



Citizen Science: Students doing science that contributes to science community

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Background

Mira Mesa High School

- Biotechnology Pathway Teacher
 - Developed 2-year articulated pathway
 - optional research project year 3
- Biology Teacher (9th, advanced, AP)

UCSD, BA Molecular Biology

- Genetics Laboratory Research (Hypertension modeling)
- Population genetics (area of focus)

San Diego, CA, Miramar College/Southern California Biotechnology Center ABE program

- ABE teacher and trainer since 2006

Citizen Science

Traditionally: Students (non researchers) are trained to gather and collect data on a specific project.

- Students collect and report research data
- Goal is given by the researchers
- May or may not analyze data
- Traditionally ecological and/or environmental studies

Expanded: Students conduct scientific studies that add to the scientific knowledge and/or science community.

- Students conduct their own research
- Data analysis is part of the research
- Outcomes support science knowledge and opportunities beyond the classroom
- Can be on any scientific topic

Citizen Science Projects

Traditional

Environmental
water sampling (for
common species)

Population/species
identification
(digital camera
traps)

ScienceBridge Tech
Site Internship

Biodiversity in San
Diego

- iNaturalist (seek) apps
- DNA barcoding

Expanded

ScienceBridge
(Nontraditional
Citizen Science)

Students use biotechnology lab skills to make and prepare materials for 4 science kits

- Utilize science skills (making and aliquoting reagents, micropipetting, accuracy and precision, documentation... etc.)
- Problem solving, communication, leadership skills
- Write and publish updates to SOP's

2nd year students

- Run and design experiments to test quality and stability of reagents and protocol process changes
- Publish updates to rest of the tech sites (currently 3)

Produce over 200 kits/year = 200 classrooms doing STEM labs

- Data collected and published improves kits and classroom outcomes



ScienceBridge supports
Scientific Community

- 4 STEM kits for 200+ classrooms/year
- Community Outreach and Presentations

Produce
Reagents &
Materials

Bacterial Transformation

Protein Purification

Ocean Acidification

Enzymes

Lab Work



- Reinforces skills
- Students take ownership
- Leadership
- Sense of purpose

Mostly internal data:

- Internal publication
- Analyze to improve system, kits, problem solve, protocols...

ABE
Fellowship:
Local
Biodiversity
Project

iNaturalist App and website

Intro: Students find 5-10 species in their neighborhood (Ideally native species)

Design your own question and experiment to collect data on

High Quality Data is then picked up and shared with local/global research projects

Species Barcoding (piloting)

Barcode local organisms from biodiversity project

New and increasing area in science research

Important tool for understanding biodiversity and ecosystems

Easy integration point for ecological studies in biotechnology

- San Diego highest biodiverse area in continental US
- Biotech students can run samples for nearby schools-allowing any classroom to integrate into their curriculum

Citizen Science Resources

- [Citizenscience.gov](https://www.citizenscience.gov) and nationalgeographic.org
 - Preorganized data collection projects
- [iNaturalist.org](https://www.inaturalist.org) (or iNaturalist app)
 - Species identification app
 - Seek is gamified simpler app that integrates into iNaturalist
 - Can create your own project parameters that will collect your student's data into one group
 - [iNaturalist Teacher Guide](#)