What does "research" look like at the Introduction level, such as at 2YCs?

Presenters & Institutions

- Kaatje van der Hoeven Kraft, Whatcom Community College (WA)
- Dave Voorhees, Waubonsee Community College (IL)
- Laura Guertin, Penn State Brandywine (PA)
- Niccole Cerveny, Mesa Community College (AZ)
- Sean Tvelia, Suffolk County Community College (NY)
- Gretchen Miller, Wake Technical Community College (NC)
- Kusali Gamage, Austin Community College (TX)

Checking in…

Poll Questions

Why would you/ or why do you do research in your class/with your students?

Put your responses in the chat

What research does for students

- learn content and practical skills.
- prepare for the geoscience workforce
- promotes cognitive development
- promotes development of self-regulatory strategies
- helps develop students' sense of self
- Increase retention / persistence
- can be the hook to by developing interest in pursuing geoscience as a career, especially minoritized students
- NGSS (K-12) students used to this, not standard ‘sage on stage’
- Develops acceptance (“belief”) of science; not shown in public

Bangera & Brownell, 2014; Bauer and Bennett, 2003; Hurtado et al., 2009; Lopatto, 2004; O’Donnell et al., 2015

What is undergraduate research?

Undergraduate Research Experiences are, "those that use the scientific method and/or the engineering design process to promote student learning by investigating a problem where the solution is unknown to students or faculty"

Patton, M., & Hause, E., (2020). *Community College Undergraduate Research Experience Summit Proceedings Report*. Washington, D.C.: American Association of Community Colleges. Retrieved from http://www.aacc.nche.edu/URESummit.

Research continuum

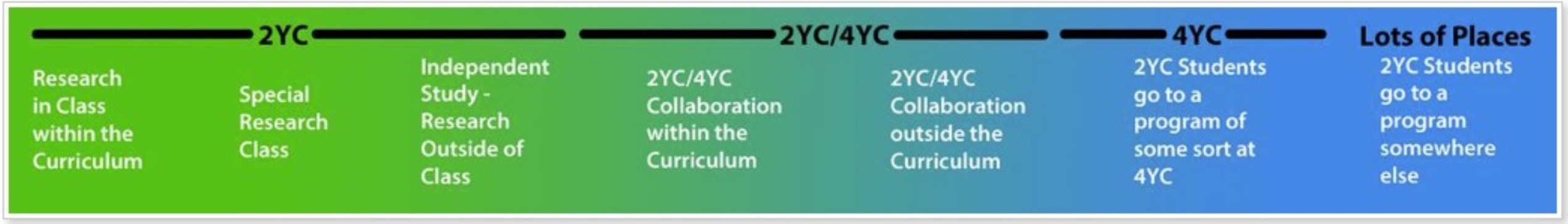
Continua of Undergraduate Research

Student, process centered	⟷	Outcome, product centered
Student initiated	⟷	Faculty initiated
All students	⟷	Honors students
Curriculum based	⟷	Co-curricular fellowships
Collaborative	⟷	Individual
Original to the student	⟷	Original to the discipline
Multi-or interdisciplinary	⟷	Discipline based
Campus/community audience	⟷	Professional audience

from Beckman and Hensel (2009)

Beckman and Hensel (2009) paper titled Making Explicit the Implicit: Defining Undergraduate Research, *Council for Undergraduate Research*

“Research” spectrum



CUREs at Whatcom as an Equity Focus

- Common class problem
  - Geology/ Oceanography/ Marine Biology – what is the health of our local watershed/estuary?
- Students develop questions
  - Archeology: students choose a question related to interpreting evidence of past human activity
  - Business: evaluate their current jobs to improve ethics in their organization
  - Chemistry: choose a topic from a set of projects, some which included partnering with local transfer university
  - English: Conduct research on an issue related to systems of justice
- Legacy research
  - Engineering: Work on a problem selected from a number of “clients” – report back to clients AND pass work on to next class
  - Psychology: develop a survey around student success for future students to administer and interpret
- Service-based research
  - Archeology: trash audit for the college as part of sustainability targets
  - Geology – work with a local organic farm to assess soil quality and success of different strategies (van der Hoeven Kraft & Kortz, 2021)

Some of the funding made possible from NSF (grant #:2021546). Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

