Increasing STEM Participation Among Students Historically Underrepresented in STEM Fields

August 30, 2022
Today’s Panel

**MODERATOR**
Jennifer Ozawa
Senior Economist, RTI International

**PRESENTER**
Frank McKay
Education Consultant, RTI International
Frank will discuss a three-year STEM initiative in Cumberland County, NC (STARward STEM)

**PRESENTER**
Rebecca Stanley, PhD
Education Consultant, RTI International
Rebecca will discuss the Defense STEM Education Consortium (DSEC), an initiative to increase STEM literacy and the STEM defense workforce.

**DISCUSSANT**
Mellotta Hill, EdD
Assistant Superintendent of K-12 Instructional Programs, Cumberland County Schools

**DISCUSSANT**
Louie Lopez
Director, DoD STEM, Office of the Undersecretary of Defense for Research and Engineering
Of the 50 million employed college graduates in the U.S., ages 25 to 64, 37% reported a bachelor’s degree in science or engineering.

STEM workers who earned a bachelor’s degree in a STEM field made, on average, $101,100 vs. $87,600.

The path to STEM jobs for non-STEM majors is narrow: 6% of non-STEM majors ended up in STEM jobs.

Source: U.S. Census Bureau, American Community Survey
## Engineering Degrees

Percentage of Total and Count of Engineering Degrees Conferred to African-American Students in Select States, 2020

<table>
<thead>
<tr>
<th></th>
<th>% of degrees conferred</th>
<th>Count of degrees conferred</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MD</td>
<td>NC</td>
</tr>
<tr>
<td>African-American population</td>
<td>31.4%</td>
<td>22.3%</td>
</tr>
<tr>
<td>Associate's</td>
<td>15.0%</td>
<td>7.6%</td>
</tr>
<tr>
<td>Bachelor's</td>
<td>9.7%</td>
<td>9.3%</td>
</tr>
<tr>
<td>Master's</td>
<td>5.0%</td>
<td>4.2%</td>
</tr>
<tr>
<td>Doctoral</td>
<td>3.3%</td>
<td>1.8%</td>
</tr>
</tbody>
</table>

Source: National Center for Education Statistics, Integrated Postsecondary Education Data System
Examples from two recent initiatives to increase STEM engagement and educational outcomes at the K-12 levels

Discussant observations

Q&A
STARward STEM
DoD STEM is an agency-wide effort to inspire, cultivate and develop exceptional STEM talent to enrich the DoD’s current and future workforce.
Inspiring student interest in STEM and STEM careers by providing them experiences that will be…

**STARward STEM**

**S**omething

**T**hey’ll

**A**lways

**R**emember

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![STARward STEM logo](image-url)
Program Objectives

- **Improve** teacher efficacy in STEM Project-Based Learning
- **Increase** student engagement in meaningful STEM learning experiences
- **Expand** STEM participation for student populations typically underrepresented in STEM fields
- **Increase** youth interest in STEM career pathways
- **Build** capacity of Cumberland County Schools to sustain STEM PBL implementation
Lead Program Partners

- RTI International
- Department of Defense DoD STEM
- Cumberland County Schools
- dreamUp
- E Williams Stewart Trust
- U.S. Space & Rocket Center
STARward STEM Activities

- Teacher and principal capacity building in STEM Project-Based Learning (PBL)
- International Space Station Design Challenge for student teams
- Ongoing STEM Enrichment for Students
- STEM Industry Partnerships
STARward STEM Reach

Over 3 years:

300 teachers
4,000 students
11 Cumberland County Schools (NC)

Focused on **Space and Space-connected STEM topics**
And aligned with **DoD modernization priorities**
STARward STEM – Student Demographic Data

- Male, 51%
- Female, 49%

- Hispanic, 18%
- American Indian, 2%
- Asian, 1%
- Black, 50%
- White, 17%
- Pacific Islander, 1%
- Multi-racial, 11%
Measuring Impact

Program Evaluation Focus:

- Improved capacity of schools and teachers to implement and sustain STEM PBL
- Improved teachers’ self-efficacy in STEM PBL
- Improved quality of STEM instruction
- Increased STEM engagement and attitudes among participating students
- Increased interest in STEM careers among participating students
Defense STEM Education Consortium (DSEC)
DSEC is a collaborative partnership between academia, industry, not-for-profit organizations, and government that aims to broaden STEM literacy and develop a diverse and agile future workforce to power the United States’ innovative defense infrastructure.
Consortium Strategy: DSEC Fundamentals

**ENGAGE**
students & educators in meaningful STEM experiences

DSEC will engage K-16 students and educators in meaningful formal and informal DoD STEM learning experiences.

