An immersive research program for high school students

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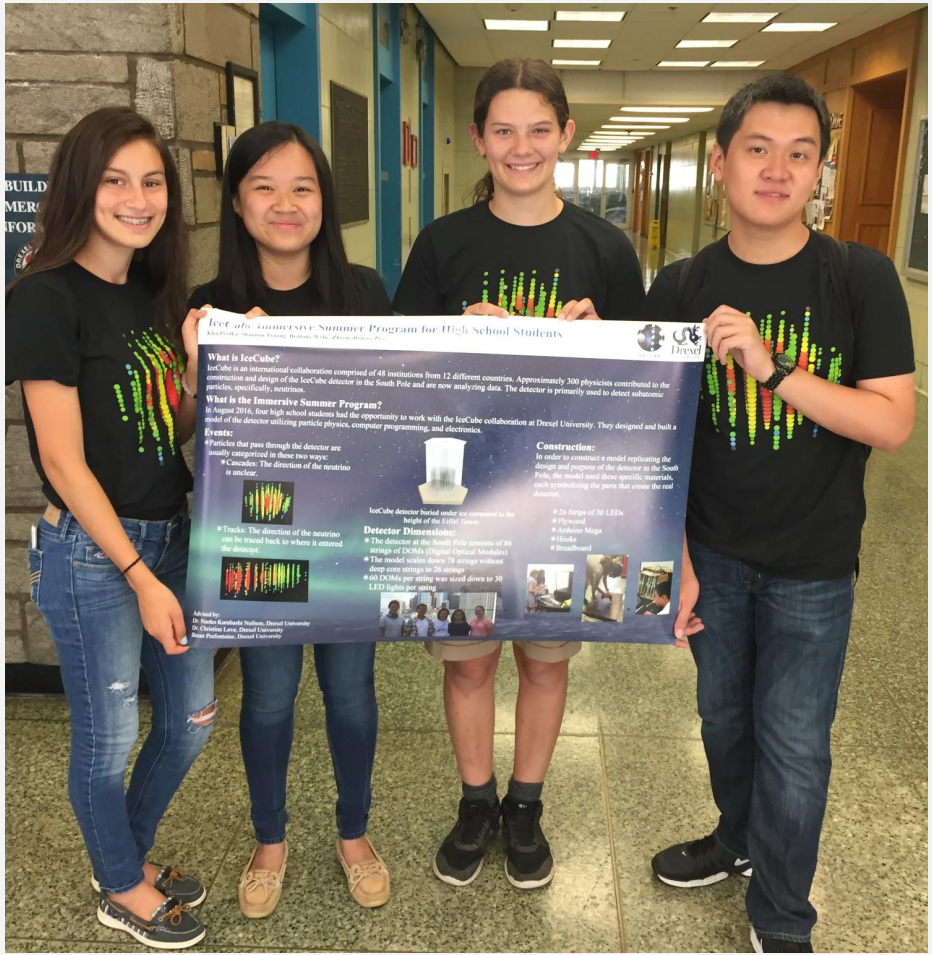
IceCube
SOUTH POLE NEUTRINO OBSERVATORY

Drexel
UNIVERSITY



Program Overview

Four high school students worked at Drexel for four weeks:

- Immersive research experience
- Capstone project
- Lab tours and lunch talks
- Workshops/lectures
- Presentations

