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PATHWAYS TO SUCCESS:

Investigating the Promotion of STEM Education in New Jersey

Prepared For:
Office of the Secretary of Higher Education
New Jersey STEM Pathways Network

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Executive Summary

The Office of the Secretary of Higher Education (OSHE) provides coordination, planning, policy development, and advocacy for the state's higher education system. It is also responsible for institutional licensure and the administration of the Educational Opportunity Fund and other programs. It serves as the principal advocate for an integrated system of higher education, which provides a broad scope of higher education programs and services. The system includes both public and independent institutions and enrolls over 410,000 full- and part-time credit-seeking students statewide. Highlighting the importance of education related to science, technology, engineering, and mathematics (STEM) to the future of New Jersey's workforce,

The New Jersey STEM Pathways Network (the Network) was established in 2014 to bring together organizations within the state to better coordinate programs supporting the education of New Jersey students in fields related to STEM. Chaired by Laura Overdeck, the public-private strategic alliance informs the alignment of STEM resources, supports an education-to-workforce STEM pipeline, identifies exemplary formal and informal learning opportunities, and promotes STEM career pathway awareness. As part of its efforts, the Network has maintained a self-reported list of STEM programs.

Efforts to support STEM education in New Jersey are extensive, but siloed. The Network provides a valuable service in connecting organizations to one another, but the program inventory that the Network maintains is not comprehensive. Many programs are not on the list, and new ones arise frequently and are not added. Given the importance of STEM education for the 21st Century workforce, a clear understanding of the programs available within the state would help the Office of the Secretary of Higher Education.

This report provides context for the efforts underway in New Jersey. It analyzes the scholarly literature on STEM programs, reviewing the factors contributing to their effectiveness or acting as barriers. The report focuses on three areas of intervention: (i) attracting students to STEM fields during their high school years; (ii) ensuring success in STEM coursework at the college level; and (iii) retaining students in STEM majors through their post-secondary education.

Four graduate student researchers from Rutgers University's Edward J. Bloustein School of Planning and Public Policy conducted a review of the literature on the effectiveness of STEM programs nationwide, and compared it to the Network's program inventory list. The researchers also conducted two surveys: (i) of Deans of Science at each of the state's universities and colleges; and (ii) of members of the Network program inventory, supplemented with programs found through additional research. The researchers also interviewed representatives from four programs that the researchers believe have valuable perspective on the facilitators and challenges that STEM program organizations face.

Key Findings

Through a statewide survey sent to all colleges and known STEM programs, our team received information on 76 programs in the state that are being operated by 56 institutions. With valid responses from 30 colleges and universities and 26 programs, (some of which were also located in higher education institutions) we were able to gather data on topics such as organizational structure, funding, program strategies, and outcomes. After the surveys were received, our team conducted phone interviews with eight respondents to collect further information regarding program implementation, challenges, and recommendations.

Through these two methods, we identified several potential areas of improvement:

- increasing reliable sources of funding for programs;
- providing support for evaluation of programs' impact;
- increasing mentorship opportunities through internships and job shadowing experiences;
- providing support for cross-organization communication

Section I: Overview of the Issues- STEM Education in the United States

For more than a decade, nearly every level of government and industry group has identified STEM education as a pressing matter for the country in the coming years. Private industry, state governments, Congress, even the President of the United States, have all advocated for more education in STEM fields to better prepare the American workforce. The President's Council of Advisors on Science and Technology (PCAST) has made STEM education a focus of their efforts to increase the understanding of science, technology, and innovation, and have published a number of reports on the importance of STEM education.[1] The importance of STEM education is not merely for the civic or academic benefits of a more knowledgeable populace, rather one of STEM education's primary purposes is to prepare students for jobs, and jobs that generally receive higher compensation than non-STEM jobs.[2]

The State of New Jersey has also focused on developing STEM education for its students. Lieutenant Governor Kim Guadagno has led a number of efforts to promote STEM education in the state, and has highlighted the work of the New Jersey STEM Pathways Network.[3] The Secretary of the Higher Education has also made STEM education a priority

[1] See Report to the President, Engage to Excel: Producing One Million Additional College Graduates With Degrees in Science, Technology, Engineering, and Mathematics. (2012).

[2] See Carnevale, A.P., B. Cheah, and A.R. Hanson. (2015). The Economic Value of College Majors. Georgetown University Center on Education and the Workforce. Available at: https://cew.georgetown.edu/wp-content/uploads/The-Economic-Value-of-College-Majors-Full-Report-web-FINAL.pdf (presenting data that graduates of STEM majors received average starting salaries between 2.4% (biological sciences) and 50.5% (chemistry) higher than average student salary expectations).

[3] "Lt. Gov. Guadagno Praises New Jersey STEM Pathways Network." (2015). New Jersey Business News Now. March 11. Available at: http://njbmagazine.com/njb-news-now/lt-governor-guadagno-praises-new-jersey-stem-pathways-network/ (last checked March 18, 2016).

by leading a number of initiatives to increase the number of STEM graduates. Other organizations such as the Statewide Network for New Jersey's Afterschool Communities and the Research and Development Council of New Jersey have worked to promote STEM education.

What *is* STEM?

The acronym "STEM" stands for "science, technology, engineering, and mathematics," and is used to describe a sector of education that serves those topics. What that sector encompasses, however, is a more complicated question, with different federal agencies offering different definitions of the category. The National Science Foundation ("NSF") uses a broad definition that includes many social sciences alongside the "hard" sciences of physics, chemistry, and mathematics, while other departments are more narrow (Gonzalez 2012, at 2).

The question of what "counts" as STEM or STEM-related is a topic of discussion in educational literature as well. Indeed, Breiner, et al. (2012), conducted a survey of 222 faculty members at a major research university and the definitions were varied. Breiner notes that in education, STEM can mean not only substantive course areas, but can also encompass teaching methodology, "the replacement of traditional lecture-based teaching strategies with more inquiry and project-based approaches," simulating the perceived methodology of the substantive areas of knowledge (2012, at 3).

For the purposes of this report, we will use a definition of "STEM" as close as possible to that used by the NSF. The NSF is a major funder of educational programs in New Jersey, many of which are directed towards the populations that this report has targeted. Additionally, the STEM programs already in the Network's inventory are focused on the substantive course areas, rather than the curriculum-focused or process-focused definitions proposed in the literature. Accordingly, "STEM," here, means programs that target the substantive areas of knowledge that include physics, chemistry, mathematics, the biological sciences, quantitative social sciences, and engineering.

What is at Stake?

There are three primary issues in STEM education for policy makers to address:

1. The needs of the future workforce, both generally and in STEM-related fields, which are projected to grow at a larger rate than other sectors of the economy;
2. Increase the number of women and minorities in STEM fields; and
3. The lack of coordination among STEM education programs.

Workforce Needs

The National Science Foundation has recognized the U.S. STEM workforce's "central role in fostering innovation, economic competitiveness, and national security." [4] In addition to the

[4] National Science Board, "Revisiting the STEM Workforce: A Companion to Science and Engineering Indicators 2014." (2014). National Science Foundation. Available at: http://www.nsf.gov/pubs/2015/nsb201510/nsb201510.pdf

positions that are expressly STEM, such as research scientists and engineers, the NSF has noted that "STEM competencies" among workers who are not engaged directly in STEM fields helps foster the "[a]doption and diffusion of innovation." [5] Even those jobs in the future workforce that are not in STEM or STEM-related fields will require workers to have greater facility with technology. Very few positions do not require the use of computers, and nearly all sectors are increasing their adoption of some form of information technology. Indeed, research has shown that while employment in STEM occupations had risen approximately 10% from 2003 to 2010, the number of workers indicating that their job requires "bachelor's level expertise in [STEM]" had nearly doubled.

It is not only the importance of STEM education to the economy that has driven the development of STEM education programs; the number of jobs requiring STEM expertise is projected to grow substantially faster than other sectors of the economy. Many employers claim further that the current educational system is not equipped to produce a sufficient number of STEM workers for the workforce of the near future, and so more programs are needed to increase the number of STEM graduates. In addition to the needs of the future workforce, the unemployment rate for workers in STEM-related fields is lower than that of the total U.S. labor force. Accordingly, many programs are focused on linking students to STEM related employers to prepare the individuals who will make up the future workforce.

Disparities

One of the key characteristics of the current STEM workforce is the presence of dramatic disparities between African-American and Hispanic students and those of other races, and between male and female students and individuals working on the STEM fields.[6] The disparities on the basis of race in STEM employment are between Asian-American and White, Non-Hispanic workers, who are traditionally over-represented, and Black, Hispanic, and Native American workers, who are traditionally under-represented. Those groups' representation in the STEM workforce has increased since the 1970s, but is still below their portion of the overall workforce.

STEM fields have been traditionally male-dominated, and like the under-represented racial groups, women's participation in those sectors has increased since the 1970s. But women are still underrepresented – in 2011, only 26 percent of STEM workers were women. Additionally, the gender disparities are focused on certain fields – while women make up 61 percent of social scientists, women make up only 27 percent of computer workers, and that rate has decreased since 1990.[7] This latter discrepancy is notable because it is precisely those areas in which women are most under-represented that make up a large part of the projected increase in STEM jobs in the next decades. The increase in participation among historically under-represented groups can be linked to a large number of programs designed to address the disparity, many of which are still in place today, along with numerous innovative approaches to bringing parity to the STEM world.

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[5] Id. at 5.

[6] Landivar, L.C. (2013). Disparities in STEM Employment by Sex, Race, and Hispanic Origin. U.S. Census Bureau, American Community Survey Reports. Available at: https://www.census.gov/prod/2013pubs/acs-24.pdf

[7] Ibid. at 6.

Table 1: Disparities in STEM employment

Factor	% of US workforce	% of US STEM workforce
Gender (female)	48%	26%
Race (black)	11%	6%
Race (white- Hispanic)	15%	7%

Source: 2011 American Community Survey

Lack of Coordination

The lack of coordination between STEM education programs is another problem that policy makers are attempting to address. As in any field where there is substantial demand for reform and innovation, there are hundreds of programs designed to improve STEM education in the United States. This is inefficient for a number of reasons: (1) there is potential added value missed that could be realized from certain programs working together; (2) it can result in a duplication of efforts that wastes educational resources; and (3) programs with different approaches could work at odds with one another, hampering policy makers' efforts to evaluate the impact of the programs' interventions.

The New Jersey STEM Pathways Network is an attempt to address this "siloing" of STEM educational programs, to provide them with a forum to communicate with one another. The Network's inventory of STEM programs enables policymakers to understand the nature and scope of programs, where programs are being implemented, and whether any benefits can be realized from cooperation and coordination. The Network's efforts to bring together stakeholders in the state allows for connections to be made between organizations and for the alignment of efforts, smoothing the pipeline for students to retain an interest in and commitment to STEM into their careers.

Section II: Literature Review

The following literature review examines the effectiveness of various types of intervention designed to improve STEM education. It is separated into three key topic areas: (1) programs targeting STEM students in high school; (2) programs designed to address the "bridge" between high school and college; and (3) programs that are designed to improve performance and retention in college.

High School Programs

The pursuit of careers in STEM-related fields is increasingly important to our nation's productivity. While we will look at research focusing on bridging students from high school to college STEM majors, and programs retaining students in these majors, this section discusses what keeps high school students interested in STEM. Many programs focus on increasing interest in these areas in middle school, or after high school, and there are many studies proving the importance of maintaining student interest in STEM during high school.

Advanced Placement (AP) Courses and Underrepresented Populations

Advanced Placement courses in STEM fields are a widely accessible route for high school students to accelerate their knowledge in these areas. Research suggests that participation

in AP courses leads to more success in college, and failure in engineering education can be traced to deficiencies in earlier mathematics and science (Robinson 2003). Additionally, students who take AP courses in calculus and sciences are more likely to choose STEM related majors in college (Robinson 2003).

While these courses are available to all students, enrollment tends to be higher for some. Moore and Slate (2008) found that 19% of White students enroll in AP courses, but only around 10% of African American students and 12% Hispanic students enrolled. Additionally, while 17% of female students and 13% of male students enroll in AP courses, "female students tend to enroll in higher percentages in the language, literacy, and history classes, whereas larger percentages of male students enroll in science and math classes with the exception of biology" (Moore and Slate 2008).

Similar research has found that Black and Hispanic students enroll in AP courses at half the rate of White students (Klopfenstein 2004). This study found that a reduction of the "impersonal nature of large high schools" would help the diversity gap in AP course enrollment. Klopfenstein also suggests that race-matched role models and AP incentive programs would increase minority student participation. Other research suggests increased professional development for teachers and continued education related to how to encourage students who are either gifted and talented, culturally diverse, or economically disadvantaged would result in increased minority enrollment in AP courses (Whiting and Ford 2009).

A lack of participation in AP courses by minorities and women is concerning given the effects some studies show regarding participation in these courses and plans to pursue STEM-related career tracks (Robinson 2003). There also tends to be disparity in the amount and level of AP courses offered by different schools. Ndura, Robinson, and Ochs (2003) found that high schools with higher socioeconomic level offered more AP courses and had greater student enrollment in these courses. The authors conclude with the following recommendations: establish culturally empowering school environments, implement culturally relevant responsive pedagogy, engage all stakeholders in dialogue about the consequences of educational inequity, develop students' faith in their ability to succeed, holding students to high expectations, and developing a firm commitment to educational equity (Ndura, Robinson, and Ochs 2003). Accordingly, increased encouragement from schools targeting students who are minorities, women, or with low socioeconomic status to enroll in AP courses may increase diversity in STEM-related careers (Robinson 2003).

