Understanding the Value of Informal STEM Programs for Diverse Youth: A Guide for Institutions of Higher Learning
Panelists

- Fan Wu, Tuskegee University: **Partnership to Provide Technology Experiences through Aerial Drones in High Schools of the Alabama Black Belt** (Award #DRL-1614845)

- Vikram Kapila, NYU Tandon School of Engineering: **Promoting Robotic Design and Entrepreneurship Experiences among Students and Teachers** (Award # DRL-1614085)

- James Diamond, Education Development Center, Inc. and Marc Lesser, Mouse: **Investigating Digital Badges as Alternative Credentials to Broaden STEM Participation Among Underrepresented Youth** (Award # DRL-1614727)
Questions to keep in mind

- If you are a faculty member, how could you make those at your institution who are involved in recruitment and admissions aware of your program and other programs like this?

- If you are involved in any part of the admissions or credit granting process, how can you imagine changes what would recognize the value of informal education programs?

- What can your project be doing to reach out to gatekeepers, such as faculty, admissions officers, other higher education administrators, to educate them about what students gain from such programs?
ITEST Drone Summer Academy
Award # DRL-1614845

PI: Hira Narang
Co-PIs: Mohammed Qazi, Cassandra Thomas, Jay Bhuyan, and Fan Wu

2018 STELAR ITEST PI & Evaluator Summit
Washington DC, May 14 – 15, 2018
Tuskegee University

- Private and state-related HBCU
- Students
  - 3,156 from across U.S. and abroad
- Degree Programs
  - Baccalaureate: 40
  - Masters: 16
  - Doctorate: 4
- Demographic
  - More than 90% are African-American
  - 43% male and 57% female
Research shows that HBCUs have a unique role to play in producing underrepresented minority STEM graduates. According to www.ed.gov

“21 of the top 50 institutions for educating African-American graduates who go on to receive their doctorates in science and engineering, are HBCUs.”

Only 3 percent of country’s colleges and universities are HBCU’s, but they produce 27 percent of African-American students with bachelor's degrees in STEM fields.
Issues Contributing to STEM Disparities

- Access to courses & quality rigorous curriculum
  - Rural County: No Calculus/pre-Calculus, Physics, Electives, Only 2.7% take SAT

- Teacher preparation
  - Rural County: 178 certified teachers and administrators. The faculty includes one counselor with National Board Certification. Only 46% holds a masters.

- Teacher availability
  - Rural County: In one school, 40% classes not taught by highly qualified teachers

- Infrastructure capacity
  - Access to wifi, computer labs with up to date software
The goals of the Drone Academy project are:

- Providing Alabama students and teachers from the rural Macon County School District and the urban Montgomery School district (ITEST Scholars) with technology-rich experiences through project-based learning.
- Developing disciplinary-based knowledge and practices, critical thinking, reasoning skills, and communication skills needed for studies in STEM.
- Using strengths of the ITEST partnership between Tuskegee University (TU) and TU’s Computer Science Department Advisory Board (CSAB) and TU’s Engineering Alumni Associate (TUEAA) to foster awareness among ITEST Scholars of the full spectrum of STEM-related occupations and to chart pathways for Scholars to these professions.
- The Academy activities are designed to encourage Scholars to seriously reflect on the benefits of choosing educational pathways that will lead to STEM-related careers and occupations in an effort to increase the participation of women and minorities in the STEM-related workforce.
Project Impact

- **Successful Recruitment**: School principals and Superintendents of the two partnering districts also played a critical role in the recruitment process.

- **Teacher Lesson Plans**: Teachers developed lesson plans for infusion in their classrooms to extend the benefits of the Academy to other students.

- **Follow-Ups during the school year**: Classroom visits took place during the 2017-2018 school year to assist teachers in implementing the lesson plans that they developed.

- Successfully Attracted the students who attended Drone Summer Academy to come to TU.

- University Administrations visited Drone Summer Academy and talked with the Drone Summer Academy Scholars.
The 2016 ITEST Drone Summer Academy

- July 11- July 29, 2016
- 42 high school students from rising 10, 11, and 12 grades.
- 4 high school teachers.
- One session.
- Macon and Montgomery Counties
- The majority of participants reported their race as Black or African American (83.3%) and there were more female students (57.1 %) than male students (42.9%). Students were from grades 10 (21.9%), 11 (43.8%) and 12 (34.4%) and the majority of students demonstrated that they were from Macon County (77.4%) and Montgomery School District (22.6%).
The 2017 ITEST Drone Summer Academy

- July 5- July 28, 2017
- 68 high school students from rising 10, 11, and 12 grades.
- 8 high school teachers.
- Two Concurrent session.
- Macon and Montgomery Counties
- The majority of participants reported their race as Black or African American (92%) and there were more female students (56%) than male students (44%). Students were from grades 10 (30%), 11 (38%) and 12 (32%) and the majority of students demonstrated that they were from Macon County (52%) and Montgomery School District (43%).
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<td>Fly drone</td>
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<td>Fly with Scratch</td>
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<td>Acquire data</td>
<td>STEM career</td>
<td>ePortfolio update</td>
<td>(outdoor testing)</td>
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<td>Fly drone</td>
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ITEST Drone Summer Academy
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- https://www.youtube.com/watch?v=UrOcF0trGhc
- https://www.youtube.com/watch?v=tRcuO0yBJyo&feature=youtu.be
- https://www.youtube.com/watch?v=yfip89a9DD4
- https://www.tuskegee.edu/programs-courses/colleges-schools/cbis/computer-science/itest_drones
Thank You!
Recognizing the Value of K-12 STEM Partnerships