**SERVE**
students who are military-connected & underrepresented in STEM

DSEC will focus on serving students who are underrepresented in STEM (as defined by DoD STEM).

**CONNECT**
to the DoD STEM workforce

DSEC will ensure STEM experiences are connected to the DoD STEM workforce and DoD careers.

**LEVERAGE**
the network as a force multiplier

DSEC will leverage the consortium as a force multiplier to amplify the reach, visibility, and outcomes of DoD STEM.

**EVOLVE**
the approach based on data

DSEC will use a data-driven approach to evolve and evaluate how DSEC operates over time to ensure positive outcomes for students and educators.

How will DSEC support these three priorities in a unique and innovative way?
Option Year One Outcomes (2020-2021)

107,022 STUDENTS SERVED

- K-5: 9%
- 6-8: 35%
- 9-12: 48%
- 2-Year: 2%
- 4-Year: <0.5%
- Graduate: <0.5%
- Not Reported: 6%

2,350 TEACHERS SERVED

- K-5: 18%
- 6-8: 37%
- 9-12: 42%
- 2-Year: <0.5%
- 4-Year: 1%
- Not Reported: 2%

1,755 OTHER PARTICIPANTS

- School Counselors: 81%
- School Administrators: 4%
- University Personnel: 1%
- Community Members: 5%
- Parents: 1%
- Other*: 7%

*Role not defined.
Student Demographic Data

GENDER: 99,257
- Female: 49%
- Male: 48%
- Prefer not to say: 3%

Non-binary is < 0.5% and not visible in the graph.

RACE/ETHNICITY: 77,380
- Asian: 40%
- Black or African-American: 19%
- Hispanic or Latino/a/x: 15%
- Native American or Alaska Native: 13%
- Native Hawaiian or Other Pacific Islander: 11%
- White: 4%
- Prefer not to say: 28%

28% of student participants did not have demographic information reported.
Impact On Students

CHANGE IN STEM INTEREST AND AWARENESS

Average Overall Change in STEM Interest Due to Program Participation

1 = Not at All
7 = Very Much

Average awareness of STEM jobs/careers

Average awareness of DoD STEM jobs/careers

Average change in interest in STEM job/career

Average change in interest in DoD STEM job/career

The sample sizes for each of these items ranged from 986 to 1028.
Longitudinal Data from a DSEC Partner

Class of 2015: 30%
Class of 2016: 32%
Class of 2017: 30%
National Average: 18%

Earned STEM Degree
Longitudinal Data from a DSEC Partner

![Graph showing the difference in scale scores between FIRST and comparison group on STEM-related interests and attitudes in 4th year of college, by gender.](image)

- **Careers**: 0.96 (FIRST Females vs Comparison Females), 0.36 (FIRST Males vs Comparison Males)
- **Knowledge**: 0.99 (FIRST Females vs Comparison Females), 0.31 (FIRST Males vs Comparison Males)
- **Interest**: 0.53 (FIRST Females vs Comparison Females), 0.33 (FIRST Males vs Comparison Males)
- **Activity**: 0.38 (FIRST Females vs Comparison Females), 0.20 (FIRST Males vs Comparison Males)
- **Identity**: 0.15 (FIRST Females vs Comparison Females), 0.16 (FIRST Males vs Comparison Males)
New Partnerships: HBCU/MI Pathways Network

K-12

2-Year Institutions

4-Year Institutions

STEM Workforce

[Diagram showing the network of partnerships]

[Logos of institutions]

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Appendix
Presenter Bios

**Frank McKay**  
Education Consultant, RTI International

Education Consultant, BA in Mathematics and Philosophy, MS in Teaching and Learning. Frank leads the design and facilitation of professional development for K-12 educators on topics ranging from inquiry and project-based learning to instructional leadership. He will discuss a three-year STEM initiative in Cumberland County, NC (STARward STEM).

