

Undergraduate Research in Geoscience with Students from Two-year Colleges: SAGE 2YC Resources

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Undergraduate Research with 2YC Students

Compiled by [John McDaris](#) of SERC.

Why Undergraduate Research?

Undergraduate Research has been shown to have many benefits for students. In particular, undergraduate research (based on [Why Use Undergraduate Research Experiences](#)):

- helps students learn content and practical skills.
- prepares students for the [geoscience workforce](#).
- promotes students' cognitive development. (Lopatto, 2004)
- promotes students' [affective development](#). (Krathwohl et al., 1964)
- helps develop students' sense of self. (Bauer and Bennett, 2003)
- can be the hook to get students interested in pursuing geoscience as a career.



These benefits are important for all students, regardless of institution. Early exposure to research experiences has been shown to be effective in increased recruitment of students, improved retention and persistence in degree programs, motivation for students to learn and increase self-

What is Undergraduate Research > from Starting Point

SAGE 2YC has developed a set of web pages illustrating ideas and advice for 2YC and 4YC/U faculty who want to involve students from two-year colleges in research experiences.

The continuum of ideas for faculty to explore includes activities at 2YCs, collaborations with other local institutions, and the involvement of students in organized Undergraduate Research programs run by a number of institutions and organizations.

Possibilities at Two-Year Colleges

2YC	Independent Study	2YC/4YC Collaboration	2YC/4YC Collaboration	4YC
Research in Class within the Curriculum	Special Research Outside of Class	2YC/4YC Collaboration within the Curriculum	2YC/4YC Collaboration outside the Curriculum	2YC/4YC Collaboration outside the Curriculum

Conducting student research at two-year colleges can be challenging. But there is a range of possibilities and models for 2YC faculty to use in getting their students research experiences. Below are detailed strategies you can use with your students, illustrated by examples shared by other faculty. You can also browse the full collection of [example programs](#).

Research In Class

Research as a part of a regular course can take many forms.

- Inquiry-based laboratory activities such as [investigative cases](#) can replace "follow the recipe" type activities in lab sections.
- Stringing together a series of such labs can lead students to reach larger conclusions and illuminate the approach science and exploration.
- Long-term monitoring projects, such as local streams or wells, are examples of research experiences of multiple years' worth of students with a relatively low threshold for participation. As an example of this, see [Cervato's Groundwater Wells](#) activity.
- Using online databases (such as the USGS) can allow research even when taking students into the field would be prohibitive.

Conducting research in class also provides an opportunity to involve students from previous classes as peer mentors, giving them additional experience and providing additional guidance for the students coming through the class for the first time.

[Penn State Brandywine - Laura Gustin](#)
Professor Gustin uses a range of inquiry-based projects with students in general education courses that involve students generating their own hypotheses and designing projects to test them. Based on those projects she approaches students to see if they are interested in an independent study project in a future semester.

2YC / 4YC Collaborations

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Establish Relationships

The first requisite for developing collaborations with between 2YCs and 4YCs is for there to be a working friendship at the two institutions. These can have benefits for both sides. For a 2YC faculty member, finding a colleague at an institution that shares a research interest can be a great way to stay connected with geoscience and/or education represents a larger share of a 4YC faculty member's responsibilities. Moreover, a deeper understanding of local 2YC faculty member understand how to better foster transfer students' success. Developing these professional friend door to collaborating together on a variety of scales. Faculty friendships naturally result in sharing knowledge and to each other's interests. Familiarity with each other's challenges and strengths can also lead to ways of sharing access to publications, pedagogical content, etc.) to facilitate better teaching and learning at both institutions.

Funding, Equipment, and Space

Funding for equipment, supplies, and other needs is often in short supply. Further, most community colleges are designed with student research in mind, leading to a shortage of useful laboratory space.

