

2016 Annual Report

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

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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 leadership team 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 adopted by the leadership team 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
- **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. *(January 2016 webinar to introduce project to 2YC Change Agents)*

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 engage 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, as shown in Figure 1 below, builds the transfer and propagation of change into the project from start to finish, with outcomes envisioned for change at the different levels (i.e., individual, program, own college, and other college).

SAGE 2YC Logic Model

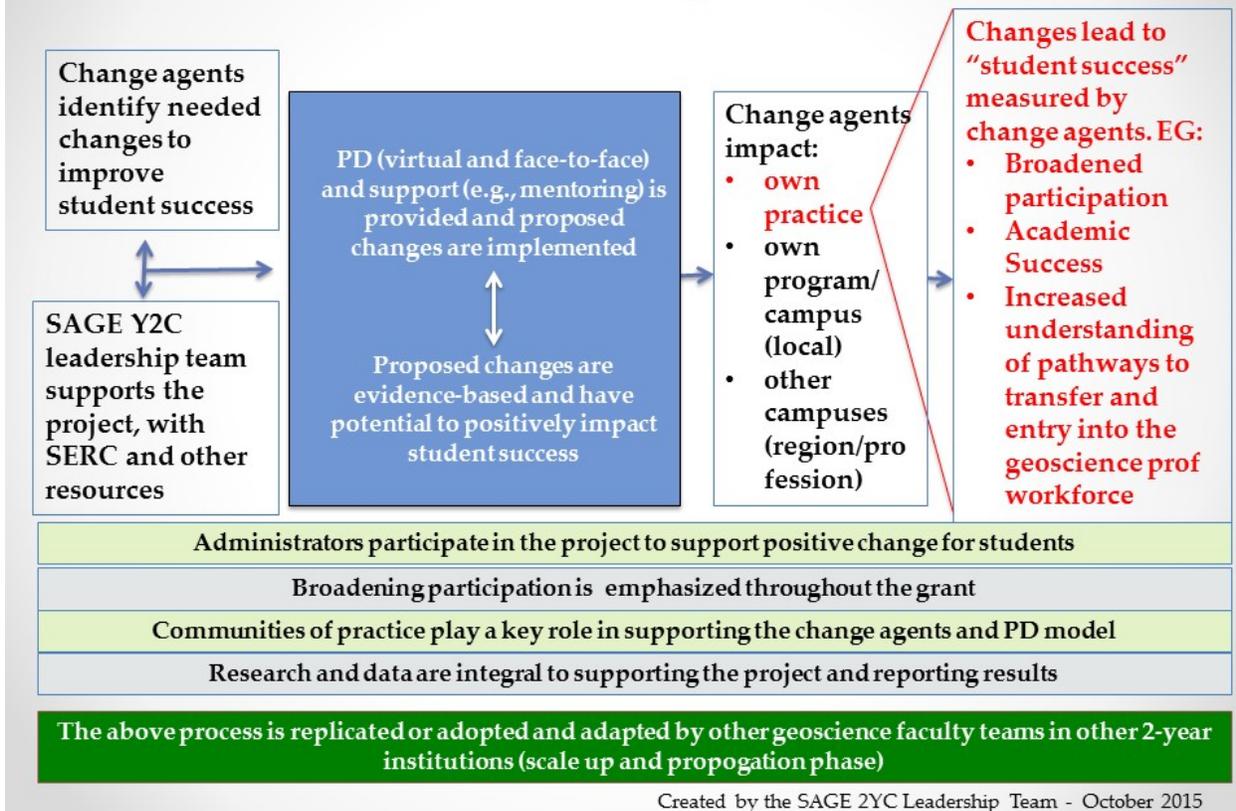


Figure 1. The theory of change for SAGE 2YC developed by the project leadership team and research/evaluation team at the start of grant funding in October 2015.

The theory of action for the project is reflected in the following graphic prepared by the PI leadership team (see Figure 2). This theory of action includes activities designed for the Change Agents and executed by the PI leadership team as well as activities performed by the Change Agents. For example, the PI leadership team will be delivering workshops and providing online professional activities (via webinar, for example) during the grant, while the Change Agents are implementing changes within their classrooms and programs; working with other geoscience and STEM full- and part-time faculty on their campuses, and working with their administration to bring about change in their campuses. On a larger scale, the Change Agents will be working within their regions to create and/or organize a network of professionals, by leading workshops customized to meet the needs of other geoscience faculty in their regions, and offering follow-on activities to promote change in practice and student success. This strategic activity keys off of individual and team action plans that the Change Agents create and that may also be informed by college administrators who are aware of the project due to their attendance at the June 2016 workshop, and these plans are reviewed and supported of the PI leadership team. This critical component of the project is referred to as the “cycle of innovation” because it scales change to an ever-larger circle of geoscience faculty who adopt and use evidence-based instructional practice to broaden participation and professional pathways that generate greater student success.

Key Evaluation Questions

The external evaluation operates in a larger context of research and evaluation for this 4-year project. A team of three lead researchers/evaluators includes Dr. Pam Eddy, Professor at William and Mary University (WMU), who is leading research; Dr. Ellen Iverson, Evaluation Director, SERC, who is leading the internal evaluation, and Dr. Debra Bragg, President, Bragg & Associates, Inc., who is leading the external evaluation. Dr. Eddy is joined by Ms. Yi Hao, graduate research assistant at WMU, and Dr. Bragg is working with collaborator Ms. Heather McCambly, who is consulting with Bragg & Associates, Inc. on the external evaluation project.

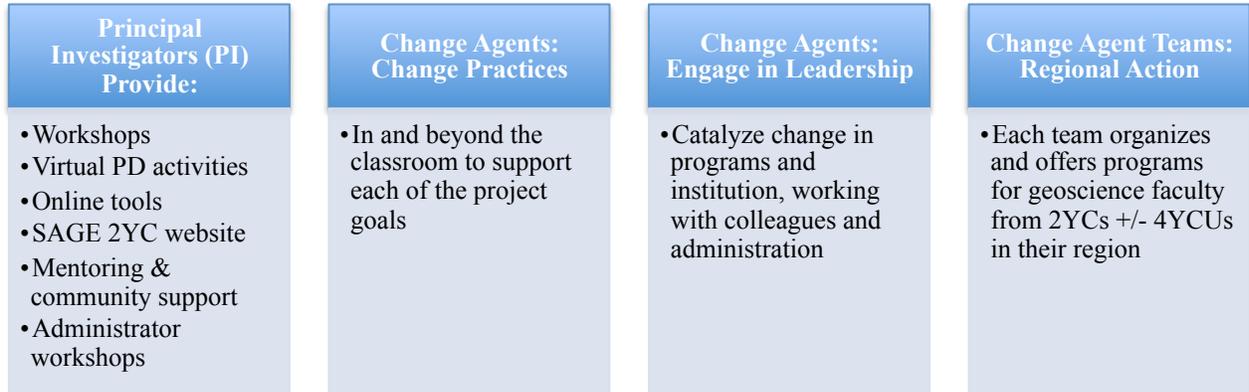


Figure 2. This theory of action for SAGE 2YC was developed by the project leadership team for the initial webinar held for the Change Agents in January 2016.

Figure 3 provides a visual depiction of the major areas of research and evaluation for the overall project, including the external evaluation that is situated in the middle of the figure. Many questions and sub-questions are associated with each major goal of the SAGE 2YC project, so the questions represented in this figure portray some of the highest priority areas of research and evaluation for the project leadership team and the overall project.



Figure 3. Guiding questions aligned to the project's internal evaluation, external evaluation, and research initiatives.

Location of Colleges of Change Agents

The location of the ten Change Agent teams is depicted in Figure 4. Included in the SAGE 2YC project are community colleges located in nine states that extend from coast to coast. Six of the community colleges are located on the east coast, and five on the west coast, with one of these community colleges (Portland) having two campuses. The other community colleges are located in the north central states of Illinois and Wisconsin and also in the southwest state of Texas. The geographic spread is similar to the locations of the project leadership team where two PIs live in the Northwest, one in the northern Midwest, and one in the eastern region of the United States.

As the project continues to unfold as part of the “cycle of innovation”, there is anticipated spread of involvement of geoscience education faculty in the 2YCs and 4YCU in similar but other regions of the country. As such, the idea of spreading positive change in geosciences education can materialize. Future efforts of the external evaluation team will document the spread and sustainability of change in these and new locations.

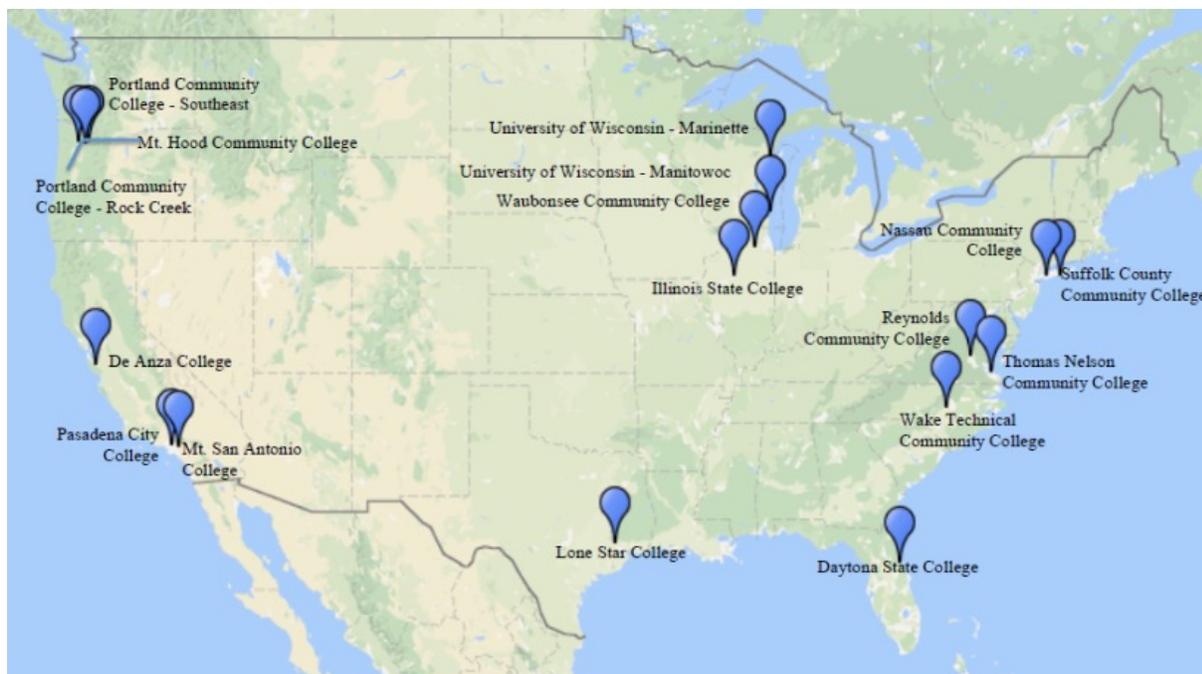


Figure 4. Map of the United States showing location of Change Agents by community colleges.

