoscience social events, promote resources for other geoscience faculty and campus groups to increase student diversity, and identify and track geoscience majors and alumni.	Initial			
		Update			
5	This team’s updated plan sustains initial goals to address that fact that under-represented minorities (URMs) are not enrolling and succeeding in geoscience courses at rates similar to other program courses within the unit. The updated plan recognizes the CA team’s experience with new strategies and use of data to create more nuanced action steps, with three tiers to 1) sustain student recruitment, 2) student support within the program, and 3) faculty development. Transfer, mentoring and proactive supports directed to all majors regardless of current enrollment in geoscience courses are added to the updated plan that calls for expanding prof. dev. for adjunct faculty (who teach proportionally more URMs).	Initial			
		Update			

Team	Initial and Updated Plan Goal & Strategy Development	Plan Year	Instruct. Practices	Broaden Part.	Prof. Paths
6	<p>This team shows strong and broad engagement with faculty on the initial goal of: “Students are not succeeding in the GEL 111 - Geology course due to changes brought about by new placement measures, structured pathways, and advising. We need to implement practices to support underprepared students in and out of the classroom so that they can be successful.”</p> <p>The team tackled this goal by defining and designing a set of student learning outcomes and using high-impact practices (HIPs). Two strategies in the initial plan that continue to be present in the new plan are to increase supports outside the classroom and HIPs within the classroom, including student support, active learning, and faculty professional development. In the updated plan, the team is also focusing on building consensus on student learning outcomes (SLOs) using backwards design.</p>	Initial			
		Update			
7	<p>In the updated plan, both colleges plan to continue with the initial goal to target the identified problem that “geoscience courses underrepresent campus diversity, which leads to a low diversity in the geoscience workforce.” Also, the updated plan of one college plans to strengthen cross-campus and cross-disciplinary collaboration to recruit and support students using mentoring, field trips, events, alumni database, and continued data use. The updated plan drops co-requisite and focuses on broadening participation, connecting student learning to community-based case studies, and promoting REUs. The other college continues the initial plan, but with a vision modeled on the other college’s goals and strategies.</p>	Initial			
		Update			
8	<p>This team’s initial goal remains the same in that it notes: “Students are struggling to succeed on tasks in the geoscience program that require critical thinking and evaluation of scientific issues. This is affecting their success in courses and the program.” However, the outcomes assessment process has brought to the fore the way URMs are affected by underrepresentation and lower success rates evident in all geoscience courses. This team noted course completion data were surprising, persuading them to continue data analysis by sub-group (given the likely link between excelling and pursuing a geoscience major). The team’s plan is also expanding SLOs to help align their curriculum and implement more active pedagogies in their classrooms. The team also plans to continue to prioritize collaboration with their champion team and hold meetings with admin to promote active learning among other instructors.</p>	Initial			
		Update			
9	<p>This team’s initial plan separated out the two colleges, whereas the updated plan is unified. Initially, one college identified recruitment and pathway issues, and the other focused on learning strategies. The new, unified plan focuses on</p>	Initial			

Team	Initial and Updated Plan Goal & Strategy Development	Plan Year	Instruct. Practices	Broaden Part.	Prof. Paths
	instructional strategies (metacognition, backward design around program- and course-level outcomes) for the success of all students (through clarity of purpose and increased course completion), with some reference to professional pathways in the plan for the regional workshop. The updated plan also adds curriculum mapping to further clarify expectations and foster more inclusive environments through elucidating implicit rules for students. Facilitating professional pathways will be addressed in the fall 2017 regional workshop.	Update			
10	This team's initial plan focused exclusively on the goal of expanding course offerings, whereas the updated plan also focuses on facilitating professional pathways by improving the transferability of classes to the 4-year campuses within the system. The team wants their students to see the geosciences as a viable academic and career path, and it is incorporating active learning strategies into their courses. The team is teaching students metacognitive skills to prepare them for these academic and career paths. Lastly, the team plans to broaden participation in both number and diversity.	Initial			
		Update			

Note: The blue shaded bubbles indicate the following level of planning by the CA teams:

-  0 = The plan does not include strategies to address the strand.
-  1 = The plan includes strategies to address the strand.
-  2 = The plan includes extensive strategies to address the strand.

