STEM
SCIENCE TECHNOLOGY ENGINEERING MATHEMATICS

2017 - 2025

A Strategic Plan for the STEM Innovation Academy of the Oranges

Vision

Explore, Innovate, Share

Our Narrative

The STEM INNOVATION ACADEMY of the ORANGES encompasses the dualities of rigor and collaborative working relationships, results and respect. We have one common intellectual mission--to ready students for college success via exposure to DEEPER LEARNING ENVIRONMENTS (project based, highly personalized, blended learning experiences) that are strategically focused on the individual needs of ALL students. This focus is supported by the belief in ALL students' abilities and is reflective of high expectations. This allows us to strike a seamless balance between striving and supporting-- demanding performance with purpose; systematically engaging students as scientists, authors, creators, inventors, collaborators and problem solvers. This is a complex shift in mindset in which the STEM INNOVATION ACADEMY community embraces, takes ownership of, and subscribes.

The long-range vision for The STEM Innovation Academy of the Oranges (the Academy) is to create an early college model for STEM education that unites public and private sector to provide better options for our students and that strengthens the continuum from high school to college to careers. The Academy provides a fully integrated STEM education model using engineering design, mathematical analysis, and scientific investigation to leverage the natural connections between STEM subjects while offering multiple pathways to post-secondary study. Its mission is to provide students, underrepresented in STEM college majors and careers, with a personalized pathway towards mastery of the skills and knowledge that they will need to make the transition from secondary education to college and industry. The STEM Innovation Academy of the Oranges considers college admission and completion the goal for all students.

School Profile

The STEM Innovation Academy of the Oranges is a highly-innovative 4 year program spanning grades 9-12 resulting from the joint collaborative between The City of Orange, the Orange Public Schools, the New Jersey Institute of Technology (NJIT), , The College of New Jersey, and Montclair State University. The Academy exemplifies an early college model whereby students, from grade 9 on, navigate through a four-year scope and sequence of high school and college coursework. The school operates on an extended school day model with students attending from 8:20am – 3:30pm; teachers, from 8:05am – 4pm. Students will earn college credits toward a degree in one of three majors - Computing Sciences, Mechanical Engineering, or Biomedical Engineering. All curricula are aligned with the Common Core State Standards or the Next Generation Science Standards as the foundation for learning in higher education institutions with strong mathematics, science and engineering programs.

The Components

The Academy provides students with a high school to college to career continuum that helps them understand the direct links between what they are learning today and the worlds of college and work. While the Academy is a comprehensive school, it embodies a few unique core components.

Focus on Early College: Student learning is focused from grade nine on, through a four-year scope and sequence of high school and college coursework.

In June of 2017, the Orange Public Schools district entered into a formal agreement with the New Jersey Institute of Technology (NJIT). The purpose of the agreement was to define the procedures for a non-exclusive program providing Orange's qualified high school students from the STEM Innovation Academy of the Oranges with the opportunity to take college courses to accrue forty college credits during the regular academic year at the STEM Innovation Academy of the Oranges; pending the availability of qualified faculty at the school, and access to specialized equipment and facilities. These credits include general university requirements (GURs) and some first and second year major requirements all of which are generally transferable to most two- and four-year colleges in the U.S.

Focus on Project Based Learning

The Academy hopes to spark a transformation of teaching and learning by offering a combined Design Thinking and project-based learning approach in grades 9-12; while emphasizing the "soft-skills" necessary for today's workplace – skills in collaboration, communication, creativity, problem-solving, and perseverance. Project-based learning is a dynamic approach to teaching in which students explore real-world problems and challenges. With this type of active and engaged learning, students are inspired to obtain a deeper knowledge of the subjects they're studying. Design thinking provides another potential form of teacher scaffolding to help craft these experiences.
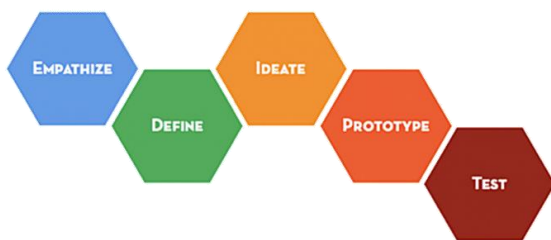
Student demonstrates his team's custom-made apparel using recycled materials; Summer 2017

Focus on Calculus-Based Majors

Calculus serves as the foundation for many college students to help them understand complex mathematical computations. Many college STEM majors require Calculus (Calculus with Analytic Geometry, Stats, Probability, and Differential Equations) as a part of a comprehensive curriculum. In grades 9 – 11, mathematics programs are offered year-round to focus heavily on the development of mathematical literacy to help address this concentration.