Change Agent Team Profiles

Knowing who the Change Agents who have been selected for the SAGE 2YC project are is important to understanding implementation of the project’s key strategies and impact over time. Tables 1 – 10 present an overview of the selected community colleges, geoscience (and related STEM) programs, and the ten Change Agent Teams. These tables provide a glimpse into the diversity of students and diversity of institutions and program types being served by this project. College data were pulled from the Integrated Postsecondary Education Data System’s (IPEDS) Fall 2014 dataset. Enrollment numbers reflect an unduplicated headcount of full- and part-time students in the Fall semester/quarter. MSI designations reflect Fall 2014 IPEDS demographic statistics based on federal definitions for each MSI designation. These descriptions do not indicate that an institution has received special recognition or federal funding related to their minority-serving status, only that they qualify based on student enrollment data.

Understanding the demographics of selected institutions is important because of the project’s goal of broadening participation and addressing gaps in the success of diverse student groups.

Demographic details for the Change Agents are limited to gender and appointment type (permanent full-time instructors, adjunct instructors at one institution, adjunct instructors at multiple institutions), based on available data. All Change Agents are White/Caucasian in terms of race/ethnicity, thus this variable is not portrayed in the tables below.

Program descriptions provide a snapshot of the size and breadth of geoscience (and related-STEM) courses offered, students served, and placement within departmental structure. This information was extracted from descriptions provided by the Change Agents, as well as the aggregate list of courses taught by the Change Agents participating in this project (which is recognized as the authors as not representing all courses taught in the designated geosciences program). Our intent is to provide a general picture, not to thoroughly inventory each college’s curriculum.

Table 1. *Profile of the Southern California Change Agent Team*

Southern California Colleges	Mt San Antonio College , located in the greater Los Angeles area and is classified as a “Suburban: Large” institution in terms of degree of urbanization with a total of 29,045 students enrolled, 36.15% of whom are full-time. Mt San Antonio College is an Asian American Native American Pacific Island Serving Institution (AANAPISI) and a Hispanic Serving Institution (HSI) with 51% of its student body made up of women, 38% of enrolled students receiving Pell Grants, a 80% full-time retention rate, and a 63% part-time retention rate.	Pasadena City College (PCC) is a large, single-campus 2YC in the Los Angeles area. PCC is classified as a “City: Midsize” institution in terms of degree of urbanization with a total of 26,611 students enrolled, 39.09% of whom are full-time. PCC is an Asian American Native American Pacific Island Serving Institution (AANAPISI) and a Hispanic Serving Institution (HSI) with 52% of its student body made up of women, 29% of enrolled students receiving Pell Grants, a 61% full-time retention rate, and a 55% part-time retention rate.
Change Agents	Three Change Agents—one male, two female—all of whom are full-time, permanent instructors.	
Program Description	The Earth Sciences and Astronomy Department at Mt. San Antonio College includes 9 full-time faculty and ~20 adjunct faculty and is part of the Natural Sciences Division. Our department offers over 150 sections of geology, oceanography, meteorology, and astronomy each academic year. Although the majority of students taking courses in our department do so to fulfill their General Education Physical Science requirement, we do have a cohort of students who intend to transfer to 4-year institutions as geoscience majors. Some of these students will earn an AA in Liberal Studies, Natural Sciences Emphasis and/or an AA in Environmental Studies before transferring.	The geoscience program at Pasadena City College includes 4 full-time and 4-6 adjunct geology faculty and 3 full-time and several adjunct geography faculty. Courses taught in the geoscience program include Physical Geology, Historical Geology, Ocean Science, Meteorology, Environmental Science, Geography, Earth System Science, and GIS certification.
Courses Taught by Change Agents	California Geology, Historical Geology, Physical Geology, Ocean Science, Earth System Science, Field Studies of Central California, Field Studies of Southern California, Special Topics in Field Geology, and field courses ranging from day trips to 2-week field excursions.	

Table 2. Profile of the Northern California Change Agent Team

Northern California Colleges	De Anza College is located in Cupertino, California, west of San Jose, is classified as a “City: Small” institution in terms of degree of urbanization with a total of 23,104 students enrolled, 47.98% of whom are full-time. De Anza College is both an Asian American Native American Pacific Island Serving Institution (AANAPISI) and an Hispanic Serving Institution (HSI) with 48% of its student body made up of women, 18% of enrolled students receiving Pell Grants, an 81% full-time retention rate, and a 47% part-time retention rate.
Change Agents	Two Change Agents—one male (a full-time permanent instructors) and one female (an adjunct instructor at multiple institutions)
Program description	The Earth and Space Sciences program at De Anza includes the Astronomy, Meteorology and Geology departments and is, along with Chemistry, Physics, Math and Engineering, part of the Division of Physical Sciences, Mathematics, and Engineering. Oceanography is taught within the Geology Department. There are two full-time and one part-time geologists on the faculty, as well as one 1/2-time and one adjunct faculty in meteorology. More information is available from the De Anza College Geology program .
Courses Taught by the Change Agents	Physical Geology, Ocean Science, and Meteorology.

Table 3. Profile of the Florida Change Agent Team

The Florida College	Daytona State College has 6 campuses in and around Daytona Beach, located in east Central Florida, is classified as a “City: Small” institution in terms of degree of urbanization with a total of 13,248 students enrolled, 39.70% of whom are full-time. Daytona State College is a Predominantly White Institution (PWI) with 61% of its student body made up of women, 50% of enrolled students receiving Pell Grants, and an unknown full-time retention rate and part-time retention rate.
Change Agents	Three agents—all of whom are female—two full-time permanent instructors one who is both an academic affairs professional and an adjunct instructor at the institution
Program description	The geoscience program at Daytona State College has 2 full-time and 2 adjunct faculty. It offers courses in Physical Geology, Historical Geology, Oceanography, Meteorology, and Environmental Science. The Institute of Marine and Environmental Studies (IMES) is a part of the School of Biological and Physical Sciences and has almost 150 students seeking an AS degree in Environmental Science Technology or AA Transfer Track degrees in either Marine Science, Marine Biology, Environmental Science, or Ocean Engineering. Most students enroll in geoscience courses at DSC to complete their general education requirements; total enrollment in these courses typically exceeds 600 annually.
Courses Taught by Change Agents	Environmental Policy, Environmental Science, Student Success, Chemistry, Biology 1 for Majors, Non-Majors Biology, Microbiology, Chemistry lab, Microbiology lab, Biology lab, Physical Geology, Historical Geology, Oceanography, Aquatic Environmental Science, and Coastal Ocean Studies in Biogeochemistry.

Table 4. *Profile of the Illinois Change Agent Team*

<p>Illinois Colleges</p>	<p>Illinois Central College, a four-campus institution located in Peoria, Illinois, is classified as a “Suburban: Large” institution in terms of degree of urbanization with a total of 10,296 students enrolled, 35.74% of whom are full-time. Illinois Central College is a Predominantly White Institution (PWI) with 55% of its student body made up of women, 28% of enrolled students receiving Pell Grants, a 69% full-time retention rate, and a 44% part-time retention rate.</p>	<p>Waubonsee Community College, a four-campus institution located in or near Sugar Grove, Illinois, is classified as a “Rural: Fringe” institution in terms of degree of urbanization with a total of 10,904 students enrolled, 30.09% of whom are full-time. Waubonsee Community College is a Hispanic Serving Institution (HSI) with 56% of its student body made up of women, 28% of enrolled students receiving Pell Grants, a 69% full-time retention rate, and a 50% part-time retention rate.</p>
<p>Change Agents</p>	<p>Two Change Agents—one male and one female—both of whom are full-time permanent instructors.</p>	
<p>Program description</p>	<p>The geoscience program at Illinois Central College is comprised of three full-time faculty, two with degrees in geology and one with a degree in meteorology. In addition, the program currently has two adjunct faculty. The geoscience program is housed in the Math/Science/Engineering Department. There is a lab coordinator for the entire department with student workers who help maintain lab materials for geoscience, chemistry, biology, physics, and engineering. Since this is the largest department on campus, one of the faculty in each discipline is designated as a teaching chair who is responsible for schedules, class assignments, adjunct evaluations, and textbooks.</p>	<p>There are 3 full-time geoscience instructors at Waubonsee, each teaching the Survey of Earth Science course as well as courses in their respective specialties of geology, meteorology and geography. In addition, Waubonsee has seven adjunct instructors in the geosciences. The program offers courses in Physical Geology, Historical Geology, Ocean Science, Meteorology, Geography, Earth System Science, Introduction to Climate, GIS, Environmental Geology, and Geology of the National Parks.</p> <p>The geoscience program at Waubonsee Community College is within the Mathematics and Sciences Division. More information about the geoscience program at Waubonsee can be found at the Earth Science program website.</p>
<p>Courses Taught by Change Agents</p>	<p>Physical Geology, Earth System Science, Historical Geology, Survey of Earth Science (Face-to-face and online), Environmental Geology, Astronomy (Face-to-face and online), Geology of the National Parks, and Geology field study courses</p>	