Program Details

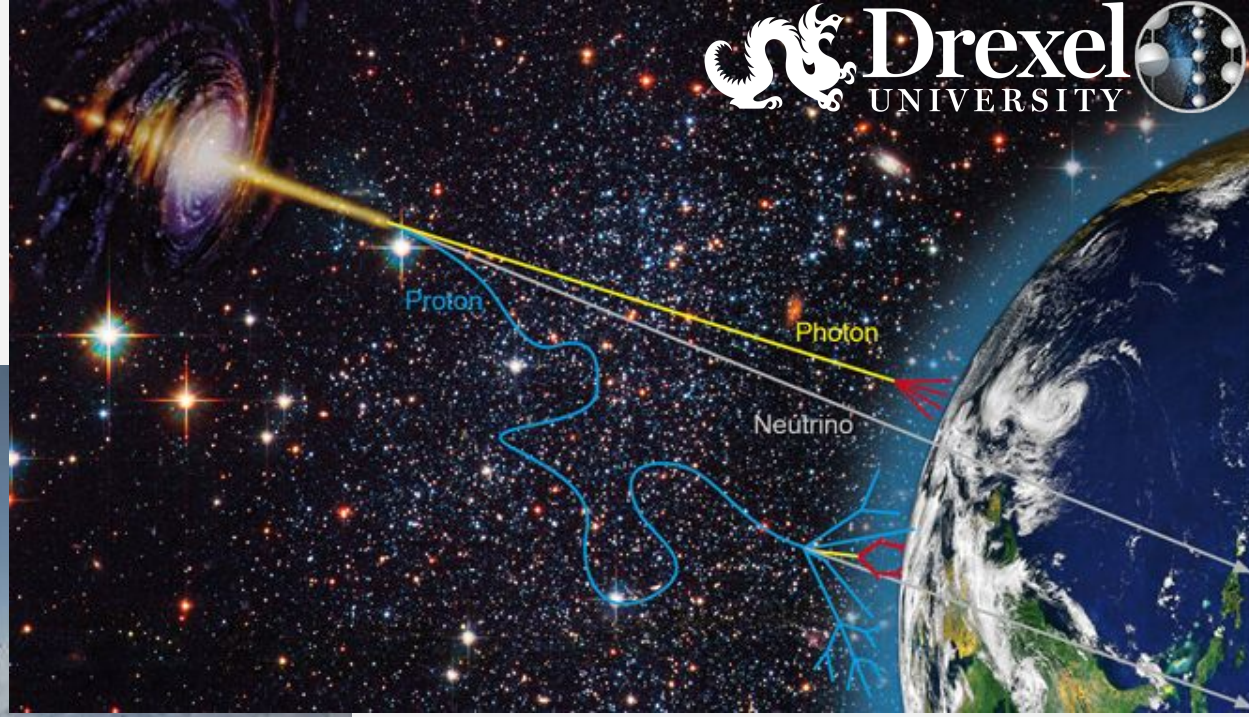
- Dates: August 1, 2016 - August 26, 2016 (four weeks total)
- Accepted 4 high school students out of 16 applicants
  - 3 rising seniors
  - 1 rising junior
  - 3 female students
  - 1 male students
- Program ran daily from 10am-3pm
- Location: primarily Drexel University with a few off site visits

Motivation

- For the high school students:
  - Exposure to university level research
  - Leads to major decisions such as career, major, etc. in an uninformed way

- For the research:
  - How effective are outreach programs?

Why IceCube?



Drexel UNIVERSITY

IceCube
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The IceCube Collaboration

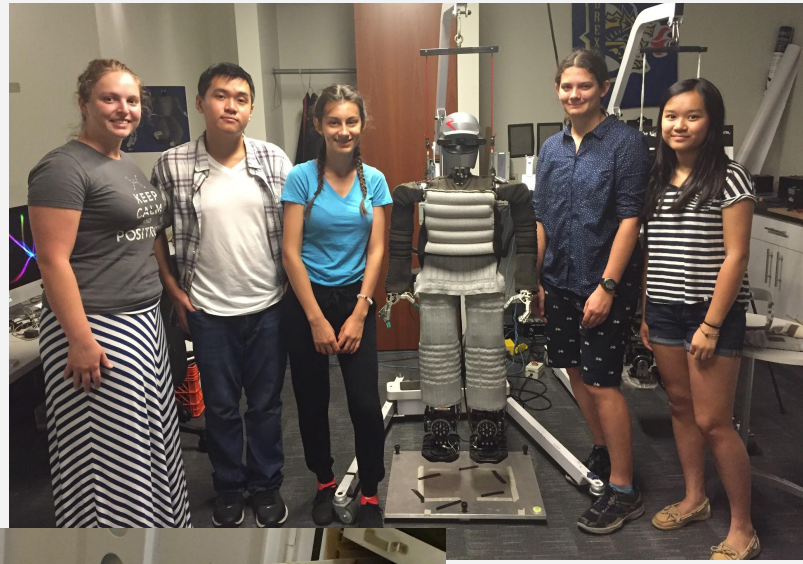
- International collaboration
  - Approx. 300 physicists from 48 institutions and 12 countries
- Drexel University IceCube research group
  - Undergraduate students
  - Graduate students
  - Postdoctoral fellow
  - Faculty