Focus on Careers

Students participate in an ongoing, sequenced workplace learning curricula informed by current industry standards. The curricula include setting career goals, mentoring, guest speakers, workplace visits and internships. Minimum requirements for entry-level IT jobs, developed in collaboration with our industry partners, will be mapped to the curriculum and will serve as academic benchmarks and targets.
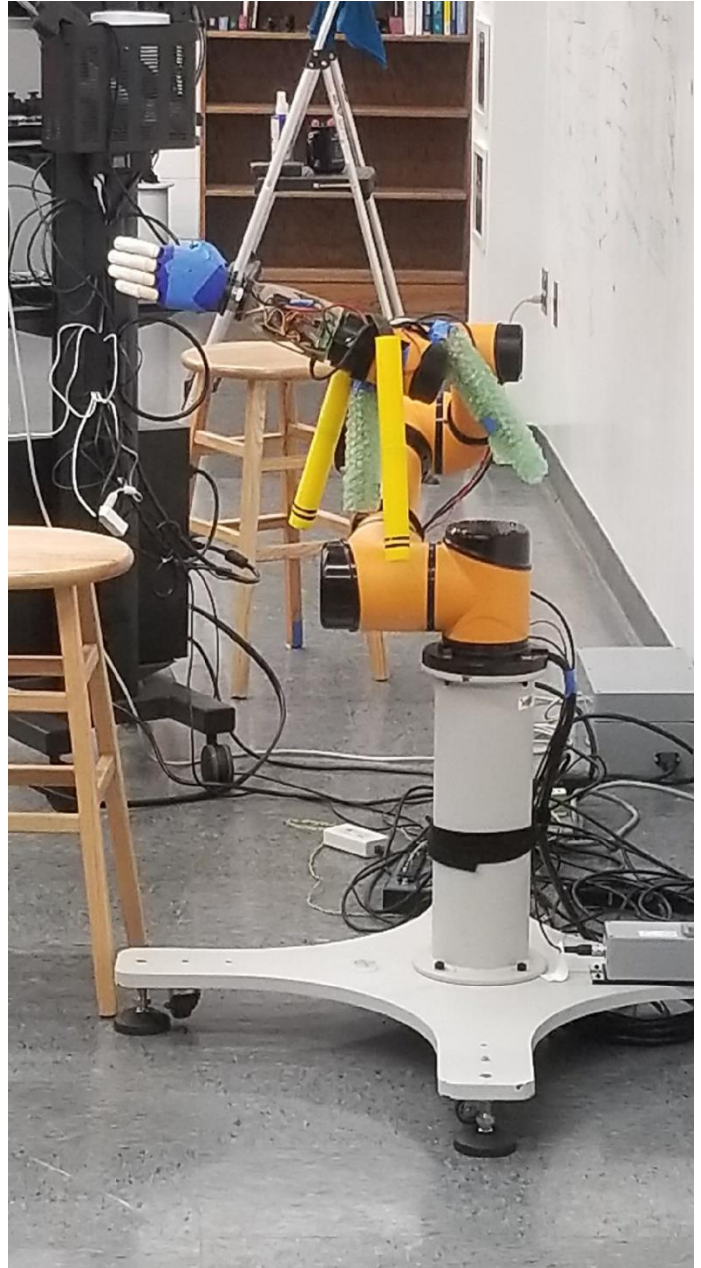
Focus on Personal Pathways

Each student moves through a personalized academic pathway that is closely monitored by his or her teachers and advisors, and based on individual needs and performance. While the school meets all state mandates for graduation, the pace at which the student moves through the high school and college requirements is personalized, and the requirements' sequences are intricately intertwined. While all students are expected to meet high school requirements and earn their respective credits, some may proceed at an accelerated pace. The Accuplacer, the PARCC, the Eng10 PARCC exam, or the PSAT offered in 9th and/or 10th grade will be used to determine whether a student is ready to begin college level coursework.

Extended Learning Time

In addition to extending college level coursework into what has conventionally been the high school years, the school day and year (via summer planning) also are extended beyond the traditional schedule to include even more individual support for students.

Specialized Staffing

In order to ensure that the model is adequately supported, the Academy includes the full-time position of an Industry Engagement Officer to work directly with the leadership, staff and students. In this way the model is continually monitored to ensure effective practice. Additionally, industry experts will be recruited to work with the school's lead teachers and subject teachers through programs such as TEALS (Technology Education and Literacy in Schools), Real World Connections (RWC), etc.

Inclusive Admissions Process

Application to the Academy is open to all grade eight students. The Academy is specifically dedicated to providing college and industry access to historically underserved students. Admissions criteria include NJSLA performance (745 and higher), portfolios, multi-year transcripts, references (teacher/student), panel interviews, and individual and group performance tasks.

No Cost to Families

Because the Academy is public and is designed to serve students from historically underrepresented backgrounds, access to no-cost postsecondary credits helps remove a critical financial stumbling block and helps students focus solely on learning.

Active Learning Spaces

The shift from passive to active learning creates a need to support the integration of pedagogy, technology, and space. Our classrooms reflect an active learning ecosystem that offers a range of settings and the choice and control to select the best environment for the learning; while considering options for adjacency, visual and acoustic privacy, and collaboration. This includes 3 instructional modes: computer work (focused work environments), talk with others (collaborative environments), making something (hands-on project work environments) . Collectively, these environments offer

- Dynamic movement
- Interchangeable configurations
- A mixture of specialized spaces: makers' spaces, engineering, digital design, etc.
- And zero distance design

- Height-adjustable worktables and rolling chairs
- Furnished alcoves, and corridors
- White board walls