Introduction to Earth Science: Examining the Health of the Watershed

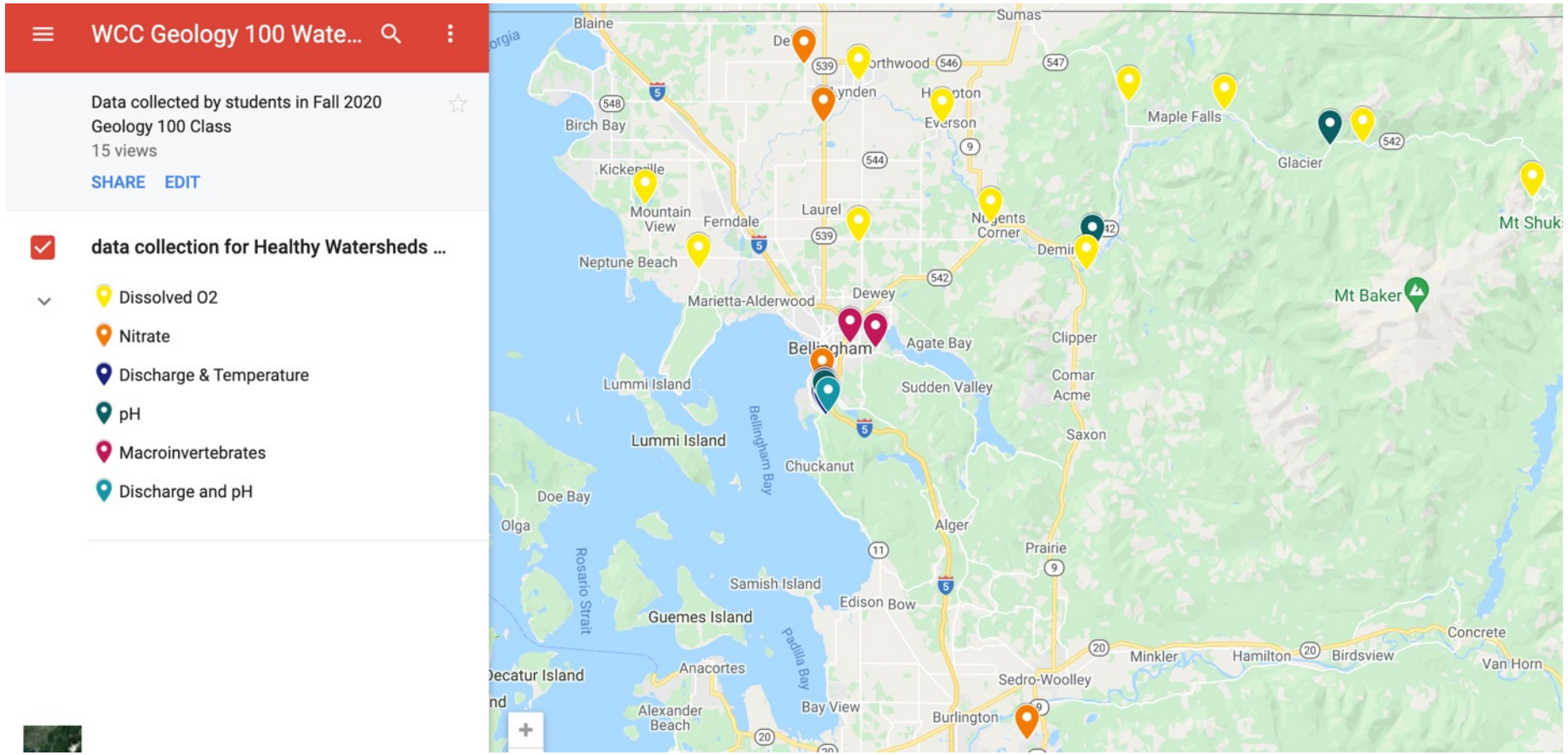
Week 4
- Introduction to Project
- Methods exploration