Immersive Program

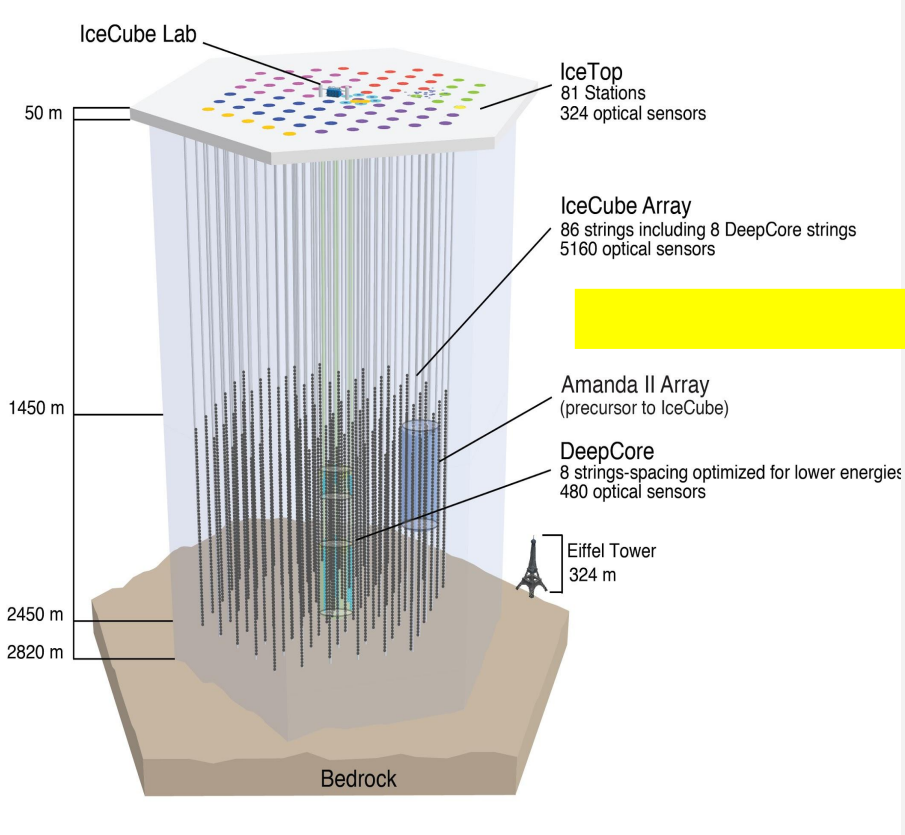
- IceCube group meeting
- Work with each of Drexel's research group members
- Worked in the IceCube office
- Workshops held by faculty and graduate students:
  - Particle physics
  - IceCube
  - Computer programming
  - Astrophysics
  - Electronics
  - Scientific presentation

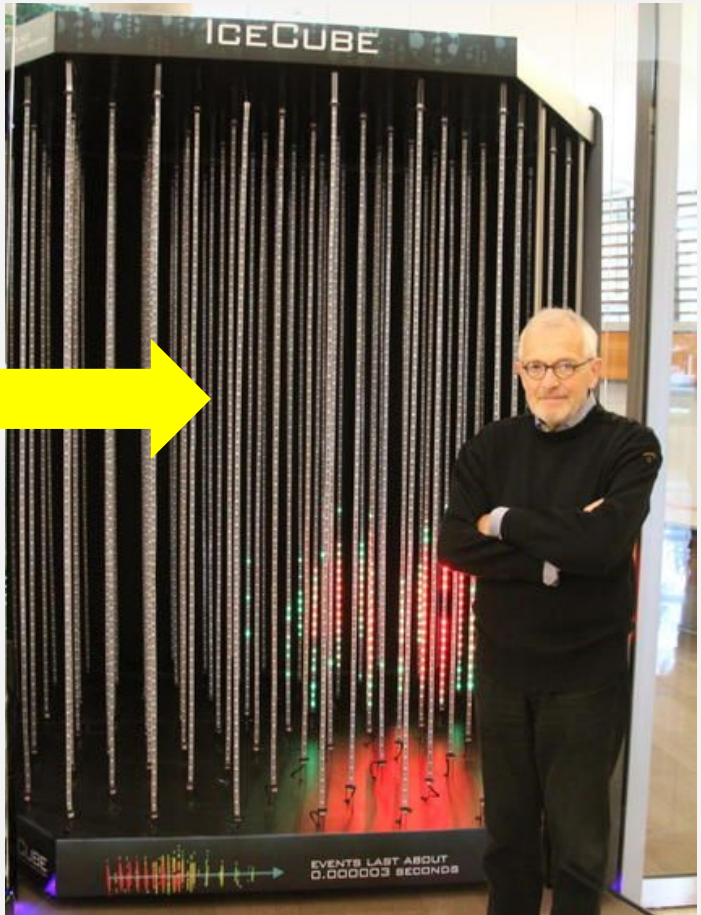
Diverse Program

- Lab tours:
  - Drexel Implant Research Center
  - Nanomaterials Lab
  - Particle physics lab
  - BLAST Laboratory at UPenn
  - Academy of Natural Sciences
- Lunch series: 14 different Drexel researchers gave informal talks about their research