Table 5. Profile of the New York Change Agent Team

<p>New York Colleges</p>	<p>Nassau Community College, the largest single-campus two-year college in New York, and is part of the SUNY system, is classified as a “Suburban: Large” institution in terms of degree of urbanization with a total of 22,374 students enrolled, 60.52% of whom are full-time. Nassau Community College is a Minority Serving Institution (MSI), General (an institution that serves more than 50% students of color) with 50% of its student body made up of women, 38% of enrolled students receiving Pell Grants, a 70% full-time retention rate, and a 58% part-time retention rate.</p>	<p>Suffolk County Community College (also known as SUNY Suffolk), the largest community college in the State of New York located, is classified as a “Suburban: Large” institution in terms of degree of urbanization with a total of 26,600 students enrolled, 53.83% of whom are full-time. Suffolk County Community College is a Predominantly White Institution (PWI) with 53% of its student body made up of women, 29% of enrolled students receiving Pell Grants, a 67% full-time retention rate, and a 47% part-time retention rate.</p>
<p>Change Agents</p>	<p>Two Change Agents—one male (full-time permanent instructor) and one female (adjunct instructor at one institution; retired from full time teaching as of Jan 1, 2016).</p>	
<p>Program description</p>	<p>The geoscience program is made up of 2 full time faculty and 2 additional adjuncts. The geosciences are part of the Physical Sciences Department at NCC that is in the process of changing its name to Earth, Space, and Environmental Sciences.</p> <p>NCC does not have a formal geoscience major (program) but advises and prepares students to transfer to four-year colleges and universities as future geoscience majors. NCC offers approximately 6-8 sections of Physical Geology per term plus 2 sections per summer; 2 sections of Historical Geology per term (no summer sections); 2 sections of Field Geology each summer session; and 10-12 sections of Beaches and Coasts per year (including Winterim and each of 3 summer sessions). Some sections of this course are taught online and each section has 24 students in it.</p>	<p>Geosciences at Suffolk County Community College are mostly part of the Earth & Space Science program that is run through the Department of Physical Sciences. The program offers courses in Physical Geology, Historical Geology, Meteorology, Environmental Science, Global Climate Change, Planetary Geology; the Biology Department offers Oceanography. The geoscience program has three full-time faculty and four adjunct faculty.</p> <p>A majority of SCCC students served by geoscience courses are liberal arts students satisfying a lab-science elective. Across three campuses, the program serves approximately 250 students a semester and has 15-20 majors each year.</p>
<p>Courses Taught by Change Agents</p>	<p>Physical Geology, Historical Geology, Ocean Science, Field Geology, and Beaches and Coasts, Geologic Field Studies, and Planetary Geology, and a non-lab coastal processes/coastal geomorphology course.</p>	

Table 6. *Profile of the North Carolina Change Agent Team*

<p>The North Carolina College</p>	<p>Wake Technical Community College is the largest two-year college in North Carolina and is classified as a “Suburban: Large” institution in terms of degree of urbanization with a total of 21,384 students enrolled, 35.60% of whom are full-time. Wake Technical Community College is a Predominantly White Institution (PWI) (although 24% of its student population is Black) with 55% of its student body made up of women, 42% of enrolled students receiving Pell Grants, a 72% full-time retention rate, and a 50% part-time retention rate.</p>
<p>Change Agents</p>	<p>Two Change Agents—both female—who are both full-time permanent instructors (one of whom is the faculty lead for Geology).</p>
<p>Program description</p>	<p>The geoscience program at Wake Tech is made up of 8 full-time and 2 adjunct faculty. It offers courses in Physical, Historical, and Environmental Geology. Intro Physical Geology and Environmental Geology are both offered as face-to-face and fully online courses. The Geology program is part of the Department of Natural Sciences at Wake Tech, which also includes Biology and Chemistry. The Department of Natural Sciences is in the Mathematics, Sciences, and Engineering Division at Wake Tech.</p> <p>Approximately 1,300 students per year complete Intro Physical Geology at Wake Tech. The majority of these students are college transfer students intending to transfer to a four-year college and take the course to meet their science requirements. Enrollment in the course is very diverse, more than 25% identify themselves as belonging to minority groups. A few students each semester will decide to major in geoscience after taking the course.</p>
<p>Courses Taught by Change Agents</p>	<p>Physical Geology and Environmental Geology</p>

Table 7. Profile of the Oregon Change Agent Team

<p>Oregon Colleges</p>	<p>Mt Hood Community College has its main campus in Gresham, Oregon, about 15 miles east of Portland. Fewer than half of its students are between 18 and 24 years old. MHCC is classified as a “Suburban: Large” institution in terms of degree of urbanization with a total of 9,276 students enrolled, 42.40% of whom are full-time. Mt Hood Community College is a Predominantly White Institution (PWI) with 52% of its student body made up of women, 43% of enrolled students receiving Pell Grants, a 55% full-time retention rate, and a 35% part-time retention rate.</p>	<p>Portland Community College is the largest higher education institution in Oregon. It has four campuses and seven centers that together classify it as a “City: Large” institution in terms of degree of urbanization with a total of 30,929 students enrolled, 40.62% of whom are full-time. Portland Community College is a Predominantly White Institution (PWI) with 54% of its student body made up of women, 45% of enrolled students receiving Pell Grants, a 60% full-time retention rate, and a 44% part-time retention rate.</p> <p><i>Note: Two PCC campuses are represented in this project.</i></p>
<p>Change Agents</p>	<p>Three Change Agents—one female and two male—who are all full-time permanent instructors, including one department chair.</p>	
<p>Program description</p>	<p>The geoscience program at Mt. Hood Community College is made up of one full-time faculty and one adjunct faculty. Geology at Mt. Hood Community College is within the Science Division and could be considered its own department. It offers courses in Physical Geology and Historical Geology. A Watersheds course is offered in Natural Resources.</p> <p>The geoscience program serves ~300 students/year. Many students take the courses to fulfill a science requirement. There are approximately 2-3 geoscience majors per year, more than half of whom are female.</p>	<p>Between these two PCC campuses’ geoscience programs, there are two full-time instructors and eight part-time instructors. The program is part of the Science and Technology Division. There is no geoscience major, but a major is being considered.</p> <p>At just one of these two campuses, there are typically 27 sections taught by three permanent faculty and 15 adjunct instructors who each teach between three and eight sections throughout the year. Most students take geoscience courses because many of the courses are four credit lab-sciences, which satisfies the requirements for associate transfer degrees. There are a small handful of future geology majors each year, most of whom eventually attend Portland State University.</p>
<p>Courses Taught by Change Agents</p>	<p>Physical Geology, Historical Geology, Ocean Science, Meteorology, Volcanoes & Their Activity, and Regional Field Geology, Geology Field Trip Courses, Pacific Northwest Geology, and Volcanoes & Earthquakes, and Astronomy.</p>	

Table 8. *Profile of the Texas Change Agent Team*

<p>The Texas College</p>	<p>Lone Star College is one of 2 large community colleges serving the Houston area. With 6 major campuses, it serves nearly 70,000 students per year, is classified as a “City: Small” institution in terms of degree of urbanization with a total of 69,395 students enrolled, 27.72% of whom are full-time. Lone Star College System is a Hispanic Serving Institution (HSI) with 59% of its student body made up of women, 34% of enrolled students receiving Pell Grants, a 65% full-time retention rate, and a 51% part-time retention rate. <i>Note: Two distinct campuses are represented in this project: Tomball and University Park</i></p>
<p>Change Agents</p>	<p>Two Change Agents—both female—who are both full-time permanent instructors (one of whom is the faculty lead for the program).</p>
<p>Program description</p>	<p>The geoscience program at Lone Star College - Tomball Campus offers courses in Physical Geology and Historical Geology serving between 150 and 180 students per year, most of whom are taking geology to fulfill a science requirement which may or may not be specific to their degree plan. There are no majors. The program has one permanent faculty member. Geology is part of a Natural Sciences Department on the Tomball campus.</p> <p>There is only one full-time geoscience faculty at the Lone Star College - University Park Campus and there are 6 adjuncts who teach 1 or 2 classes each. There is also one lab-science coordinator that is shared with the chemistry program. The geoscience program is part of the Math & Sciences Division which covers all of the natural sciences, mathematics and the social sciences. Most geoscience courses have a maximum of 32 students. These students take physical geology so that they can meet the science class requirement for their Associates degree. Those who take historical geology tend to be students who want to transfer to 4 year schools, and about 1/3 want to major in geology.</p>
<p>Courses Taught by Change Agents</p>	<p>Physical Geology and Historical Geology</p>

Table 9. Profile of the Virginia Change Agent Team

<p>Virginia Colleges</p>	<p>J Sargeant Reynolds Community College, located in Virginia, is classified as a “Suburban: Large” institution in terms of degree of urbanization with a total of 11,861 students enrolled, 27.92% of whom are full-time. J Sargeant Reynolds Community College is a Black serving, non-HBCU with 61% of its student body made up of women, 43% of enrolled students receiving Pell Grants, a 59% full-time retention rate, and a 37% part-time retention rate.</p>	<p>Thomas Nelson Community College, located in Virginia, is classified as a “City: Midsize” institution in terms of degree of urbanization with a total of 10,436 students enrolled, 31.47% of whom are full-time. Thomas Nelson Community College is a Black serving, non-HBCU with 60% of its student body made up of women, 41% of enrolled students receiving Pell Grants, a 60% full-time retention rate, and a 39% part-time retention rate.</p>
<p>Change Agents</p>	<p>Three Change Agents—two female and one male—all of whom are full-time permanent instructors (and one of whom is a department chair).</p>	
<p>Program description</p>	<p>The geology program at Reynolds has one full-time faculty member and one to two adjunct faculty members each semester. The full-time faculty member reports to the Physical Sciences Program Head, and the Dean of the School of Math, Science and Engineering.</p> <p>Geology serves approximately 80-100 students per semester, except for summer terms that draw about 15-20 students. The majority of Reynolds geology students are non-science majors, representing primarily social science (including pre-service teachers), liberal arts, and business majors. Only 20-25% of students enrolled in geology courses in a given semester are science majors. Most students take geology to fulfill a lab-science degree requirement.</p>	<p>The geology program at TNCC is comprised of two full-time faculty members, and at least four adjunct instructors each semester. One of the full-time faculty positions is also the Department Chair, and reports directly to the Dean of the Division of Science, Engineering, and Technology; this division also includes Chemistry, Biology, and Physics. More information is available from the Thomas Nelson Community College Geoscience program.</p> <p>Geology serves ~ 200 to 250 students each semester (except for summer terms, which draw ~30 students). TNCC offers an Associate of Science degree, but it is not specific to geoscience.</p>
<p>Courses Taught</p>	<p>Physical Geology (lecture/lab and online), Historical Geology (lecture/lab and online), Introduction to Research, and Oceanography</p>	

