

# A successful Pre-College Nanotechnology experience for low-income students (Evaluation)

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# Nanotechnology Center Goals



- (1) advance the state of knowledge in engineered nanomaterials, while achieving national competitiveness
- (2) prepare students for successful insertion into the future Nanotechnology workforce
- (3) increase the number of minority students entering and receiving engineering degrees related to materials science and nanotechnology

# Nanotechnology Center Facts



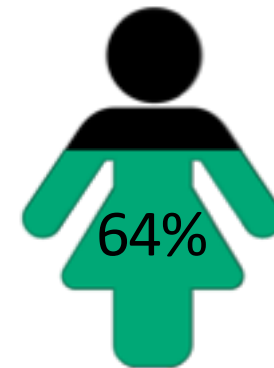
Since 2014, has impacted with Science,  
Nanotechnology, and Engineering activities:



73% families  
below poverty  
levels

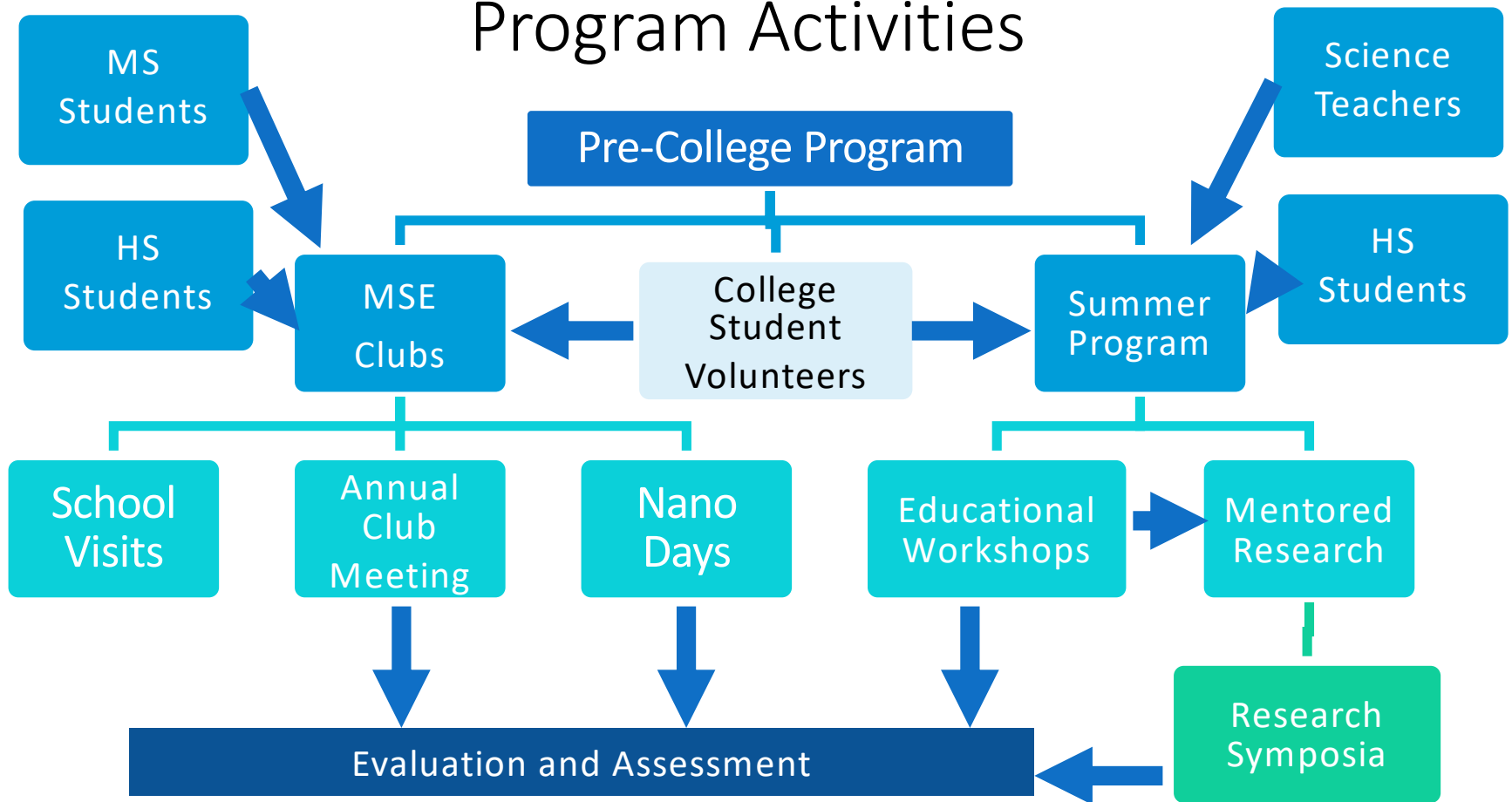


1,512  
Hispanic  
students

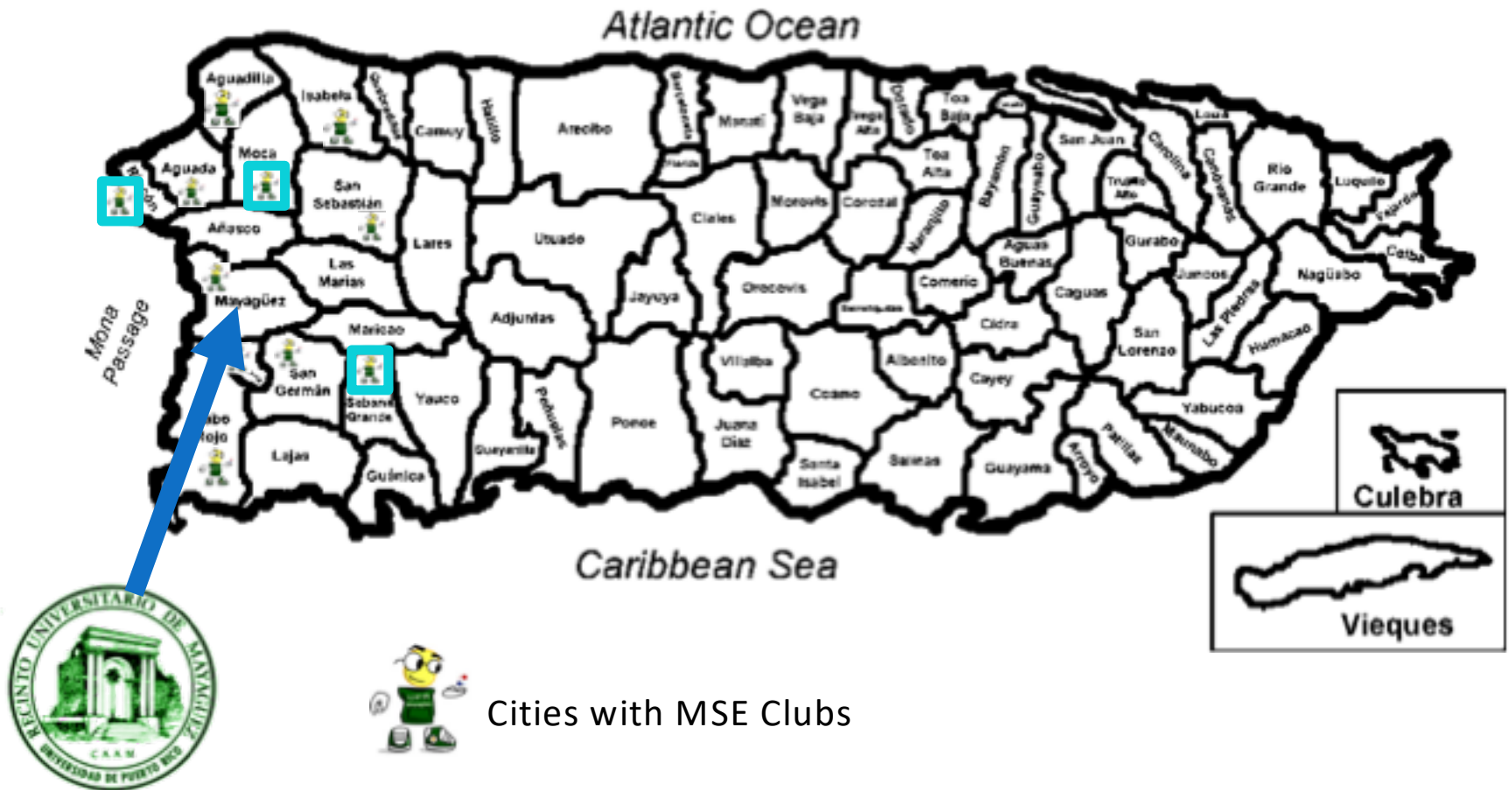


female  
students

# Program Activities



# MSE Clubs at Puerto Rico



# Annual MSE Club Meeting

## Qualitative Student Feedback

*"Learn about nanotechnology, polymers, engineering, and how engineering relates to the environment... Working in groups and sharing with other schools."*