The gender gap in STEM is another important issue that can be addressed in high school, since the key predicting factor for STEM career interest is interest in STEM at the start of high school. For males, this interest remained stable through the four years in which they were enrolled, ranging from 39.5 to 39.7 percent. For females, however, this percentage started low and declined over the span of high school, going from 15.7 percent to 12.7 percent of students interested in STEM careers (Sadler et al 2011). One study by Legewie and DiPrete (2011) discusses similar issues related to increasing female participation in STEM. One of their main findings was that the gender gap in STEM was solidified during

high school. However, they found that this gap varied by high school, noting that going to a high school that is supportive of a positive orientation by females towards math and sciences can reduce the eventual gender gap in STEM bachelor degrees by 25 percent (Legewie and DiPrete 2011).

Student Identity/Attitude

Another important factor influencing student success in STEM is their attitude toward learning the material. Bennett and Hogarth (2009) find that it is often the case that student's negatively perceive those who study science, rather than seeing the benefits of a career in the field. When following a cohort of 280 students aged 11, 14, and 16, this study found a significant decline in interest toward science at age 14, which they deemed the "age 14 dip". While this study cannot conclude on the features of a school that influences attitudes, they urge programs and future research to incorporate attitudinal instruments as well as studies detailing such features of schools that cannot be obtained from student data.

With the same attitudinal instruments in mind, Aschbacher, Li, and Roth (2010) followed 33 ethnically and economically diverse students to uncover some of the issues causing a decline in students' interest in science. Their study found that the microclimate of each student, involving their own experiences with science communities in school and through their family, shape their perception of STEM, their abilities, career options, and expected success. In addition, students reported that difficulty of school science courses, a lack of positive science mentors at school and home, and a lack of meaningful opportunities to work with science professionals led to a decline in student STEM interest during these years. To conclude, they show that students' positive attitudes derived from these various factors, but were heightened when they experienced success and received support from important people in their lives (Aschbacher, Li, and Roth 2010). Using this information, more programs may incorporate encouraging approaches that use mentors and provide opportunities for small successes throughout the program.

Robnett and Leaper (2013) also discussed the importance of community and student attitude in retaining students STEM interest, or peer-to-peer approaches. Their study focused on friendship groups, and had students rate their groups' support of STEM and English as well as their personal motivation in both. They conclude that group support of STEM and personal science interest predicted STEM career interest, but that this was not the case for English. Again, encouraging students to pursue education in STEM fields, keeping in mind the impact social identities and self-concepts may play, can lead to more successful outcomes.

Enrichment Programs

Another major factor determining student STEM interest is their level of involvement in science related programming before and during high school. A lack of such involvement has led to a lag in science achievement for all students, but particularly for women and minorities. Supplemental enrichment programs can take place during the school year or in the summers during high school to address this issue. Skate and Marris (2001) found that of 330 gifted high school students, supplemental enrichment program benefits were strongest for female students, those who had more supportive families and teachers, and

those who entered the programs with greater confidence in their abilities. These findings suggest the need for programs to identify these successful factors and utilize program functions to enhance them.

Similarly, Markowitz (2004) performed an evaluation of a university high school summer science program and found that participation in the program led to increased performance in advanced science courses, desire to participate in other science programs, and eventual desire to pursue a science career.

Alternatively, one program evaluation found less promising results, following a program that combined mentorship, an apprenticeship, and coursework. In that evaluation, findings suggested that although most students left with increased knowledge of the processes of scientific inquiry, their knowledge of key aspects of the nature of science did not change. Only one case, which indicated the students' demand for knowledge and reflection, resulted in substantial gains (Bell et al 2002).

Another program evaluation of a seminar series that produced more successful findings, Cantrell and Taylor (2009), involved weekly sessions for eight weeks where students engaged with presenters from STEM fields. This program showed stability in female students' career choices over the course of the series, and that seniors were better able to learn the STEM related content. Additionally, senior students were more able to relate their high school coursework to the seminar than the juniors had. The previously mentioned study by Skate and Morris (2001), however, found that returning students reported more positive changes than first time students, showing that continued participation in enrichment programs may have compounding results.

Teacher Approach

Teachers are at the front line for generating interest in STEM related fields for high school students. As stated in one study, "the educational experience for students is dependent on the quality and effectiveness of teachers, more than any other single alterable factor" (Nathan et al 2010). Without effective teachers, any program seeking improvement in curriculum or extracurricular work may have far less impact.

Improvement within a curriculum is one approach to increase motivation within students. Hulleman and Harackiewicz (2009) found that making STEM more "relevant to students' life" can increase motivation and ability. This includes "providing out-of-school research experiences, creating learning modules for specific topics, developing an undergraduate course, and redesigning the academic structure of entire high schools. The hope is that "programs that emphasize personal relevance may be particularly empowering for students who are disengaged because of a lack of confidence" (Hulleman and Harackiewicz 2009). In their study, they found that "relevance-based" curricula increased both interest and grades among students with low-expectations while having little effect on high-expectations students.

Along with relevant courses, courses that had "socially interactive projects, collaborative-learning labs, field trips, and demonstrations" would improve science courses while "boring instruction, complicated content and tests, and too many facts discourage learning"

(Bryan, Glynn, and Kittleson 2011). The researchers found that the greatest motivating factors for students were "hands-on activities, good grades, and good teachers," with good teachers being defined as "knowledgeable, inspiring, enthusiastic, and caring" (Blynn, Glynn, and Kittleson 2011).

While the methods discussed above are successful in generating STEM interest among students, there are some "teacher approach" methods that have proven less successful. These methods focused on the teachers instead of the classroom. Some examples are the length of a teacher's career and their previous background. Teacher training programs appear to have little effect in improving academic performance – especially at the high school level – and are not cost-effective solutions (Foster, Toma, and Troske 2013). While teachers with certifications did better than teachers with no certification or probationary certifications, there was no statistical difference between teachers with "emergency certification", or teachers that require additional coursework before regular certification can be obtained, compared to teachers with regular certification (Goldhaber and Brewer 2000). However, teachers who teach math and are not certified in math do worse compared to their counterparts (Goldhaber and Brewer 2000). Additionally, teacher experience does have a positive impact on students' academic performances but it takes a relatively short amount of time – five years – for additional years to provide a negligible increase in performance (Henry, Fotner, and Bastion 2012). Therefore, the most important impacts on increasing student success are teaching methods and curricula, rather than teacher training and experience.

STEM Bridge Programs

Bridge programs are those that "provide comprehensive support to assist first-year college students in preparation for the rigors of university work" (Hall 2011). Many high school graduates failed to be adequately prepared for college-level math and science coursework, and that those who enrolled in STEM majors in colleges had low completion rates (Raines 2012). Participants of a summer intervention program will be more likely to achieve academic success and increase retention rates. This section of the literature review will focus on this kind of program and include some specific cases.

Characteristics of STEM Bridge Programs

Bridge programs, which can be government funded, or run by private/nonprofit organizations, school district partnerships and university partnerships, have wide range of services and populations served (Contreras 2011; Raines 2012). These programs can bring together high school teachers or college faculty to shape a supportive environment and expose the students to a problem-based lab work which can help to develop students' career awareness in a STEM area. Program sessions have various length, ranging from one week to eight weeks (Raines 2012). Some may include a residential component, requiring students to live on campus in order to "promote academic and social integration" among the participants and faculty (Hall 2011). No matter what the design of the bridge program is, the consistent goal is to "prepare incoming college freshmen to succeed and persist with their education" (Raines 2012). Some programs may also be designed to expose students to STEM activities in order to stimulate students' interest in these areas (Reisel et al. 2012).

Among these programs, many are designed specifically for first-generation college students. For those underrepresented students, only 59% had attended post-secondary education, fewer of them had enrolled in STEM related majors. The main goal of the bridge programs designed for underrepresented students "is to retain at risk student populations at the institution and provide them an equal footing with their peers" (Hall 2011).

Stolle-McAllister (2011) noted that this inequality had resulted in "academic and cultural isolation, low performance expectations on the part of students and faculty, unsupportive peer communities and both perceived and real discrimination". Bridge programs are believed to effectively support these underrepresented students to succeed in their STEM study. A study observed that a summer bridge program is vital for underrepresented minority students' success by improving their graduation rate from STEM majors (Murphy et al. 2010).

Factors Impacting Effectiveness of STEM Bridge Programs

Students' subjective initiative and self-directed learning can help to increase retention and develop greater interest in a subject (Hall 2011). Self-directed students are those who are intrinsically motivated, independent and can utilize divergent thinking while learning new things. STEM bridge programs can in turn help to strengthen students' self-efficacy, which is described as a reflection of students' capability to handle academic issues. Participation in STEM bridge programs can increase students' scientific self-efficacy, relative to their nonparticipating peers.

Another factor impacting success for STEM students is parental involvement. Although parents may not be able to help students in science or math problems through high school and college, home environment-including parent expectation, home communication, as well as the STEM climate of the home-could help to sustain student interest in STEM (Ebert 2011). Parent involvement is even more important for talented underrepresented STEM students (Grantham and Henfield 2011).

Other than self-efficacy and parental involvement, program format and an institution's engagement with students are also important for student success. A study recommended that good STEM bridge programs overall should provide opportunities for students to participate in ongoing lab research activities. STEM bridge programs should also develop a high quality mentoring relationship among students and school faculty and should involve current STEM graduate students (Zhe et al. 2010). These programs can expose students to professional settings and help them to build a powerful social network for their future competence in STEM organizations (Stolle-McAllister 2011). Access to school resources is also a major factor facilitating students' readiness to college. As for underrepresented minorities, institutions are supposed to make a specific commitment to overcome their barriers to succeeding in higher education. Universities can play a crucial role in ensuring minority student's success by providing programs in combination with academic support, minority engineering societies and bridge programs (Murphy et al. 2010). Successful STEM bridge programs are those which expose students to professional or academic settings, help build networks among peer students and supportive individuals, and have an effective data-driven evaluation system (Stolle-McAllister 2011; Reisel et al. 2012).

Some researchers had a concern that the enormous diversity of bridge programs may lead to insufficient research on this topic, for the fact that there is not enough technique to generalize appropriate and comprehensive success indicators to evaluate these programs. Based on limited empirical research, the literature on bridge programs corroborates that they are effective to support high school graduates to thrive in their college life. The common measures of effectiveness of STEM bridge programs are course scores, GPA and retention or graduation rates in STEM related majors, but different programs utilize different method to collect these data and may count in other supplemental information (Zhe et al. 2010; Raines 2012; Stolle-McAllister 2011). This section of the literature review describes three successful STEM bridge programs in the United States.

Examples of Bridge Programs

The following three programs are cases of bridge programs for which research provides information on the participants and indicators that may be used to judge the programs' success. The three presented here were chosen because they helped students to improve performance in STEM courses and stimulate students' interest to persist with their STEM majors.

Texas A & M University System LSAMP

The Texas A&M University System (TAMUS) Louis Stokes Alliance for Minority Participation (LSAMP) provide several enrollment outreach activities for incoming freshmen with a variety of strategies, such as mentoring, tutoring and curriculum-based interventions. For instance, Phase I is a program provided by TAMU offering pre-calculus and engineering courses with seminars and advisement support. Learning to Excel in Engineering through Preparation (LEEP) provides students with opportunities to experience life as a student at Texas A&M University through instruction in engineering, math, physics and study skills. TAMUS LSAMP is regarded to be successful as the number of underrepresented students that graduate from TAMUS STEM programs has increased from 303 in 1991 to 1165 in 2015, which is a 284% increase (TAMUS 2015). Graham et al. (2002) conducted a multi-dimensional longitudinal study regarding the impact of TAMUS LSAMP on underrepresented minority students.

- **Participants-** Participants for this study were 851 minority freshmen enrolled in College of Engineering from seven cohort years. Graham et al. (2002) analyzed the data from two groups of students based on their participation in AMP-related activities.
- **Success Indicators-** A former focused study arrived at the conclusion that LSAMP program contributed to the success of incoming college students by measuring participants' outcome variables such as GPA, retention, and course progression. Graham et al. (2002) collected information of student performance across period of freshman, progression, and upper-division. Students in the LSAMP group and the comparison group were matched in terms of financial need, scores on standardized tests, and high school math preparation. Graham et al. (2002) examined students' first year grade point average (GPA), their GPA in Core Body of Knowledge (CBK) courses, and their retention status during first year. The results indicated that

TAMUS LSAMP is effective as participants attained higher First year GPA, CBK GPA and retention rate; additionally, they also have higher academic completion rate compared to students who did not participate in this program.

University of Maryland LSAMP Bridge Program

The Summer Bridge Program for Scientists and Engineers provided by the University of Maryland admits about 20 incoming college freshmen to participate in a five-week residential program to help them smoothly transition from high school to college. It offers various bridge courses including calculus and chemistry workshop. Hicks (2005) assessed the effectiveness of LSAMP Summer Bridge Program along with the Preparation and Adjustment for College Entrance Program (PACE) provided by the University of Maryland – Eastern Shore, which is aimed to help incoming students to succeed in higher education.