Table 10. *Profile of the Wisconsin Change Agent Team*

Wisconsin Colleges	Both the University of Wisconsin - Manitowoc and the University of Wisconsin - Marinette are campuses in the multi-campus University of Wisconsin Colleges (UWC), the two-year college part of the University of Wisconsin System. There are 13 physical and one online campuses in the UWC system. The <u>Geography/ Geology Department</u> includes approximately 22 full time and adjunct faculty from across all the campuses, typically one or two faculty from each of the campuses and is part of the Math/Natural Science Division. Most faculty teach at one campus exclusively, but a few teach at multiple campuses.	
	The University of Wisconsin - Manitowoc serves 460 credit students from its campus on Lake Michigan. The students at UW-MAN include 61% first-generation college students and 39% part-time students.	The University of Wisconsin - Marinette serves almost 500 students at its campus on Green Bay in eastern Wisconsin. The students at UW-MNT include 64% first-generation college students and 56% part-time students.
Change Agents	Two Change Agents—both male—both of whom are full-time permanent instructors.	
Program description	The geoscience program at University of Wisconsin - Manitowoc is made up of 1 full time, tenure-track geography professor. UW-Manitowoc is a small campus and, as a result, enrollments are not large for any particular class. In geography/geology, there are normally a total of 50-75 students per semester. The largest enrollments are in Physical Geography. The typical student is a non-science major who needs a lab science course but does not want to take biology, chemistry, or physics. The department offers a geography, geoscience, and environmental science emphasis, but no majors.	The geoscience program at University of Wisconsin - Marinette offers courses in Physical Geology, Historical Geology, Meteorology, Environmental Science, Geography, Earth System Science, Cultural Geography, Human Geography, and Regional Geography. It has one tenured faculty member. Across campus, most students do not have declared majors, and the vast majority of the students in geoscience classes are satisfying general education requirements, although we have been known to attract a few converts.
Courses Taught by Change Agents	Geography, Introduction to GIS, Introduction to Maps and Air Photos, Introduction to Cultural Geography, World Regional Geography, Human Impact to the Environment, Geography of Wisconsin, Human Geography, Physical Geography, and Natural Disasters	

Change Agent Interview Results

Understanding implementation of the project – what has happened and what is still to come – relies largely on understanding who the Change Agents are, what they intend to do, and how they implement their project work. In this regard, the research/evaluation team conducted two interviews with the Change Agents. One set of interviews was conducted using one-on-one telephone interviews during the January-March 2016 time period. An interview protocol was developed by the research/evaluation team and reviewed by the project leadership team. While the time for each telephone interview varied, the average time for each interview is estimated to be about 45 minutes. In June 2016, the research/evaluation team conducted face-to-face focus group interviews with the Change Agents who attended the June 2016 workshop held on the University of Wisconsin-Madison campus. Similar to the earlier interviews, the focus group interviews relied on a standard protocol that was reviewed by the project leadership. Three focus group interviews were conducted, with each led by one of the three lead researchers or evaluators, and these interviews took approximately 50-60 minutes. Approximately 6-8 Change Agents participated in each focus group interview. All interviews, including those conducted via telephone as well as in-person, were audio recorded and transcribed for purposes of thematic qualitative data analysis, according to research methods approved IRB at the College of William & Mary (CWM).

Table 11 summarizes results from the individual telephone interviews conducted in February, 2016 as well as the focus group interviews conducted in June, 2016. The results are organized according to assets mentioned by the Change Agents that could be perceived to aid in addressing the three SAGE 2YC project strands of improved instructional practices (IP), broadening participation (BP), and professional pathways (PP). In addition, the analysis identified needs or areas that might benefit from further problem-solving or professional development (PD) to support success in the three project strands.

Table 11. *Assets and Needs/Areas for Development from Change Agent Interviews and Focus Groups*

Category	Instructional Practices	Broadening Participation	Professional Pathways
Assets identified by the Change Agents (CAs)	<ul style="list-style-type: none"> • CAs are proud of their expertise in geoscience • CAs are dedicated to being good teachers; they value student-centered teaching • Most CAs report a range of pedagogical strategies, including active and experiential learning, hands-on learning in the classroom; college labs and field work • Most CAs seek to convey passion for geoscience to their students through active engagement • Most CAs report good collaboration with other STEM faculty, depending on the institutional culture • A few CAs mentioned valuing existing communities of practice associated with the geosciences profession 	<ul style="list-style-type: none"> • Most CAs know their students • Many CAs know different challenges that their students experience (e.g., quantitative skills, writing, reading, ESL) • Many CAs want to help their students persevere and gain successful learning strategies to position them to move forward in sciences or other disciplines • Some CAs have a systematic way to look at student performance by sub-group • Some CAs are aware of students expecting real-world experiences and different worldviews and consider it in their teaching • Some CAs see connections between broadening participation and improved pedagogical practice, especially using active learning to benefit underserved students 	<ul style="list-style-type: none"> • The quality of articulation and transfer arrangements varies among CA colleges • Some CAs cooperate with other STEM programs to form pathways at their colleges • Some CAs have a strong sense of direction for improving professional pathways due to prior effort to improve transfer pathways at their colleges • Some CAs have built geoscience related-groups; some affiliate with professional geoscience assoc. that help students understand career options • Some CAs already share stories from real, diverse professionals (alums) working in related careers • Some CAs see partnerships within the institution (e.g., career services) as valuable to this strand of work

Category	Instructional Practices	Broadening Participation	Professional Pathways
Needs / Areas for Development for CAs	<ul style="list-style-type: none"> • Most CAs are very focused on their teaching, but experience high teaching loads; some need support • Some CAs are already using active learning strategies and see this project as an opportunity to spread or learn to spread these practices beyond their own classroom • Some CAs know about and comply with campus-level program assessment and student learning outcomes assessment, although some express concerns about cumbersome processes, and a few believe onerous requirements benefit their teaching or their program • Many CAs report they are not part of a "community of practice", although a few mention state professional groups that they have led and continue to influence. • Some CAs had not never thought about having a "teaching philosophy" before this project, and some found it challenging articulate in the context of the grant interview process 	<ul style="list-style-type: none"> • Many CAs do not use student learning outcomes assessment for purposes of improvement, including not disaggregating assessment results that could reveal achievement gaps • Many CAs associate broadening participation to individual student performance, with less apparent focus on patterns of group achievement • Most CAs reference academic achievement issues to student under-preparedness, learning style differences, and limited ability to retain content. • Many CAs attempt to accommodate student learning needs but reveal frustration that some of their students are not capable of higher-order academic performance. • Many CAs note they do not have many minority or disabled students, and while they understand the need for more diverse learners in geoscience, some question whether recruitment is their job. • Most CAs are not aware of or actively engaged in campus-level change initiatives (e.g., Achieving The Dream); Many mention time limitations due to faculty role • Most CAs have a general but vague sense of strategies to broaden participation 	<ul style="list-style-type: none"> • Most CAs place higher priority on helping students to persist and complete geoscience courses than becoming geoscience majors • Some CAs do not have majors, thus offer general service courses. • Most CAs have modest connections to other faculty on their campus or in their college district, and more modest networks beyond the campus/district. Although, most CAs participate in some professional groups at the state and/or national levels. Professional group participation typically does not include leadership or engagement beyond meeting attendance (some present.) • Most CAs highlight challenges in identifying potential partnerships in industry to form professional pathways, and in measuring the success of these partnerships or placement success overall • Some CAs highlight logistical challenges for students to participate in internships

Pedagogical Analysis: SAGE RTOP Observations

To understand change in instructional practices used by the Change Agents from beginning to end of the project, the research/evaluation team utilized the Reformed Teaching Observation Protocol (RTOP) developed by Lawson et al., 2002; Sawada et al., 2002) to conduct a baseline analysis. The RTOP provides a standardized means for detecting the degree to which classroom instruction uses student-centered, engaged learning practices and to measure the quality of instruction in college science and mathematics courses. The RTOP protocol uses five subscales with five items on each subscale, with each item described on a 5-point (0-4) Likert scale. Observational data for this section of the report came from Dr. Ellen Iverson, as her role was to train and oversee the use of the RTOP in classroom observations of the Change Agents near the beginning of the project, before the professional development workshops

took place in March and June 2016. For additional reference material pertaining to RTOP, please see: <http://serc.carleton.edu/NAGTWorkshops/certop/interpret.html>.

Observations were made of 19 SAGE 2YC Change Agents in the spring 2016, before the first workshop. Of these observations, 8 were scored in the range of traditional teacher-centered, 7 were scored in the range of traditional teacher-guided, three were scored in the range of transitional student-centered, and one was scored in the range of reformed student-centered (see Figure 5). Dispersion of scores on the RTOP categories, ranging from traditional/teacher-centered instruction through reformed/student-centered instruction, are displayed in Table 12.

The results show the preponderance of the Change Agents are in the categories of “traditional teacher-centered” and “transitional teacher-guided”. Only three Change Agents scored in the two “student-centered” categories, based on the instructional practices that were observed by the SERC-trained observers. These results suggest the importance of SAGE 2YC providing professional development (PD) and support on evidence-based instructional practices and reinforce the importance of the project achieving its goal to improve geoscience education. The wide variability among Change Agents on various dimensions of the RTOP suggests potential for growth, both through their practice and through their collaborative work with other Change Agents involved in SAGE 2YC on their campuses or through their team projects and professional networking.

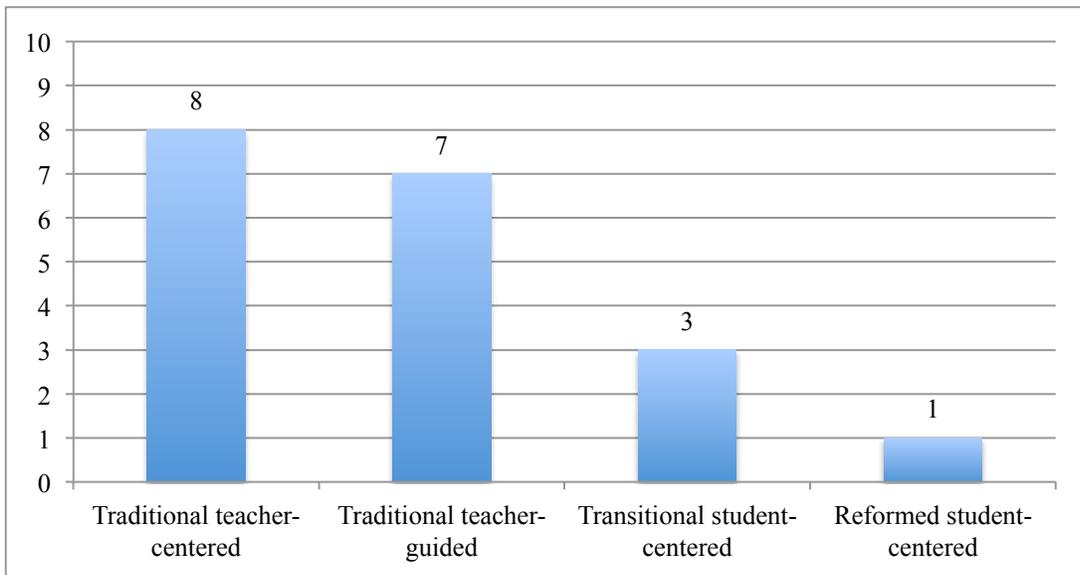


Figure 5. Number of Change Agents on four major RTOP categories.