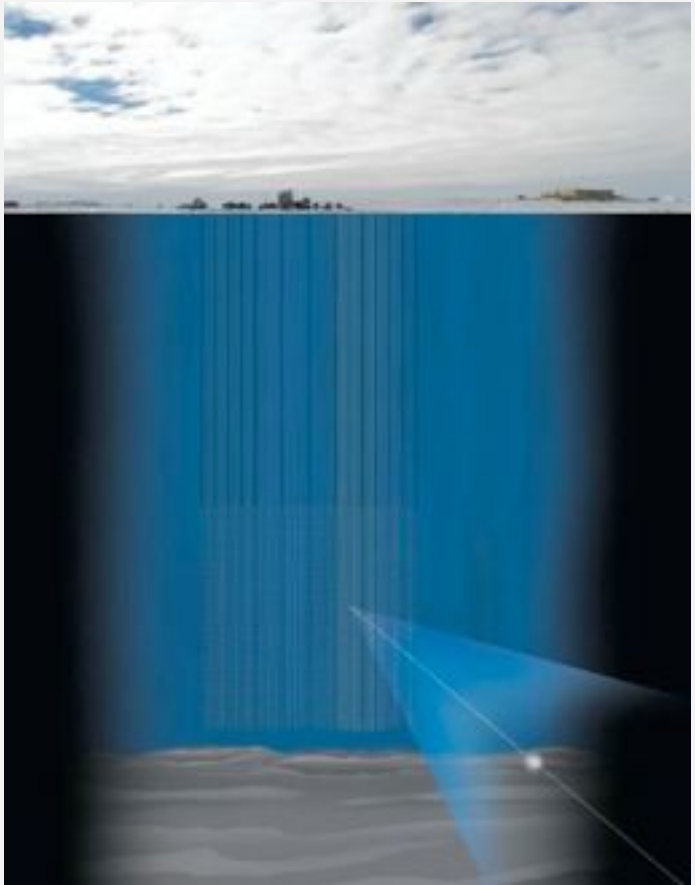


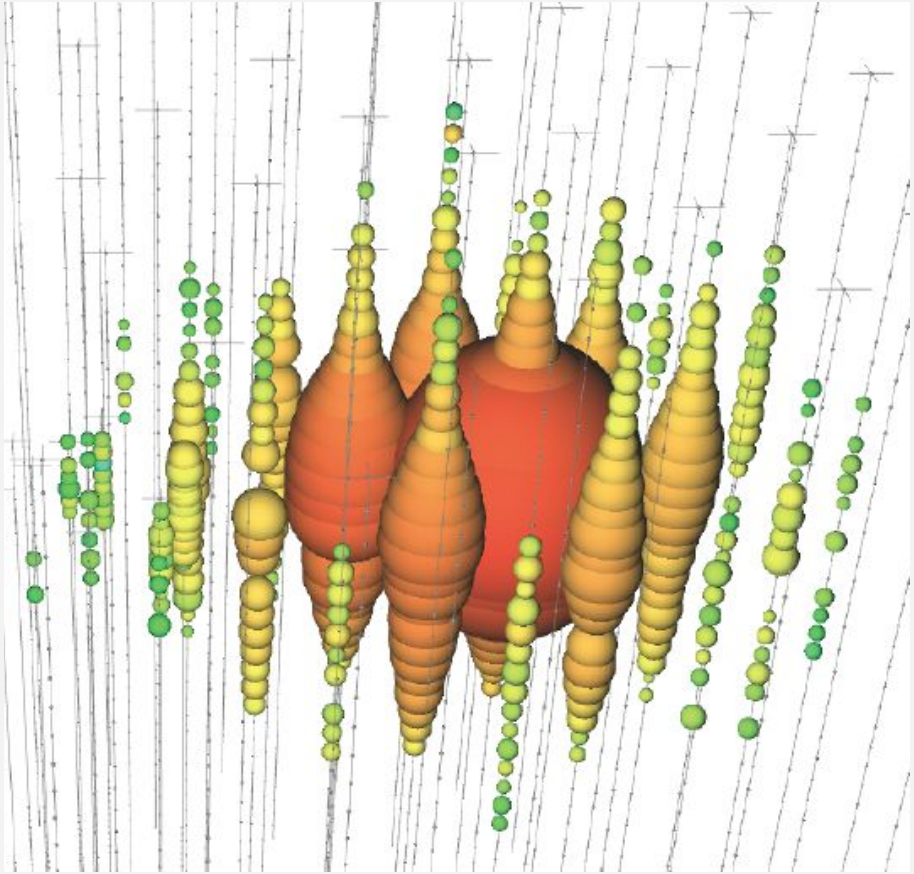
Capstone Project: A Model of IceCube





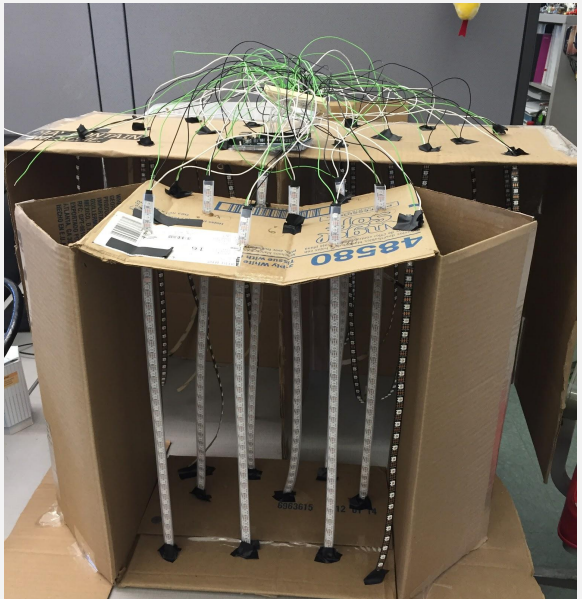
What does IceCube look like?