Vikram Kapila
Mechatronics, Controls, and Robotics Lab (MCRL)

http://engineering.nyu.edu/mechatronics/
http://engineering.nyu.edu/mechatronics/ITEST/index.html

NSF ITEST DRL: 1614085

ITEST PI Meeting
May 15, 2018, 10:15—11:45 AM
K-12/NYU Tandon STEM Partnership

• Creates opportunities to
  – Engage K-12 participants in engineering education and research
  – Create pipeline of future STEM scholars
  – Make broad societal impact

• Lab researchers mentor and interact with K-12 students
  – Learn to communicate without technical jargon
  – Broaden their own education and training
  – Receive financial support for participation and contribution

• Faculty can develop research proposal with authentic broader impact statements

• Explore new educational and research programming
K-12 STEM Education at NYU Tandon

- RET Site – NSF
- GK-12 Fellows – NSF
- DR K-12 – NSF
- ITEST – NSF
- NYS and NYC funded projects
- CBSI – Philanthropy
- ARISE – Philanthropy
- SoSC – Philanthropy
- CSAW – Philanthropy

::
Summer of STEM @ NYU Tandon
Industry Interactions
Chancellor, Microsoft, and NYU Polytechnic Announce NYC Summer STEM 2015

5/7/2015

Pilot Program Will Provide Hands-On STEM Opportunities for 1,200 Students

Microsoft Leading Supporter of Design and Implementation of Program
Classroom Integration of Summer Learning
Midwood High School won the city championship in robotics last year. That was totally due to our engineering program which would not exist without the four teachers who participated in NYU-Poly’s SMART program.—Dr. Ernest Pysher, AP, 2011
Impact on Engineering Students

- Improved communication skills
  - Presenting to “non-science” audiences
  - Significant gain in Fellows’ ability to communicate complex STEM concepts to lay audiences (mean pre-score 2.75/4 v/s post-score 3.23/4)

- Highlight the importance of STEM to society

- Ability to influence students
  - Share knowledge
  - Generate enthusiasm for STEM
  - Academic achievement
  - Dispel stereotypes
  - Correct attitudes
  - Creativity of students
Scholarship on K-12 STEM Activities
Soil Mechanics and Engineering Design Process

- Soil permeability
- Shallow and deep foundations
- Erosion in rivers
- Use EDP: ask, imagine, plan, create, and improve
Celebrate K-12 STEM
Celebrate K-12 STEM
Engage and Partner with Admissions

NYU TANDON SCHOOL OF ENGINEERING

1. Location-
Heart of the
Brooklyn Tech
Triangle

9. Career Placement
The Wasserman Center for Career Development holds an Engineering and Technology Career and Internship Fair in Brooklyn each semester, in addition to the 15 other fairs that are hosted at the school.

Employers from the following companies, among others, were in attendance last fall:
- General Dynamics – 9th largest defense contractor based on revenue.
- General Dynamics, the world's largest producer of jet fighters, the F-16 Fighting Falcon.
Engage and Partner with Marketing and Media

NYU-Poly Mentoring Helps Take Brooklyn Robotics Team to World Finals

Robots Teach; More Brooklyn Kids Learn
Brooklyn Community Foundation Grant Expands Highly Successful NYU-Poly Robotics Outreach Program

The atmosphere at the First Lego League robot competition qualifier in January felt similar to a WestEnd match — except the gradations in opinion were Lego robots created by hundreds of Brooklyn elementary school students. This year, P.S. 11’s Robotics Team, Minion 11, captured the first-place award at that contest, which was held at the NYU-Poly’s Jacob’s Center.

NYU-Poly Celebrates Engineers Week on NBC Today Show

On February 20, 2011, more than 3.8 million viewers tuned into the Sunday NBC Today Show to see Rucker Miller, Pasha Maleh with robots and signs promoting NYU-Poly Celebrates Engineers Week. Our team included over 50 members (including four 5th grade middle school and two elementary students) in six teams competes at the Brooklyn Community Foundation, the founding sponsor of NBC. The team carried signs advertising our student groups, including the National Society of Hispanic Engineers and the Student Society of Engineering.