- Without dedicated research space, [Laura Gustin](#) taps into student interest in community- and outreach-based projects to engage them in outdoor research such as her [tree banding project](#).
- Seek out sources of used equipment. Often, government agencies and universities store old but usable research equipment as surplus that can either be given to community colleges or sold at a discounted rate ([Jalilobon, 2010](#)).
- [Reza Walker](#) and [Mark Bostja](#) encourage their students at Mt. San Antonio College to think creatively about presenting at professional meetings. Local regional meetings tend to be more cost effective than national ones; shared lodging with other students can further reduce costs; volunteering at the meeting can result in discounted registration; attending functions with free refreshments can help.

Conduct Joint Research with 4YC Colleagues

Joint research collaborations can take many forms. Faculty members can collaboratively design research activities for a course at the 2YC that will better prepare students in the geosciences. Or both faculty could conduct joint in-class research projects that get their students working

Solutions to Common Challenges

Two-year colleges vary widely across the country and each one has different strengths and challenges when it comes to students' access to research experiences. But there are some common challenges the many faculty face and anyone doing this work will recognize many of them. It can be very empowering to know that other faculty are facing similar issues and have

Time

It is no surprise that faculty and student time is at a premium at many 2YCs. 2YC students are more likely to be non-traditional and face work or family pressures on their time than those at four-year institutions; tenured geoscience faculty at 2YCs teach full loads and are more likely to be "one-of-a-kind" on campus. There are creative ways to do more research with students that don't dramatically increase anyone's time commitment.

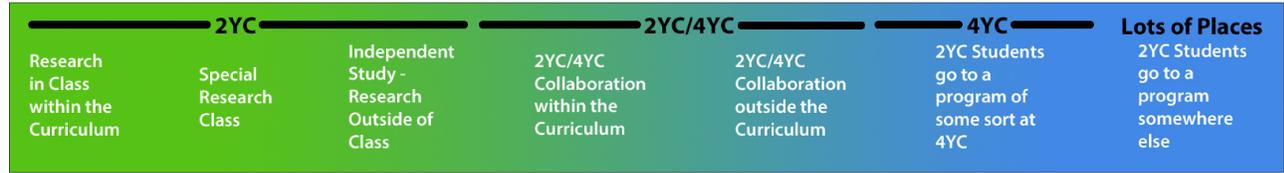
- [Karen Kottz](#) has designed opportunities for students to give each other peer feedback and mentoring into her in-class research projects at the Community College of Rhode Island.
- [Shelley Jaye](#) worked with her dean at Northern Virginia Community College to arrange her teaching load into two long days so that she could devote the rest of her week to guiding and mentoring students doing research.
- Making research spaces as available as possible outside of class as well as during class can give flexibility to conduct their work. Using campus local projects can reduce or eliminate transportation

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There are a series of pages synthesizing the many ways to involve 2YC students in research ranging from single activities in a class to collaborating with faculty at four-year institutions to conduct joint efforts.



Undergraduate Research in Geoscience at Northern Virginia Community College

Information for this profile was provided by Shelley Jaye, Geology.

Departmental/Institutional Context

Northern Virginia Community College (NOVA) is the largest educational institution in Virginia and the second-largest community college in the United States, comprising of more than 75,000 students and 2,600 faculty and staff members. NOVA is also one of the most internationally diverse colleges in the United States, with a student body consisting of individuals from more than 180 countries. Located near Washington, D.C., the college includes six campuses along with four educational centers. NOVA offers more than 160 degrees at the associate's level and certificate programs. NOVA also offer distance learning programs through our Extended Learning Institute and continuing education courses through workforce development.

The geoscience program at NOVA is large and robust. We have eight full-time faculty spread across our four largest campuses: our Annandale, VA campus which is NOVA's largest campus. We currently have three full-time geoscience faculty and five adjunct teach a variety of geoscience courses including Introductory Physical and Historical Geology, Oceanography, Mineralogy, and, Env. Geology. We offer an array of specialty classes, such as Snowball Earth and the National History and Environment of the Chesapeake as a large assessment of one credit field trip courses and longer, weekend, one- and two-week field courses in various locations in Canada.