**Rebecca Stanley, PhD**  
Education Consultant, RTI International

Education Consultant, BS in Biology and PhD in Science Education. Rebecca has 20 years of experience as a classroom teacher, professional development creator, and instructional coach. She works with teachers to implement high quality inquiry-based and STEM learning for all students. She will present the Defense STEM Education Consortium initiative to increase STEM literacy and the STEM defense workforce.
Mellotta Hill is the Assistant Superintendent of K-12 Instructional Programs, Cumberland County Schools. Mellotta is a lifelong education leader who holds a master’s in School Administration and a doctorate in Education Leadership from Fayetteville State University. She is currently the Assistant Superintendent for K-12 Instructional Programs for Cumberland County Schools.

Louie Lopez is the Director of DoD STEM in the Office of the Undersecretary of Defense for Research and Engineering. Louie develops, coordinates, and executes DoD STEM education, outreach, and workforce development projects, including the Defense STEM Education Consortium (DSEC) and other initiatives aligned with DoD and Federal STEM Strategic plans.
Abstract

The ability to achieve STEM workforce diversity goals in the U.S. is a function of the academic pipeline. One of the most important predictors of success in STEM careers and higher education is pre-college academic preparation for all students. However, reaching students historically underrepresented in STEM fields continues to be a challenge.

The question is how to engage and retain students of color, low-income students, and first-generation college students in high-quality STEM education given inequities that exist across K-12 education systems. This RTI webinar offers examples from two recent efforts: (1) a three-year program to support equitable access to high-quality STEM educational opportunities through project-based learning and STEM enrichment in Cumberland County, North Carolina (STARward STEM), and (2) the Defense STEM Education Consortium (DSEC), a partnership between academia, industry, not-for-profit organizations, and government focused on increasing STEM literacy and developing a diverse and agile workforce.
# State Demographic Data

## Breakdown of Population by Race and by Gender in Select States and the U.S., 2020

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>MD</th>
<th>SC</th>
<th>NC</th>
<th>KY</th>
<th>U.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>49.0%</td>
<td>63.7%</td>
<td>61.9%</td>
<td>83.5%</td>
<td>60.1%</td>
</tr>
<tr>
<td>Black or African-American</td>
<td>31.4%</td>
<td>27.0%</td>
<td>22.3%</td>
<td>8.6%</td>
<td>12.5%</td>
</tr>
<tr>
<td>Hispanic or Latino*</td>
<td>11.1%</td>
<td>6.0%</td>
<td>10.2%</td>
<td>4.2%</td>
<td>18.5%</td>
</tr>
<tr>
<td>More than one race</td>
<td>3.1%</td>
<td>2.0%</td>
<td>2.5%</td>
<td>2.2%</td>
<td>2.2%</td>
</tr>
<tr>
<td>Asian</td>
<td>6.9%</td>
<td>1.8%</td>
<td>3.4%</td>
<td>1.7%</td>
<td>5.8%</td>
</tr>
<tr>
<td>American Indian, Alaska Native</td>
<td>0.7%</td>
<td>0.5%</td>
<td>1.6%</td>
<td>0.3%</td>
<td>0.7%</td>
</tr>
<tr>
<td>Native Hawaiian, Pacific Islander</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.2%</td>
</tr>
<tr>
<td><strong>Total—All Races</strong></td>
<td><strong>102.3%</strong></td>
<td><strong>101.1%</strong></td>
<td><strong>102%</strong></td>
<td><strong>100.6%</strong></td>
<td><strong>100.0%</strong></td>
</tr>
<tr>
<td>Female</td>
<td>51.3%</td>
<td>51.6%</td>
<td>51.1%</td>
<td>50.5%</td>
<td>50.8%</td>
</tr>
<tr>
<td>Male</td>
<td>48.7%</td>
<td>48.4%</td>
<td>48.9%</td>
<td>49.5%</td>
<td>49.3%</td>
</tr>
</tbody>
</table>

Note: *The Hispanic or Latino population estimates are preliminary estimates, which is why the breakdown of population by race and ethnicity does not sum.*

Source: U.S. Census Bureau, American Community Survey