Department of Physics
&
Engineering Physics

Outcome of A Summer High School Quantum Program :

Innovative Quantum Education, Science & Technology (iQuEST)

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The Chesapeake and North Carolina Sections of the
American Association of Physics Teachers
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Thomas Jefferson National Accelerator Facility Newport News, VA.

iQuEST is a **PAID** five-week summer program that builds 21st century skills that involve problem solving, critical thinking and innovation concepts in quantum science.

Supplemental STEM Education

- Readiness and assessment tools in mathematics
- Fundamentals of reading, composition, and communication
- Introductory courses in physics

Hands-on Field Experiences

- Face-to-Face and virtual field trips
  - Laboratory site visits
  - Science museums
  - Virtual field trips

Innovation Enforcement

- Hands-on summer physics projects utilizing entrepreneurial concepts.

Math Enrichment

- Improve math performance and placement

Career Preparation

- Learn about the interdisciplinary careers and jobs in the field of quantum

PAID Summer Experience

- Participation stipend

This proposed program included

(1)Three Community Recruitment Workshops during the academic year

- Workshop 1 – April 6, 2024 (Pre-Eclipse campus event)
- Workshop 2 – May 18, 2024
- Workshop 3 – June 29, 2024 (Parents Orientation)

(2) Five-week Summer Academic Accelerator Program including Hands-on Field Experience.

- iQuEST served 22 students
- Comprised of underrepresented minority students each from rising 9th , 10th , 11th, and 12th grades, respectively.

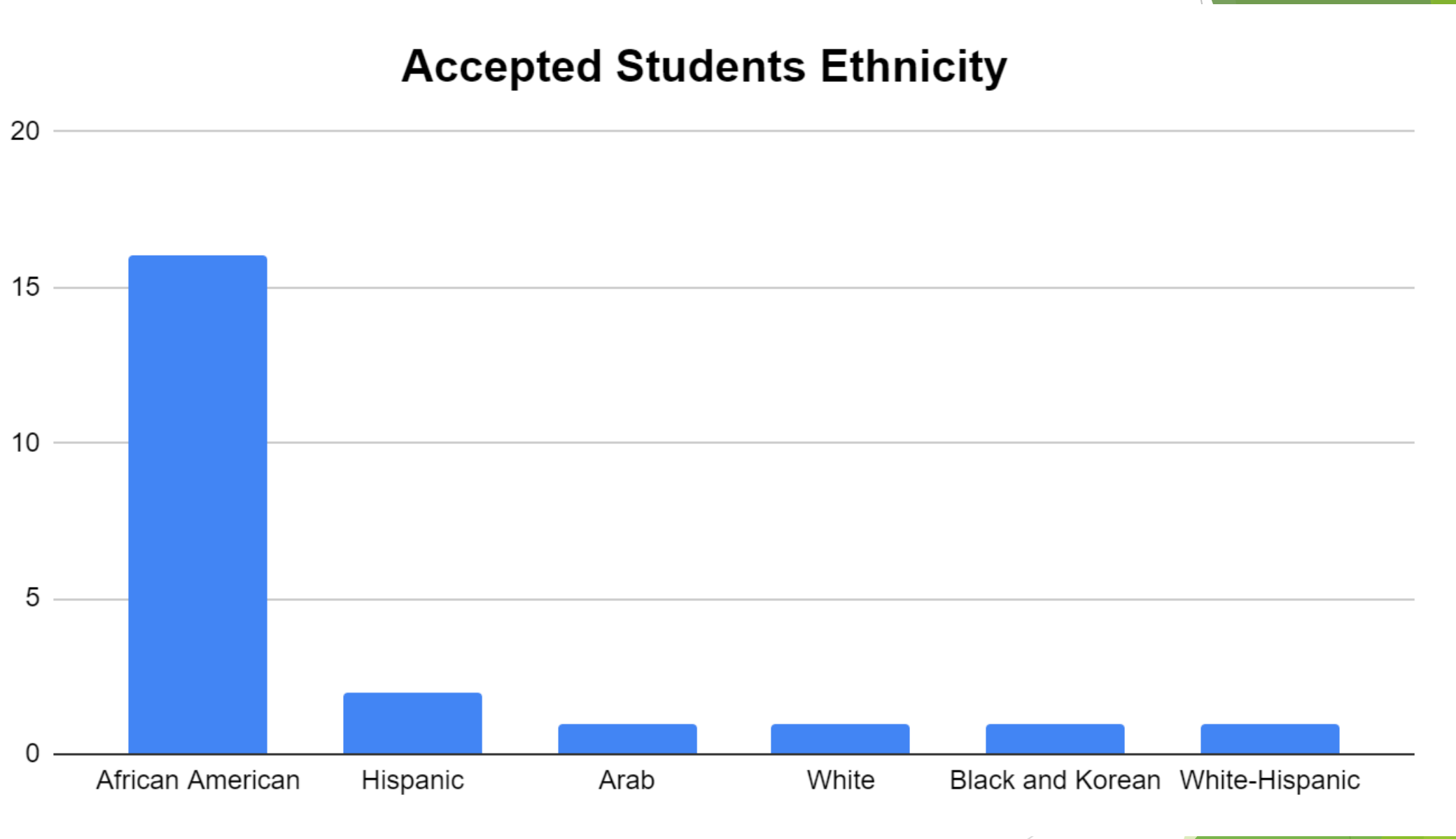
(3) Following-up academic year mentoring program