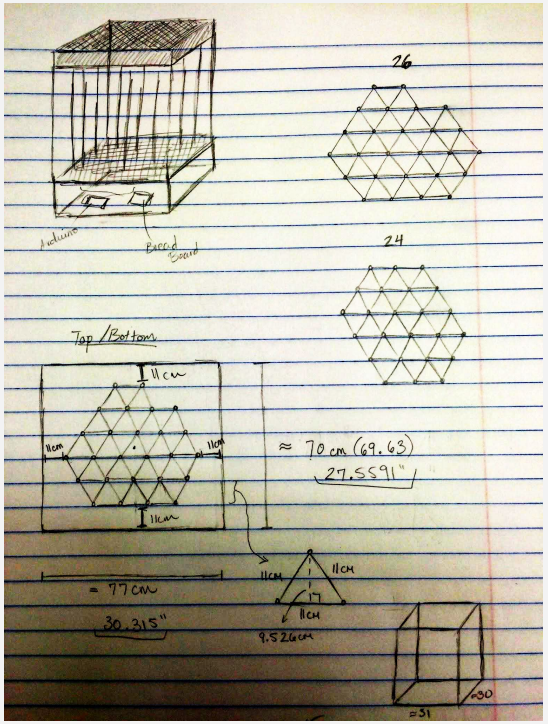




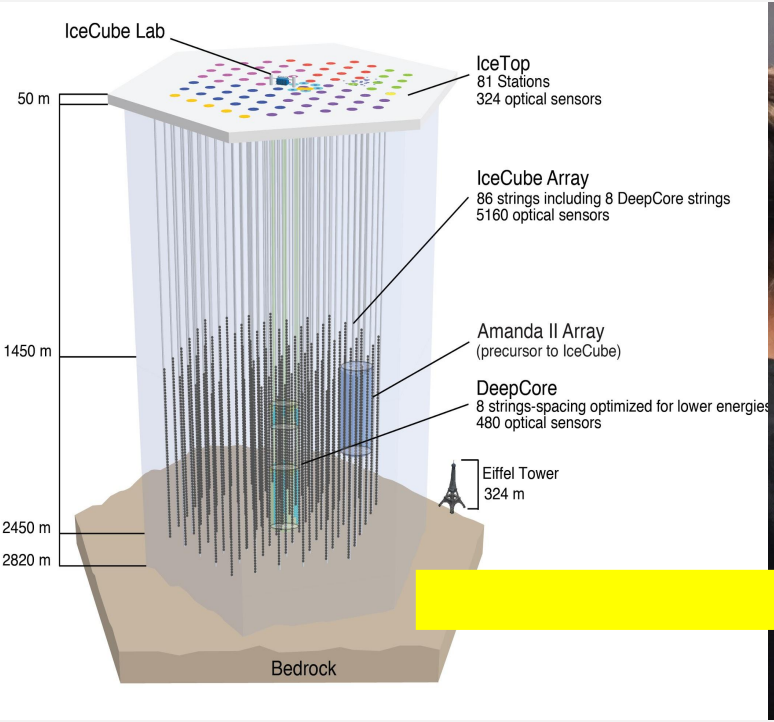
Diversity of Capstone Project

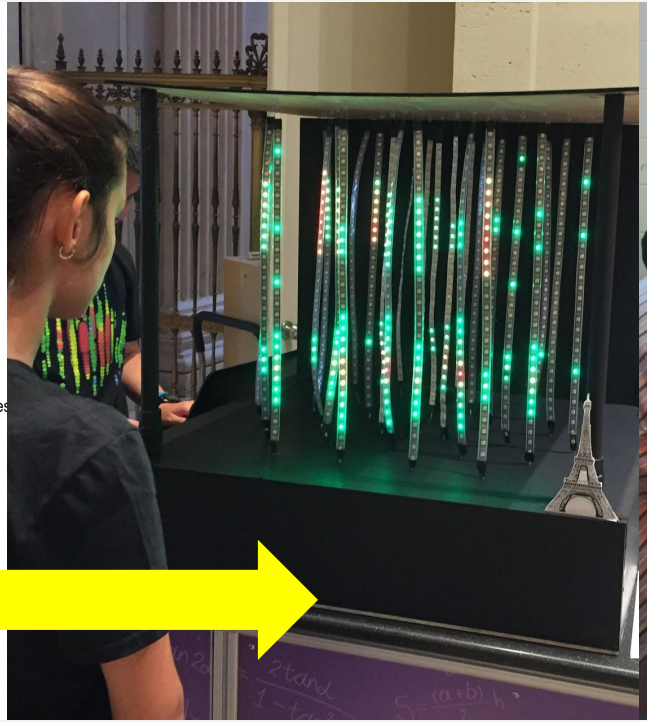
- Planning and building a structure
- Electrical engineering
- Programming skills