- **Participants-** The participants of the study are 197 freshmen aged from 17 to 19. 31% are first-generation and 51% are female. To be eligible for LSAMP, students must show evidence of superior academic excellence with a cumulative GPA of 3.0 or higher. Students are required to commit to and conduct research with a STEM faculty member, provide regular reports and updates regarding research participation and attend monthly meetings.
- **Success Indicators-** Hicks (2005) analyzed data from Perceptions, Expectations, Emotions, and knowledge (PEEK) questionnaire. Data regarding students' expectation to experience 30 situations from three scales of academic, personal and social aspects were collected before and after participating the programs. The PEEK questionnaire were assigned to participants including well-rounded focus group participants. Students participating in summer intervention programs are more likely to "experience greater academic, personal and social success and have higher retention and graduation rates" compared to other students (Hicks 2005, 24)

The University of Maryland – Baltimore County Meyerhoff Scholarship Program (MSP)

The Meyerhoff Scholarship Program (MSP) at the University of Maryland Baltimore County (UMBC) targeting gifted African American students in STEM fields has found to be very successful (Contreras 2011; Stolle-McAllister 2011). "Students are provided financial assistance as well as access to ongoing mentorship while they are in college" (Contreras 2011, 514). Carter (2011, 18) found that participants in MSP were "twice as likely to earn a STEM bachelor's degree and more than five times more likely to enroll in graduate study, compared to students who were accepted but declined to participate in the Meyerhoff program". Contreras (2011) reaffirmed that students participated in MSP intended to obtain higher GPAs, more likely to graduate from STEM fields and continue to enter STEM graduate programs. UMBC also provides various resources for parents of Meyerhoff Scholars to support students' success, such as Meyerhoff Parents Association and Parent Orientations (UMBC 2016). Stolle-McAllister (2011) analyzed the impact of MSP on talented African American students.

- **Participants-** The study collected longitudinal data from 134 participants (65 were male and 69 were female) based on academic, social and professional expectation of bridge programs. Among these students, 85 were African American, 23 were Asian/Pacific Islanders, 22 were Caucasian and 4 were Hispanic.
- **Success Indicators-** Stolle-McAllister (2011) utilized focus groups to do data collection to make sure that the program works from students' perspective. She conducted group interviews to collect student descriptions of academic, social and professional effectiveness of MSP. Each group had between 3 and 9 participants and lasted approximately one and a half to two hours. Participants in every focus group considered MSP summer bridge program was an important component of overall MSP, and was helpful to meet the academic, social and professional expectations in STEM fields.

STEM College Retention and Completion

The third method of creating students that will be ready for the STEM-related careers is to create programs at the university-level to increase the retention of students in STEM programs so that they can graduate and enter the workforce. As of now, fewer than 40% of students that enter a STEM-related major actually remain within their major and graduate (Olson and Riordan 2012). "[T]he retention of STEM majors to just 50 percent would, alone, generate approximately three-quarters of the targeted 1 million additional STEM degrees over the next decade," which will then fulfill the projected needs of the STEM workforce (Olson and Riordan 2012). So while high school and bridge programs can improve both skills and motivation for future students, without substantial changes within STEM programs at the university level, these changes would produce only modest benefits due to the inefficiency within the system.

In this section, there will be a discussion on what available techniques colleges can use to increase the success of their STEM programs. This will reveal the various interventions that can be used to improve STEM retention. After the discussion of the interventions, we will examine several existing programs at the college/university levels. To increase STEM retention higher education institutions can incorporate many different strategies. These strategies can include improving counseling and engagement with students, providing resources outside of the classroom, and modifying curricula, all of which have been shown to increase retention rates.

Building Relationships

The first category that is used to improve STEM retention rates is creating and fostering strong advising and mentoring relationships between students and with faculty or older students. This can either be accomplished by students receiving social support or academic support.

The importance of having a mentor cannot be overstated. In a study featuring Chicano/a Ford Foundation Minority Fellowship recipients about their educational experience, it is found that "the single-most important factor identified in students' degree attainment was

a positive mentoring experience" (Tsui 2007). Another study found that "having a socially supportive network is central to academic persistence; particularly strong is the effect having faculty/staff mentors" (Tsui 2007). "Studies show that undergraduate students tend to have higher GPAs, higher retention rates, and more units completed per semester as compared to their un-mentored colleagues" (Wilson, Holmes, deGravelles, Sylvain, Batiste, Johnson, McGuire, Pang, and Warner 2012). While the best strategy for mentoring students includes both academic faculty and among peers, it is important for students to have faculty that are relatable (Tsui 2007). This means diversity within faculty is important especially for students who are minorities and/or women (Tsui 2007).

Along with mentoring, career counseling and academic advising are other strategies that can be used to increase STEM retention. "Quality academic advising has been described as the 'cornerstone' of student retention" with institutions proving that "strong orientation programs and advising services have higher graduation rates" (Tsui 2007). Additionally, students' chances of "persisting increased with the number of counseling sessions they received" (Tsui 2007). The impact of academic counseling and advising on underrepresented groups, minorities and women, in STEM is even greater. "The failure to elicit reassurance from faculty members that they are performing well, and have made a proper choice of science, has disproportionately negative effect on both females and minority students because their confidence tends to be neither strong, nor internalized,, and is often tied to particular high school teachers who encouraged them" while "students in the study who persisted in science, mathematics and engineering (SME) majors expressed a strong appreciation for faculty, professional advisors, departmental assistants, and teaching assistants who showed an active long-term interest in their learning, their problems and their progress" (Tsui 2007).

The reason why the interaction between academic faculty and students is important for underprivileged groups is that they tend to lack access to STEM experts outside of colleges. "Those majoring in a natural science tended to be from a higher SES than those pursuing a social science or non-science major" and "scientists come disproportionately from well-educated families, with fathers engaged in professional or managerial occupations" (Tsui 2007). Among valedictorians in underprivileged groups, it was found that they had a "critical lack of tacit knowledge about higher education and careers" (Tsui 2007). This means without proper advising, students without the access to a STEM expert were more likely to change to a non-STEM major (Tsui 2007).

A third method to increase STEM retention based on relationships is tutoring. The "length of exposure to tutoring had a consistent effect on course credits earned" (Tsui 2007). Even though in a study it was found that there were no differences between course grade and overall GPA between students who were tutored and students that did not have any tutoring, it was found that "course withdrawal was significantly lower for the tutored groups than the non-tutored group" due to the fact that "members of the tutored groups held more positive views about mathematics and other courses" (Tsui 2007). In another study, a "group of students who attended six or more tutoring sessions . . . performed better than the other two groups despite the superior initial mathematics ability of the non-tutored group" (Tsui 2007).

Additional Resources and Research Opportunities

Another strategy for increasing STEM retention is increasing the amount of resources given to students. This includes increasing the amount of research opportunities and increasing financial support.

Research experience among undergraduate students not only improves satisfaction but also improves future career options. "Alumni who participated [reported] significantly greater overall satisfaction with their undergraduate education were more likely to attend and complete graduate school than comparable alumni who had no research experience" (Tsui 2007). In another study, "many students, especially those in the sciences, reported that engaging in hands-on research experience with faculty was one of their most important academic experiences and was particularly influential to their finishing college" (Tsui 2007). Undergraduate research also "strongly influenced participating engineering students' skills, job values, and life objectives" and reported it "to be very influential to their career choice, far more so than their classroom experience" (Tsui 2007). Regarding research, a "high percentage of students would recommend the experience to others, and that students perceived the most valued skills derived from the experience to be technical skills, problem-solving skills, and the development of professional self-confidence" and that research creates "high level of satisfaction among participants and the most often cited gains to pertain to increased confidence to "work as a scientist" (Tsui 2007). In a study of various interventions, the most effective after a short period of time was "the performance accomplishment treatment [successful completion] of a number series task" which led to greater course self-efficacy, math and science related career interests, "STEM-relatedness" in courses the students planned to enroll in, and choice of STEM major (Tsui 2007). Due to these reasons, "reduced attrition rates and increased rates of graduate education for all students, especially underrepresented students" (Wilson et al. 2012).

Not only does undergraduate research improve academic experience for students, it improves social interactions for students. As discussed before, mentoring is an important strategy for increasing the STEM retention rate. "Engaging in hands-on research experience with faculty" was considered one of the most important academic experiences among students and improved retention rates (Tsui 2007). That this "informal mentorship" allows students "to develop a basis for a true mentor-protégé relationship" (Tsui 2007). Not only does the research increase mentorship, but increase future job opportunities. "Research with faculty may entail such professional development experiences as conference attendance, presentation of one's work, and publication submissions—all of which socializes one to a career in research while strengthening self-efficacy" (Tsui 2007).

Along with undergraduate research, paid research has even greater benefits for students, especially for students who are unable to meet the financial burden of studying at a university. This is especially true for minorities. "Working off-campus was found to have a significant negative effect on persistence for minorities (reducing the chance of persisting by 36%)" (Tsui 2007). However, the opportunity for a student to work a job "related to one's major initial career aspirations has a positive net impact on career choice, career attainment, and level of professional responsibility" (Tsui 2007). This combination of both research experience and financial support can be used to increase STEM retention. Along

with the benefits of research experience, reducing the student loan among the poorest families can increase graduation rates and STEM retention rates. “A shift of just $1,000 from scholarship aid to loan reduced the probability of graduation by 17%” (Tsui 2007).

Curriculum

Historically, STEM programs evaluated the success of curriculum-based interventions not on the rates at which students succeeded in learning the course material, but by the perceived difficulty of the course measured by the rate of student attrition, with more students withdrawing seen as a more successful class. “The infamous speech commonly delivered during the first lecture in calculus-based physics or organic chemistry courses, instructing students to look their left and look to their right to identify students who would drop the class” (Christe 2013). The culture of these programs were “to promote the survival of the fittest” which would leave only the “excellent scientists and engineers” (Christe 2013). The idea was “that hard work alone was the key to success” (Christe 2013). To achieve the results, “high standards and high stress” were needed to eliminate “incapable students unfit for the rigors of scientific inquiry” (Christe 2013). Obviously, this type of curriculum is counterproductive when there is a high demand for STEM students and this type of culture adversely impacts students based on their background.

Instead, of following the traditional method of teaching, there is new movement using “active” methods for new curricula. Instead of creating class curricula based on “long-winded lectures, intimidating tests and non-applicable lab experiments”, professors should “create courses where students acted rather than just listened. Where they worked together to solve real problems. Where they remembered what they learned. And where students ranging from philosophy to physical education worked together to share their expertise and learn directly from each other” (Baldwin 2009). Teaching should not be a one-sided conversation but instead foster collaboration among students and their instructor, increase participation within the lessons, and generate more engagement within the course.

The newer, “active” methods to teach STEM courses are leading to greater success compared to the traditional method. “Performance on common test[s] was higher among those who were taught with active methods” according to a meta-analysis that included among 6,000 students when comparing active methods and traditional methods (Olson and Riordan 2012). Another meta-analysis discussed “small-group learning and showed that it enhanced academic performance, attitudes toward learning, and persistence in STEM” (Olson and Riordan 2012). A third meta-analysis showed that the average effect of student learning from active method instead of a traditional method would “move a student from the 50th percentile to the 70th percentile” and about a quarter of the studies “showed an average 22 percent higher retention of students in STEM after an active learning chemistry course than a traditional one” (Olson and Riordan 2012). When a class uses techniques such as “introduction of clickers” or “personal response systems” (Smith, Wood, Adams, Wieman, Knight, Guild 2009), “having students solve a problem before attending a lecture, use of group discussion, problem-solving, individual writing or one minute papers, taking a test, conducting an inquiry-based lab, and combinations of these activities all have had significant impact in improving learning” (Olson and Riordan 2012).

Examples of College/University-Based Programs

Throughout the country, colleges and universities are experimenting with their STEM programs. Their goal is to increase the STEM retention rate through the various strategies listed above. What follows are descriptions of some programs that illustrate the challenges and facilitators identified above; the programs were selected because they were successful and emphasize different aspects of what can make a successful college-based program.

Louisiana State University - Howard Hughes Medical Institute (LSU-HHMI)

At LSU, this program's strategy focuses on mentoring, undergraduate research experience, and active learning curricula. "Mentoring forms the foundation of the program" (Wilson et al. 2012). This program "ensures that each undergraduate participant has mentoring relationships with faculty, staff, and their peers" (Wilson et al. 2012). To accomplish this goal, LSU created workshops for both faculty and graduate students who interact with the students (Wilson et al 2012). In the program, there is a requirement "that the mentee-scholars must mentor others, particularly their peers" which results in reinforcement of the the skills learned by the mentee-scholars (Wilson et al. 2012). The second aspect of the program is increasing the undergraduate research. The goal is to have "all participants are engaged in undergraduate research as early as possible"; to make this possible, LSU "developed and sponsored student-focused workshops on securing research experiences and have also developed partnerships with faculty interested in providing research opportunities" to the students (Wilson et al. 2012). The third and final component is to improve the education of LSU-HHMI scholars. This means additional workshops and tutoring if the student does not do well in their classes (Wilson et al. 2012).

- **Participants-** The program was aimed at students "based on two factors: (1) academic underperformance during their freshman year as STEM majors and (2) their potential in the STEM areas as suggested by their pre-college background" (Wilson et al. 2012). Students were selected "through a rigorous application process which included written essays, interviews with faculty and staff mentors, and letters of recommendations" and showed potential for success within STEM fields based upon "high school background and performance" (Wilson et al. 2012). The average student was a rising sophomore and had a GPA between 2.5-3.0 GPA; there were a small number of rising juniors and there were some students with a GPA over 3.0 (Wilson et al. 2012). Eventually, the students with a 3.0 GPA were moved over to a "sister program" (Wilson et al. 2012). A slight majority of students were Black, 35% were White, 9% were Asian/Pacific Islander, and 4% were Hispanic (Wilson et al. 2012).
- **Success Indicators-** In the years leading up to the program, the graduation rate for students within the STEM field were 32% to 35% but was only 19.2% to 23.5% for African-American students (Wilson et al. 2012). Comparing the six year graduation rate of the LSU-HHMI Scholars with students not within the program, it is clear the program was a success. 62% of all students within the LSU-HHMI program graduated within the STEM field and 55% of minority students graduated within the STEM field (Wilson et al. 2012). Students who did not enter the program had similar graduation rates compared to the previous years. Considering that LSU-HHMI

students were primarily accepted within the program due to academic underperformance and had much higher graduation rates, this would indicate the program was a success.