Table 12. *RTOP Subscale Overview and Score Summary*

RTOP Subscale	Description: http://serc.carleton.edu/NAGTWorkshops/certop/interpret.html	Faculty Change Agent Average Score (Max = 20)	Score Range
Lesson Design and Implementation	This subscale examines the design and application of a lesson to determine if it is sufficient to support student understanding. Items examine how the instructor organizes the lesson to honor students' preconceptions from other classes and everyday experiences, and to provide opportunities to explore aspects of the topic prior to formal instruction.	5.5	8 (2-10)
Procedural Pedagogic Knowledge	This scale addresses what the character of the content the instructor teaches and their command of the material. For example, given the context of the course, does the lesson highlight fundamental concepts and are these concepts presented clearly to illustrate the relationships among key components.	3.4	10 (0-10)
Propositional Pedagogic Knowledge	This scale addresses what the students are asked to do within the classroom and includes a variety of higher order skills, tools and strategies an instructor might choose to employ to support student learning of content; this subscale examines scientific ways of knowing and student engagement in this process in classrooms.	14.8	8 (10-18)
Student-Student Interaction	This scale evaluates the number and type of interactions among students and how the instructor facilitates such interactions. In reformed classes, students are not passive listeners, but rather actively communicating with one another. This process of explaining their own ideas and evaluating the ideas of others is key to the development of student critical thinking skills.	5.9	16 (1-17)
Student-Instructor Interaction	This scale addresses the culture of respect and comfort in the classroom as supported by the teacher and learners. In a reformed classroom, the teacher fosters a culture where students feel comfortable asking questions and have control over their own learning. Teachers in this classroom demonstrates patience, they listen to students, and they act as a resource for student learning.	6.4	17 (0-17)

2YC Workshop Results (March and June 2016)

Two workshops were held in the first year of the project. One workshop was held in March, 2016 at the College of William and Mary (CWM) in Williamsburg, VA, and the second workshop as held at the University of Wisconsin-Madison in Madison, WI in June, 2016. These workshops were designed to address the three strands of the project (improving instructional practice, broadening participation, and enhancing professional pathways) and to address key workshop topics and eventually deploy online resources to support professional development of the Change Agents in the following areas:

- Research-based high-impact practices
- Mechanisms for implementing high-impact practices in geoscience programs in 2YCs
- Web-based resources supporting the geoscience community

- Team action plans to improve geoscience courses, programs, departments, and/or institution
- Local workshops offered by the Change Agents to reach the broader geosciences professional community

Beginning with the March 2016 workshop, the agenda included activities focused in introducing the Change Agents to one another and to the project leadership team; introducing the three strands of the project on instructional strategies that support student success, broadening participation, and professional pathways; developing strategies for the Change Agents and project leadership team to engage with one another; and generating the initial individual and team action plans for the lifetime of the project. Twenty-two Change Agents participated in this meeting, and 100% responded to the end-of-workshop survey. (Additional information is available about this workshop on the SERC website at <http://serc.carleton.edu/sage2yc/workshops/march2016/index.html>).

Each Change Agent participant was asked to rate the degree to which several statements about the workshop were true for themselves. A 4-point scale was used to assess the statements, ranging from 1 for Disagree, to 2 for Tend to Disagree, to 3 for Tend to Agree, and 4 for Agree. Figure 6 shows the percentage of participants who rated the statements at the Tend to Agree and Agree levels. Results show the vast majority of respondents indicated that rating of Tend to Agree and Agree on all the workshop outcomes. This graphic also reveals the strength of ratings in that the preponderance of respondents rated at the Agreed over the Tend to Agree level. This graphic is not intended to diminish dissatisfaction with the workshop's outcomes because the ratings of Tend to Disagree and Disagree were acknowledged and address by the PI leadership team, but rather to illustrate areas where there is an opportunity to achieve an even higher level of participant satisfaction. Aggregating responses for all workshop outcomes, about 75% of the responses are at the Agree level.

Figure 7 displays results using the same rating scale. The March workshop survey provided results relative to participant ratings of Tend to Agree and Agree on five workshop goals having to do with building community, learning about the three project strands, developing strategies to work with their colleges and partners, developing individual action plans, and developing team action plans. Similar to Table 6, the preponderance of respondents rated these workshop goals at the Tend to Agree and Agree level. Again, about 75% of the respondents when asked to respond to goal statements that follow this stem: "I believe the goals of the workshop as stated were met."

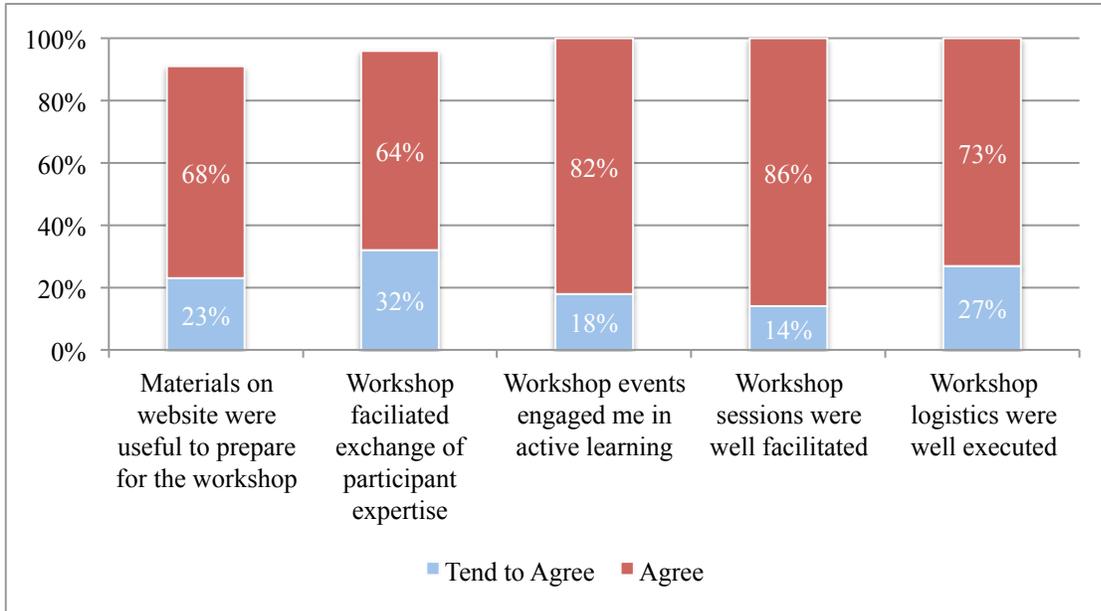


Figure 6. Percentage of Change Agents who Tend to Agree or Agree with March workshop outcomes statements.

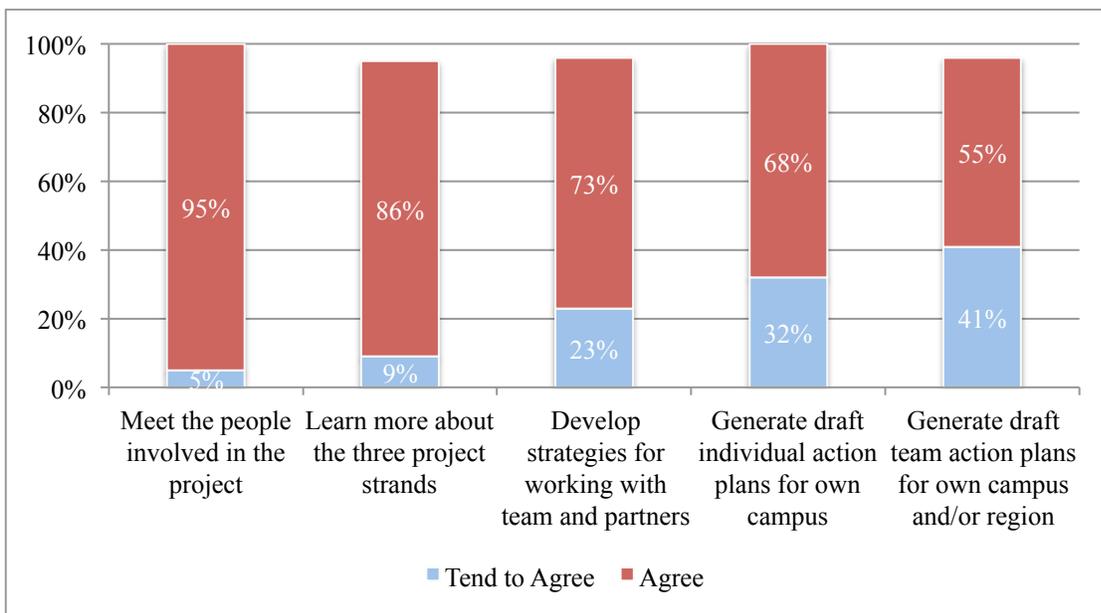


Figure 7. Percentage of Change Agents who Tend to Agree or Agree with March workshop goals.

The March workshop participants valued the time spent getting to know their fellow Change Agents, and most appreciated the workshop activities focusing on evidence-based instructional practices, including metacognition. There were also positive statements about focusing on professional pathways, particularly with helping students understand potential careers in the field, and there varied levels of appreciation on the topic of broadening participation. While some participants thought the topic was important to address, others thought the topic was premature, too time-consuming, and duplicative of information that is already known. These comments should be tempered by the fact that the overall feedback regarding the

workshop was very positive overall. In addition, many respondents mentioned the importance of improving the SERC website for the SAGE 2YC project so that Change Agents can easily find and disseminate project-related materials to support their action planning and implementation.

Looking at the workshop held in June 2016, the agenda featured sessions and activities to build the project community and continue the teaching and learning process on the three project strands. (Additional information is available about this workshop on the SERC website at <http://serc.carleton.edu/sage2yc/workshops/june2016/overview.html>.) All 24 Change Agents participated in the workshop evaluation, providing a 100% response rate to the end-of-workshop survey. The process for gathering and analyzing the workshop data was consistent with the survey process used in March, providing the opportunity to compare responses on these two major project events.