Sparking Interest in Math and Science Among At-Risk Students, One Robot at a Time

BLACK MALE DONOR COLLABORATIVE JOINS NYU-POLY TO EXPAND SUCCESSFUL BROOKLYN SCHOOLS PROGRAM

From left, EMRI Program Coordinator Ashley Saneiro, NYU-Poly President of Mechanical Engineering and CBP Principal Investigator Vikram Kapila, Bedford Academy and CBP graduate Khalil Reed, who has been accepted into a college computer science program, P.S. 11 Robotics Team Member, and CBP Director Jock Shapter.
Certificate of Excellence

Presented to

Dr. Vikram Kapila

In recognition of a longstanding partnership and commitment to the students of New York City’s Career and Technical Education Programs and Schools
February 29, 2016

Division of Teaching and Learning
Office of Postsecondary Readiness
New York City Department of Education
Brooklyn's hot new trend: robots

A new grad program on the frontier of innovation is changing how we work and live.
MECHATRONICS EDUCATION INNOVATION WORKSHOP: A SUMMARY REPORT

The Internet of Things, robotics, and smart systems are beginning to make demands on academic programs to deliver a more modern and complete treatment of the necessary skills, methodologies, and technologies to meet the requirements of industry. Mechatronics, with its inherent interdisciplinary character, offers a vehicle to address these challenges and opportunities. Mechatronics education programs can...

BY VIKRAM KAPILA
NYU TANDON
PROFESSOR OF MECHANICAL AND AEROSPACE ENGINEERING
TOM LEE
QUANSER
CHIEF BUSINESS DEVELOPMENT OFFICER
Sustainability and Institutionalization

- Broaden project: Serve additional constituencies
- Ensure longevity: new funds, hone sustainable elements (courses)
- Spur institutional change: integrate across academic activities, develop leadership strategies, invite tenure-track faculty participation, engage university administrators
- A multifaceted approach: Involve faculty, students, administrators, K-12 community, civic leaders, media, philanthropies
- Institutional commitment: Center for K-12 STEM Education
  - Cyber security
  - Science of Smart Cities
  - ARISE—Summer research for high school students
  - Local and international projects
Investigating Digital Badges as Alternative Credentials to Broaden STEM Participation Among Underrepresented Youth, Award #1614727 (Project dates: 09/2016–08/2019)

Jim Diamond (EDC), PI: jdiamond@edc.org
Marc Lesser (Mouse), Co-PI: marc@mouse.org
Research Questions

1. How does the process of building accredited alternative credential portfolios contribute to the development of STEAM identities among underserved and underrepresented youth?

2. In what ways do individual and institutional stakeholders come to agreement to recognize mutual value in and accredit alternative credential portfolios?
mouse_ design league
Human-Centered Design
User Interviews
Brainstorm
Prototyping
Pitch & Publish
Mouse Competency Badges

Mouse competency badges are awarded to learners who have demonstrated their grasp of skills and knowledge through project evidence reviewed by local educators.

**Badge: Brainstorm: Finding great ideas**
Awarded for demonstrating understanding of key aspects of design ideation, producing and iterating on ideas derived from design research. Mouse competency badges are awarded to youth who have demonstrated their grasp of skills and knowledge through project evidence reviewed by local educators. Mouse supports the growing capacity of youth to apply technology, engineering, and design skills toward solutions that effect social change.

**Project: Rules of Brainstorming**
Practice the professional process of brainstorming once your research and problem identification are complete.

Evidence Date: 09/20/2016
- Work Submitted: 09/20/2016 15:57 pm

**Project: Framing Questions**
Learn how to frame your design challenges with How Might We Questions in order to achieve the most from brainstorming.
Mouse Design League Parsons Badge Endorsement

This Mouse Design League Badge is formally endorsed by Parsons School for Design. In this context, *badge endorsement* is the action of having expert individuals or institutions formally recognize or value the achievements of learners participating in learning experiences outside of their own institution. The purpose of this endorsement is to pronounce relationships between organizations with shared goals related to skills-building and to establish more explicit learning pathways for individuals who seek expertise applicable to their personal or professional interests.

A “Badge,” in this context, is a graphic representation of a skill or competency that is accessed online, earned through specific criteria, and that links to “evidence” or portfolio data that can be reviewed by various stakeholders.
Why does higher ed need to partner with community organizations?

High-quality out-of-school programs can give young people occasions to engage in authentic practices that relate to their own interests, are meaningful to their peers, and are within their cultural milieu (Bell, Lewenstein, Shouse, & Feder, 2009). Underrepresented youth do not necessarily have the means to convert those experiences into “currency” for use in the college admissions process, as do middle-class students, who typically possess greater social capital (Archer, et al., 2012).
We are challenging the general notion of what a portfolio can be.

Linear
Narrative
Interactive
Final Work
In progress
Solely Visual Art
Multidisciplinary
Static
Easily Sharable
Awarded for showing competence in testing versions of a design using prototypes, and documenting feedback from real users.

Demonstrate an understanding of the iterative and incremental making process, including experimenting, taking creative risks, developing concepts and scenarios; drafting, mocking up, and prototyping; testing; and editing, altering, and responding to feedback.
Growing the alternative credentials herd
1. Faculty as advocates (the Justice League)
2. Faculty and admissions brainstorming together (EAGER)
Thank you! Questions? Get in touch!

Investigating Digital Badges as Alternative Credentials to Broaden STEM Participation Among Underrepresented Youth, Award #1614727

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