8

STRATEGIES
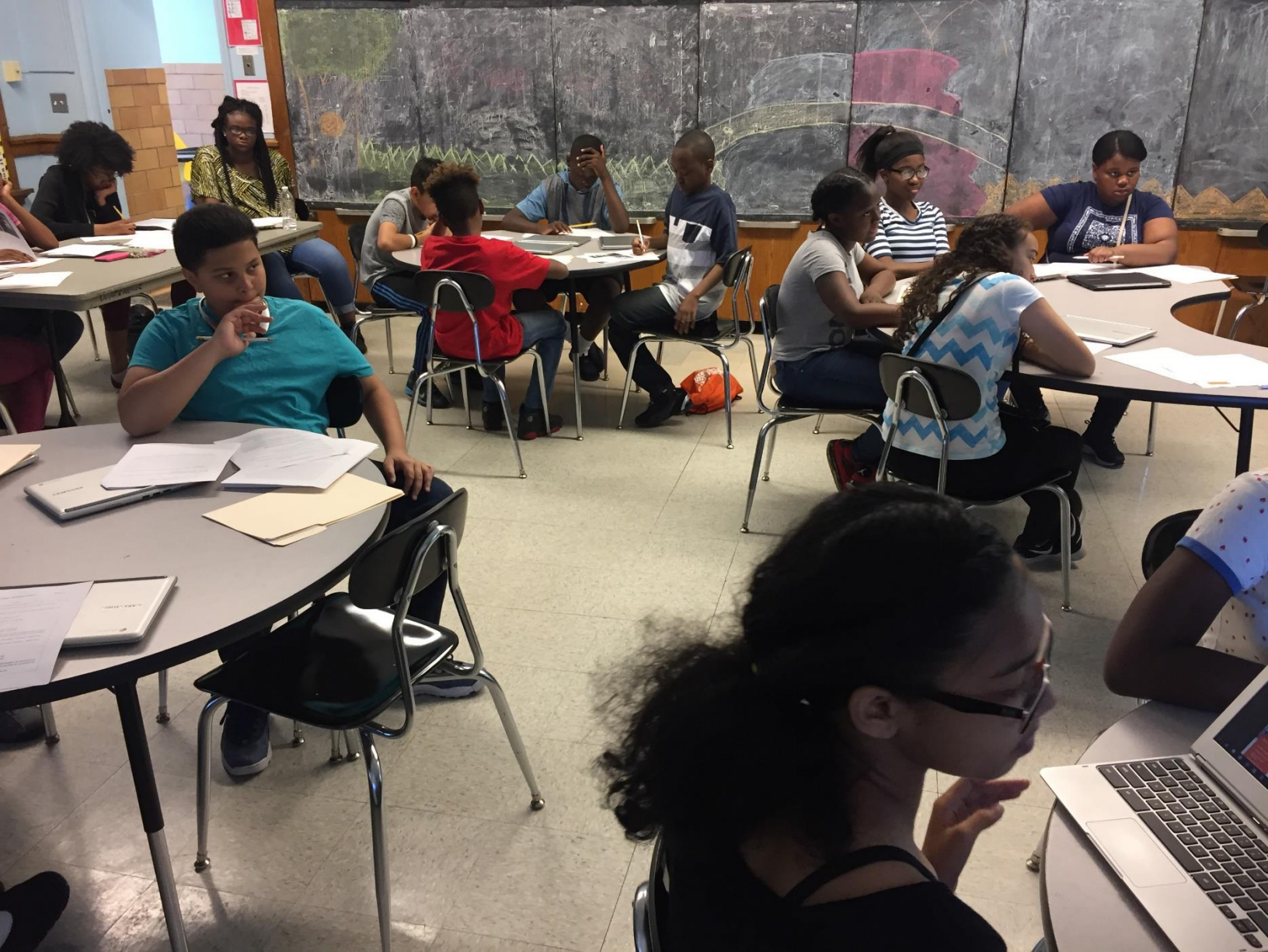
Priority One

Supports for Students

Once enrolled at the STEM Innovation Academy of the Oranges, students will receive the highest level of academic and social support to enable them to persevere through a rigorous curriculum. This includes summer bridge programs, Advisory periods, tutoring programs, extended school day, and an extended school year to strengthen student transitions to STEM coursework , college-level coursework, and careers.

Benchmarks

- Implement focused outreach efforts to identify and recruit prospective students.

- Establish a viable feeder program through the Scholars Program.

- Increase use of software tools such as Naviance and NWEA MAP for analysis; tracking student progress and offering more effective advising.

- Analyze student data to identify at-risk students to make possible timely intervention before, during, and after school.

- Coordinate tutoring, mentoring, adaptive learning and student support via

    o Structured advisory resulting from quarter-cycle progress
    o Post secondary tutoring formats
    o Structured use of teachers' office hours

- Intensify first year of advisement for the purpose of keeping students on-track and helping students identify their major of study.