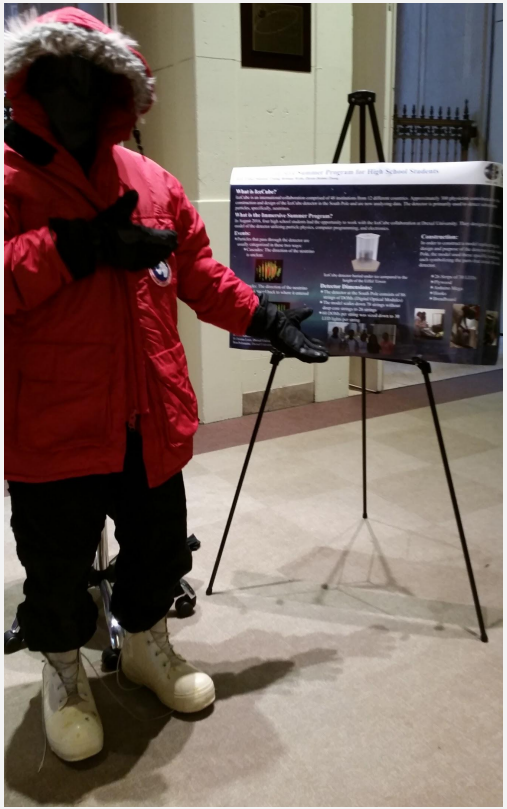




Final Capstone Project







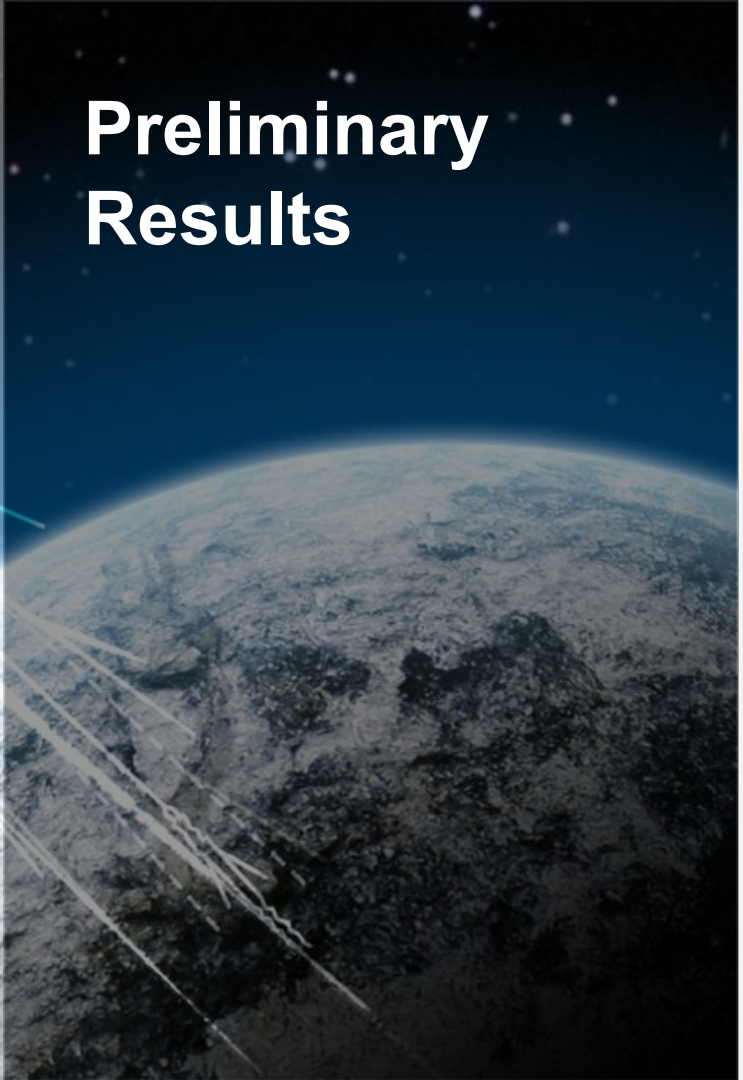
Presenting at the Franklin Institute: Cascading outreach effect