Reviewing the results, five of the 10 CA teams made changes from their initial plan in 2016 to the updated plan in 2017, and the remaining CA teams continued their 2016 plans. No CA teams reduced priorities they had already established in their initial plan in 2016. Results show instructional practices are the strongest area of focus for the CA teams' action plans at both the initial and updated stage. In the cases where CA teams were updating their plans and making changes, the two areas that emerged in the updated plans are broadening participation and professional pathways. While professional pathways lags behind the other two strands in both years, the focus on broadening participation increased, possibly due in part to the emphasis that the PIs have provided through the annual workshops. All three of the workshops involving the CAs in person were included considerable focus on broadening participation, with the workshop held in June 2017 dedicating a one-half day hands-on session to this topic (lead by the PI team).

Outcomes Assessment Process

An important part of the external evaluation is outcomes assessment. During year two of the project, the external evaluation team developed an outcomes assessment process that was used by the CAs to measure their geoscience student participation, course success, and pathways progression. An Excel template was developed and disseminated to the CA teams, with training

and technical assistance provided by the external evaluation team to the CAs to help them to use the template. In some cases the CA teams worked together to represent their data at the district level, and in other cases CAs provided data for their own colleges within districts.

The entire process of outcomes assessment began in fall 2016, with two webinars occurring in November and December 2016 and one-on-one calls with the external evaluation team and either the PI Heather Macdonald or the co-PI Jan Hodder. These calls occurred between January and March 2017, and a final webinar held by Dr. Debra Bragg and Dr. Pamela Eddy on May 1, 2017 to prepare the CA teams for the workshop held June 13-16 in Tacoma, WA. In this call, the CAs were informed about what to expect at the workshop in terms of submitting and reviewing data to be referenced in Tacoma. To this end, all CA teams were advised to submit their first Excel template populated with student data on geoscience data for the Spring 2017 term by June 1, 2017. The CAs were then engaged in a 3-hour session during the Tacoma workshop to review the outcomes data and contemplate ways to use the data in help the CA teams address the goals in their action plans. *A copy of the Excel template is available upon request from the external evaluator.*

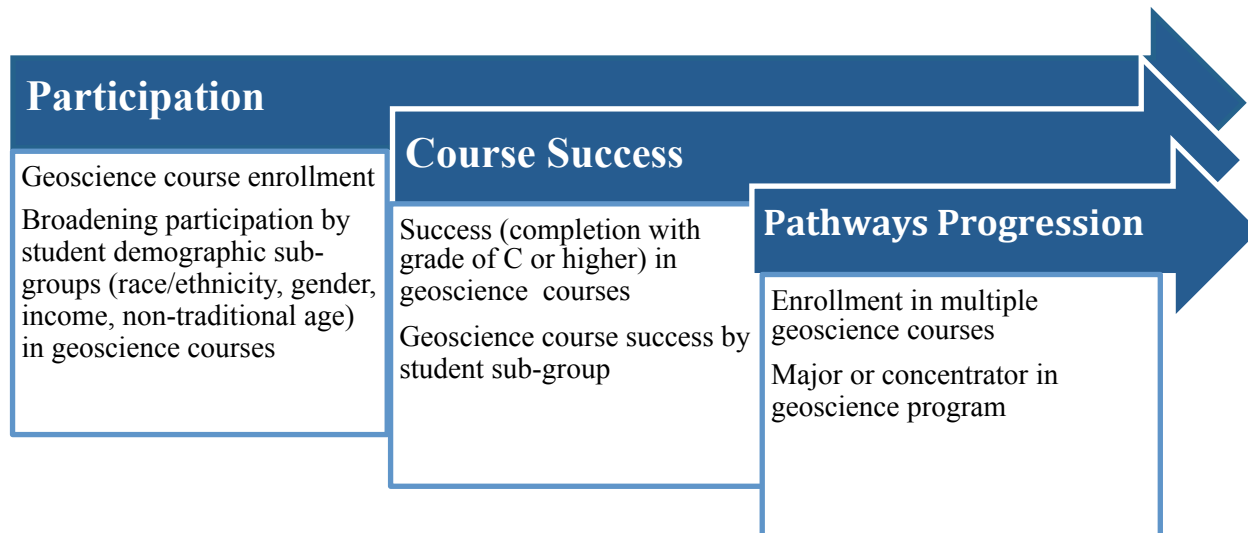


Figure 3. The three major areas of outcomes assessment for the SAGE 2YC project.