Research Program Description

The NOVA geoscience department regularly offers a comparable and transferable course in Mineralogy that includes a strong research component. NOVA has a well-established relationship with the US Geological Survey headquartered in nearby Reston, VA. The Survey has hired a good number of NOVA geoscience students as interns and part-time employees. Through this partnership I have been able to establish a small research project involving honors Mineralogy students. The project involves teaching the students how to make rock thin-sections and then complete detailed petrographic descriptions and modal analyses of crystalline basement rock cored from the Virginia Coastal Plain. The rock core was drilled by the USGS while conducting their discovery and scientific investigation of a buried impact structure near the mouth of the Chesapeake Bay.

The NOVA geoscience department provides undergraduate students to one of the basic fundamentals of geologic research, which is whole rock petrographic



The website includes collections of profiles, essays, teaching activities and other resources illustrating how 2YC geoscience faculty have tackled various models of research and addressed potential challenges such as lack of time, space, and funding as part of supporting the wide diversity of 2YC students.

Undergraduate Research in Geoscience at Central Wyoming College

Information for this profile was provided by Suzanne M (Suzie) Smaglik, Earth & Science.

Departmental/Institutional Context

Central Wyoming College is a rural community college, within the boundaries of the Indian Reservation. CWC serves a student population of ~1500 and dual-enrollment students. The Earth, Energy, Environment is housed in the Science Department, within the Health and Safety. There are 2 geoscience faculty who serve 5 different tracks: 1) 2-year AS degrees and industry-defined AAS degrees and certificates. 2) 4-year BS degrees in geology, environmental and environmental geology. 3) 4-year BS degrees in geology, environmental science, industry health and safety (IOSHA), environmental technician (water, soil), geographic information systems.

Research Program Description

Central Wyoming College currently supports three research topics: 1) Understanding/defining the biogeochemistry and microbiology of environments in Hot Springs Park, Thermopolis, WY explaining the landscape evolution and prehistoric climate change of homynously flat, elevated surfaces (Table Mountain, Red Butte, etc.) unexplained along the eastern front range of the Wind River mountains. 2) Climate studies on glacier evolution in the Wind River Mountains (Snowlet and Snowy-Clovers) understanding current climate change. 3) Other (retired) projects include:

- Organization and cataloging of mineral, rock and fossil collections at CWC
- Understanding/defining the hydrogeology of Red Canyon Creek and its tributaries



serc.carleton.edu/sage2yc/studentsuccess/ug-research/



More Resources from SAGE 2YC

Geoscience Careers

Geoscientists in the Workforce: An Overview
People with geoscience expertise can be found in many parts of the workforce. This page lays out information about what geoscientists do, what kinds of preparation are necessary, and what the earning potential is in various parts of the geoscience workforce.

Career Pathways
There are a wide array of careers available to people with degrees in geoscience but they require different levels of preparation. Students can use the information on this page to plot their own route to a satisfying career in the geosciences.

Geoscience Employment Trends
The landscape of career opportunities in geoscience is constantly changing. To help your students prepare for their future careers, you need to know what their options will be. This page from the Building Strong Geoscience Departments site has predictions based on recent trends. The page also has links to salary data for professional geoscientists.

Professional Society Career Resources
There are many professional societies in the geosciences that offer guidance and resources for students interested in that particular field of work. There are also professional networks to support women and minorities in geoscience and in science careers in general.

Career Profiles
If students don't personally know someone with a geoscience background, it can be difficult for them to imagine themselves as a geoscientist. This collection of career profiles combines personal descriptions of the individual career paths of many geoscience professionals. From academia, to industry, to government, and beyond, there are many ways that a geoscience degree can set our students up for success.