Figure 8 and Figure 9 shows respondent results on a similar scale used to gather feedback on key areas of the workshop relative to the statement: “I believe the goals of the workshop as stated were met...”: a) project community, b) three strands, and c) individual and team action plans, as shown in the figure. Overall, over 80% of the respondent ratings on the workshop outcomes and workshop goals were at the Agree level, indicating this second workshop was perceived as slightly more positively than the March workshop, although both workshops were rated at a very high level.

Overall, the June Change Agent participants noted that the information on metacognition and instructional practice change was most valuable, as was the opportunity to meet, share and inform their administrators about their aspirations to bring about classroom, program and possibly also college-level change. The less valuable sessions focused on implicit bias and Pathways to Results (PTR), with some respondents commenting that the information presented in the session on implicit bias was already familiar to them and/or that already resonated with their values as a teacher. They saw the value in reinforcing the importance of recognizing implicit bias, but they wanted more concrete examples to deploy in their practice. With respect to PTR, some respondents were confused about the purpose of this session. They felt some ideas were overly complicated and somewhat confusing, although a few respondents mentioned their intention to use some PTR tools on their campuses in the future. Finally, similar to responses to the March workshop, respondents shared excitement for the opportunity to get to know other Change Agents and to build community within the Change Agent group. They also made recommendations to improve the SERC website pages on SAGE 2YC.

Finally, the June workshop was unique because of its inclusion of administrators from the Change Agent’s colleges. Figures 10 and 11 show the overwhelmingly positive results of the administrators, based on results on the workshop outcomes and workshop goals. The administrator’s comments showed appreciation for the time to interact with their own faculty and to get a better understanding of the intentions of the project to implement change. In commenting on their roles to support the SAGE 2YC project in the future, administrators used the following terms to describe their roles: facilitator, helper, cheerleader, visionary, connector, supporter, advocate, and encourager. The majority of responses from administrators acknowledged that they could assist the Change Agents with institutional resources, including funding for campus-level faculty professional development. A few administrators mentioned assisting with grant writing to secure funding for peer mentors, student success strategies, and other related initiatives. One administrator mentioned helping the Change Agent(s) secure statewide resources, and a few administrators indicated that they would be able to assist the Change Agents in securing the data they need to engage in the project. With respect to reducing barriers, several of the administrators mentioned helping to remove obstacles, clear paths, and break through red-tape. Possibly best representing the goal for involving administrators in the SAGE 2YC project, one administrator pledged to “work with [my campus’ Change Agent] to ensure changes are made at the departmental and institutional level. [My campus’ Change Agent] is also looking to hold workshops at our institution, and I will support this in any way I can.” This verbal statement is indicative of the kind of support the PI leadership team

envisioned when designing the SAGE 2YC project, and it is noteworthy for this initial annual report to recognize that the workshop data support this intent.

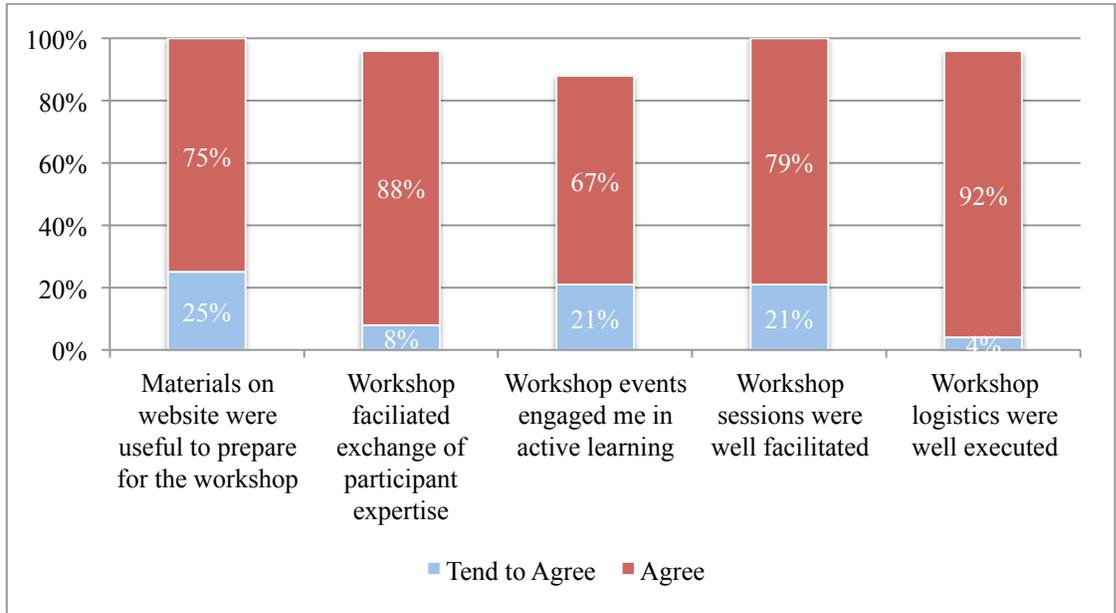


Figure 8. Percentage of Change Agents who Tend to Agree or Agree with June workshop outcomes statements.

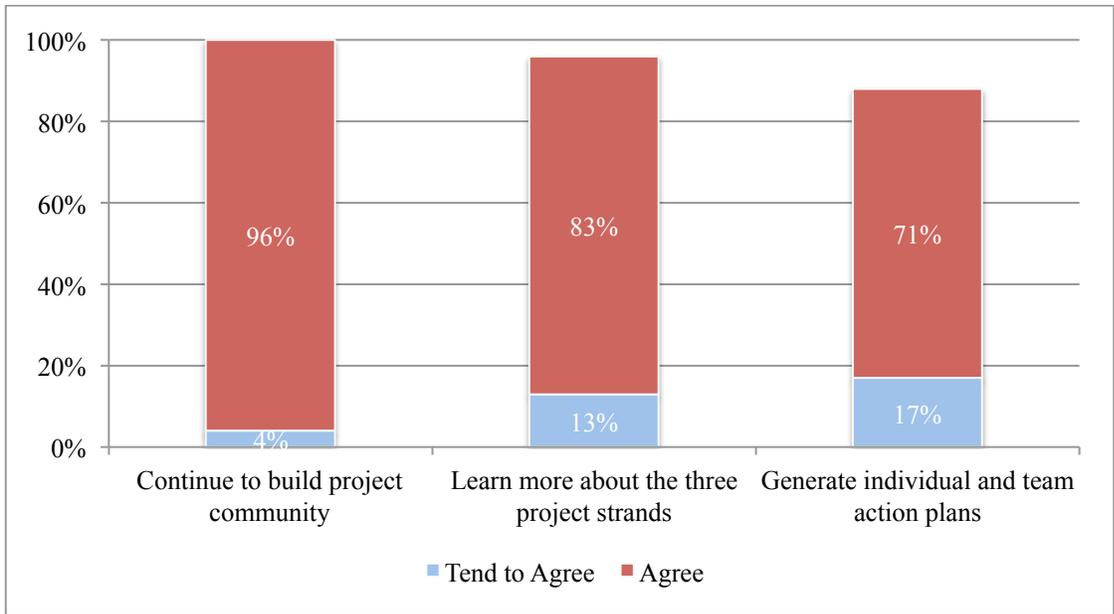


Figure 9. Percentage of Change Agents who Tend to Agree or Agree with June workshop goals.

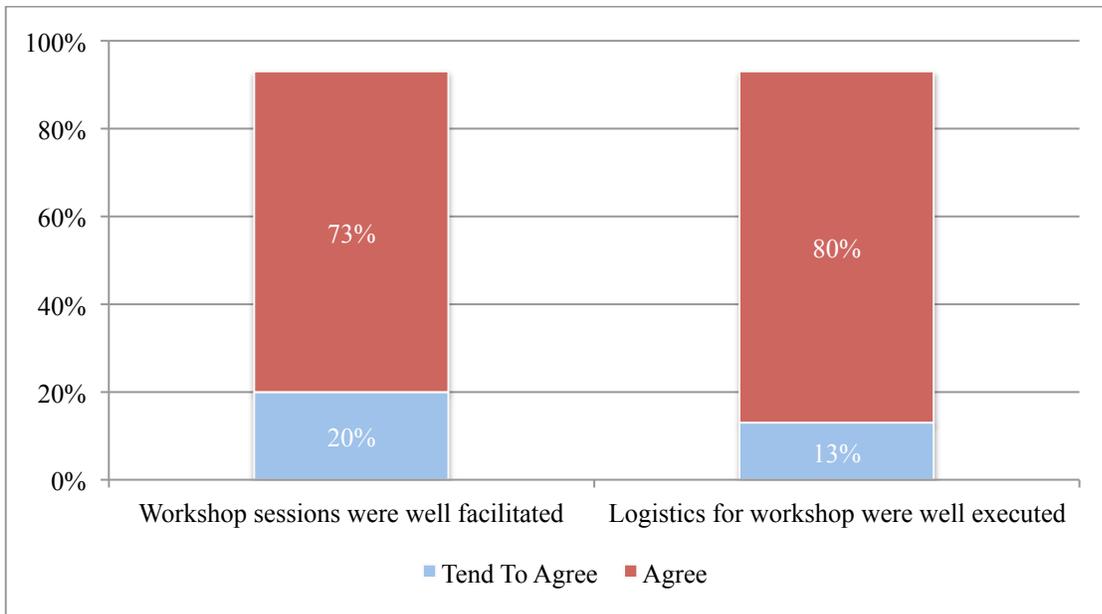


Figure 10. Percentage of Administrators who Tend to Agree or Agree with June workshop outcomes statements.