*Student 2014*





*“[Learned to] preserve water (recycle water) and avoid its contamination, as well as reduce waste by choosing products that do not contaminate.”*

Student, 2015



# College Student Feedback

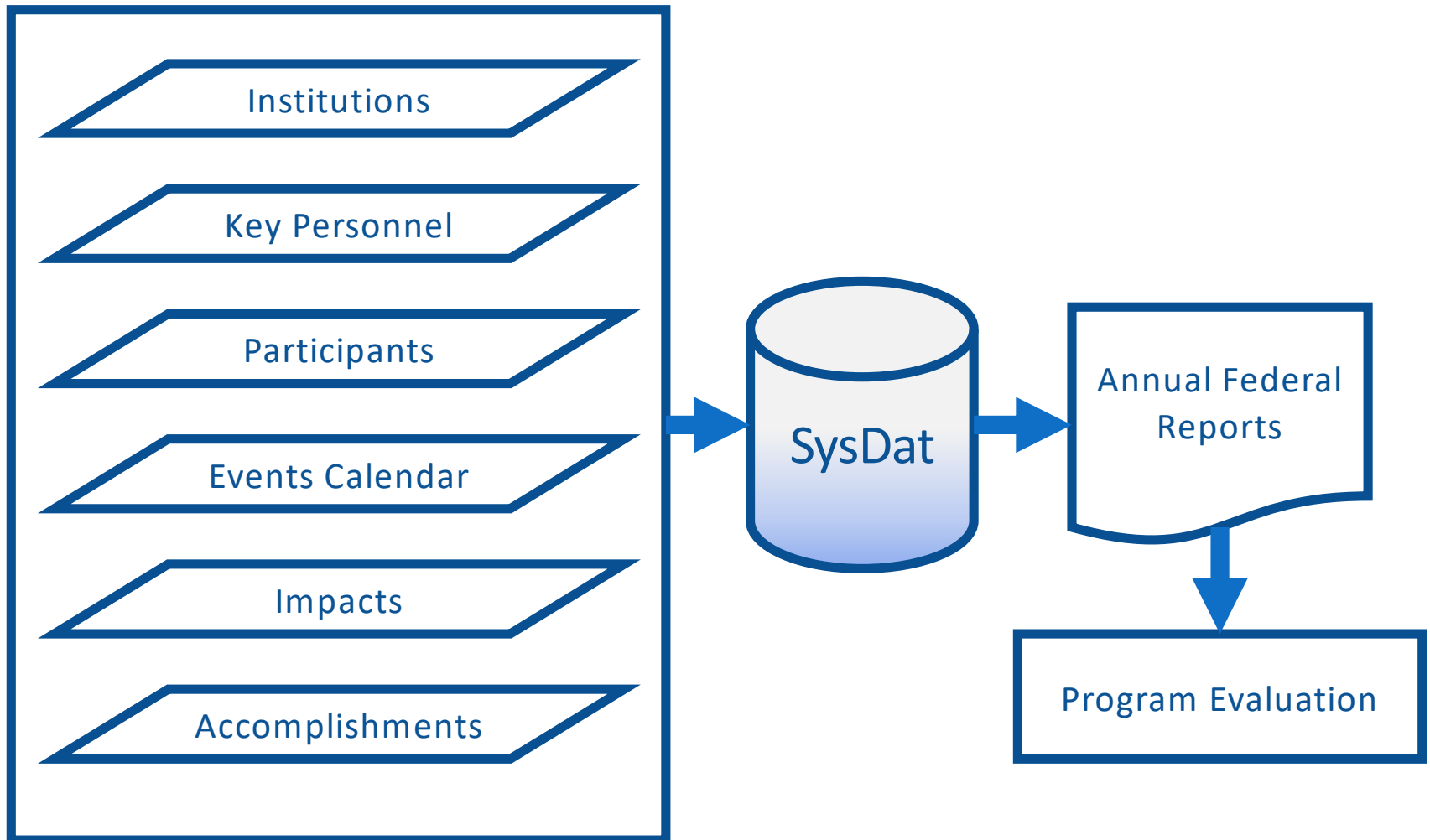
“... the Center has **transformed** the way I see things. I have become a better **mentor and researcher**. Also, I have learned to **communicate** difficult topics to the general public and other students.”