- Celebrate the successes of students meeting and exceeding performance expectations and those showing noteworthy growth within and between Marking Periods.
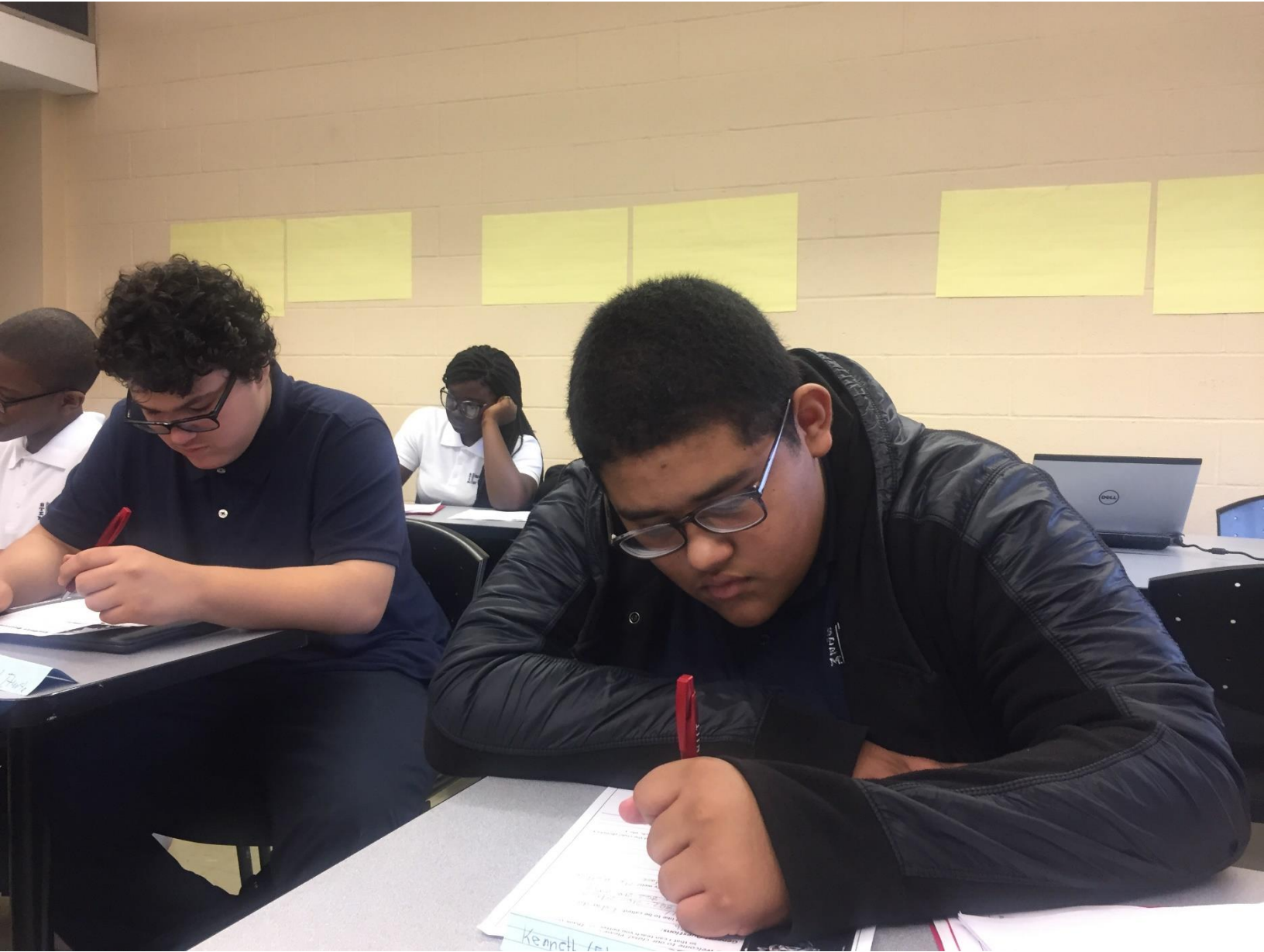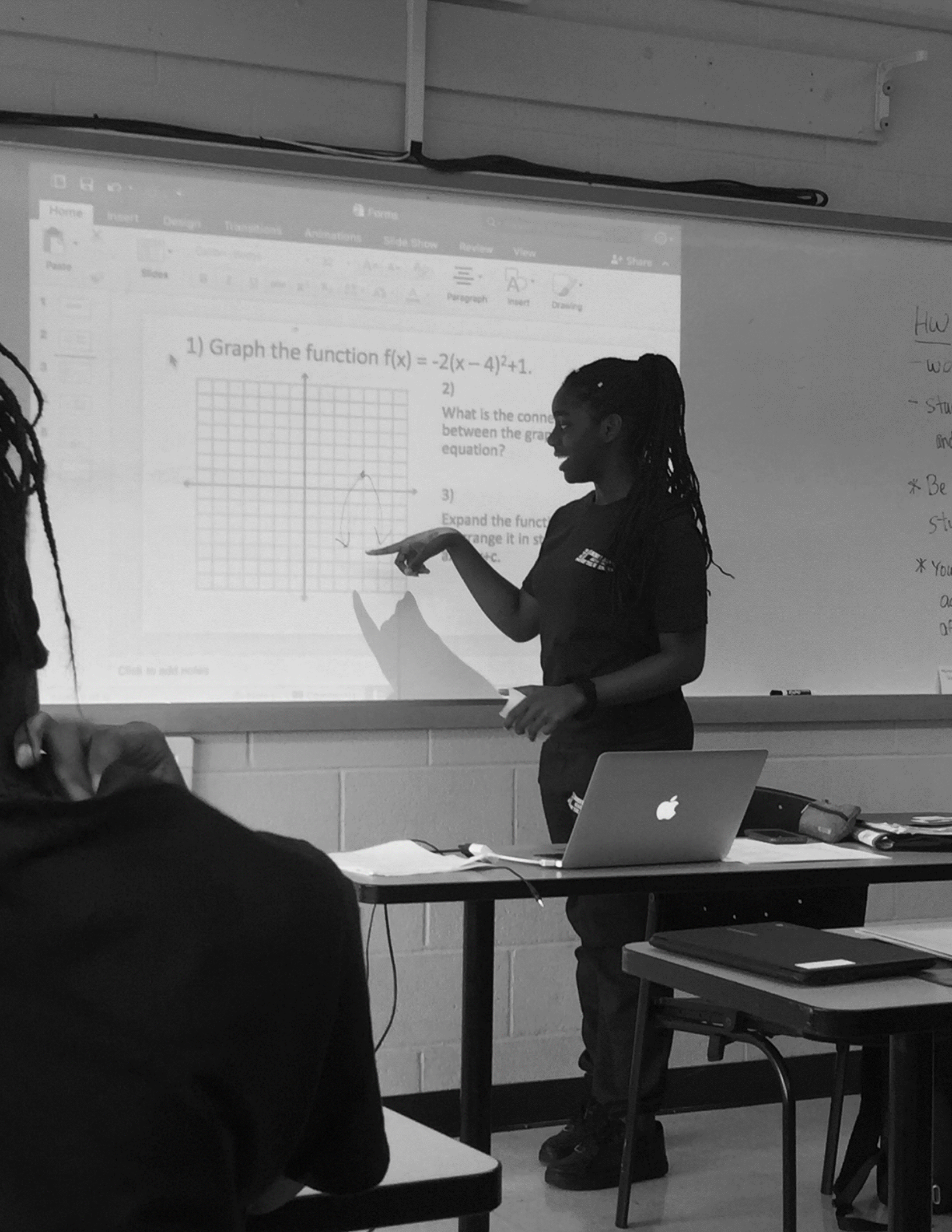
Priority Two