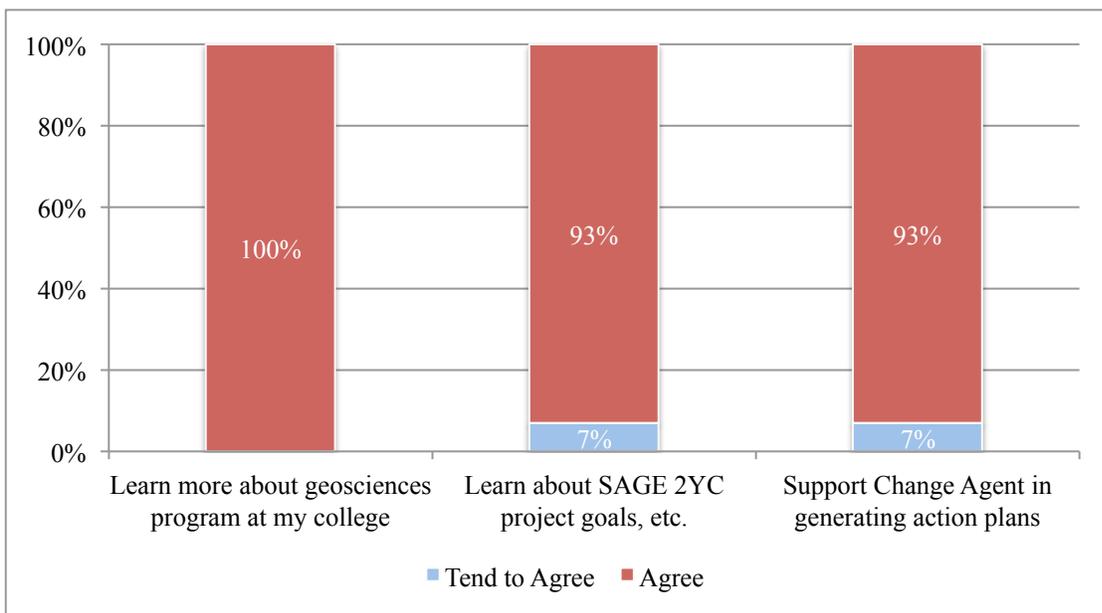


Figure 11. Percentage of Change Agents who Tend to Agree or Agree with June workshop goals.

Preliminary Change Agent Team Action Plans

At the June workshop, each Change Agent developed a team action plan to implement change at the course, program, department, or organizational level at their college. In addition, working as a team, the Change Agents developed a collective plan to implement shared activities to improve practices and student success in geoscience education at their institution(s). Though still under development at this time, the team action plans address one or more of the project strands of improving instructional practice, broadening participation and improving student success, and/or enhancing professional pathways.

Summary of Preliminary Change Agent Team Action Plans

Table 13 presents preliminary action plans of the Change Agents that formed into 11 teams, including each team’s needs statement, preliminary strategies, and preliminary outcomes. This data for this table are based on the preliminary action plans that the Change Agent teams created at the June, 2016 workshop. This analysis does not include individual action plans, only team action plans so as to avoid any chance to disclose the individual identity. The value of describing the action plans in this first annual report is to provide an understanding the substantive foci, scope and importance of the Change Agent teams’ aspirations to improve geoscience education relative to the goals of the SAGE 2YC project. Though preliminary and possibly undergoing some change, Table 13 shows the team action plans in random order to avoid disclosing the identify of any Change Agent teams during this formative stage of the project when the PI leadership team is still working with the Change Agent teams to formalize their plans. The second annual report to be submitted in August 2017 will report on the actual plans the teams chose for their SAGE 2YC projects.

Table 13. *Summary and Analysis of Preliminary Change Agent Team Action Plans*

Team	Preliminary Need Statement	Potential Strategies	Potential Outcomes
Team A	Geoscience program needs strategies to support student recruitment, enrollment, retention, or completion in the geoscience pathways.	<ul style="list-style-type: none"> • Recruitment and orientation for geoscience majors • Improve student advisement • Add UG research, field courses • Mentor for student support • Create more active learning • Monitor job placement • Formalize transfer agreements • Monitor transfer success 	<ul style="list-style-type: none"> • Enrollment • Retention • Completion
Team A	Students need supportive pathways that lead to successful transfer outcomes to 4-year universities and colleges	<ul style="list-style-type: none"> • Recruit with diversity-specific components • ID students interested in major • Assess instruction relative to major • Build a network across colleges 	<ul style="list-style-type: none"> • Student self-identify as geoscience majors • Number of transfer of geoscience majors to 4YCU

Team	Preliminary Need Statement	Potential Strategies	Potential Outcomes
Team B	Students need awareness of and preparation for academic and professional geoscience pathways that are attainable with a 2-year, 4-year degree, or certificate	<ul style="list-style-type: none"> • Create a CTE certificate for entry-level geoscience careers • Prepare students for immediate or delayed transfer to 4YCU • Provide advisement (counselors and faculty) to communicate with students on needs, questions, goals 	<ul style="list-style-type: none"> • Job placement • Transfer • Student science identity
Team C	Students, particularly minority students, need to enroll in geoscience courses at the same rate as other science courses	<ul style="list-style-type: none"> • Educate people and groups across campus about geology courses • Conduct outreach events • Create a geology concentration within an Earth Science majors • Provide resources and curricular strategies for majors 	<ul style="list-style-type: none"> • Recruitment • Enrollment through completion
Team D	Geoscience courses need higher student success rates, as defined by a “C” grade or higher	<ul style="list-style-type: none"> • Increase metacognition and other proven learning strategies • Introduce implicit bias to colleagues • Leverage existing resources to support at risk or underrepresented minority (URM) students • Leverage or start supplemental instruction • Increase students’ science identity 	<ul style="list-style-type: none"> • Course pass rate • Enrollment • Declared majors • Geoscience students using other support services • Student science identity
Team E	Students, particularly URMs, need to enroll and succeed in geosciences courses at rates similar to other programs within the department	<ul style="list-style-type: none"> • Recruitment • Student support within the program • Faculty development 	<ul style="list-style-type: none"> • Enrollment in intro-level geoscience courses • Retention in geoscience courses • Percentage of URMs enrolling and persisting in geoscience courses
Team F	Students need to succeed in key geoscience course, including supporting underprepared students in and out of the classroom	<ul style="list-style-type: none"> • Support outside of the classroom • High-impact classroom practices, including student support, active learning, and professional development for faculty 	<ul style="list-style-type: none"> • Number of students who successfully complete key geoscience course, with a grade of C or better • Number of students who access support services

Team	Preliminary Need Statement	Potential Strategies	Potential Outcomes
Team G	Students need to succeed on tasks in the geoscience program that require critical thinking and evaluation of scientific issues to success in courses and the program	<ul style="list-style-type: none"> • Collaboration across a champion team and meetings with administrators • Create resources for advisors to improve advisement to students • Adopt active learning strategies to disseminate to other instructors • Adopt metacognition strategies • Undergraduate research 	<ul style="list-style-type: none"> • Student learning outcomes to measure change in math and writing • Grade distribution reports over time to evaluate student academic success • Enrollment and retention data on semester-to-semester retention
Team H	Students need effective learning strategies in geoscience classes	<ul style="list-style-type: none"> • Introduce learning strategies • Use a moderate/high stakes assignment through metacognition and periodic reinforcement • Provide opportunities for using strategies in class assignments • Collect feedback and track grades 	<ul style="list-style-type: none"> • Inventory student study techniques early and late in the semester • Grades on quizzes and exams (pre & post-metacognitive strategies)
Team I	Students need to be able to access sufficient courses on each campus to complete an emphasis in the geosciences (geography, geology, geoscience, sustainability)	<ul style="list-style-type: none"> • Inter-campus communication within geoscience department • Enhance course offerings to students using different delivery modes • Improve transferability of geoscience courses 	<ul style="list-style-type: none"> • Variety of courses on each campus so students can complete pathways to Associate Degree with an emphasis in geosciences • Enrollment in geoscience major or transfer to 4YCU geoscience degree
Team I	Geoscience courses need to represent campus diversity to increase diversity in the geoscience workforce	<ul style="list-style-type: none"> • Reach out to developmental education • Increase recruitment from multi-cultural centers • Develop co-requisite model • Incorporate project-based, real-world problem-driven authentic science learning and metacognition • Offer UG research opportunities and internships, targeting URM 	<ul style="list-style-type: none"> • Enrollment of URM in geoscience courses • Enrollment of URM in the geoscience program • Longitudinal tracking of URM that transfer to 4YCU geoscience-related majors/careers
Team J	Program needs to recruit more AS in Science students for lab sequence and increase student awareness of/participation in geoscience pathways	<ul style="list-style-type: none"> • Recruitment • Enrollment within the college, including learning community • Improve the quality of advising • Expand active learning, tutoring, and UG research 	<ul style="list-style-type: none"> • Student completion of lab sequence

Summary Reflections and Recommendations of the Principal Investigators

At the conclusion of the first year of the SAGE 2YC project, the external evaluator conducted a one-on-one telephone interview with each PI. A standard set of questions was used for this interview, including questions about implementation of the three major project strands, initial impressions of Change Agents and their action plans, and outstanding successes or missteps in the first year. The telephone interviews were not recorded verbatim but rather extensive notes were taken by the interview, and the qualitative data were analyzed for thematic results. The intention of this section of the report is to provide a baseline marker of project implementation at the 1-year mark and to identify areas deserving of further attention as the project develops in year two and beyond.

A summary discussion of the major themes that emerged from the external evaluator's telephone interviews with the PI leadership team follows:

Large Scope and Meaningful Work

- The Principal Investigators (PIs) commented on the project being new and challenging, but they all expressed appreciation for the importance of the project. They strive to bring together different areas of expertise within geosciences and with different disciplines, including higher education and research/evaluation that are part of the SAGE Y2C scope of work. The PIs acknowledged that the project is “stretching” them, and that they are learning theories that are new to them (e.g., leadership and organizational change theory were mentioned by several PIs). All PIs mentioned how uniquely important the project is to the geosciences field, and they are grateful, proud, and enthusiastic to be part of the project in the future.

Change Agent Group shows Promise to Create Meaningful Change

- All PIs observed that the Change Agent group is an impressive, engaged, and potentially impact-creating group that is central to achieving the primary goals of the SAGE 2YC project. The PIs have worked deliberately to build personal and professional relationships with the Change Agents, including observing their engagement in the March and June workshops, conversing with them about their goals and aspirations to bring about change, and encouraging and guiding them in their pursuit of innovation and change. The interactions that the PI leadership team has had with Change Agents has given them confidence that the project is off to a good start and that there is great potential for success. They are enthusiastic about the opportunities the project presents to bring about change in geosciences in the 2YC context.