Early recruitment of students was critical

Eligibility

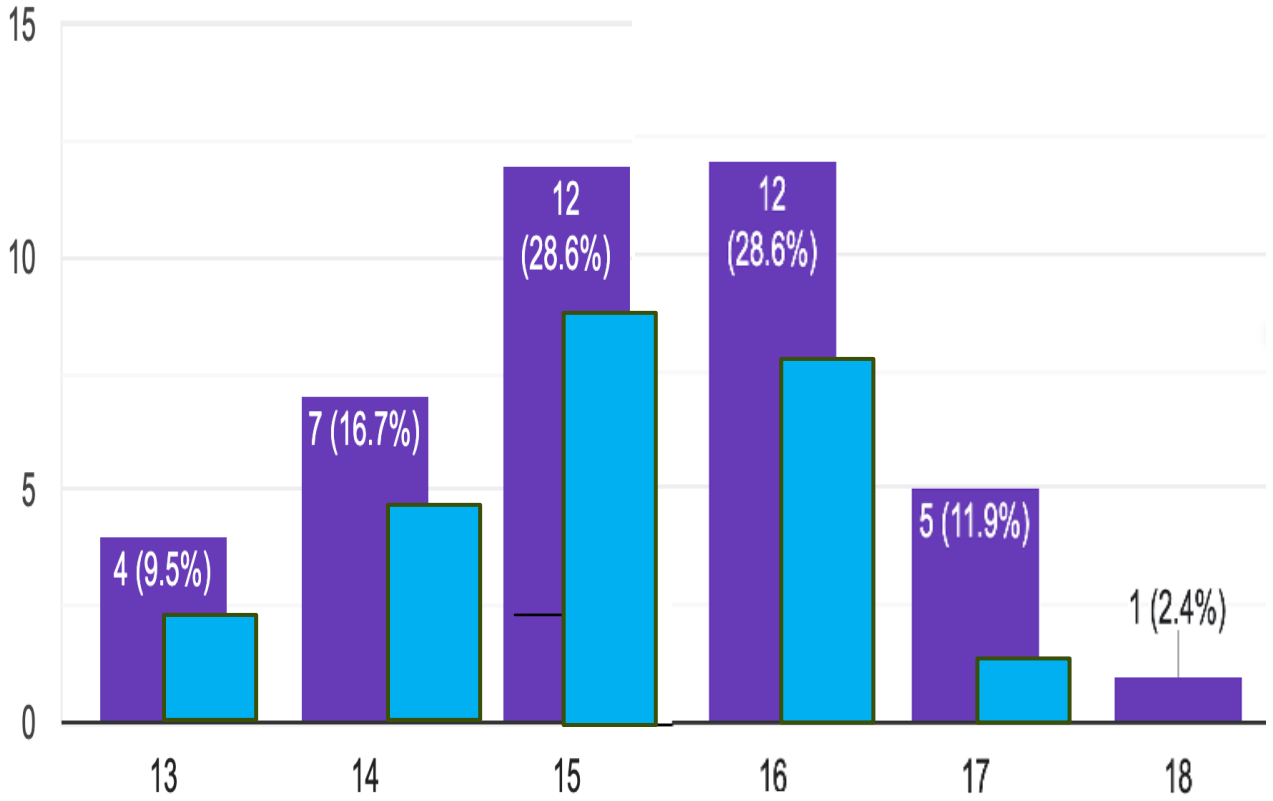
- Rising 9th , 10th 11th, and 12th grades, respectively
- Interest in STEM
- Commitment to the five weeks of the summer program
- Ability to commute to Morgan State University