Week 5
- Literature Review "Crowdsourcing"
- Research Question Brainstorm

Week 6
- Research Questions refined
- Research Proposals
- Teams developed

Week 7-8
- Collect data

Week 8-12
- Peer Reviews
- Final Poster Presentations

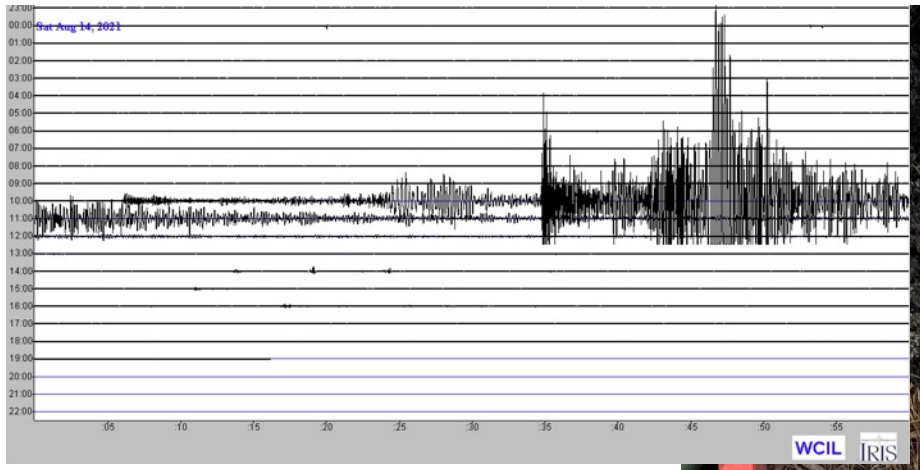


Whatcom COMMUNITY COLLEGE

Kaatje van der Hoeven Kraft
kkraft@whatcom.edu

Waubonsee CC
David Voorhees

WAUBONSEE
COMMUNITY COLLEGE
Where futures take shape



- Groundwater
- Dendrochronology
- Earthquakes / tectonics
- Paleontology

Citizen science projects: kicking it up a notch

- Template/model in place
- Local data set, feeds into larger database
  - Someone else using student data
- Not resource-intensive
- Foundation for long-term monitoring

scistarter
Science we can do together.

citizenscience.gov

Picture Post

tree banding

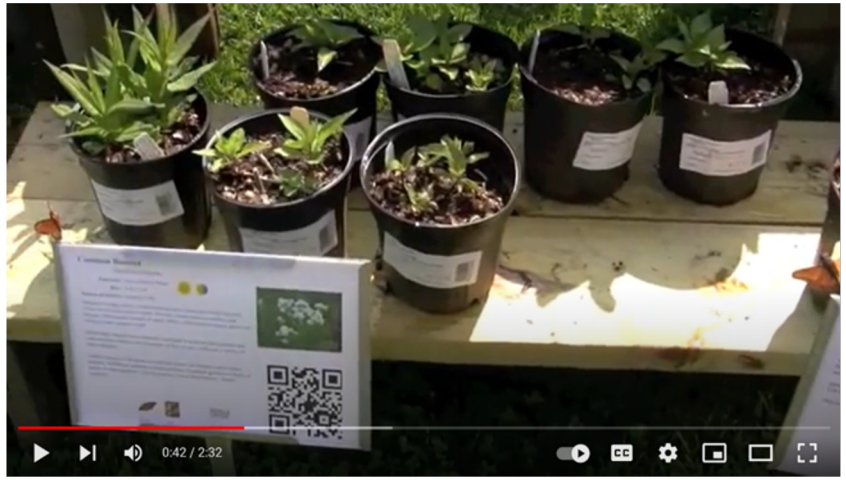
GLOBE

GLOBE Observer

mPING

Community-based projects: what is needed vs what you can provide

Enhanced Podcast of Pennsylvania Tree Biodiversity in Ridley Creek State Park *(Journal of Pennsylvania Academy of Science)*



Tyler Arboretum Plant Sale *(with QR codes)*
Bring Out Your Dead *(with American Studies, Art courses)*

Now what? Helping Students Open Doors to Undergraduate Research Experiences Upon Transfer (GSA 2014)

- Take photos of students doing the work
- Have students write an abstract, prepare elevator speech
- Update LinkedIn profile
- Have campus write a news article for website