Formal Presentation: Department of Physics

Assessment

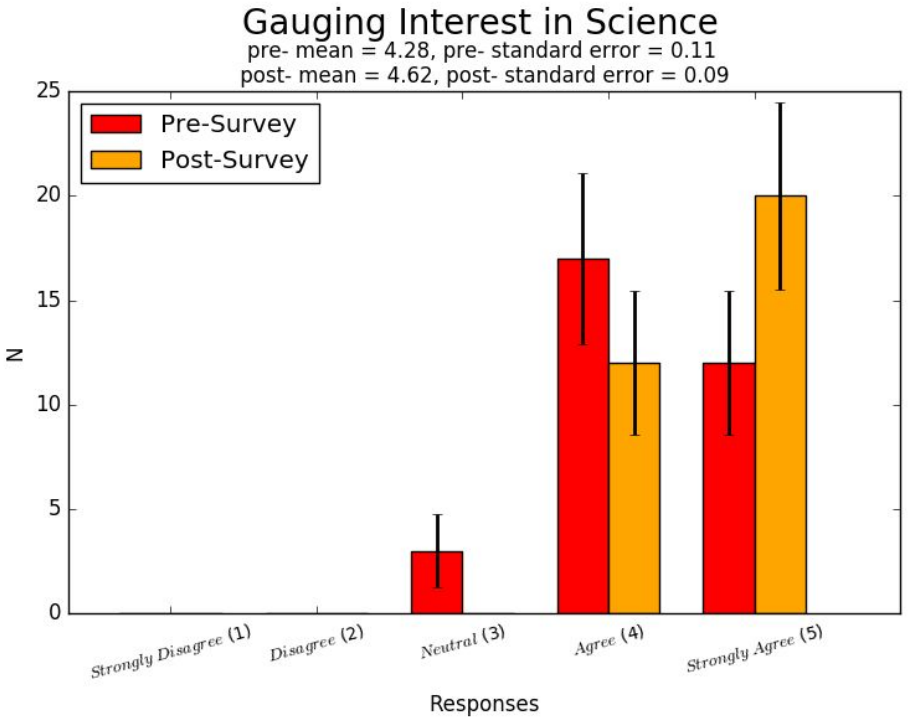
- Two pre- and post- surveys:
  - Survey specifically designed in-house
  - Friday Institute Student Attitudes Toward STEM Survey (6-12th grade)
- Weekly blog posts:
  - Ex. How do you describe the work you have been doing this summer to your friends?
- Oral exit interview
  - Group interview held after the final presentation on the last day

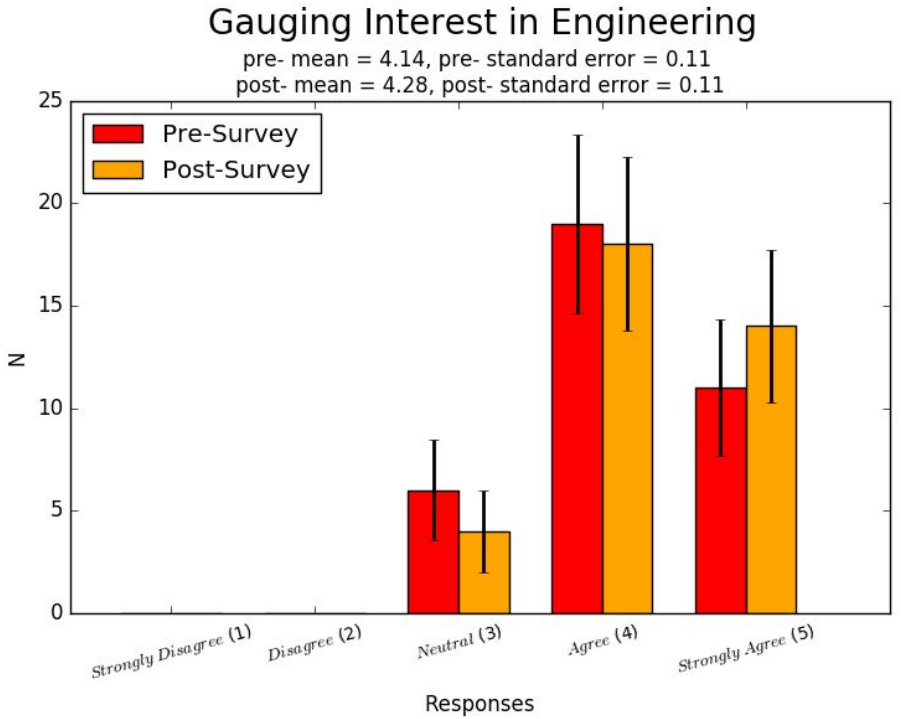
Preliminary Results



- “I really felt accomplished with myself after these four weeks in the program.”
- “Some people might say that the last week is when things are supposed to wind down, but at the end of the day it felt as though we were wound up about programming, physics research, and all the possible careers that lay in our future and the scientific realm.”