“One of the greatest opportunities that I’ve ever had to **give back** to our society the knowledge, experiences and help that I’ve acquired for the next generation of professionals. It is, without any doubt, a great **satisfaction!**”

“Outreach activities have helped me **discover many opportunities** available within the engineering branches and further aided me be a **sensible guide and mentor** to others. As a professional, I feel the obligation to help students discover their own goals in the same way my mentors have helped me.”



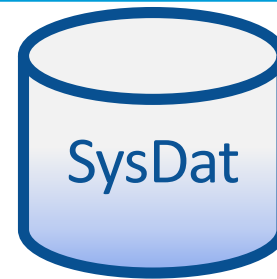
# Web-Based Data Management System



# Evaluation Strategies

## Documentation and student tracking using the Center's data management system

- Demographic information
- Parental consent forms
- School record (i.e. school name, GPA, study year)
- Academic interests
- Member code



## Activity and Program Evaluation

## Student Self-Evaluations/Reflections

## College Admissions Data

# Evaluation Strategies

## **Before Activity:**

### **Register Event**

- Trust area
- Target
  - Research
  - Education
  - Knowledge transfer
  - Working with K-12 students
- Participating institutions or schools
- Key participants
- Date, location and description

## **After Activity:**

### **Document Impact**

- Attendance
  - MSE Club Participants
  - Gender
  - Geographical information
- Highlights, participants and contributions

# Activity Evaluation

## Closed Questions

Objectives

Speaker knowledge, effectiveness and question response

Usefulness of information

Knowledge gain and application

Organization

Overall rating

## Open Questions

What would you do differently given what you learned in the activity?

When would you apply the skills learned and the information provided?

Suggestions to improve the activity in the future.

# Evaluation Results



# Summer Research Program Evaluation Results

The summer program successfully provided opportunities to <b>learn about nanotechnology and its applications.</b>	100%
The summer program helped me develop <b>effective communication skills.</b>	100%
The summer program helped me develop new <b>technical skills.</b>	100%
The program provided a space to share my ideas and <b>collaborate</b> with others.	100%
The workshops and activities <b>increased my knowledge</b> in the topics presented.	100%
I will be able to <b>apply the skills</b> learned in the program to my academic or personal life.	100%
Overall how will you <b>rate</b> this summer program?	Excellent



# Summer Research Program Evaluation Results

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## Teachers (n=8)

83% Motivated to integrate nanotechnology and science concepts in their courses

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83% Comfortable implementing the modules they developed during the summer

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83% Comfortable creating new modules based on the training provided by the program

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## Students (n=16)

66% Motivated to participate in future science fairs

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44% Interested in developing a science fair project aligned with the summer program project

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77% Confirmed the summer program motivated them to pursue a college degree in STEM fields

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# Summer Research Program Outcomes



- 75% enrolled @ UPRM (N=16)
- 92% admitted in STEM programs

In a 2yr period:

- 100% active at UPRM
- 91% retention in STEM fields

# Summer Research Program Feedback

*"I learn how to develop effectively an **oral presentation**, as well as improve my English" [S]*

*"I was interested in Engineering...**now I am decided**; I saw it was fun, interesting and very important" [S]*

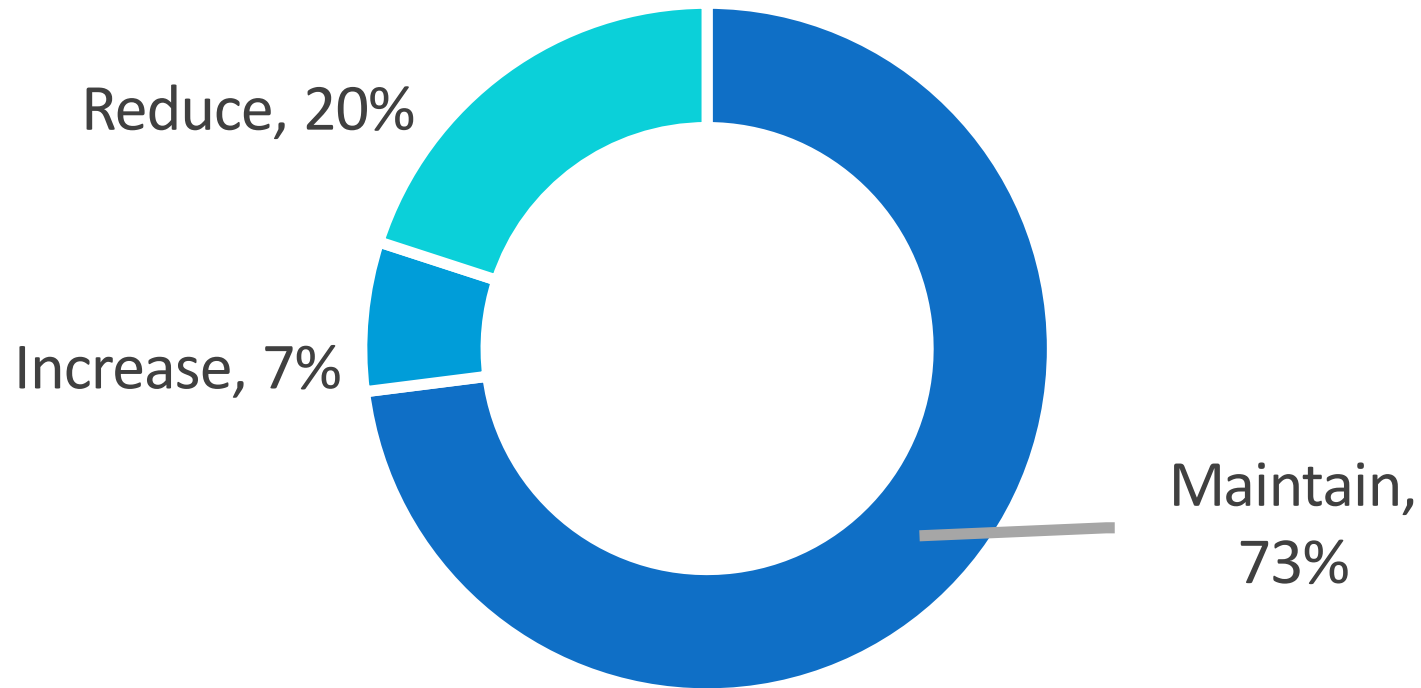
*"I was helped to give **presentations more fluidly** and I know that in school I'll be more **professional** in my presentations" [S]*

*"Learned to prepare an **effective presentation**, for research purposes, and an adapted **educational module to translate** what I learned to my classroom" [T]*

*"I will modify my **classes towards research**" [T]*

*"... first-hand experience and [will guide] my students **towards studying engineering**" [T]*