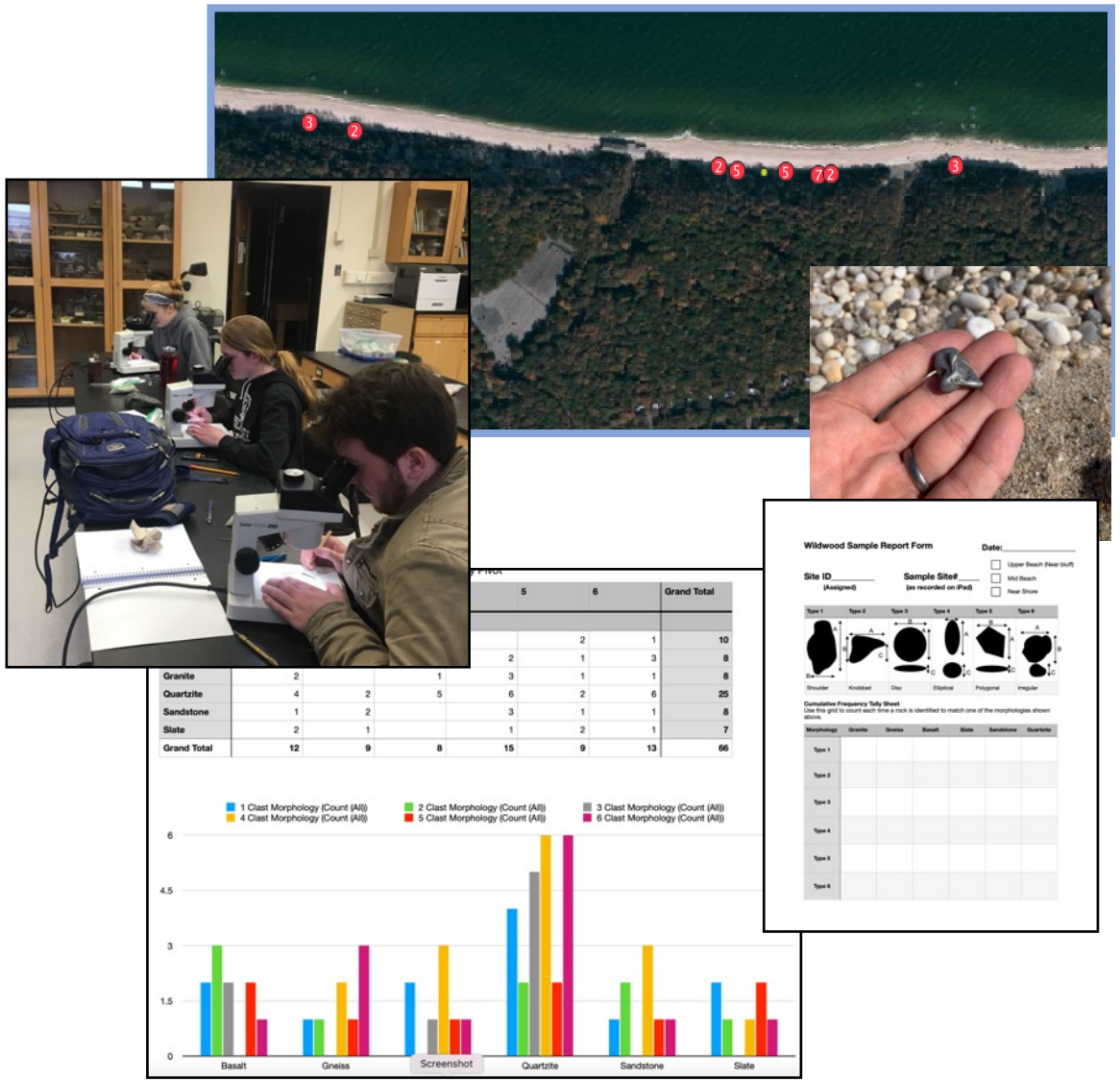
Laura Guertin (guertin@psu.edu), Penn State Brandywine

Extracurricular/low-stakes Research Opportunities

Sean Tvelia, Suffolk County Community College

Low-stakes research allows students to test the waters and explore their interest without being concerned about their ability.

- Opportunities built around larger faculty-sponsored research projects.
- Students can actively engage with little discipline knowledge.
- Students can choose level of involvement from casual participation to individual research projects.
- Builds stronger ties between faculty and students.