STEM Academy students will encounter a course of study that is under continual scrutiny in order to ensure that it meets current academic standards, provides a core

STEM-Focused Curriculum

education to produce the most highly prepared students and is delivered by enthusiastic instructors using innovative and effective methods. Digital learning is an integral part of every student's experience, with instructors engaging students through blended pedagogies that promote anytime and any place learning. Students are given opportunities to learn at their own pace and to explore their own path to achieve their learning goals.

<u>Benchmarks</u>

- Assure uniformity of academic standards via shared development and peer-reviews of unit plans that include
    - Standards and Assessment Alignment
    - Authentic and Project-Based Learning experiences
    - Presentation Expectations
    - Supports for below-, at-, and above-level learners

- Implement an independent evaluation for student support programs to guide resource allocation.

- Use student and parent satisfaction as indicators of success to guide programs toward promoting an academically supportive and nurturing climate.

- Develop assessment plans with learning targets for all programs to establish clear standards and measures for success and improvement.

- Align curricula to NJIT's General University Requirements (GUR) and other post-secondary offerings.

- Implement a progressive schedule that addresses curriculum expectations and student needs

    - 240 minutes per week of mathematics; with up to 160 additional minutes weekly of intervention or enrichment support
    - 240 minutes per week of applied science
    - 400 minutes per week of ELA, SS, research, and current events
    - 600 minutes per week of Major

- Use the freshman year as an exploratory year that will provide students with a working knowledge of their pathway-- Biomedical Engineering, Mechanical Engineering, or the Computing Sciences.

- Continue the partnership with NJIT's Real World Connections (RWC) to provide exposure to tracks offered within the Computing Sciences pathway.