# MSE Club Program: Interest in STEM degrees



7% increased their interests in STEM degrees

# College Admissions Data (2015-2016)

## Admissions

42% of all  
students  
from  
schools  
with MSE  
clubs

## Enrollment

107  
students

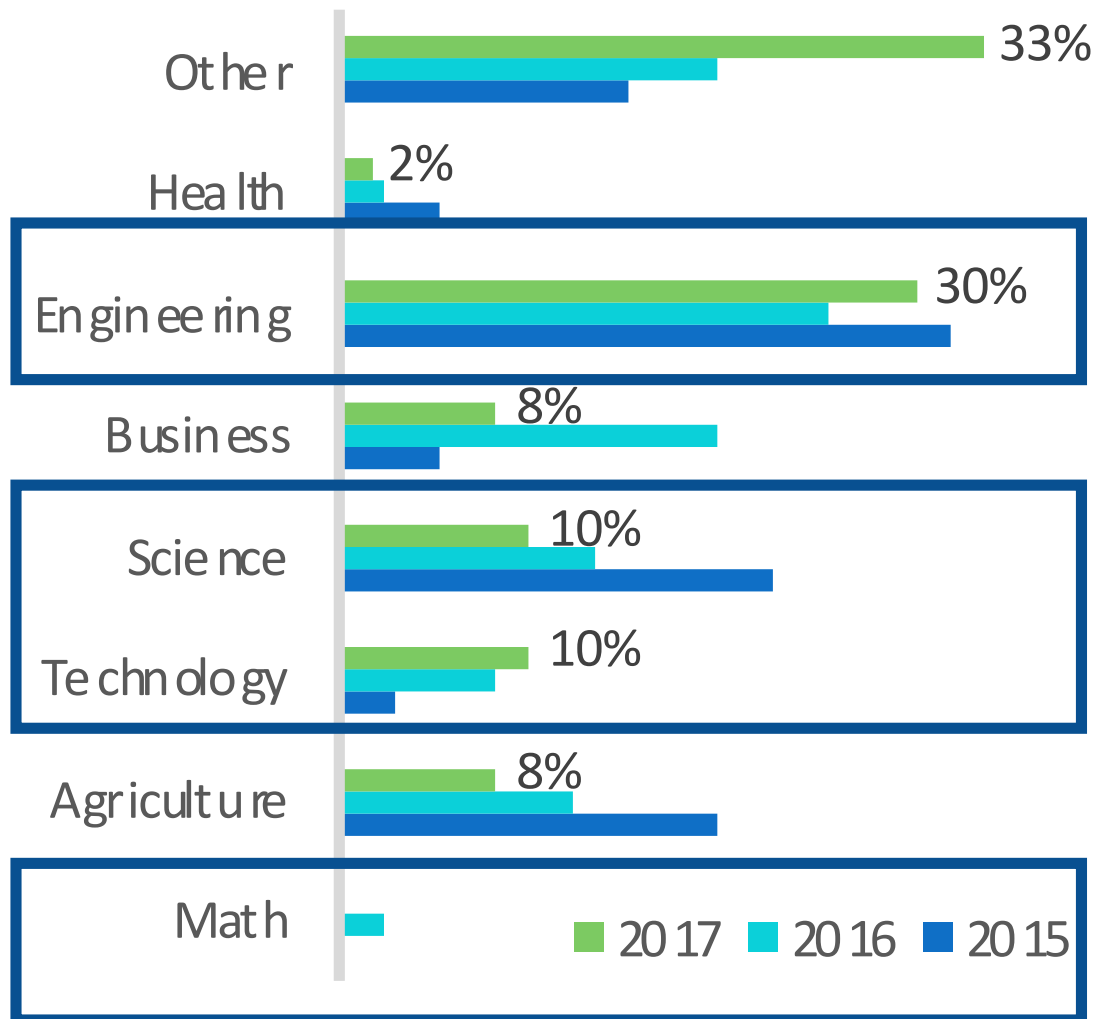
>60%  
females

## Retention

94%  
MSE

90%  
Regular

# Fields chosen by students from MSE clubs



## STEM Programs

Chemistry  
Microbiology  
Biology  
Geology  
Nursing  
Surveying  
Agricultural Sci.  
Computer Sci.  
Engineering  
Mathematics