University of Texas - Austin

At the University of Texas at Austin, they developed their own STEM program based upon research and mentorship. While research is the base of this program, mentorship is a priority as well. While professors make the general plan for the class, postdoctoral fellows or "Research Educators" run the class and work with the students and shape their "experience and motivation" (Olson and Riordan 2012). The key of the mentorship is to help the students with "presentations, data collection, and analysis, and placement after the three-semester research stream" (Olson and Riordan 2012).

- **Participants-** A quarter of freshman students within the College of Natural Sciences enroll in a three-semester-long laboratory courses based upon faculty research (Olson and Riordan 2012).
- **Success Indicators-** This innovative approach has retention rates that are "30 to 35% higher" in STEM programs compared to the other students (Olson and Riordan 2012).

University of California – Davis, Biology Undergraduate Scholars Program (BUSP)

The major features of the BUSP are that students enroll into a "rigorous academic program", receive funding throughout their freshman and sophomore years, and "meet regularly with skilled advisers who offer academic guidance and personal support" (Olson and Riordan 2012 and Villarejo, Barlow, Kogan, Veazey, and Sweeney 2008). Along with the basic classes, there were "small cochemistry workshops" and students are "encouraged to work in groups" (Villarejo et al. 2008). When "BUSP was initiated in 1988, it was intended to address the disproportionate attrition of underrepresented minority students from the biological services at UCD" (Villarejo et al. 2008).

- **Participants-** Incoming freshmen who was interested within biology could enroll as long as they were ready "to embark on the core undergraduate gateway" (Villarejo et al. 2008). The students were encouraged to "engage in research early" in their career; while most students started research in their sophomore year, some students managed to start research within the freshman year (Villarejo et al. 2008). The purpose of the program was to retain students within biology and get them to consider future research careers (Villarejo et al. 2008).
- **Success Indicators-** At UC-Davis, underrepresented minorities had a calculus and chemistry persistence rate at 42% and 43% respectively (Olson and Riordan 2012). For white/Asian students, the calculus and chemistry persistence rate was 54% and 55% respectively (Olson and Riordan 2012). For students within BUSP, the calculus persistence rate was 75% and the chemistry persistence rate was 81% (Olson and Riordan 2012). Not only were students in BUSP had greater persistence but also had greater GPA in those respective classes (Olson and Riordan 2012).

University of Maryland, Baltimore County – The Meyeroff Program

The Meyeroff Program at the University of Maryland Baltimore County takes a different approach to increase STEM retention. It is designed to build "a strong family-like program community" (Tsui 2007). Students who receive the scholarship have regular group meetings with staff and students, and freshmen scholars live within a shared residence hall (Tsui 2007). Along with the social side of the program, students have access to a summer bridge program before school starts, scholarships (contingent on a 3.0 GPA), "academic advising and personal counseling, tutoring, study groups, summer research internships in science and engineering, mentoring by scientific professionals, and faculty and family involvement" (Tsui 2007).

- **Participants-** "Top mathematics and science African American students are selected for participation" within the program (Tsui 2007).
- **Success Indicators-** Like the other programs, this program increase STEM retention as well. Regarding short-term success, Meyerhoff students "had both a higher mean overall GPA (3.5 vs 2.8) and a higher mean science GPA (3.4 vs 2.4)" compared to "comparable talented African American science students at the university" (Tsui 2007). When Meyerhoff students were compared to multiple comparison groups that included "students who declined the Meyerhoff scholarship, a historical cohort of comparable students, and a contemporary comparison group", Meyerhoff students generally had higher grades, higher graduation rates with STEM degrees, and attended graduate schools in STEM fields at a higher rate compared to other groups (Tsui 2007).

All of the programs listed above are regarded as successful. The means the colleges used to increase retention rates were different, who they targeted was different, and how they used their strategies to accomplish their goals were different. Each program followed a unique strategy. But there are common factors that made each program successful. These programs created an atmosphere where students had easy access with professionals, created opportunities outside the classroom to stimulate academic growth, and created an easier path to a viable career within the STEM field. Due to the atmosphere within these programs, STEM retention rates went up, especially for underprivileged groups.

Section III: Methods

In our effort to learn more about New Jersey's STEM programs and to expand the current inventory, our team utilized multiple techniques and resources. First, we received the current listing we received from OSHE which were compiled by the Research and Development Council of New Jersey and the "Science Near You" map-integrated database at the Liberty Science Center. Originally, this document contained 252 STEM related programs. After filtering for programs focused on high school students, there were 95 programs. Unfortunately the current inventory did not list programs targeting students after high school or during college.

In order to identify additional STEM programs, the research team utilized a database of National Science Foundation (NSF) funded programs in the state. Keeping only the projects that were focused on high school or college students and were currently operating, we added 20 programs to the listing. The final inventory included 119 programs. After exhausting our search for current programs in the state, we began gathering basic information including current contact information for each. Simultaneously, our team began collecting information on each college/university in the state. Using the NJ College & University Directory from OSHE, we targeted 47 colleges. From this list, we identified contact information for each Dean of Science.

We designed a survey to gather information about more programs in the State. We created three similar surveys for: (i), program inventory; (ii), colleges; and (iii), high schools. Unfortunately, due to timing, we were unable to distribute surveys to high school staff members, which left us with the program inventory survey and the college survey. The goal of the program inventory survey was to expand our knowledge of their program including how it is administered, required prerequisites, and performance measures. Alternatively, our goal for the college survey was to identify their top STEM related programs (up to three) that may not have been included in the Network's program inventory. Each survey can be found in Appendix A.

Following an introductory email from OSHE to college presidents, we distributed the survey to the Deans of Science at each institution via email. At the same time, we sent the current program survey to our listing of 119 contacts.

After the initial distribution, two reminder emails were sent to those who had not yet completed the survey over the two weeks that followed. The next phase of follow up included phone calls, during which time our team contacted those who had not yet completed the survey to ensure we had accurate contact information and to inform them of our efforts. This occurred over a two week span, which completed our data collection phase.

Finally, after reviewing the results of the survey, with the help of OSHE, our team selected programs for follow up phone interviews. Attempting to gather a variety of programs, we spoke to two nonprofit organizations and two universities. Each phone call lasted roughly 30 minutes. The protocol for these interviews can be found in Appendix B.

Section IV: Results

The initial survey was sent to our current program inventory and listing of colleges/universities the week of February 29th. After over five weeks of being active, including four weeks of follow up through email and phone calls, we received 26 responses from the program inventory list and 30 responses from the college list. After cleaning the data, removing colleges that reported their academic programs rather than extracurricular programs, we received information on 76 programs operating in the State.

Type of Organization

Of the organizations that completed either the college survey or program inventory survey, nine reported that they were private organizations, 14 reported that they were public, and 12 reported that they were nonprofit organizations. For this question, "nonprofit" refers to 501(c)3 organizations separate from universities. The response breakdown is shown in Table 2 below.

Table 2 Survey Respondents by Type

Type	Number	Percentage
Public	14	40.0%
Nonprofit	12	34.3%
Private	9	25.7%
Total	35	100.0%

Program Administration

The next set of questions focused on organization structure and program administration, asking about sources of funding, how the program is administered, staff size, program budget, and partnerships.

The question of how a respondent's program was funded could be answered with multiple responses from those listed in Table 2. The most frequently reported funding source, foundations and grants, was reported by 44.7% of respondents. The next most frequently reported funding source was corporate grants, at 34%. Additional funding sources are listed in Table 3 below. 12 programs reported "other" as their funding source, which they most frequently listed as tuition or fee-for-service payments.

Table 3 Funding Sources

Source	Frequency*	Percentage*
Foundation/Nonprofit Grants	21	44.7%
Corporate Grants	16	34.0%
Federal Government	12	25.5%
Other	12	25.5%
State Government	11	23.4%
Local Government	4	8.5%
Total	47	

*Many programs indicated more than one funding source

The cross tabulation in Table 4 compares program funding sources by the organization type. Again, the organization type can be public, private, or nonprofit. As seen below, public organizations rely more heavily on funding from federal, state, and local grants. Alternatively, private and nonprofit organizations receive more funding from foundation and corporate grants.

Table 4 Funding Source by Program Type Crosstab

		Program Type			
		Public	Private	Nonprofit	**Total**
Funding Sources	Foundation/Nonprofit Grants	6	6	9	21
	Corporate Grants	8	2	6	16
	Federal Government	8	1	3	12
	Other	5	3	4	12
	State Government	10	0	1	11
	Local Government	4	0	0	4

Regarding organization structure, the majority of programs were administered in person, with 95.7%, and the remaining 4.3% reporting a combination of both online and in person methods. In addition, respondents from the programs inventory survey were asked about their staff size. Of the 18 organizations, most reported a staff size of under six people, with 35.3% reporting three or less and 35.3% reporting between four and six staff members. The next most frequent response was greater than ten employees, with 29.4% reporting this answer, and 0 organizations reporting between seven and nine employees. These data are presented in Table 5 below.

Table 5 Staff Size

Size	Frequency	Percentage
1-3	6	35.3%
4-6	6	35.3%
10+	5	29.4%
7-9	0	0.0%
Total	17	100.0%

Budget

With some respondents not reporting, and some reporting for multiple programs, a total of 41 program budgets are accounted for in Table 6 below. Programs reported a wide range of budgets, with 24.4% reporting less than $20,000, and 34% reporting budgets greater than $200,000. The remaining 41.6% of programs reported budgets between $20,001 and $200,000.

Table 6 Estimated Annual Budget

Amount	Frequency	Percentage
Greater than $200,000	14	34.0%
Less than $20,000	10	24.4%
$100,001-$200,000	9	22.0%
$20,001-$50,000	4	9.8%
$50,001-$100,000	4	9.8%
Total	41	100.0%

Admission Criteria

When admitting students to their program, organizations responded that they focused on a myriad of factors from GPA to gender – this question in the survey also allowed for multiple answers for each response. A plurality of programs took GPA into consideration, with 47.8% of programs reporting this factor; other frequently reported admission criteria included financial need, gender, and race. Additional factors are listed in Table 7.

Table 7 Admission Criteria

Criteria	Frequency*	Percentage*
GPA	22	47.8%
Financial Need	15	32.6%
Gender	15	32.6%
None or Other	13	28.3%
Race	12	26.1%
First Generation College Student	10	21.7%
Number of AP Courses Taken	3	6.5%
PSAT Scores	2	4.3%
Total	46	

*Often, more than one criterion was used for admitted individuals to the programs

Community Partnerships

The final question in this section asked respondents about the type of community partnerships their programs may hold. The most common partnerships are held with corporate or nonprofit organizations, with 19 reporting each. Additional partnerships are listed in Table 8 below.

Table 8 Organization Partnerships

Type	Frequency*	Percentage*
Corporate Organization	19	63.3%
Nonprofit Organization	19	63.3%
Local School	17	56.7%
College/University	12	40.0%
Other	1	3.3%
Total	30	

*Many programs had multiple partnerships

Purpose and Strategy

The next section of questions asked about program purpose and strategy. These questions sought to provide more information about how the programs were designed to operate, what perceived need the program was designed to meet, and what types of students the program targeted.

Program Purpose

Programs were asked to identify their program purpose as either Student Interest in STEM in High School, Bridge Programs from High School to College, or Retention of STEM Majors in College. High school interest programs were defined as "programs that encourage high school students to develop their interest STEM education;" bridge programs were defined as "programs providing support to assist rising freshman students in preparation for STEM related course work;" and college retention programs were defined as "programs addressing the needs of current college students pursuing STEM majors to ensure completion of STEM degrees." With some organizations skipping this question and others reporting for multiple programs, a total of 47 responses were collected, with some reporting multiple purposes for each program. Of the responses, 78.7% of programs reported high school interest as a program purpose, 36.2% reported bridge programs, and 48.9% reported college STEM retention. The breakdown of responses is shown below in Table 9.

Table 9 Program Purposes

Issue	Frequency*	Percentage*
Student interest in STEM in High School	37	78.7%
Retention of STEM Majors in College	23	48.9%
Bridge Programs from High School to College	17	36.2%
Total	47	

*Many programs had more than one purpose

Program Strategy

Another question asked respondents about their program strategy, or what type of intervention the program used to realize its goal. Examples include tutoring or counseling, job shadowing, and financial aid. Respondents could indicate multiple program strategies for each response. The top responses listed enhanced curriculum (59.6% of respondents), college visits (48.9% of respondents), workshops or competitions (44.7% of respondents), and faculty presentations (42.6% of respondents) as their program strategies. Further responses are listed below in Table 10.

Table 10 Program Strategy

Strategy	Frequency*	Percentage*
Enhanced Curriculum	28	59.6%
School/College Visits	23	48.9%
Math/Science Workshop or Competition	21	44.7%
Faculty/Teacher Presentations	20	42.6%
Tutoring/Counseling	19	40.4%
Financial Incentives/Aid	15	31.9%
Internships/Co-Op Education	13	27.7%
Job Shadowing	11	23.4%
Total	47	

*More than one strategy was utilized by many programs

Program Impact

The final section of the survey focused on program impact, asking about performance data collected and total number of students served. Table 11 displays responses for current program size, ranging from less than 20 to more than 100 participants. Most organizations, 83%, reported having programs that currently served over 100 students.

Table 11 Current Student Participation

Size	Frequency	Percentage
More than 100	25	54.3%
51-100	9	19.5%
Less than 20	6	13.0%
21-50	6	13.0%
Total	46	100.0%

Most organizations reported currently collecting some type of information on the success of their programs. Information collected typically included graduation rate, retention, and enrollment. Some programs also administered surveys to students to gauge satisfaction and assess knowledge gained.