- Establish partnerships with Project Lead the Way, Creative Learning Systems, RWC, and others to support the implementation of their respective program modules (PLTW: Engineering and Design, Principles of Biomedical Science, SmartLab: circuitry, computer graphics, digital communications, mechanics and structures, robots and control technology, software engineering, etc.; RWC: Animation, Web Development, Android App Development, Game Design, Crime Scene Investigation, CyberSecurity, Coding).
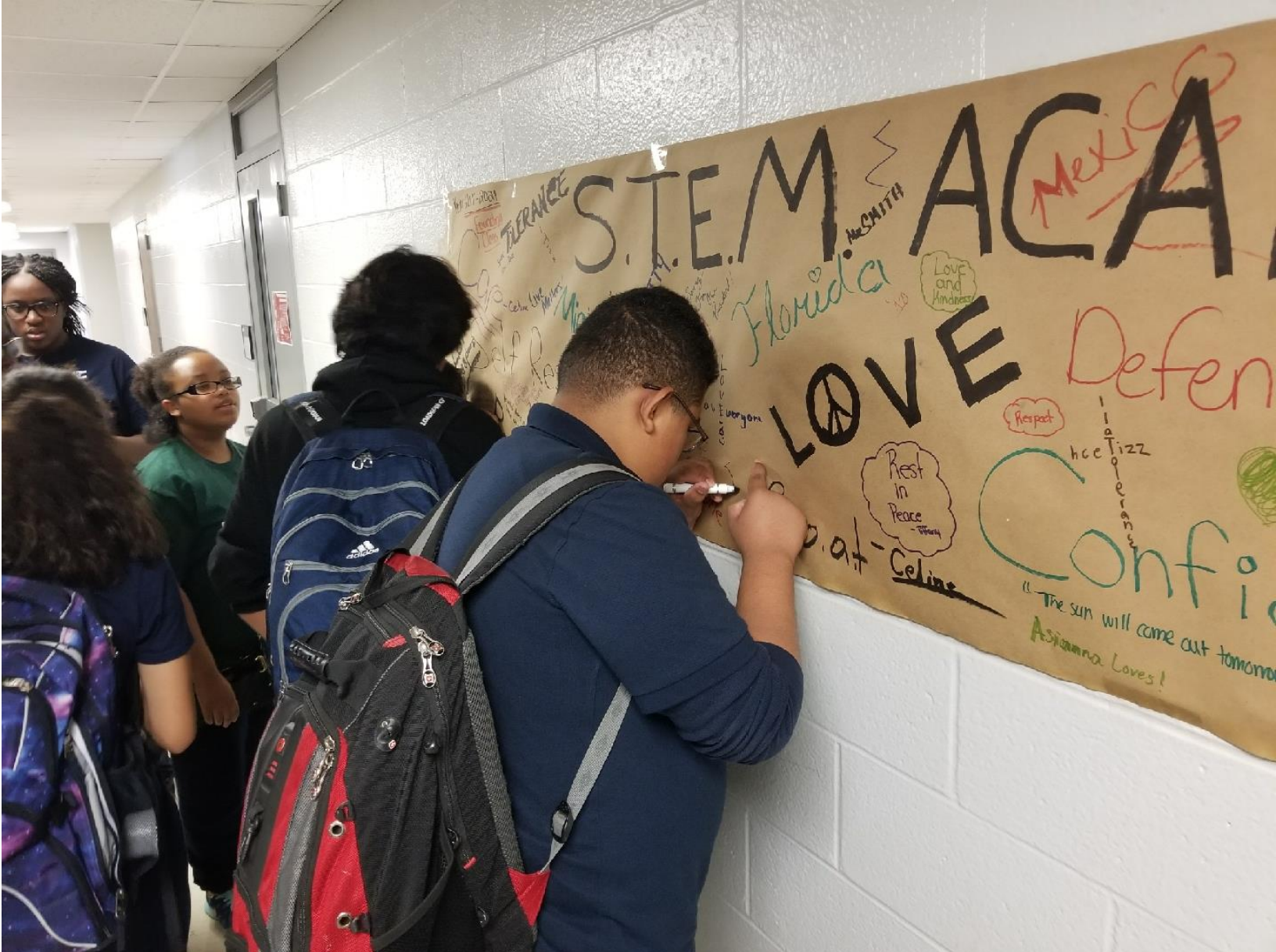
Priority Three

Campus Life: Formal and Informal Settings

Beyond the typical school day, week, or year, STEM Academy students are involved in apprenticeships, mentoring, social networking and doing STEM in locations off of the school site, in the community, museums and STEM centers, and business and industry.

Benchmarks

- Provide every student with unique, possibly credit-bearing learning opportunities outside of the classroom (summer, yearlong, during breaks).

- Expand opportunities to promote collaboration and connect knowledge acquired in the classroom to applied research problems.

- Cultivate a courteous and welcoming campus climate. This will enhance student satisfaction and success.

- Develop a service-focused message for all faculty and staff.

- Pair STEM Academy students with Scholars students during Advisory periods to assist in the SmartLab.

- Facilitate sustainable and supported Academy events and experiences such as interest clubs, and academically oriented teams, such as debating and robotics, that will engage the entire Academy community and enhance campus life.

Students visit the JP Morgan Chase Technology Center, September 2017

Priority Four

STEM Academy students connect to business, industry, and the world of work via mentorships, internships, or projects that occur within or outside the normal school day/year.

STEM-Focused Partnerships

Benchmarks

- Identify industry-alliances to provide curriculum mapping support and entry-level career opportunities.

- Increase the number of industry-support field trips, job shadowing experiences, mentoring opportunities, research experiences and internships. This will enhance student opportunities for early industry experience.

Priority Five

Early College Level Coursework

Partner with local universities to provide opportunities for students to take classes at institutions of higher education or online.

<u>Benchmarks</u>

- Continue to execute the Options for Advanced Academic Achievement Secondary School Partnership Program Agreement between NJIT and the Orange Public Schools district.

- Continue to pursue summer STEM-focused pre-college programs for all students (e.g. NJIT's Center for Pre College Program's Summer STEM Camp).