Preliminary Results





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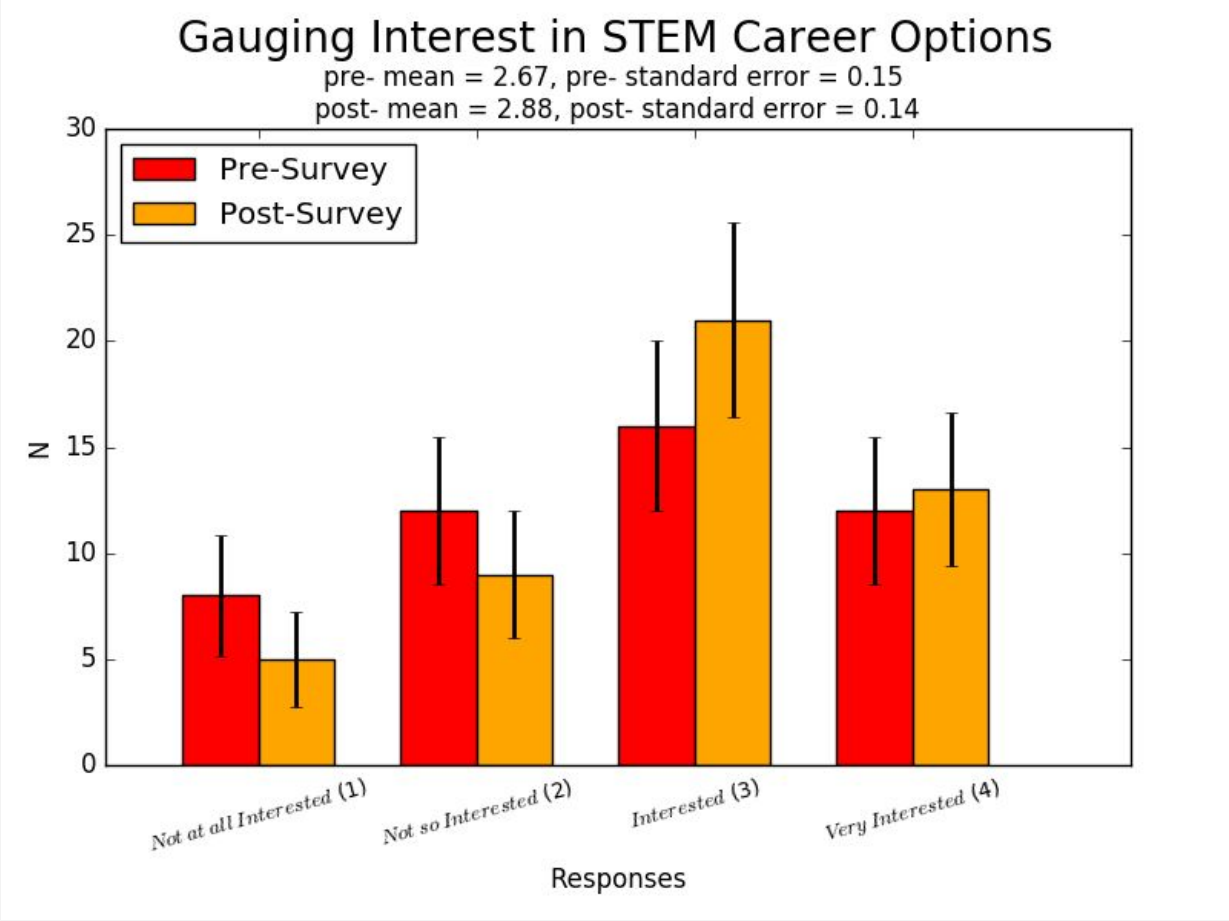
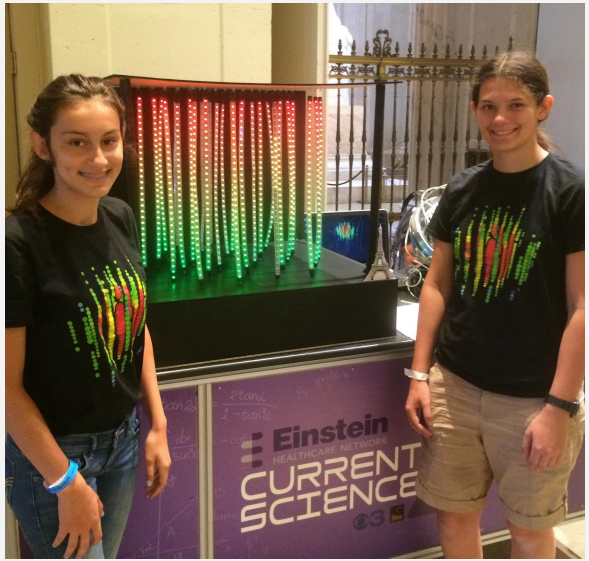


Summary

- We designed and assessed a summer program for high school students
- Curriculum was:
  - Immersive - exposure to university research
  - Diverse - coding to communication
- Formal assessment with preliminary results



Future Plans

- More analysis and publication
- Currently accepting applications for July 2017

Acknowledgements

- IceCube Collaboration
- Brean Prefontaine
- Naoko Neilson and Eric Brewe
- Valerie Klein and Jason Silverman
- Madi Brennan
- David Goldberg and Frank Ferrone
- ExCITe Center
- Chris Badurek
- Jack O’Brien
- Mark Davis
- Matt Mawhinney
- Erin Hansen
- Michael Royster
- Women in Physics Society
- Nanomaterials Lab
- Implant Research Center
- UPenn Cosmology Lab
- The Franklin Institute
- Brown Bag Speakers