Extracurricular/low-stakes Research Opportunities

Sean Tvelia, Suffolk County Community College

Research-based workshops and seminars.

- Centered around universal skill sets (Excel, python, surveying, sampling etc…)
- Provides opportunity to work with area professionals and four-year faculty and peers.
- Helps provide place-based context to course content.

Undergraduate Research in National Parks

- Valuable Partnerships for Limited Resources
- Affinity for NPS and Participant Pride
- Learning Beyond what you have planned

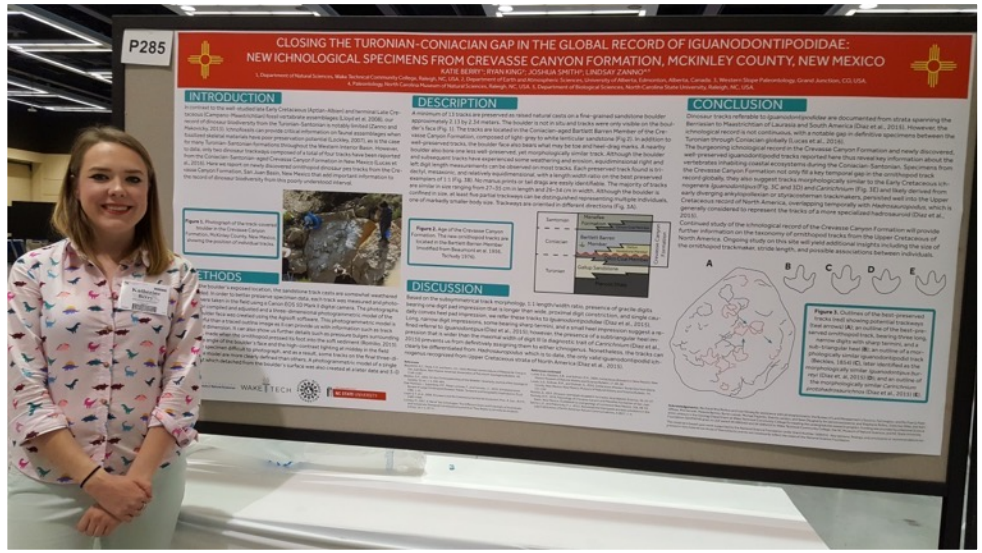
Partnership Between Community College, 4-Year University, & Science Museum

Gretchen Miller, glmiller@waketech.edu

- Wake Tech Community College students conducted summer research projects at NC State University or NC Museum of Natural Sciences
- 8 summer cohorts of students from 2012 through 2019
- Total of 80 students completed research project and presented poster, many participants were from diverse backgrounds
- 11 students additionally presented research poster at national/international geoscience meeting
- Funding from 2 National Science Foundation grants

Strengths of the Project:

- Flexible working schedules for students & most projects close to home
- 4-Year University faculty could test out “seed projects” with students without spending too much of their own time or resources
- 4-Year University had strong REU program with mentoring, training, and presentation resources available to participating students
- Science Museum had extra hands available during field expeditions
- 2-Year College faculty did not have to develop or oversee research projects, but were involved with general mentoring of participating students
- Many Wake Tech students who completed research projects mentored new cohorts in following years
- Students given multiple opportunities for professional socialization
- Students were paid with grant funds, but similar program could also run with other type of incentive such as course credit



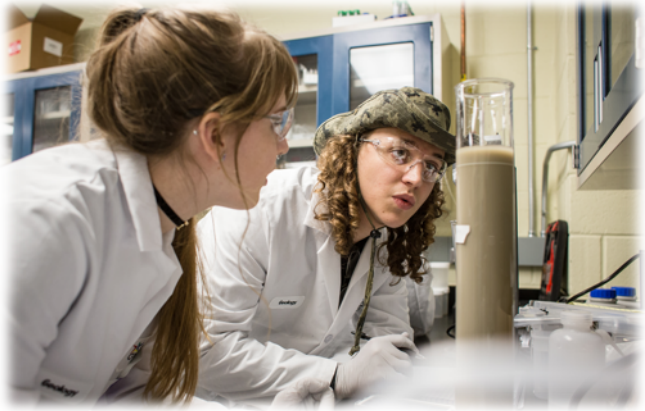
Supporting STEM Transfer Students Through Cross-institutional Undergraduate Research Experiences

Kusali Gamage[1] , Hugh Daigle[2], Chammi Miller[2]
[1]Austin Community College, Austin, TX. [2] University of Texas, Austin, TX.