- Identify additional opportunities for students to engage in college level coursework.
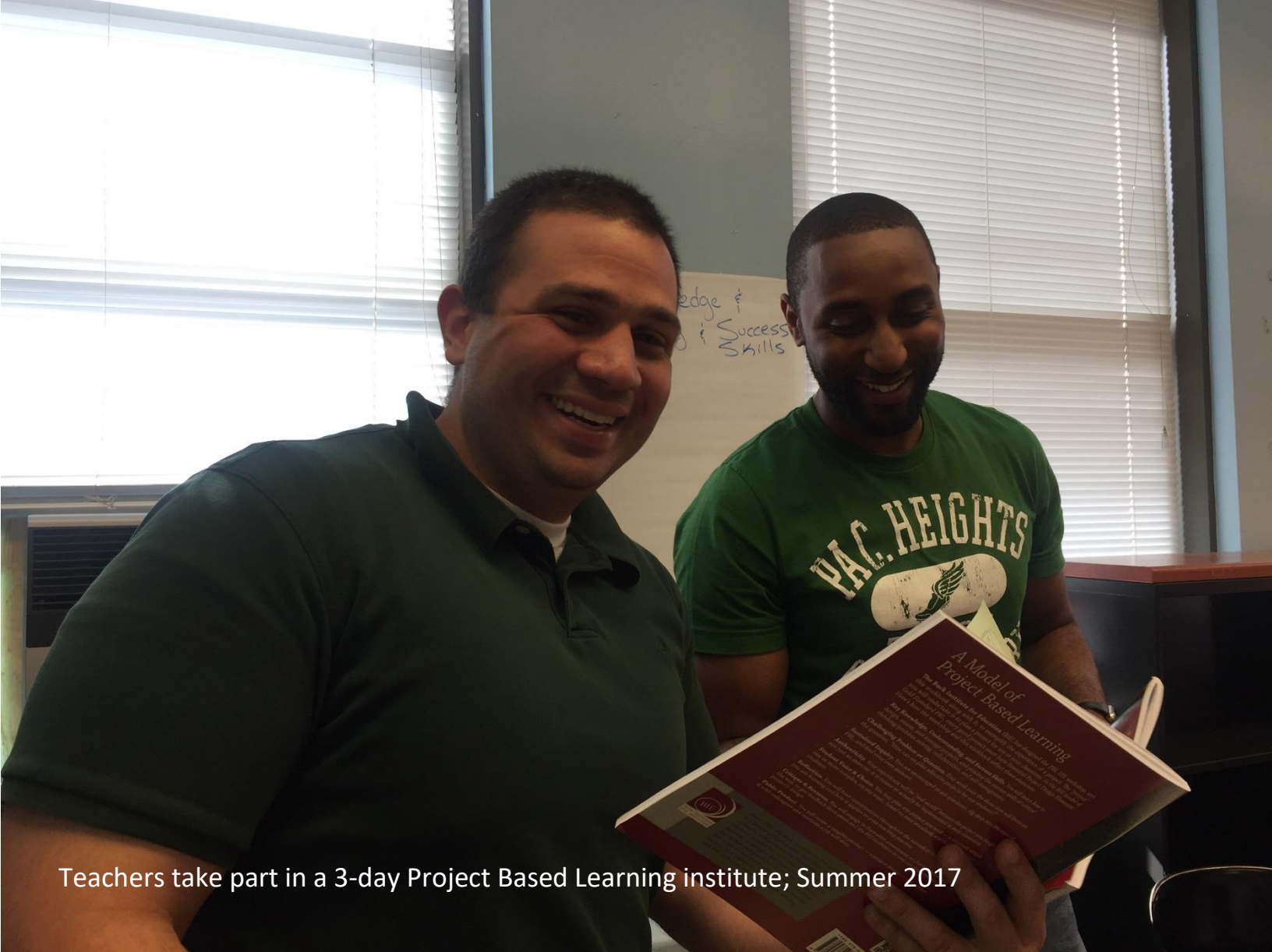
Teachers take part in a 3-day Project Based Learning institute; Summer 2017

Priority Six

STEM Academy teachers are qualified and have advanced STEM content knowledge and/or practical experience in STEM careers.

Well-Prepared STEM Teaching Staff

■ Engage in strategic hiring, development, and retention of staff; beginning recruitment efforts at least one year in advance.

■ Develop a Teacher Village Fellowship within the partnership with NJIT and Montclair State University to train and prepare pre-service and in-service teachers for teaching and leadership roles within the district.

■ Develop a four-year hiring plan to build strength in areas that address the Academy's needs while considering projected enrollment growth. Consider Option II staffing, recruitment of Options teachers with MA/MS degrees and higher in support of specialized programming, e.g. computer science, manufacturing, etc.

■ Develop a mentoring plan for both faculty and instructional staff.

Hiring Strategy (4 years)*

	Teacher	Subject	Location	Size
1	HS Math	Integrated Mathematics I Integrated Mathematics II/III Scholars I & II	Math Lab 1	Single
1	HS Math	Integrated Mathematics III College Calculus I & II	Math Lab 2	Single
1	HS Bio	Biomedical Science Human Body Systems *Scholars I & II*	Bio Lab 1	Mid
1	HS Bio	Medical Interventions Biomedical Innovation	Bio Lab 2	Mid
1	HS Chem	Chemistry *(considered for Scholars)* *(considered for BE Majors)* College Chem I & II	Chem Lab 1	Mid
1	Mechanical Engineering	Computer Integrated Manufacturing *Physics (considered for ME Majors)* Mechanical Engineering Principles	Engineering Lab 2 and/or Physics Lab 1	Double
1	HS Engineering	Intro to Engineering & Design PLTW Engineering Design & Develop *Scholars I & II*	Engineering Lab 1	Double
2	HS Computer Science	Computer Science Essentials Computer Science Principals Computer Science A	Computer Science Lab 1	Double
1	HS English	American Experience Political Studies	Humanities Studio 1	Double
1	HS History			
1	HS English	College English Comp + College World History	Humanities Studio 2	Double
1	HS History			
1	World Language	To Be Determined	World Language Studio	Mid
1	Physical Education	Physical Education/Health	Gymnasium	Gym