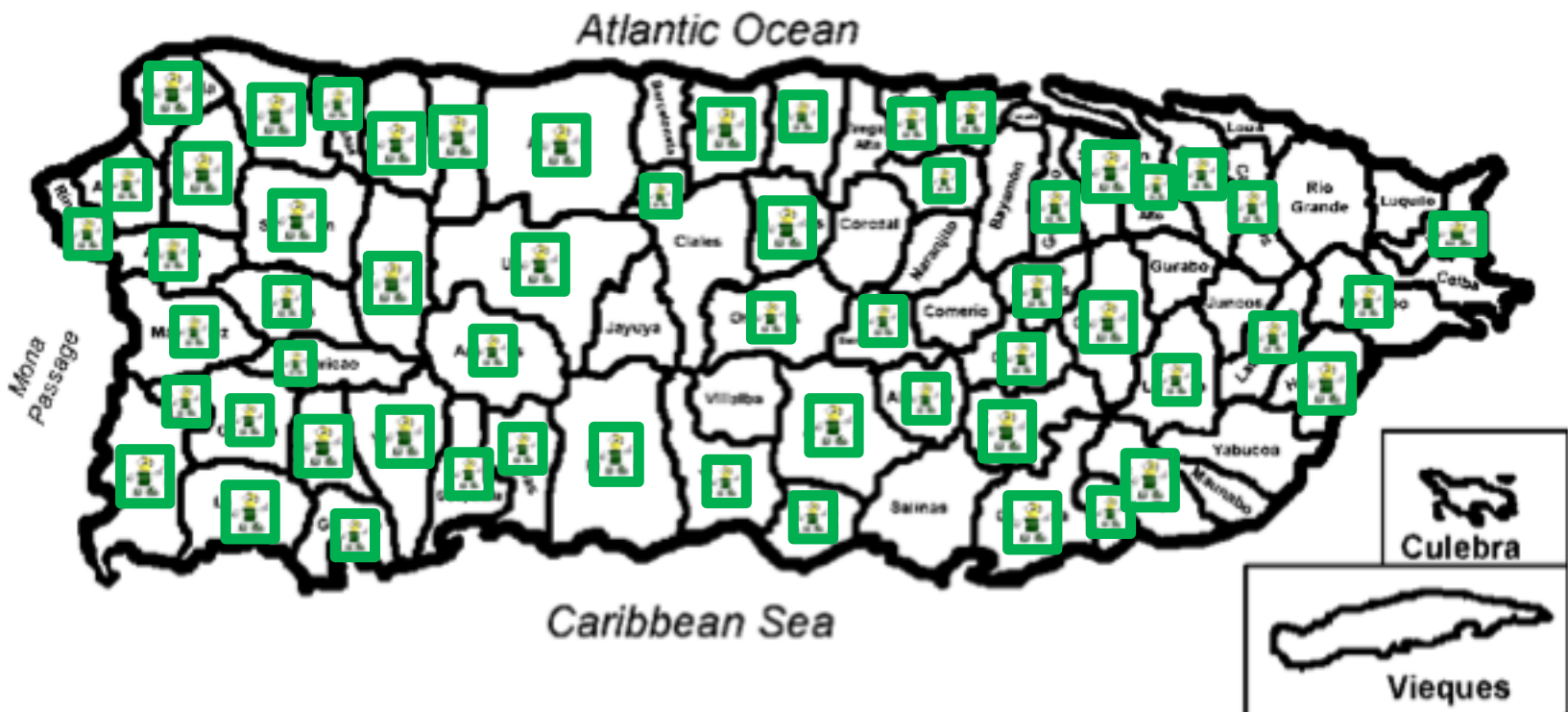


# Conclusions

- Pre-college program as an effective strategy to engage community members with limited access to educational resources
- Our pre-college intervention in public schools, serving underprivileged Hispanic communities, uses limited campus resources
  - faculty members, undergraduate and graduate student volunteers
- Successful intervention recruiting and retaining high school students from MSE Clubs and summer program

# Future Work

- Number of students who completed their college degrees by 2021.
- Survey students to understand if club participation is related to student's career choice



# Contact Information

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