Stereotype Threat and Solo Status

Based on work by Cheryl Dicker (College of William and Mary) and Christine Mallison (University of Maryland Baltimore County) presented at the 2013 workshop [Supporting Student Success in Geoscience at Two-Year Colleges](#). Compiled by John McDaris (SERC-Carleton College).

Stereotype Threat and Solo Status are two related issues that underrepresented populations often face in the academia. Knowing what triggers the negative effects and how to minimize their impacts on students' success is an important part of helping all students be successful in our classes.

What is Stereotype Threat?
Stereotype threat is "the threat of being viewed through the lens of a negative stereotype or the fear of doing something that would inadvertently confirm that stereotype". (Steele, 1998) When activated, stereotype threat causes students to perform worse on assignments than they might otherwise.

What is Solo Status?
Solo status is the experience of being the only member of one's particular community present in a group. This experience can lead to stress and poor performance because the student may be perceived to represent his or her entire community.

Mitigating the Impacts
There are a number of things that faculty can do in their classes to minimize the effects of both stereotype threat and solo status. Many of these strategies do not depend on what kind of stereotype is in play and also provide benefits to many students for whom neither effect is relevant.

Resources

Supporting Geoscience Transfer Students

Information for this profile was provided by Katherine Kottz, College of William & Mary, expanding from a presentation at the 2013 [Supporting Student Success in Geoscience at Two-Year Colleges](#) meeting.

In addition to other resources, this site draws on discussion by participants at the 2012 [Transferable Students in Two-Year Colleges for Geoscience Degrees and Careers](#) workshop.

Many students enroll in two-year colleges (2YC) as a cost-effective and flexible way to pursue higher education. Some students begin their studies with the intent of completing an associate's degree, and transferring on to a four-year college (4YC) to complete a bachelor's degree. Others may not have that path in mind, but discover a passion for geosciences while at their 2YC. 2YC faculty play a key role in identifying students that have an interest in geoscience, supporting programming that serves the advising needs of these students, and exposing students to professional development activities that will promote the skills and interactions necessary for success as a four-year institution.

Early Recruitment of Majors
2YC geoscience faculty are typically the first point of contact for 2YC students considering transfer to a 4YC geoscience program. Personal interactions and encouragement from faculty can be essential to giving 2YC students confidence to explore this path.

Supportive Advising for the Transfer Process
Once students have shown an interest in learning more about transfer options available to them, consistent, quality advice must be available regarding fulfillment of 2YC degree completion and 4YC transfer requirements.

Minimize Transfer Shock
Transferring to a new institution and adjusting to new expectations and ways of doing things can be stressful. But there are things that faculty can do to reduce the effects on students.

Make the Most of 2YC - 4YC Collaborations
Working closely with colleagues at 4YC can provide students with research opportunities and a chance to begin building a network of support with both 2YC faculty and students.

Supporting English Language Learners in Our Classes

This module was developed by Katherine Kottz, College of William & Mary, expanding from a presentation at the 2013 [Supporting Student Success in Geoscience at Two-Year Colleges](#) meeting.

English Language Learners (ELLs) are currently the fast growing segment of the public school student population in the United States. The K-12 ELL student population is more than ten times increased over 2008 in the ten-year period from 1995-2005. Seven more states saw their ELL student populations grow by 100-200% during the same time period (Data from National Clearing House for English Language Acquisition, 2010 Migration Policy Institute). More than ever, students graduating from high schools in the U.S. are entering college while still in the process of acquiring and/or refining their skills in English. Two-year colleges have already begun to provide instruction to this new wave of undergraduate students. "Today, about one in four students in community colleges is an immigrant and the numbers are increasing" (Crandall and Shepard, 2004).

Who are the English Language Learners (ELLs) in our classes?
The broad heading of "English Language Learners" includes several identifiable subsets of individuals who may have very different, and distinct, instructional needs.

- International Students
- Immigrant Students



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<http://serc.carleton.edu/sage2yc/index.html>