Recommendations

We asked respondents to the survey and the personal interviews to provide recommendations for their own programs or those that may be tackling similar issues. The most frequent response to this was for a more stable funding source, or more funding in general. Respondents explained:

> *Additionally, there needs to be more federal funding to allow access to these programs. It costs A LOT of money to run these programs and with no financial support from the institution, we need to pay for those costs in high tuition prices.*

This cost shift for the programs from direct funding to tuition can also impact the mission of the program. New Jersey Medical School's targets underrepresented (African-American, Latino, and low-SES) youth for its SMART initiative, and when the program transitioned to a different funding source it could not maintain the level of direct student support that it had used to attract students who could not otherwise afford to attend. The program has grant funding currently, but is beginning to self-sustain from students' tuition payments.

> *[We need] allocated funding for smaller institutions, especially like ours that enroll a large number of first-generation, under-served, and minority populations we wish to direct towards success in STEM fields.*

> *[I suggest] more support from government funding agencies such as Department of Energy, NSF, etc. More state funding to grow existing federally funded programs.*

An alternative funding approach is illustrated by Project Lead the Way, a national nonprofit organization that provides evidence-based STEM curricula to public schools in New Jersey. The development of the curricula and training programs for teachers is funded by fees charged to the school districts that purchase the course materials (e.g., software, curriculum guides, and lab equipment).

Another identified challenge was that of evaluating the performance of the program. Grant funding is becoming increasingly tied to impact evaluation, and the respondent from the SMART program suggested that any guidance or advice with respect to evaluating the program, such as tools for student tracking, would be welcome; the program manager responded that she had encountered medical students at NJMS who had been part of the SMART program, but their success was not recorded because the program lacked the necessary evaluation infrastructure. A survey respondent indicated that assessment was the primary area of focus for improvement of its program, and noted that it worked with the National Student Clearinghouse to determine if involvement in the program helped the students' performance and enrollment in college.

A final concern encountered in our survey and interview responses was that the programs do not translate into course credit at either the high school or college level. Project Lead the Way has found it challenging to arrange it with districts so their curricula are counted as science or math requirements in the districts with which they contract. Likewise, NJMS's SMART program has not been able to reach an agreement with the City of Newark – a target for student recruitment in the program – whereby Newark schools would provide credit for the SMART summer programs. Survey responses similarly indicated that facilitating the transfer of credits from programs at the high school and community college level to the university level would help support their initiatives.

Phone Interviews

Based upon the literature review and our survey respondents, we conducted follow-up phone interviews with four programs in the state that either possessed some of the factors of success, or that we felt could provide important insights to future programs. The programs included (1) Project Lead the Way's STEM Curricula, (2) Wetlands Institute's Changing Tides with STEM program, (3) New Jersey Medical School's Science Medicine and Related Topics Program (SMART), and (4) Montclair State University's Garden State Louis Stokes Alliance for Minority Participation (LSAMP).

Each program utilized a different approach and possessed a different level of experience in promoting STEM education in the state. A brief description of each program is provided below:

- **Project Lead the Way:** Project Lead The Way offers transformative learning experiences for K-12 students and teachers by providing cutting edge curriculum in science. The Biomedical Science program includes four courses: Principles of Biomedical Services, Human Body Systems, Medical Interventions, and Biomedical Innovation, each lasting 10 hours and using cases to demonstrate theories. In

addition to the provided curriculum, the organization provides professional development for teachers and student-centered assessments.

- **Wetlands Institute's Changing Tides with STEM:** Just starting their pilot year, this program seeks to increase student interest in STEM, career awareness and skill development. Programs include teacher presentations, college visits, and hands on science lessons. As a very new program, we believe Changing Tides will be able to offer important insight on implementation challenges and provide helpful suggestions to others.

- **New Jersey Medical School's Science Medicine and Related Topics Program (SMART):** SMART is a pre-college enrichment program designed to cultivate student interest in health science and research, providing opportunities to underrepresented 7th-12th graders to gain knowledge and experiences necessary to maximize their potential for success. Activities include hands on applied STEM workshops, career exploration, and teamwork. In addition to the summer program, students take educational field trips, perform community service, and receive college and career counseling.

- **Montclair State University's Garden State Louis Stokes Alliance for Minority Participation (LSAMP):** LSAMP aims to foster success of historically underrepresented American Indian, African American, Hispanic, and Pacific Islander students earning a bachelor's degree in STEM. Students in the program take part in training sessions, carry out research with faculty, and meet leaders in STEM. Students also have access to the Bridge Program, which targets incoming freshman and features motivational elements and academic courses such as pre-calculus and physics. Additional activities include tutoring, social events and mentorship.

Section V: Findings

Overview

To increase the number of individuals that are prepared for STEM-related careers, we first analyzed existing literature. Based upon this analysis, the evidence shows that there are a number of strategies that can improve motivation and skills of high school students, improve the transition of students from high school to college, and to increase retention within college. At the high school level, the factors that increase success are class selection (AP classes), outside STEM programs, and teacher curricula and approaches. In fact, teacher curricula were shown to be important through all three stages. For bridge programs, student preparation and the availability of faculty to advise and support students led to greater success. To increase STEM retention within colleges, successful strategies include professional support for instructors, opportunities for students to conduct research inside and outside the classroom, and financial aid. The most successful programs often incorporated multiple strategies.

Throughout the State of New Jersey, there is a wide variety of STEM programs. This includes the type of organizations that offer STEM programs, the budget of the program, and their funding source. The majority of programs work with corporate organizations, nonprofit organizations, or local schools and over three-quarters of the programs included the purpose of increasing "student interest in STEM in high school." However, slightly less than half of the programs listed STEM retention within college as a priority and little more than a third prioritized bridge programs. The programs had a diversity of strategies, but the two most common types were "enhanced curriculum" and "school/college visits" with 59.6% and 48.9% of programs reporting those areas of focus, respectively.

There were a number of key issues identified by survey respondents and interviewees:

Engagement with Employers. Although the literature review highlighted the success of college STEM retention due to increased knowledge of professionals within the field and increased awareness of STEM career opportunities, the survey respondents did not focus their programs on "internships/co-op education" or "job shadowing". Several programs identified connections to STEM employers as an important potential improvement, but our survey suggests that for the most part STEM programs in New Jersey are either not taking advantage of opportunities such as internships and job shadowing of professionals, or they do not have access to these opportunities. One survey respondent suggested that "all programs in the state" ought to engage in "[p]ersistent engagement of local industry personnel," and NJMS's SMART program invites guest lecturers to its intensive summer courses to discuss STEM opportunities with its students.

Increased Collaboration. Another goal of the STEM Pathways Network is to increase collaboration between STEM programs, which will yield positive results. Due to the wide variety of programs, greater collaboration will give students extra tools to succeed while improving efficiency. Project Lead the Way reported that they worked with a number of other large, national organizations to develop their curricula, and one survey respondent indicated that "[c]ollaboration and exchange of ideas with similar programs" was a key recommendation for improving STEM education in the state.

The Wetlands Institute's Changing Tides program provides an interesting case. The organization has just launched a program that introduces the study of water quality to participating high school classes, and the respondents noted that since the formal incorporation of "STEM education" into their programs was new, any opportunity to tap into a network of successful STEM programs would be very helpful. The Wetlands Institute respondents indicated that learning about other organizations' approaches to supporting STEM education – "what works for them, what's been successful," as well as how other programs have dealt with the ramifications of the Next Gen science curriculum standards – would facilitate the development of their own program.

Funding to Address Disparities. Numerous programs included a focus on addressing disparities in STEM fields, with about a quarter of programs recruiting minority students to their program while nearly a third enrolled women in their programs. Addressing these disparities has been a focus of STEM education policy, and its importance is reflected in the New Jersey programs. Funding challenges are borne particularly hard by such programs,

since in the case of African-American and Latino students, the targeted demographics often have fewer resources to support the programs through tuition or fees.

Research Opportunities for Students. Engagement of students through research opportunities has been shown in the literature to help students' success in STEM fields, and a number of respondents to our surveys and interviews were employing these methods. NJMS's SMART program breaks students into groups to perform research experiments after the aforementioned guest lecturers, and the program manager reported that she offered 1:1 advising with each of the 11th and 12th grade students in the program, and keeps in touch with students after they "graduate" and go on to college. Additionally, both SMART and Project Lead the Way representatives stressed the importance of engaging students' families in the efforts to promote student success in STEM fields.

Advanced Placement Participation. Few of the respondents to our survey indicated that they were focused on increasing participation in Advanced Placement examinations, There are also opportunities for STEM programs to focus on AP courses. Students who take STEM-related AP classes are more likely to pursue a STEM-related career. Thus, increasing AP-prep and enrollment will lead to more students interested in STEM careers. This strategy can and should be used to help increase participation among underrepresented groups.

Sustainability. Lastly, sustainability is always a challenge for innovative initiatives, and the most frequent concern of STEM programs in New Jersey was a lack of reliable funding, with many stating it was their most critical issue. One program within the survey ended due to a lack of funds, and others voiced concern of a similar fate. To ensure the survival of these programs, we suggest increased funding, as well an increase in-kind support to develop methods of program evaluation, and for the donation of equipment.

Expanded Inventory

As a final product, we created an expanded database of programs with the new information on previous current programs, as well as all of the programs reported by colleges. This inventory includes program name, location, category, staff size, funding source, estimated budget, contact information, and a web link. As stated, these programs focus on generating interest in STEM for high school students, providing bridge programs from high school students to college STEM majors, and retaining college students enrolled in STEM majors. This inventory includes 76 programs currently operating in New Jersey and is included as Appendix C.

Section VI: Conclusion

Noticing a lack of coordination and support between STEM programs in the state, the New Jersey STEM Pathways Network was created to advance the missions of and provide coordination between these programs. Of the programs present in the state, our study received information from 76 programs that focus on attracting students to STEM fields during their high school years, ensuring success in STEM coursework at the college level, and retaining students through their post-secondary education. If successful, students will be better prepared for college, graduate within the STEM field, and will be able to enter the

21st century workforce in a STEM career. The benefit of the Network will not only be at the microeconomic level, but will also benefit the nation and create a more representative STEM field.

In both the literature review and the survey analysis, it was evident that there is not one single path to creating a successful STEM program. Since there is a multitude of effective strategies in theory and in practice, it allows each STEM program to create its own viable path for the students of New Jersey.

We identified two major areas where the Office of the Secretary could help STEM programs in New Jersey:

Developing Connections.

- OSHE or the Network could help establish communities of STEM education programs that could learn from each other and share information about their successes and challenges. New programs can learn from existing programs and practices could develop that better serve the state.
- OSHE or the Network could also help establish connections between existing programs and institutions of higher learning, and between programs and potential employers.

Targeted Assistance

- The Network could also aid the State in providing guidance for programs in areas that they lack expertise, such as managing data about their participants, and supporting programs' efforts to evaluate their impact. A data & evaluation toolkit, containing basic information for program evaluation would help organizations that lack the capacity for such activities.
- OSHE and the Network could also develop an employer engagement toolkit to help sites develop relationships that can supply the internship and job shadowing opportunities identified by the literature and already recognized by New Jersey stakeholders.

Due to the importance of STEM for the future of New Jersey and the future of its students, it is important to foster an environment that supports the varied programs in the state. OSHE and the Network have an opportunity to provide stability and help programs continue the successes that they have already realized. Given an increase of State and Federal Government to organizations with this mission, some targeted efforts can lead to a prosperous future for the New Jersey STEM workforce.

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Appendix A: Surveys

College Survey

Default Question Block

As a component of our graduate professional education at Rutgers University's Edward J. Bloustein School of Planning and Public Policy, we are conducting a survey for the New Jersey's Office of the Secretary of Higher Education (OSHE). Our principal goal is to develop a detailed inventory of programs designed to generate student interest in Science, Technology, Engineering, and Math (STEM)-related fields, help them succeed in college-level STEM courses, and enter STEM- related careers upon graduation.

For the purposes of this report, we will use a definition of "STEM" as close as possible to that used by the National Science Foundation. Accordingly, "STEM," here, means programs that target the substantive areas of knowledge that include biological sciences, chemistry, computer science, engineering, geological sciences, mathematics, physics, research and evaluation, and social sciences.

Our research will assist OSHE to better understand the wide array of STEM-related programs available and identify promising strategies that will be of interest to educators and policy makers.

We appreciate you taking the time to complete the following survey.

If you have any questions, please email Matthew Guglielmello at matthew.guglielmello@rutgers.edu or Stephanie Holcomb at stephanie.holcomb@rutgers.edu, or call (609) 444-9141.

Thank you for your time,

Matthew Guglielmello
Stephanie Holcomb
Jim Lloyd
Hao Wu
MPP Candidates 2016

Faculty Supervisor:
Carl Van Horn, Ph.D.
Distinguished Professor of Public Policy
Edward J. Bloustein School
Rutgers University
(vanhorn@rutgers.edu)

School Name

School Type

- Public
- Private

Does your school currently offer specialized programs aimed at the promotion of STEM education?

- Yes

- ○ No

How many STEM-related programs does your organization currently offer?

- ○ 1
- ○ 2
- ○ 3 or more

Please enter the name of your STEM program

Please enter the names of your STEM programs

Program 1	
Program 2	

Please enter the names of your top 3 STEM programs

Program 1	
Program 2	
Program 3	

How is your program administered?

- ☐ Online
- ☐ In Person

How are your programs administered?

	» Program 1	» Program 2
Online	☐	☐
In Person	☐	☐

How are your top 3 most significant programs administered?

	» Program 1	» Program 2	» Program 3
Online	☐	☐	☐
In Person	☐	☐	☐

What is the annual operating budget of your STEM program?

What is the annual operating budget of your STEM programs?

» Program 1

» Program 2

What is the annual operating budget of your top 3 STEM programs?

» Program 1

» Program 2

» Program 3

If you cannot provide an exact number, what is the estimated annual budget of your program?