Data gathered through the outcomes assessment process are useful to the CA teams because they provide insights into who is enrolling in geoscience courses, broken out by sub-groups; how the students are performing in terms of course success (completion and grades); and whether the students progress to take more than one geoscience course and/or whether they identify themselves as a geoscience major or concentrator. The sub-groups that are used for purposes of disaggregating the outcomes results are: race/ethnicity, gender, age, and socioeconomic status (SES) as represented in the data by Pell eligibility. To the extent possible, IPEDS was used to designate the variable categories that were used for this study.

Data gathered in Spring 2017 are considered a baseline for the project, and these data will be updated annually to gather comparable information on a term-by-term basis through to the end of

the grant. The goal of the assessment process is to see if changes occur in students' academic success and professional pathway progression over time, with constant attention paid to broadening participation over the course of the grant.

It is noteworthy that the majority of CA team action plans submitted in year 2 of the grant mention using these outcomes assessment data to strengthen their work on the SAGE 2YC project, including making changes in their own courses and geoscience program, assisting other geoscience faculty within their colleges to make changes to their courses, and assisting geoscience faculty in other colleges in their regions to improve their courses and program. These plans will be submitted to the SAGE 2YC PI team and the ER team over the next two years and through to the end of the grant.

Social Network Analysis

An important aspect of the SAGE 2YC project is implementation and documentation of the "cycle of innovation" that suggests change begins with the work of CA teams' within their geoscience courses and programs within and STEM-related programs and their college campuses. The CAs also have responsibilities to share what they are learning and to spread change strategies to other geoscience educators to create a professional network to promote change in geoscience education in the 2YC context. One way to capture and depict this change over time is by using Social Network Analysis (SNA).

Social Network Analysis (SNA) is a systemic means of illustrating how networks of people and organizations grow over time. Because the SAGE 2YC project envisions a "cycle of innovation" in which ideas proliferate to and through CAs, who themselves form a network of individuals and teams, it is important to understand this phenomenon. Knowing the structure of the network of CAs, along with the project's PIs, Project Managers (PMs), and ER team members, is important to understanding how ideas spread, first within the network and then beyond the network. Whereas there are many ways to understand impact, SNA represents one way of capturing the formation and growth of the network phenomenon that may prove to be meaningful as this large-scale project proceeds.

Social networks are defined by a set of relationships between network members and the implications of those relationships. Network members, or nodes, typically consist of people or organizations that represent units that may be connected to other units within the network. This approach to studying networks is known as social network analysis (SNA), and this methodology focuses on categorizing nodes and relationship types within a network map, as well as the structure of the network as a whole (Scott & Carrington, 2011).

This application of SNA utilized UCINET, is a publicly available network analysis tool that is used widely for the purpose of analyzing and mapping social networks. The data used to create the map were obtained through an online survey that was created by the external evaluation team, with input from other members of the ER team as well as the PI team. All CAs as well as all members of the PI team and the ER team participated in the survey, creating 34 distinct nodes that appear in Figure 4 below. The nodes are color coded so that the reader can easily identify the location of three major groups of participants in the network: Aqua nodes designate the PI team,

including two project managers: the Black nodes designate members of the ER team; and the remaining color nodes designate the CA teams, with either 2 or 3 team members associated with each of the 10 teams appearing in a unique color. To identify teams, the coding system designates the first number after T to identify the team and the second number designates a team member. So T11 designates Team 1, Member 1. The numbers assigned to the teams is the same number that appeared earlier in Table 1, making it possible to associate team action plans to the network positioning the team in the SNA map.

This initial network map shows that the PI and project managers (PMs) are central to the project, as are senior members of the ER team. Unsurprisingly, CAs are most strongly connected within their own teams, but some CAs are situated more centrally than others to the map. These CAs are individuals who have more connections to other CAs in the network, suggesting that they may be playing a role in network formation and support. Over the following two years, we plan to conduct additional surveys to map the SAGE 2YC network to see how it changes. Also, data from the SNA will be integrated into the comprehensive CA dataset described in the following section of this report.