Funding made possible from NSF (grant #: 1600177). Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation

Goal

- to increase transfer rates in geosciences/STEM by exposing 2YC students to undergraduate research during their second year



Project Details

- twelve second year 2YC students
- combined academic, financial and mentoring support
- stipend supported, full tuition/fee waiver
- 12 weeks, three-credit-hour course

- students worked in groups of four on scientific ocean drilling research
- research activities - *developed hypotheses, learned new instrumentation, collected and analyzed data, conducted peer review, formal poster presentation*

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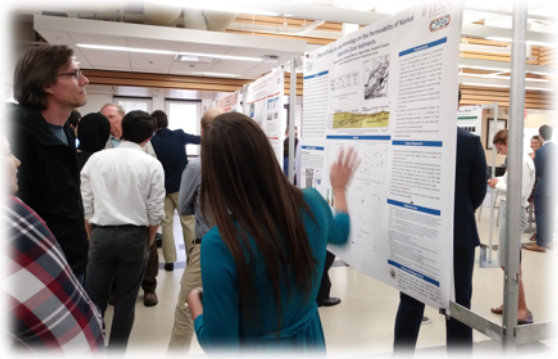
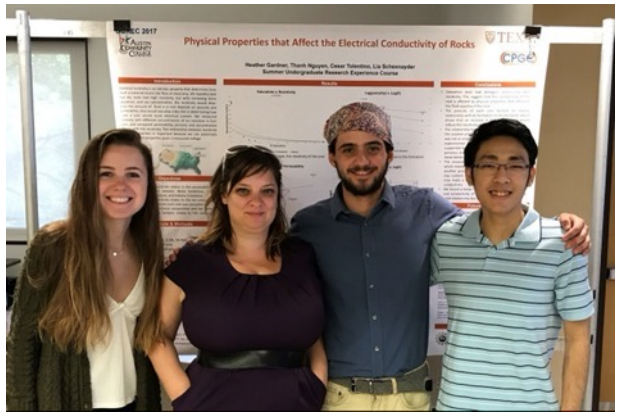
Kusali Gamage[1] , Hugh Daigle[2], Chammi Miller[2]
[1]Austin Community College, Austin, TX. [2] University of Texas, Austin, TX.

Evaluation

- surveys (URSSA: Undergraduate Research Student Self-Assessment)
- faculty assessment of student performance & skills
- institutional research data





Success & Challenges

- *42% geoscience majors, 25% intended geoscience majors*
- 100% agreed that their research experience prepared them for a job
- 92% agreed that doing research confirmed their interest in their fields of study
- 83% transferred to a four-year institution

- *lack of funding*
- *lack of faculty commitment*

Resources:

- Supporting STEM transfer students through cross-institutional undergraduate research experiences, Journal of Geoscience Education, https://www.tandfonline.com/doi/full/10.1080/10899995.2021.2005510
- NSF GEOPAths https://beta.nsf.gov/funding/opportunities/pathways-earth-ocean-polar-and-atmospheric-geospace-sciences-geopaths

Reflection Time

- Take ~5 minutes to quietly reflect and/or record your thoughts:
  - What would you like to know more about?
  - What are your thoughts for your own context?
  - What are your next steps?
  - What resources (people, equipment, etc…) might you need?

Consultation and Crowdsourcing

- Put in the chat or use the “raise hand” feature
  - Questions for specific individuals? General Questions?
  - Share ideas/resources?

Undergraduate Research in the First Two Years

Thursday, July 14, 2022; 1:30-4:00 PM
As part of the 2022 Earth Educators' Rendezvous

Kaatje Kraft, Whatcom Community College; John McDaris, Science Education Resource Center

Workshop Goals

Workshop participants will:

1) Identify the model of undergraduate research that best supports student learning in their context,
2) Develop goals and a preliminary plan for a CURE or other undergraduate research implementation that is appropriate for them,
3) Give feedback on other participants' preliminary plans and receive it for their own.

http://serc.carleton.edu/earth_rendezvous/2022/index.html