- ○ Less than $20,000
- ○ $20,001-$50,000
- ○ $50,001-$100,000
- ○ $100,001-200,000
- ○ Greater than $200,000

If you cannot provide an exact number, what is the estimated annual budget of your programs?

	» Program 1	» Program 2
Less than $20,000	○	○
$20,001-$50,000	○	○
$50,001-$100,000	○	○

$100,001-$200,000	○	○
Greater than $200,000	○	○

If you cannot provide an exact number, what is the estimated annual budget of your programs?

	» Program 1	» Program 2	» Program 3
Less than $20,000	○	○	○
$20,001-$50,000	○	○	○
$50,001-$100,000	○	○	○
$100,001-$200,000	○	○	○
Greater than $200,000	○	○	○

How is your program funded? (Check all that apply)

- ☐ Foundation/Nonprofit Grants
- ☐ Corporate Grants
- ☐ Federal Government
- ☐ State Government
- ☐ Local Government
- ☐ Other

How are your programs funded? (Check all that apply)

	» Program 1	» Program 2
Foundation/Nonprofit Grants	☐	☐
Corporate Grants	☐	☐
Federal Government	☐	☐
State Government	☐	☐
Local Government	☐	☐
Other	☐	☐

How are your top 3 programs funded? (Check all that apply)

	» Program 1	» Program 2	» Program 3
Foundation/Nonprofit Grants	☐	☐	☐
Corporate Grants	☐	☐	☐

Federal Government	☐	☐	☐
State Government	☐	☐	☐
Local Government	☐	☐	☐
Other	☐	☐	☐

Do you currently have partnerships with the following organizations?

- ☐ Corporate Organization
- ☐ Local High School
- ☐ Other Colleges/Universities
- ☐ Nonprofit Organization
- ☐ Other

The following questions ask you to categorize your program based on target population, purpose, and intervention method. The three main target populations are defined as:
Student Interest in STEM in High School –Programs that encourage high school students to develop their interest STEM education
Bridge Programs from High School to College – Programs providing support to assist rising freshman students in preparation for STEM related course work
Retention of STEM Majors in College – Programs addressing the needs of current college students pursuing STEM majors to ensure completion of STEM degrees

Which of the following issues does your program address?

- ☐ Student Interest in STEM in High School
- ☐ Bridge Programs from High School to College
- ☐ Retention of STEM Majors in College

Which of the following issues do your programs address?

	» Program 1	» Program 2
Student Interest in STEM in High School	☐	☐
Bridge Programs from High School to College	☐	☐
Retention of STEM Majors in College	☐	☐

Which of the following issues do your top 3 programs address?

	» Program 1	» Program 2	» Program 3
Student Interest in STEM in High School	☐	☐	☐
Bridge Programs from High School to College	☐	☐	☐
Retention of STEM Majors in College	☐	☐	☐

Program Purposes for STEM interest in high school and bridge programs are defined as:

Career Awareness – programs that target student knowledge of STEM fields
SAT Preparation – programs that improve students' performance on the Scholastic Aptitude Test (SAT)
Skill Development - programs improving enrichment of skills necessary for success in STEM coursework
AP-Prep / Enrollment – programs that encourage students to enroll in Advanced Placement coursework, or to help them succeed in that coursework
Recruitment to a Program or School – programs that recruit students to a particular STEM program or institution of higher learning

What is the purpose of your program? (Check all that apply)

- ☐ Career Awareness
- ☐ SAT-Prep
- ☐ Skill Development
- ☐ AP-Prep/Enrollment
- ☐ Recruitment to a Program or School

What is the purpose of your program? (Check all that apply)

	» Program 1	» Program 2
Career Awareness	☐	☐
SAT-Prep	☐	☐
Skill Development	☐	☐
AP-Prep/Enrollment	☐	☐
Recruitment to a Program or School	☐	☐

What is the purpose of your program? (Check all that apply)

	» Program 1	» Program 2	» Program 3

Career Awareness	☐	☐	☐
SAT-Prep	☐	☐	☐
Skill Development	☐	☐	☐
AP-Prep/Enrollment	☐	☐	☐
Recruitment to a Program or School	☐	☐	☐

Program Purposes for retention in college STEM programs are defined as:

Increasing Diversity of Students Enrolled in STEM Fields – programs to increase the participation of particular groups of students in fields
Enrollment in STEM Majors – programs designed to increase the enrollment in STEM majors
Completion of Specific STEM-Related Courses –programs designed to help students succeed in specific STEM courses
Increasing Awareness of STEM Careers – programs to increase target student knowledge of STEM fields
Recruiting Graduates to Work in STEM Careers at Specific Companies or in Specific Sectors – programs designed to recruit students to particular STEM employer or employment sector

What is the purpose of your program? (Check all that apply)

- ☐ Increasing Diversity
- ☐ Enrollment in STEM Majors
- ☐ Completion of Specific STEM-Related Courses
- ☐ Increasing Awareness of STEM Careers
- ☐ Recruiting Graduates to Work in STEM Careers

What is the purpose of your program? (Check all that apply)

	» Program 1	» Program 2
Increasing Diversity	☐	☐
Enrollment in STEM Majors	☐	☐
Completion of Specific STEM-Related Courses	☐	☐
Increasing Awareness of STEM Careers	☐	☐
Recruiting Graduates to Work in STEM Careers	☐	☐

What is the purpose of your top 3 programs? (Check all that apply)

	» Program 1	» Program 2	» Program 3

Increasing Diversity	☐	☐	☐
Enrollment in STEM Majors	☐	☐	☐
Completion of Specific STEM-Related Courses	☐	☐	☐
Increasing Awareness of STEM Careers	☐	☐	☐
Recruiting Graduates to Work in STEM Careers	☐	☐	☐

Program Strategies are defined as:

Tutoring / Counseling – programs that provide target students with additional academic help
Internships or Co-Op Education – programs that provide target students with work experience
Job Shadowing – programs that allow target students to observe a workplace
Math/Science Competition – programs that consist of a STEM-focused competition between target students
Financial Incentives / Aid – programs that provide target students with monetary incentives to pursue STEM fields
Educator Professional Development – programs that provide STEM educators with resources or training to increase student success
School / College Visits – programs that bring target students to an institute of higher learning
Enhanced Curriculum – programs to improve STEM curricula to better serve target students

How would you describe your program strategy? (Check all the apply)

- ☐ Tutoring/Counseling
- ☐ Internships or Co-Op Education
- ☐ Job Shadowing
- ☐ Math/Science Competition
- ☐ Financial Incentives/Aid
- ☐ Educator Professional Development
- ☐ School/College Visits
- ☐ Enhanced Curriculum

How would you describe the strategies of your programs? (Check all the apply)

	» Program 1	» Program 2
Tutoring/Counseling	☐	☐
Internships or Co-Op Education	☐	☐
Job Shadowing	☐	☐
Math/Science Competition	☐	☐
Financial Incentives/Aid	☐	☐
Educator Professional Development	☐	☐
School/College Visits	☐	☐
Enhanced Curriculum	☐	☐

How would you describe the strategies of your top 3 programs? (Check all the apply)

	» Program 1	» Program 2	» Program 3
Tutoring/Counseling	☐	☐	☐
Internships or Co-Op Education	☐	☐	☐
Job Shadowing	☐	☐	☐
Math/Science Competition	☐	☐	☐
Financial Incentives/Aid	☐	☐	☐
Educator Professional Development	☐	☐	☐
School/College Visits	☐	☐	☐
Enhanced Curriculum	☐	☐	☐

Which of the following factors do you consider when admitting students to your program(s)? (Check all that apply)

- ☐ GPA
- ☐ First Generation College Student
- ☐ Financial Need
- ☐ Race
- ☐ Gender
- ☐ Number of AP Courses Taken
- ☐ PSAT Scores
- ☐ None
- ☐ Other

Which of the following factors do you consider when admitting students to your program(s)? (Check all that apply)

	» Program 1	» Program 2
GPA	☐	☐
First Generation College Student	☐	☐
Financial Need	☐	☐
Race	☐	☐
Gender	☐	☐
Number of AP Courses Taken	☐	☐

PSAT Scores	☐	☐
None	☐	☐
Other	☐	☐

Which of the following factors do you consider when admitting students to your program(s)? (Check all that apply)

	» Program 1	» Program 2	» Program 3
GPA	☐	☐	☐
First Generation College Student	☐	☐	☐
Financial Need	☐	☐	☐
Race	☐	☐	☐
Gender	☐	☐	☐
Number of AP Courses Taken	☐	☐	☐
PSAT Scores	☐	☐	☐
None	☐	☐	☐
Other	☐	☐	☐

Do you currently collect any information on the success of the program(s)?

- ○ Yes
- ○ No

Are there any required prerequisite courses for your program(s)?

- ○ Yes
- ○ No

Please describe the information you currently collect on program success

Please list the required prerequisite courses for your program(s)

In what year did your program begin?

In what years did your programs begin?

- » Program 1
- » Program 2

In what years did your top 3 programs begin?

- » Program 1
- » Program 2
- » Program 3

How many students are currently participating in your program?

- Less than 20
- 21-50
- 51-100
- More than 100

How many students are currently participating in your programs?

	» Program 1	» Program 2
Less than 20		
21-50		
51-100		

More than 100		

How many students are currently participating in your top 3 programs?

	» Program 1	» Program 2	» Program 3
Less than 20			
21-50			
51-100			
More than 100			

What is the cumulative number of students served since your program began?

What is the cumulative number of students served since your programs began?

» Program 1

» Program 2

What is the cumulative number of students served by your top 3 programs since they began?

» Program 1

» Program 2

» Program 3

Do you have any recommendations for improving your program or similar programs in the state?

Program Inventory Survey

Default Question Block

As a component of our graduate professional education at Rutgers University's Edward J. Bloustein School of Planning and Public Policy, we are we are conducting a survey for the New Jersey's Office of the Secretary of Higher Education (OSHE). Our principal goal is to develop a detailed inventory of programs designed to generate student interest in Science, Technology, Engineering, and Math (STEM)-related fields, help them succeed in college-level STEM courses, and enter STEM- related careers upon graduation.

For the purposes of this report, we will use a definition of "STEM" as close as possible to that used by the National Science Foundation. Accordingly, "STEM," here, means programs that target the substantive areas of knowledge that include biological sciences, chemistry, computer science, engineering, geological sciences, mathematics, physics, research and evaluation, and social sciences.

Our research will assist OSHE to better understand the wide array of STEM-related programs available and identify promising strategies that will be of interest to educators and policy makers.

We appreciate you taking the time to complete the following survey.

If you have any questions, please email Matthew Guglielmello at matthew.guglielmello@rutgers.edu or Stephanie Holcomb at stephanie.holcomb@rutgers.edu, or call (609) 444-9141.

Thank you for your time,

Matthew Guglielmello
Stephanie Holcomb
Jim Lloyd
Hao Wu
MPP Candidates 2016

Faculty Supervisor:
Carl Van Horn, Ph.D.
Distinguished Professor of Public Policy
Edward J. Bloustein School
Rutgers University
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Organization Name

Organization Type

- Private
- Government

- ○ Nonprofit

STEM Program Name

Is your STEM program still operating?

- ○ Yes
- ○ No

If your program is no longer operating, what year did it end?

How is your program administered?

- ☐ Online
- ☐ In Person

How many staff members work with this program?

- ○ 1-3
- ○ 4-6
- ○ 7-9
- ○ 10+

What is the annual operating budget of your program?

If you cannot provide an exact number, what is the estimated annual budget of your program?

- ○ Less than $20,000
- ○ $20,001-$50,000
- ○ $50,001-$100,000
- ○ $100,001-200,000
- ○ Greater than $200,000

How is your program funded? (Check all that apply)

- ☐ Foundation/Nonprofit Grants
- ☐ Corporate Grants
- ☐ Federal Government
- ☐ State Government
- ☐ Local Government
- ☐ Not Listed

Do you currently have partnerships with the following?

- ☐ Corporate Organization
- ☐ Local School
- ☐ College/University
- ☐ Nonprofit Organization
- ☐ Other

The following questions ask you to categorize your program based on target population, purpose, and intervention method. The three main target populations are defined as:

Student Interest in STEM in High School: Programs that encourage high school students to develop their interest STEM education
Bridge Programs from High School to College: Programs providing support to assist rising freshman students in preparation for STEM related course work
Retention of STEM Majors in College: Programs addressing the needs of current college students pursuing STEM majors to ensure completion of STEM degrees

Which of the following issues does your program address?