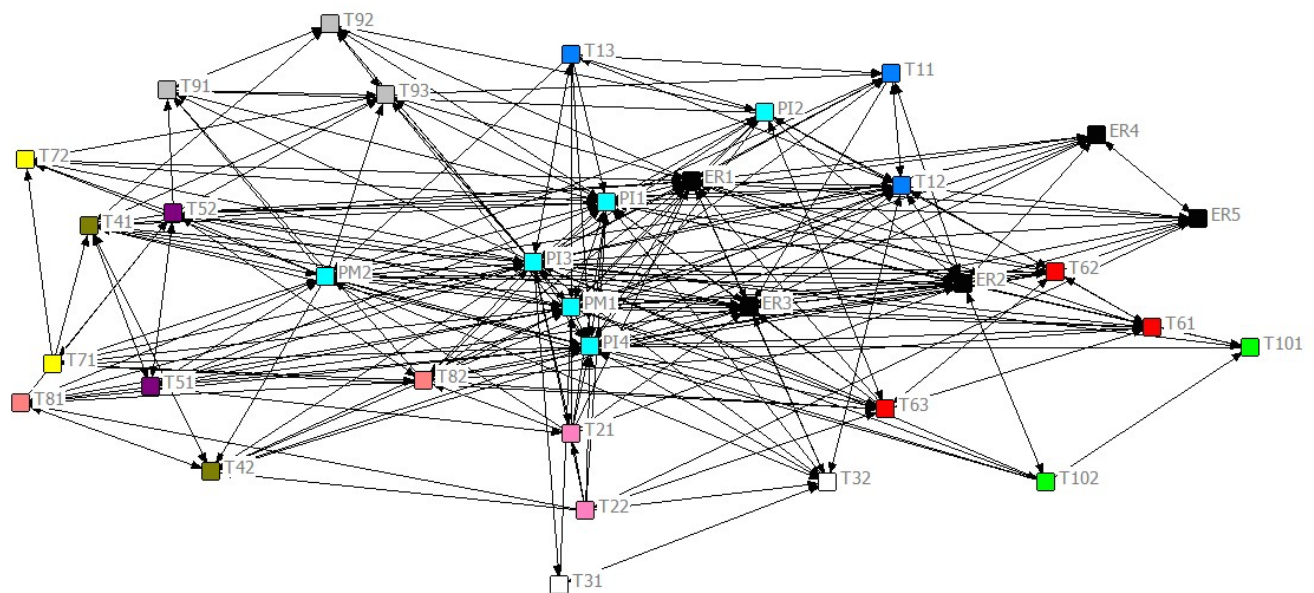


Figure 4. SNA Map for the SAGE 2YC project as of June 2017.

Related Research and Evaluation

As noted, the research and evaluation process associated with the SAGE 2YC project is comprehensive, including qualitative and quantitative data collection. The mixed-method design also includes action research that involves the CAs in gathering and analyzing data on their own action plans, with assistance from the PI team and the ER team. Data that are gathered include information about changing instructional practice, implementation of regional workshops, as well as student participation and outcomes. In addition to the other data collection processes and results reported in this report.

W11

Change Agent Portraits

The complexity of the data collected as part of the SAGE 2YC-Faculty as Agents of Change project requires a need to see the data for each individual CA and for each team to understand better what changes over time and what supported the change. Under the leadership of Dr. Pamela Eddy, the ER team synthesized data in the form of individual and team portraits affords an opportunity for triangulation and support of common emergent themes. The individual portraits consist of a summary of institutional context and a summary of the CA's role on campus. We collated data on the various data instruments and observations occurring since the inception of the grant in fall 2015. These data sources included: (1) individual interview about teaching philosophy; (2) Reformed Teacher Observation Protocol (RTOP) observation; (3) Wieman Teaching Practices Inventory (TPI)—self-reporting of teaching practices; (4) Bolman and Deal Leadership Orientation Survey; (5) Educational Practices Inventory (EPI); (6) individual reflections and workshop evaluations (both face-to-face and virtual). The team portraits include a summary of the team context, including ways in which the CAs have been involved in the SAGE 2YC workshops. The team portrait also includes a copy of the team's action plan and a summary of work to date on this plan. Finally, the team portrait includes information on the regional workshop conducted by the CA teams in Fall 2016, including the title of the workshop, the end-of-workshop evaluation by participants, and information on the follow-up conducted of the Spring 2017 virtual regional workshop. These base portraits serve as a longitudinal record for the project, and they will also be updated over the course of the project to ensure that a full accounting of the work and accomplishments of each team are documented and evaluated, as appropriate.