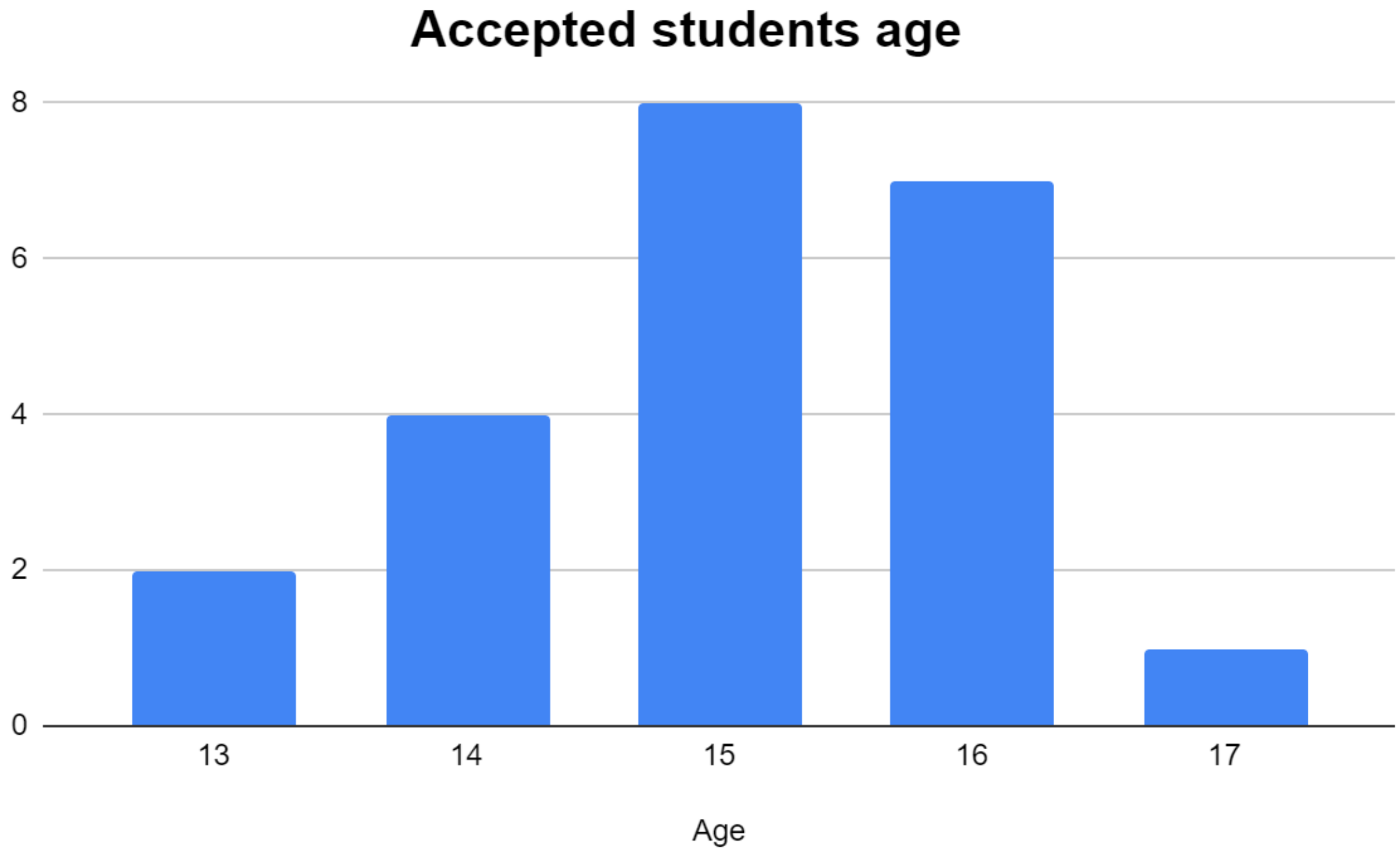
Application


Accepted Students Ethnicity
20
15
10
5
0
African American
Hispanic
Arab
White
Black and Korean
White-Hispanic