- [ ] Student Interest in STEM in High School
- [ ] Bridge Programs from High School to College
- [ ] Retention of STEM Majors in College

Program Purposes for STEM interest in high school and bridge programs are defined as:

Career Awareness – programs that target student knowledge of STEM fields
SAT Preparation – programs that improve students' performance on the Scholastic Aptitude Test (SAT)
Skill Development – programs enhancing student skills required for STEM coursework
AP-Prep / Enrollment – programs that encourage students to enroll in Advanced Placement coursework, or to help them succeed in that coursework
Recruitment to a Program or School – programs that recruit students to a particular STEM program or institution of higher learning

What is the purpose of your program? (Check all that apply)

- [ ] Career Awareness
- [ ] SAT-Prep
- [ ] Skill Development
- [ ] AP-Prep/Enrollment
- [ ] Recruitment to a Program or School

Program Purposes for college retention programs are defined as:

Increasing Diversity of Students Enrolled in STEM Fields – programs to increase the participation of particular groups of students in fields
Enrollment in STEM Majors – programs designed to increase the enrollment in STEM majors
Completion of Specific STEM-Related Courses –programs designed to help students succeed in specific STEM courses
Increasing Awareness of STEM Careers – programs to increase target student knowledge of STEM fields
Recruiting Graduates to Work in STEM Careers at Specific Companies or in Specific Sectors – programs designed to recruit students to particular STEM employer or employment sector

What is the purpose of your program? (Check all that apply)

- [ ] Increasing Diversity of Students Enrolled in STEM Fields
- [ ] Enrollment in STEM Majors
- [ ] Completion of Specific STEM-Related Courses
- [ ] Increasing Awareness of STEM Careers
- [ ] Recruiting Graduates to Work in STEM Careers at Specific Companies or in Specific Sectors

Program Strategies are defined as:

Tutoring/Counseling – programs that provide target students with additional academic help
Internships or Co-Op Education – programs that provide target students with work experience
Job Shadowing – programs that allow target students to observe a workplace
Math/Science Workshop or Competition – programs that consist of a STEM-focused competition between target students
Financial Aid/Incentives – programs that provide target students with monetary incentives to pursue STEM fields
Faculty/Teacher Presentations – programs that provide STEM educators with resources or training to increase student success
School/College Visits – programs that bring target students to an institute of higher learning
Enhanced Curriculum – programs to improve STEM curricula to better serve target students

How would you describe your program strategy? (Check all the apply)

- [ ] Tutoring/Counseling
- [ ] Internships/Co-Op Education
- [ ] Job Shadowing
- [ ] Math/Science Workshop or Competition
- [ ] Financial Incentives/Aid
- [ ] Faculty/Teacher Presentations
- [ ] School/College Visits
- [ ] Enhanced Curriculum

Which of the following factors do you consider when admitting students to your program? (Check all that apply)

- [ ] GPA
- [ ] First Generation College Student
- [ ] Financial Need
- [ ] Race
- [ ] Gender
- [ ] Number of AP Courses Taken
- [ ] PSAT Scores
- [ ] Other

Do you currently collect any information on the success of the program?

- [ ] Yes
- [ ] No

Are there any prerequisite courses required for your program(s)?

- [ ] Yes
- [ ] No

Please describe the information you currently collect on program success

Please list any prerequisite courses required for your program(s)

In what year did your program begin?

How many students are currently participating in your program?

- ( ) Less than 20
- ( ) 21-50
- ( ) 51-100
- ( ) More than 100

What is the cumulative number of students served since your program began?

Do you have any recommendations for improving your program or similar programs in the state?

Appendix B: Phone Interview Protocol

My name is _____, and we would just like to get some additional information about your experiences running a STEM program in New Jersey. We're not recording this call, and if we would like to use anything in this call, we will give you a chance to review the text and we will remove it from the report if you request it.

1. What is your role at the organization?

2. Can you briefly describe your program?

3. What would you consider the biggest challenge that you have faced in implementing your program?

4. What were the most important lessons learned from which you think other organizations could benefit?

5. Can you describe how you have evaluated the impact of your program? What has that evaluation revealed?

6. Do you work with or communicate with other programs?

7. How do you plan to sustain your program going forward?

8. What kind of additional support would you like for your program?

Appendix C: Program Inventory

Organization Name	Organization Type	Program Title	Category	Target Population	Offering/Description	Website	Location	Contact Name	Phone Number	Contact Email
Alcatel-Lucent	Corporation	Education Frontiers for Young Women and Youth in Under-Served Communities Program	Research	High School (Underrepresented, Women)	The goal of "The Education Frontiers for Young Women and Youth in Under-Served Communities Program" is to increase the number of participants from underrepresented groups in the fields of science, technology, engineering and math. Applicants for this program are females of any ethnicity, or males of African American, Hispanic or Native American descent.	http://janj.org/get_involved/faq		Jane London	609-419-0404	jane.london@alcatel-lucent.com
Bio NJ Talent Network	Nonprofit Organization	Dorothy Dillahunt Memorial Scholarship	Summer Academy / Research	High School	The program helps scientifically talented and economically disadvantaged high school students pursue their interest in biomedical research. The program supports three or more high school students, for the summer between their junior and senior years, to come to the Newark campus of the Graduate School of Biomedical Sciences to work in a research laboratory for an 8-10 week period. These students will partner with college, graduate, or post-doctoral students working in faculty research labs.	http://www.bionjtalentnetwork.org/jobs/node/2192		Dr. Nick Ingoglia	(973)972-4776	ingoglia@umdnj.edu
Buehler Challenger & Science Center	Private-Educational	Product Engineering Summer Camp	Summer Academy	High School	Summer Product Engineering camp exposes high school students to engineering challenges to encourage careers in math and science.	http://www.bcsc.org/summer-camps/	Buehler Challenger & Science Center PO Box 647 Paramus, NJ 07653 (201)251-8589	Peggy	201-251-8589	missionservices@bcsc.org
Burlington County College (Rowan College at Burlington County)	Community College	College Bound	College Coursework	High School	The College Bound program (funded by the Commission on Higher Education) targets 60 high school students from the districts of Burlington City and Pemberton Township. The grant supports pre- college educational and enrichment activities to ensure that students complete high school and successfully pursue post-secondary careers in math, science, or technology.	http://casp.nacacnet.org/organizations/college-bound-burlington-county-college	601 Pemberton Browns Mills Rd, Pemberton, NJ 08068	James Kerfoot	609-894-9311	jkerfoot@bcc.edu
Computer Science Collaboration Project	Nonprofit Organization	CSCP Programs	Various	High School	A variety of STEM programs aimed at various populations in the state, from high school through employment.	http://www.cscproject.org/cscprograms?title=&city=&province=New+Jersey&postal_code=&field_org_name_value=	50 Station Road, Sparta, NJ 07871	Bill Tucker		billt@c-techtraining.com

Organization Name	Organization Type	Program Title	Category	Target Population	Offering/Description	Website	Location	Contact Name	Phone Number	Contact Email
County College of Morris	Community College	Pathways of Applied Career Experiences (PACE) Science Program in Biotechnology and Chemical Technology	Internships	College	The Pathways of Applied Career Experience (PACE) Science Program provides opportunities for students enrolled in the Biotechnology and Chemical Technology programs to complete internships and other applied industry experiences to supplement student learning. The PACE program addresses students in need of remediation and improves the retention of all students by using Process Oriented Guided Inquiry Learning (POGIL) activities in selected courses. The PACE Science Program allows CCM to meet the needs of the STEM economy and the alliance with local industries demonstrates the success of the project by the number of prepared technicians produced and successfully employed.	http://www.nsf.gov/awardsearch/showAward?AWD_ID=1400494	214 Center Grove, Randolph, NJ 07869	Keri Flanagan	9733285000	kflanagan@ccm.edu
County College of Morris	Community College	College for Kids	Summer Academy	High School	This course reviews the verbal and math skills for high school students planning to take the SAT,SAT Math–Logical reasoning, efficient and effective use of time, comprehensive math skills.	http://www.ccm.edu/cfk/	214 Center Grove Road Randolph, NJ 07869 (973) 328-5000		973-328-5072	cfk@ccm.edu
Destination ImagiNation	Nonprofit Organization	Destination Imagination	Competition	High School	Students work in teams to research, design and build a solution to their preferred Challenge. Students who participate in the Challenge Program have the opportunity to present their solutions at a local tournament and if they qualify at the state level, they're invited to participate in Global Finals, our culminating international tournament that celebrates student creativity.	https://www.destinationimagination.org/	Destination Imagination, Inc., 1111 South Union Avenue, Cherry Hill, NJ 08002		(888)321-1503	AskDI@dihq.org
Drew University	Private University	New Jersey Governor's School in the Sciences	Summer Academy	High School	Selective summer residential program	http://www.drew.edu/govschool/	All	Adam Cassano	(973) 408-3341	acassano@drew.edu
Drew University	Private University	Governor's School in the Sciences	College Coursework	High School	The Governor's School in the Sciences is a summer residential program hosted by Drew University. The program introduces scholars to a hands-on research experience in a student's area of interest through a series of courses, laboratories, projects, lectures, and other activities centered on math and science. Students learn about possible career paths from Drew's faculty and from some of New Jersey's leading industrial, governmental, and academic representatives.	http://www.drew.edu/govschool/	36 Madison Avenue, Madison, NJ 07940	Adam Cassano	tel:(973) 408-3605	acasano@drew.edu

Organization Name	Organization Type	Program Title	Category	Target Population	Offering/Description	Website	Location	Contact Name	Phone Number	Contact Email
Fairleigh Dickinson University	Private University	Middle College Program	College Coursework	High School	The Middle College Program now services more than 2,600 honors-level, college-bound juniors and seniors annually, affording them the opportunity to experience university-style learning before they even graduate high school and giving them a head start on their college education. Participating students may attain advanced standing and college credit through the Program.	http://view2.fdu.edu/academics/petrocelli-college/academic-units/middle-college-program/	FDU - Middle College Program, 1000 River Road, H-DH1-02, Teaneck, NJ 07666		201-692-6504	mcp@fdu.edu
FIRST	Nonprofit Organization	For Inspiration and Recognition of Science and Technology (FIRST)	Competition	High School	For Inspiration and Recognition of Science and Technology (FIRST) is a high school robotics team competition. Teams plan, design, prototype and build a robot and then compete in an engineering challenge that looks like a high-tech sporting event.	http://www.firstinspires.org/robotics/frc	200 Bedford Street, Manchester, NH 03101		603-666-3906	
Hudson County Community College	Community College	Project L.E.A.P.	College Coursework	High School	Project L.E.A.P. enables high school seniors to enroll in up to three college-level courses per semester and earn credits towards a degree. The courses may be offered during or after the school day at a high school campus or the college campus.	http://www.hccc.edu/leap/	70 Sip Avenue, Jersey City, NJ 07306		(201) 360-5330	LEAP@hccc.edu
iD Tech	Corporation	Summer Technology and Computer Camps	Summer Academy	High School	Experience North America's most reputable and distinguished summer technology program. Over 100,000 kids and teens worldwide have learned to create 2D and 3D video games, websites with Flash®, digital movies, C++ and Java programs, iPhone® and Facebook® apps, robots, 3D models and animations with products experts use in their professions. These weeklong, day and residential summer camps are located at 60 prestigious universities in the U.S. and Canada. Additional multi-week summer camp teen programs for ages 13-18 at select universities include: iD Gaming Academy, iD Visual Arts Academy and iD Programming Academy.	http://www.internaldrive.com/locations/nj-summer-camps-new-jersey-computer-camps/	Princeton University		1-888-709-TECH (8324)	info@InternalDrive.com
Kean University	Public University	Project Adalante	Competition		The mission of Project Adelante is to encourage at- risk Latino youngsters in grades 6-12 to graduate from high school and go on to Post-Secondary education. These enrichment activities include parental involvement, assistance with career selection, college admissions and financial aid, field trips, college tours, individual and group counseling, exposure to positive role models among others.	http://www.kean.edu/project-adelante	Kean University	Jose Caceres	908-737-3870	

Organization Name	Organization Type	Program Title	Category	Target Population	Offering/Description	Website	Location	Contact Name	Phone Number	Contact Email
Kean University	Public University	Project ASK: Applying Student Knowledge for Success in CS and IT	Financial Support	College	The Department of Computer Science at Kean University is implementing "Project ASK: Applying Student Knowledge (ASK) for Success in Computer Science (CS) and Information Technology (IT)," which is aimed at increasing the number of academically talented, financially needy students graduating with undergraduate degrees in CS and IT. ASK Scholars participate in weekly workshops, cohort experiences, and interact closely with faculty members who provide academic and professional support through advising and mentoring. The individual and cohort experiences offered to ASK Scholars provide a basis for intellectual growth and promote increased student confidence, retention, and timely degree completion. Upon graduation, ASK Scholars are prepared to enter the scientific workforce or graduate school as competent, highly trained individuals who are skilled in teamwork and research, serve as role models to members of their communities and contribute to increased diversity in the fields of CS and IT.		Union	Patricia Morreale	9087373349	pmorreal@kean.edu
Kean University	Public University	Group Summer Scholars Research Program of the New Jersey Center for Science, Technology & Mathematics	Summer Academy	High School	The NJCSTM offers a Group Summer Scholars Research Program (GSSRP), a 6-week, hands-on research experience aimed at attracting and developing talented students who are interested in pursuing an education in a STEM field. Upon entering the program students are divided into small research teams that are paired with a faculty mentor conducting actual scientific research. Students learn how to conduct basic and applied research during this program.	http://www.kean.edu/academics/new-jersey-center-science-technology-and-mathematics/group-summer-scholars-research	Kean University STEM Building, 1000 Morris Avenue, Union, NJ 07081		(908)737-7200	njcste@kean.edu
Kean University	Public University	Upward Bound	College Preparation	High School	The academic year and Saturday classes will include courses in math, science,science labs, foreign language, literature, corporate mentoring, and STEM research with university faculty, tutoring, SAT, NJ HSPA preparation and financial literacy. Participants are provided college/university tours, parent/student financial aid workshops, career workshops and cultural enrichment activities, along with group, individual and career counseling.	http://www.kean.edu/academics/college-natural-applied-health-sciences/upward-bound-project	1000 Morris Avenue, Union, NJ 07083	Dean Gworge Chang	908-737-3600	gchang@kean.edu
Kumon	Private Tutoring Company	Various	Tutoring	High School	Whatever your children's current level, we design individualized math programs (counting up through calculus) that allow them to advance at their own pace	http://www.kumon.com/berkeley-heights	multiple locations (about 100)		908-725-2857 ; 201-928-0444	wenchen@ikumon.com