* Consider staffing for all college-level pathways and offering
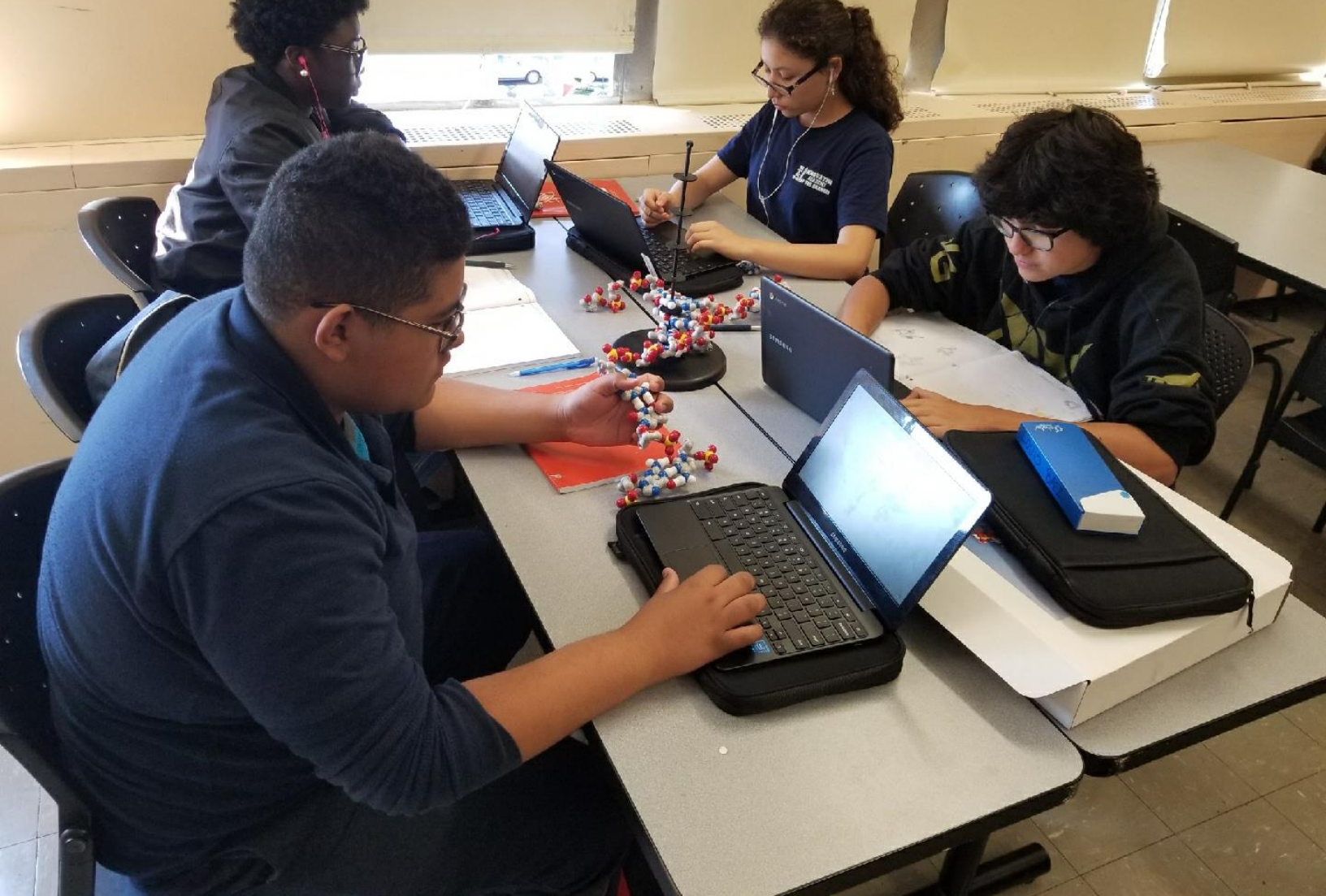
Priority Seven

Integrated, Innovative Technology Use

Use the power of technology to connect students with information systems, models, databases, STEM research, teachers, mentors, and, social networking resources for STEM ideas during and outside the school day.

<u>Benchmarks</u>

- Enhance the Academy's web presence via the development of a high-impact website to improve recruitment, promote the Academy's identity and highlight successes, and better serve the needs of the community through increased two-way communication channels.

- Improve the use of online modes of course delivery to lessen the boundaries between the physical and virtual classrooms, improve timely access to resources and information, and underscore personalized learning formats.

- Progress toward online textbooks and other digital platforms to enhance the teaching and learning environment.

- Incorporate high quality adaptive learning systems to provide additional supports to students via personalized web-based responsive platforms that provide anytime any place learning.

Students begin Day One of a 16-week Animation class at NJIT; October 2017