Developing the Global Awareness of STEM Students Through Undergraduate Research Experiences

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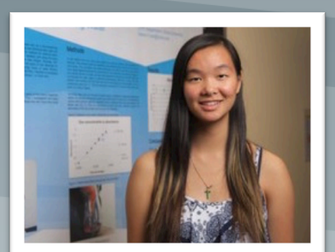
Program

In 2015, professors and students at Biola University, a small predominately undergraduate institution, came together in order to promote undergraduate research in science and engineering. The result of this effort was a series of university funded, undergraduate research projects focused on real-world scientific issues of social relevance. These include both individual and group projects which span various scientific and engineering disciplines. The ultimate goal of this program is to develop scientists and engineers with experience in hands on research and a sensitivity to various global contexts.

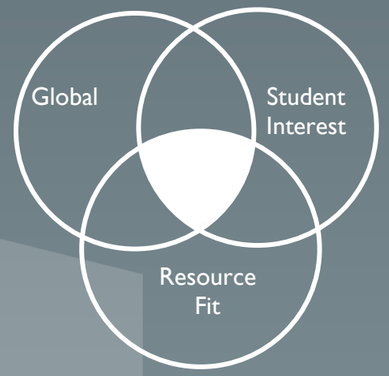
Student Generated Deliverables

- Two peer-reviewed scientific journal articles with a student as lead author
- Three poster presentations on research results
- A fully functioning electric vehicle restored entirely by student researchers
- Two educational presentations to elementary and middle school students on research results to inspire STEM learning
- World-Class Problems Night: a roundtable discussion on how research can help address global humanitarian crises featuring experts in political science, international development and scientific research



Research Topics

In order to qualify as a suitable research project, a topic must bear direct relevance to a global issue of social relevance, and be practical within the limited allotted resources. Most importantly, however, a project must be the result of student interest, since all projects are student led.



Recent Research Topics:

Topic	Format	Description
Tree Branch Water Filtration	Individual	Evaluate methods of water filtration using locally sourced tree branches as filters (Inspired by research at MIT)
3D Printing with Recycled Plastic	Individual	Develop filament for a 3D printer using binary blends of recycled plastic
Fluoride Filtration from Water	Group (2 Members)	Develop a method for filtering fluoride from water using appropriate technology
Electric Vehicle Design	Group (10 Members)	Restore/make improvements to a nonfunctioning battery electric vehicle

Challenges

There have been a number of challenges related to the fact that Biola is not a major research institution. These range from the big picture (finding funding, lack of institutional knowledge, relatively small STEM student population), to the day to day (obtaining access to journals, having the necessary facilities).

It is difficult to find research projects that are within the bounds of what can be accomplished with the available resources, while also meeting student interest.

Lessons Learned

- Define concrete milestones in order to keep students accountable during the research process.
- The amount of guidance necessary for each student varies widely depending on their preparedness and learning style.
- A diverse research pipeline/portfolio is useful in generating student interest, since individual interests vary greatly.
- Set aside substantial time in order to help students focus their research interests and topics.

Future Goals

- Establish an incubator facility for student run start-up companies to commercialize the results of globally focused scientific research projects
- Integrate university funded research in the sciences with university sponsored international education and service opportunities

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