Instructional Practice Resonates with Change Agents and PIs

- Several PIs have the impression (from observations, personal interaction, workshop surveys, etc.) that the Change Agents are resonating strongly with ideas that the PI leadership team is presenting on evidence-based instructional practices. They also observe that the Change Agents are demonstrating a desire to improve their instructional practices, and they continue to plan to support these types of changes as central to the project. The PIs note the Change Agents' affinity for topics such as metacognition, active learning, and also undergraduate research and internships, etc. All of the PIs see improving instructional practice as very central to the project's goals, not only to improve classroom instruction but to moving the other two strands of the project on broadening participation and professional pathways.
- With respect to broadening participation and professional pathways, the PIs expressed a number of perspectives that may be useful to the future of the project. For example, a couple of the PIs thought the initial focus of the project on instructional practice would provide the means by which broadening participation and professional pathways would come to fruition. They recognized that broadening

participation and professional pathways could be more difficult to implement than instructional practices, partly because they see instructional practice as something they and the Change Agents can more readily influence and control. The way in which these three strands are envisioned to interact and evolve appears to be somewhat unique to each PI leader, but ultimately relies for most on the centrality of changing instructional practices as a means of leveraging change beyond the classroom level. The argument goes as follows: Without improvement to the core of geoscience education (i.e., instructional practice), geosciences will continue to struggle with broadening participation and building professional pathways. Improving geoscience instructional practices will improve students' academic success, and through this success, improve the recruitment of diverse learners including URM students, and that will advance professional pathways, both transfer to 4YCs and employment.

Shifting Vision of 2YC Faculty Role

- The PIs observed that SAGE 2YC project encourages a shift in mindset in terms of the geoscience faculty role, particularly in terms of influencing geoscience programs and organizations (primarily community colleges). Illustrating this point, one PI said, “We’re helping them [the Change Agents] to change their mindset about the role of a faculty member... [We’re creating a] set of stepping stones for levels of leadership.” Noting that geoscience faculty are “often isolated and not integrated into the institutional hierarchy [of their colleges] in a way that other disciplines are”, this PI observed that the project is opening doors for Change Agents to make a difference within but also beyond their classrooms. An emphasis on geoscience program improvement is an especially strong aspiration for all of the PI leadership team, and on some level, all PIs expressed enthusiasm for being part of a project that will enable geoscience faculty to experience growth in leadership skills and opportunities in their programs, colleges, and beyond.

Unique Project Focus on Administrative Support

- There was an overwhelmingly positive response among PIs concerning the inclusion of administrators at the June 2016 workshop. One PI observed that, “so many good things came out of that, including simple realizations that our project goals are very well aligned with institutional goals. The Change Agents learned that there are resources available to them that they didn’t know about. It will raise their profile in ways they didn’t expect and that could be beneficial.” One PI mentioned that the project design to purposefully link the faculty Change Agents to campus administrators from the beginning of the scope of work is an especially important interest of the National Science Foundation (NSF). Pioneering this approach, the PIs admitted some nervousness to this aspect of the project design, but they also showed great satisfaction in that their thinking was on target and potentially valuable not only to SAGE 2YC but other future projects seeking to influence innovation and change.

Confidence in the PI Team’s Collaboration and Effectiveness

- There was a strong general impression among the PIs that they are working together very well, and their effectiveness as the PI leadership team will continue to grow. All members of the PI team had some familiarity since before the grant, with some having worked together on NSF grants before, and this familiarity provided a foundation for growing a positive team experience. The work of the group is supported by SERC, which has a very positive reputation in the field and provides the team with a solid foundation from which to do its work. There appears to be good-faith efforts by all team members to deliver on the project’s goals and to contribute to the greater good of the grant. There is little ego or self-promotion evident among the PI team, which at least one team member mentioned as refreshing and somewhat uncommon in their experience. Rather than seeking attention or credit, the team members show genuine appreciation for each individual’s expertise as well as a shared commitment to bring about real and significant change for the good of the geoscience profession, which they greatly admire and respect.

Enhance Communications

- Recognizing that the project is still evolving, some PIs mentioned the need to improve communications among themselves and with the research/evaluation team. This recognition is not due to any major concerns, but more out of a desire to ensure that everyone is contributing to the project in ways that fully respect expertise and optimizes the potential of the project to succeed. For example, some PIs requested greater understanding of activities being carried out by members of the research/evaluation team, but they also said they expected this clarity to emerge. Again, it is important to note that these comments were not expressed in the form of discontent but more as an opportunity to improve communications to maximize the impact of the project. The desire to learn from one another is very strong among all members of the team.

Future Evaluation/Research

This section of the report provides a brief description of two areas of the external evaluation that will develop during year two of the grant: outcomes assessment and social network analysis.

Outcomes Assessment

An area of the external evaluation that is expected to evolve substantially during year two of the SAGE 2YC grant focuses on outcomes assessment. This focus represents an important development to measure the extent to which the project is improving student academic success by improving instructional practices, broadening participation, and building professional pathways. This aspect of the evaluation design focuses on sharing and supporting data collection tools and templates with Change Agents so they are able to gather meaningful data at the college level that are summarized and share with the PI leadership team and evaluation/research team. These tools and templates will enable the Change Agents and the Change Agents teams to measure the impact of strategies that they are deploying on program, course, and student outcomes in aggregate (at both the total group and sub-group levels). The evaluation tools and templates will include common (e.g., enrollment, retention) as well as specific measures unique to specific plans. This decentralized approach will provide insights into how strategies are working while also building capacity for data analysis and utilization at the college level.

To support this work, the external evaluator will draw on Office of Community College Research and Leadership's Pathways to Results (PTR) Outcomes and Equity Templates that will be customized to fit the purpose and vision of this project. PTR is a process that engages community college practitioners and their partners to identify and understand the problematic aspects of systemic design--whether processes, practices, policies, or pedagogies--and to find sustainable solutions that will support equitable student outcomes. These templates will also be used to inform the overall project evaluation. In addition to this common purpose, it is also critical that the data collected and the process of collecting the data are useful to the Change Agents in their own practice. As such, in addition to a few common outcomes to be collected across sites, the templates will feature the following: 1) categories for disaggregation and figures to display disaggregated outcomes to help Change Agents see baseline and ongoing differences in student outcomes of interest, 2) space for additional outcomes Change Agents would like to collect specific to their project, and 3) space to recognize if a given outcome was not part of a specific Change Agent teams' scope or set of goals.

The details of the outcomes assessment design will be determined with the PI leadership team early in the second year of the grant and execution of the plan will begin in Fall 2016 and continue through the life of the grant so as to identify, comprehend, and report the impact of the grant on the geosciences in the 2YC context.

Social Network Analysis (SNA)

Another important aspect of this project is the documentation of the “cycle of innovation” that suggests change in geoscience education starts in the Change Agents’ instructional practice and extends to geoscience and STEM-related programs and possibly across the Change Agents’ college campuses, and to other geoscience educators that are part of professional networks that promote change to geoscience education in the 2YC context (see Figure 12). 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” where ideas proliferate to and through Change Agents, who are themselves in a network of individuals and teams, it is important to determine and describe how this phenomenon occurs. Knowing how ideas take hold in the Change Agents’ own classrooms, programs and colleges, and how they spread to other 2YCs as well as to 4YCs and other geoscience-related organizations (i.e., professional organizations, employers, etc.) is important to understanding the grant’s impact. While there are many ways to understand impact, SNA represents one way of capturing the networking phenomenon that may be especially meaningful in the context of such a large-scale project as this one.

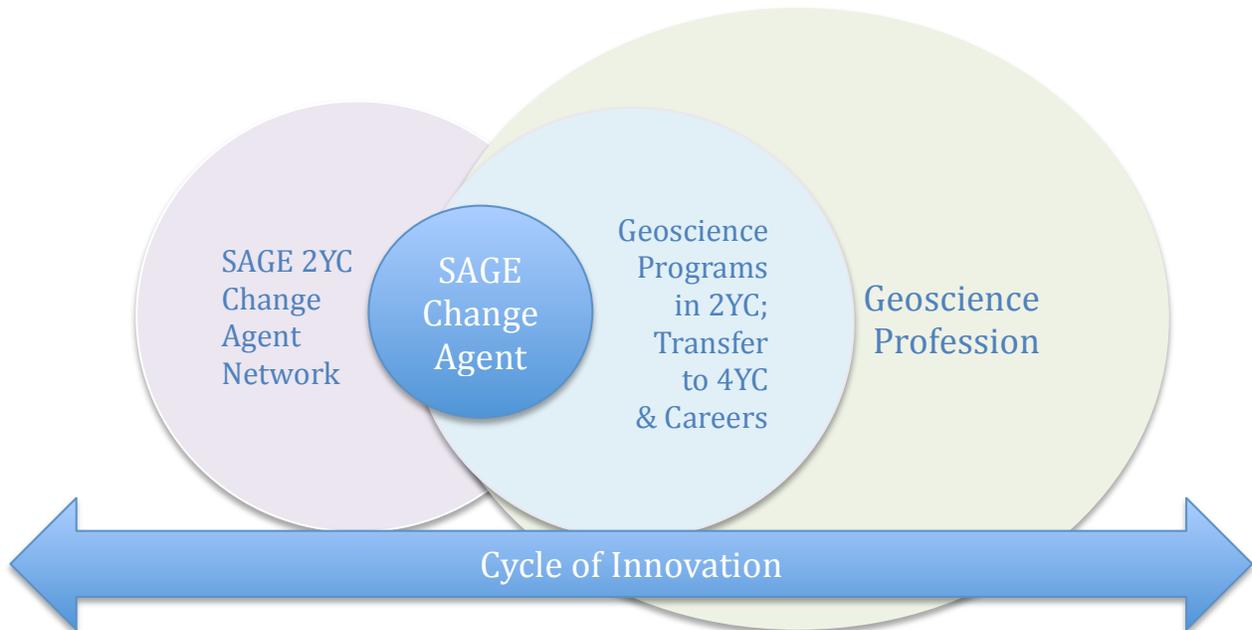


Figure 12. A visual depiction of the cycle of innovation and the spheres of influence that may emerge in the SAGE 2YC grant.

SNA has received increased attention over the last couple of decades and its use is growing as technology improves to operationalize the methodology and especially to visualize the complex patterns of results. Social networks offer a means of visualizing relationships between network members and illuminating understanding of the proximity and strength of relationships between them.

While similar to outcomes assessment, the details of the external evaluation will emerge during the second year of the grant, the external evaluators anticipate using online survey tools such as Survey Monkey to gather data on the SAGE 2YC network formation and growth, coupled with interviews to

enlighten the evaluators on the meaning and value of the cycle of innovation as it grows and changes through the project. UCINET is a publicly available network analysis tool that may be used for this purpose, although the external evaluation team is still actively engaged in researching determining the best software for the project.

The plan and decisions regarding SNA are expected to emerging early in year two of the SAGE 2YC grant, with the external evaluator and PI leadership team working collaboratively to determine the appropriate timing to begin and continue to carry out the data collection process.

Stay tuned!