Change Agent Data Set

Under the leadership of Dr. Ellen Iverson, the ER team developed a relational database of CA data organized by tabs in an Excel workbook. The relational database provides an organizational structure for critical aspects of CA data. CA identifiers ensure anonymity and organize the CAs by region. A cover sheet provides a snapshot of key data related to each CA such as past professional development participation, Bolman & Deal leadership scales, RTOP score, and CA workshop reported influences. Subsequent tabs provide data from specific instruments including the Wieman Teaching Practices Inventory (TPI), IPEDS, virtual PD, Educational Practice Inventory (EPI), and so on. The tabs also correspond in numbering to the file folder organization of all data organized in the William & Mary secure Box account. The Excel workbook has already proved useful in serving as a basis for drafting case study portraits for all of the CAs involved in the project, beginning with the current round 1 CA group.

Future Evaluation and Research

This section of the report presents areas of additional focus for the external evaluation in the 2017-18 academic year.

Outcomes Assessment

After launching the outcomes assessment process in 2016-17, the CA teams are primed to begin working with their data to improve geoscience programs and student outcomes. The external evaluator is prepared to work closely with the PI team to assist the CA teams in the implementation and execution of the outcomes assessment process. This includes utilizing the existing outcomes assessment templates but also in customizing the data template to add data elements needed to measure the impact of changes to the geoscience programs and courses, including adding new data elements, as needed to conduct the project.

In 2017-18, the outcomes assessment process will be extended to a second cohort of CAs that are being inducted into the SAGE 2YC project now. The cohort 2 CAs will be introduced to the outcomes assessment process by the PI team, with support from the external evaluator, and the outcomes assessment data gathered by this group will be analyzed together with the outcomes assessment data gathered by cohort 1 CAs.

As the CAs and the PI team become more familiar with the outcomes assessment process, including better understanding how to customize the data process to ensure its value to the CAs, the opportunity will grow to use the outcomes data to tell a more complete and meaningful picture about how to improve geoscience education in the 2YC context. Given that so little focus has been given to this type of effort in the past, the SAGE 2YC project is uniquely positioned to provide leadership concerning 2YC geoscience education improvement.

Social Network Analysis (SNA)

The SNA will continue with an online survey to be conducted in summer 2018 and 2019, in conjunction with the annual SAGE 2YC workshop. The survey will be extended to cohort 2 CAs in the spring 2018 data collection. The purpose of the longitudinal approach to SNA data collection is see how the SAGE 2YC network continues to develop and change over time. At the present, the SNA map shows the centrality of the PI and PM team, as well as some members of the ER team, which is to be expected because of their role in developing and supporting the start-up of the project. We also see the rather tight coupling of CA team members to one another from particular regions of the country, which, again, is to be expected. However, over time, it is possible that the CAs will change positions relative to one another and relative to the PI and PM team, and the ER team.

Also, the data gathered through SNA also provide meaningful variables in the analysis of outcomes as the project continues to unfold. Using SNA, it is possible to know the centrality and strength of CAs and CA teams to determine the extent to which these variables impact the outcomes that are demonstrated through the project over time.

Implementation

During the 2017-18 and 2018-19 academic years, the ER team will be conducting site visits to the majority of CA teams. All members of the ER team will be involved in these visits, which are designed to gather information for the external evaluation but also in support of the internal

evaluation on instructional practice change and the research on organizational change. The ER team members are working together closely with the PI team to develop the data collection protocols to ensure that the data that are gathered address a comprehensive set of questions about how geoscience education is changing on the 2YC campuses.

Integration

Finally, the ER team recommends working very closely with the PI team during this next year to find ways to maximize all of the qualitative and quantitative data gathered for the project. As this report makes clear, an extensive amount of data is being collected to address multiple questions and purposes, and it is very important to ensure that these questions are addressed but to also make sure that the data are used to address other emerging concerns, as they arise. The regular PI and ER team meetings that occur via Zoom are critical to ensuring that all team members are talking and understanding how to ensure that the data are utilized in as productive and informative way as is possible.

Reference

Scott, J., & Carrington, P. (2011). *The SAGE handbook of social network analysis*. London, England: Sage Publications, Ltd.

Appendix A

The SAGE 2YC Logic Model