Age

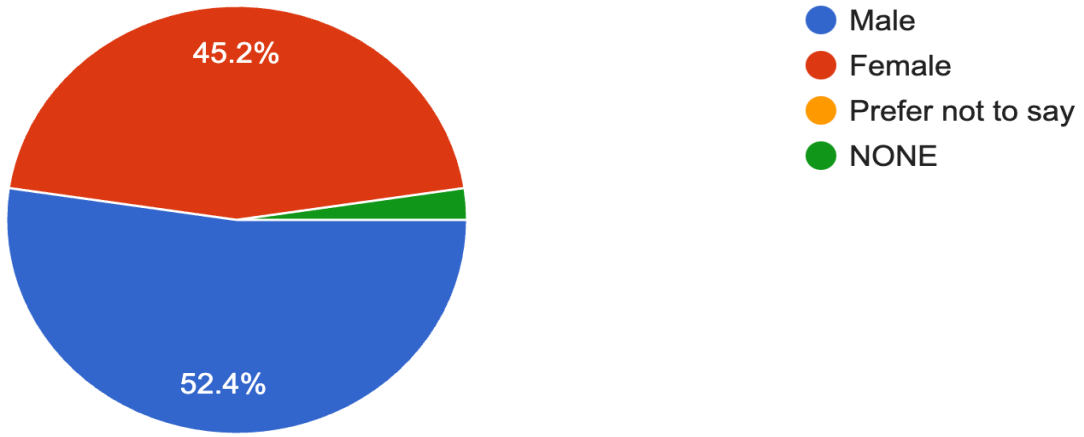
42 responses



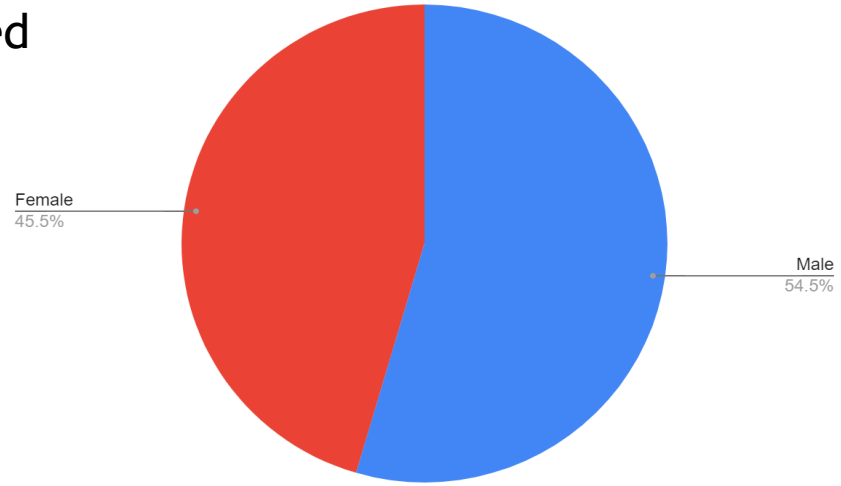

Accepted students age
8
6
4
2
0
13
14
15
16
17
Age

Gender

42 responses

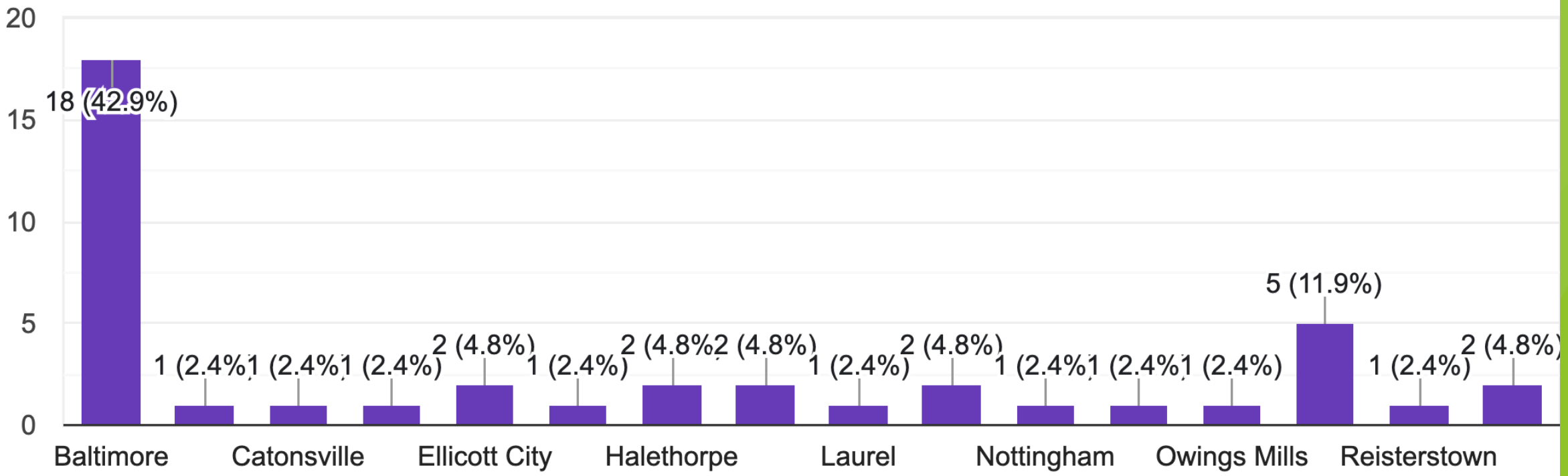


22 Accepted



City

42 responses



iQuEST Summer 2024 Academic Accelerator Program:

- Summer Supplemental STEM education will include
  (1) readiness assessment tools in mathematics

  (2) fundamentals of reading, composition, and communication, and

  (3) introductory courses in Quantum Physics.

  (4) Guided through the Scientific Method by designing their own project and incorporating the process of innovation. Students work in teams to develop quantum-based products to address real world problems.

  (5) Hands-on Field Experiences: Three In-person and virtual field trips are important to inform students of the interdisciplinary nature of quantum jobs and careers.

iQuEST Daily Agenda:

Program Dates :July 01 - August 02 2024

Time	Activity
8:00 – 9:50	Check-in/ Breakfast
9:00 - 10:20	Math A / English B
10:20 – 10:30	Break
10:30 – 11:50	Math B/ English A
11:50 – 12:50	Lunch
12:50 – 1:00	Transition to Afternoon Sessions
1:00 – 3:50	Quantum Science
3:50 – 4:00	Closing Review
4:00 – 5:00	Study Hall/Departure

Weeks 1-2 Quantum Basics: Mysteries, Foundations, & Phenomena	
Example Quantum Topics	Secondary Education Activity
Atomic Spectra	How do Astronomers use the color of a star's light to determine what it is made of? Students use of spectroscopes in predictions with burning salts.
Photoelectric Effect	Activity on chemo-luminescence and quantum leaps will give students the opportunity to make a cool blue light appear in the dark and design experiments to explore the reaction rate and energetics.
Energy Quantization	How do Scientists separate white light into certain colors of the rainbow? Student build spectroscopes with diffraction gratings and mirrors to predict distinct colors in different white light sources (sunlight, flashlight, room lights).
Quantum Properties	What is the numbering method of quantum particles? Student learn quantum label system with Lego model.
Weeks 3-4 Quantum Science & Technology: Applications in Biology, Chemistry, Engineering, & Physics	
Example Quantum Topics	Secondary Education Activity
Superconducting Magnets	You do not need to be Harry Potter to levitate objects: Science is the real Magic
COVID-19 virus and Nanoparticles	Can the virus be filtered: how does weave size and weave pattern of your mask protect you?
Quantum Fluids: non-Newtonian fluids, Superfluids, etc.	Boat building to cross a non-Newtonian sea of Oobleck fluid.
Week 5: Quantum Information & Innovation	
Example Quantum Topic	Secondary Education Activity
Quantum Computing & Internet	Can information on the current internet system travel faster? Student code Raspberry Pi on current 5G internet and IBM Qiskit (Quantum computer) system.


Thank
You