Organization Name	Organization Type	Program Title	Category	Target Population	Offering/Description	Website	Location	Contact Name	Phone Number	Contact Email
Liberty Science Center Partners in Science	Public Museum	Partners in Science	Summer Internship	High School	LSC's Partners in Science program provides an intensive, eight-week summer experience for high school juniors and seniors. The program pairs students with mentors in science, health and technical fields and challenges them to participate in ongoing research and independent projects.	http://lsc.org/for-educators/programs-at-the-center/partners-in-science/	North & Central	Ruben Rosario	201.253.1533	rrosario@lsc.org
Lockheed Martin	Corporation	Engineers in the Classroom	Classroom Presentation	High School	This kindergarten through grade 12 education initiative is designed to identify, develop, inspire and channel students into careers that draw their foundation from science, technology, engineering, and math courses. The touchstone of this school-based initiative is a one-on-one connection between Lockheed Martin engineers and students, teachers and guidance counselors.	http://www.lockheedmartin.com/us/aeronautics/community-relations/engineers-in-the-classroom.html	Lockheed Martin, 6560 Rock Spring Drive, Bethesda, MD 20817			community.relations@lmco.com
Marine Advance Technology Organization	Nonprofit Organization	Underwater Robotics Competitions	Competition	High School / College	The MATE competition challenges K-12, community college, and university students from all over the world to design and build ROVs to tackle missions modeled after scenarios from the ocean workplace. The competition's class structure of beginner, intermediate, and advanced complements the education pipeline by providing students with the opportunity to build upon their skills – and the application of those skills – as they engineer increasingly more complex ROVs for increasingly more complex mission tasks.	http://www.marinetech.org/rov-competition/	Monterey Peninsula College, 980 Fremont Street, Monterey, CA 93940		831-645-1393	vmvrobot@gmail.com
Mercer County Community College	Community College	Scholarships Advancing Mercer STEM Students (SAMS)	Scholarships / Learning Community	College (Low SES)	Scholarships for Advancing Mercer STEM Students (SAMS) will provide 120 scholarships for full-time STEM students who have demonstrated financial need at Mercer County Community College (MCCC). The specific goal of this program will be to provide scholarships for academically talented students who have demonstrated financial need so that they can successfully graduate and/or transfer to a 4-year institution in a STEM field. Highlights of additional recruitment and retention activities are: a high school summer bridge program, weekly cohort meetings focusing on college success and transfer strategies, one-on-one mentoring, weekly review sessions in STEM gateway courses, STEM seminars with focused discussion afterwards, undergraduate research with a presentation and peer-tutoring with certification.	http://www.mccc.edu/stem/	1200 Old Trenton Rd, West Windsor Township, NJ 08550	James Maccariella	6095703330	maccarij@mccc.edu

Organization Name	Organization Type	Program Title	Category	Target Population	Offering/Description	Website	Location	Contact Name	Phone Number	Contact Email
Middlesex County 4-H Clubs	Public Organization	Youth Development		High School	The name 4-H conjures up different pictures for different people.Your vision of 4-H may be county fairs, horse shows, a model rocket launch, or 4-H camping programs.Your vision depends on your experiences with 4-H Youth Development. Please note that these are clubs that meet once a month.	http://www.co.middlesex.nj.us/extensionservices/4hclubListing.asp	42 Riva Ave, Davidson's Mill Pond Park North Brunswick, NJ 08902 (732) 398-5261		848-932-3700	dave.donegan@co.middlesex.nj.us
Middlesex County College	Community College	High School Scholars	College Coursework	High School	The Office of School Relations builds partnerships with the K-12 sector to provide professional development for teachers and counselors, academic and career development programs for students, and responds to students' needs by offering programs and support for the seamless transition from high school to college.		Middlesex County College, Edison, NJ	Karen Gormish	(732)548-6000	Kgormish@mcc.edu
Monmouth University	Public University	Junior Science and Humanities Symposium	Competition	High School	Junior Science and Humanities Symposium (JSHS) is an annual high school science competition designed to encourage and develop oral presentation skills and the ethical conduct of original research. JSHS awards scholarships to highly talented students from across the nation. ARL scientists and engineers serve as judges in the Maryland regional competition, provide students with mission related research topics, and provide national winners with summer internships.	www.monmouth.edu/mjss	Monmouth University	Dr. Richard Veit	732-571-7520	rveit@monmouth.edu
Montclair State University	Public University	Gifted and Talented Summer Academy	Summer Academy	High School / Bridge	Montclair State University's Academically Gifted and Talented Youth Program provides accelerated, inquiry based courses designed to meet the unique intellectual and social needs of high ability students. Gifted students in grades K-11 have an opportunity to enroll in fall and spring weekend courses, as well as six-week summer camp.		Montclair State University, 1 Normal Avenue, Montclair, New Jersey 07043	Paulette Blowe	(973) 655-4104	blowep@mail.montclair.edu

Organization Name	Organization Type	Program Title	Category	Target Population	Offering/Description	Website	Location	Contact Name	Phone Number	Contact Email
Montclair State University	Public University	Networking and Engaging in Computer Science and Technology in Northern New Jersey	Scholarships	College	This project is designed to bring together Montclair State University (MSU), Saint Peter's University (SPU), and Seton Hall University (SHU) to collaborate and enable students who have demonstrated academic ability to pursue a Master's Degree in Computer Science. Computer science students as well as those students who have majored in other science, technology, engineering, and mathematics (STEM) and non-STEM fields are eligible for the scholarships. The program is mentoring and supporting students through their graduate studies in computer science, many of whom are women and under-represented minorities. It is also offering opportunities to students from non-STEM backgrounds, since the program is considering strong candidates from non-CS backgrounds for the program.	http://nsf.gov/awardsearch/showAward?AWD_ID=1259758&HistoricalAwards=false	Montclair State University, 1 Normal Avenue, Montclair, New Jersey 07043	Katherine Herbert	9736556923	herbertk@mail.montclair.edu
Montclair State University	Public University	Opening Pathways, Engaging, and Networking in Chemistry in Northern New Jersey (OPEN-NJ)	Scholarships / Mentoring / Support	College	This National Science Foundation (NSF) Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM) project at Montclair State University in New Jersey will provide scholarships for talented students with demonstrated financial need pursuing Master of Science degrees in Chemistry, and Biochemistry. The program will provide pathways for supporting Biology B.S. graduates to transition into M.S. degree programs in Chemistry and Biochemistry. OPEN-NJ will award approximately 51 yearly scholarships to students admitted to the M.S. programs in Chemistry, Chemistry with a concentration in Biochemistry, and Pharmaceutical Biochemistry. OPEN-NJ will offer students support services including review of general chemistry during summer orientation, dedicated tutoring services, dedicated faculty mentors, and a learning community. . Students will learn about careers and explore their interests via weekly exchanges with a mentor. Students will take part in a set of workshops on resume preparation, interviews, and on different aspects of professional skills development.	https://www.montclair.edu/csam/open-nj/	Montclair State University, 1 Normal Avenue, Montclair, New Jersey 07043	Nina Goodey	9736556923	goodeyn@mail.montclair.edu
Montclair State University	Public University	TUES Type 1: Incorporation of Research Skills into the Undergraduate Biochemistry Curriculum to Create Extraordinary Scientists for the Modern Research Environment	Research / Industry Connections	College	This project is establishing a two semester series of biochemistry laboratory courses, Biochemistry I and II, in which students carry out class research projects that are an outgrowth of the research projects of on-campus faculty. Students present their work at the end of each semester. A unique feature of the project is an advisory board composed of industry representatives and faculty from nearby institutions.		1 Normal Ave, Montclair, NJ 07043	Nina Goodey	9736556923	goodeyn@mail.montclair.edu

Organization Name	Organization Type	Program Title	Category	Target Population	Offering/Description	Website	Location	Contact Name	Phone Number	Contact Email
Montclair State University	Public University	Passaic River Environmental Education and Monitoring Organization	Research	High School	This program brings together high school students from communities across the socioeconomic spectrum within New Jersey's Passaic River basin. Students study and monitor benthic ecology and water quality in their community, learn how rivers are affected by land use and industry, and discover how rivers are used and what they mean to different communities.	http://pages.csam.montclair.edu/~barrettki/preemo/	1 Normal Ave, Montclair, NJ 07043	Dr. Kirk R. Barrett	973-655-7117	pri@mail.montclair.edu
New Jersey Audobon Society	Nonprofit Organization	Lorrimer Sanctuary	Location Activities	High School	New Jersey Audubon fosters environmental awareness and a conservation ethic among New Jersey's citizens; protects New Jersey's birds, mammals, other animals, and plants, especially endangered and threatened species; and promotes preservation of New Jersey's valuable natural habitats.	http://www.njaudubon.org/SectionCenters/SectionLorrimer/CalendarofEvents.aspx	790 Ewing Avenue PO Box 125 Franklin Lakes, NJ 07417 (201) 891-2185	Patrick Scheuer Sanctuary Director	(201) 891-2185	patrick.scheuer@njaudubon.org
New Jersey City University	Public University	Increasing Science, Mathematics, and Computer Science Opportunities for Low-Income Undergraduate Students	Scholarships	College (Low SES)	The S-STEM project at New Jersey City University (NJCU) encourages low-income, academically talented students to major in the natural sciences, mathematics and computer science, and provides them with the support that they need to succeed in their academic programs. Together with strategic activities, the project accomplishes this goal by providing a total of 105 scholarships distributed over a 5-year period to students in NJCU's biology, chemistry, geoscience, mathematics, physics, and computer science programs.		2039 John F. Kennedy Blvd, Jersey City, NJ 07305	Sandra Caravella	2012003364	Scaravella@njcu.edu
New Jersey Institute of Technology	Public University	Fundamentals of Physical Sciences	Summer Academy	High School	The Fundamentals of Physical Sciences (FPS) Program is a five-week program designed to prepare students for college-level work while they are still in high school.	http://www5.njit.edu/precollege/studentprograms/summer_programs_College_Pre.php	New Jersey Institute of Technology, Center for Pre-College Programs, Central Ave Building, 2nd Floor, University Heights, Newark, NJ 07102		(973)596-3550	cpcp@njit.edu
New Jersey Institute of Technology	Public University	Academy College Courses in Science, Technology, Engineering, Mathematics, and Business	College Coursework	High School	Offers up to eight college credits in small, customized classes taught by faculty. Eligibility grades 10-12.	www.njit.edu/precollege	New Jersey Institute of Technology University Heights Newark, NJ 07102 (973) 596-3550	Tammy Knight	973-596-3550	knight@njit.edu
New Jersey Institute of Technology	Public University	Early College Preparation Programs	Summer Academy	High School	The Center for Pre-College Programs offers a series of summer prgrams for academically talented students from post-fourth to post-eleventh grades. The programs are designed to encourage students to pursue and successfully complete education in science, mathematics, engineering and technological fields.	www.njit.edu/precollege	New Jersey Institute of Technology University Heights Newark, NJ 07102 (973) 596-3550			kathryn.kelly@njit.edu

Organization Name	Organization Type	Program Title	Category	Target Population	Offering/Description	Website	Location	Contact Name	Phone Number	Contact Email
New Jersey Institute of Technology	Public University	UNITE	Summer Academy	High School (Women)	The UNITE program at NJIT is coordinated in conjunction with the FEMME8 and FEMME Academy programs, challenging rising ninth and tenth grade females to improve their math and science backgrounds, while encouraging them to pursue STEM careers, with an ultimate goal of increasing the number of women in these fields. Two groups of 25 students each will participate in this part-commuter, part residential program that extends learning outside the classroom, helping shape the minds of tomorrow's female innovators.	www.njit.edu/precollege	New Jersey Institute of Technology University Heights Newark, NJ 07102 (973) 642-4795	Kathryn Kelly	973-596-3300	kathryn.kelly@njit.edu
NJ Governor's School of Engineering & Technology at Rutgers University	Public University	New Jersey Governor's School of Engineering & Technology	Summer Academy	High School	Selective summer residential program	http://soe.rutgers.edu/new-jersey-governors-school-engineering-technology	All	Ilene Rosen	848-445-4756	ilrosen@rci.rutgers.edu
Passaic County Community College	Community College	Northern New Jersey Bridges to the Baccalaureate (NNJ-B2B)	Research / Mentoring	College (Hispanic)	The Bridge to the Baccalaureate (B2B) track in the Louis Stokes Alliance for Minority Participation (LSAMP) program provides support for alliances of community colleges (2-year institutions) to accelerate the transfer of students historically underrepresented in STEM to four-year institutions in pursuit of STEM baccalaureate degrees. In collaboration GS-LSAMP, NNJ-B2B partners will require that students participate in a powerful set of STEM learning experiences that will instill in them the motivation, skills, and experiences needed to succeed in their STEM coursework and transfer to the universities. The STEM learning experiences will include the following five high impact practices: undergraduate research, peer led team learning (PLTL), Math Bridge programs, peer mentoring, and career/transfer seminars.	http://www.nsf.gov/awardsearch/showAward?AWD_ID=1410389	1 College Blvd, Paterson, NJ 07505	Jacqueline Kineavy	9736845656	jkineavy@pccc.edu

Organization Name	Organization Type	Program Title	Category	Target Population	Offering/Description	Website	Location	Contact Name	Phone Number	Contact Email
Princeton University	Private University	Materials Academy	Summer Academy	High School (Low SES, Women)	Princeton University Materials Academy (P.U.M.A.) is a program committed to improving the science education of under-represented high school students in Trenton, NJ and the surrounding districts. P.U.M.A. brings 30-50 high school students to the labs of the Princeton Center for Complex Materials (PCCM) for 2-3 weeks every summer to teach them about science and engineering. Students learn through hands-on, inquiry-based activities, labs modeled after actual experiments currently done by PCCMs researchers, and lectures by faculty members and lead teachers. Topics covered include nanotechnology, cancer research and materials science.	http://pccm.princeton.edu/education/puma-princeton-university-materials-academy	Princeton, New Jersey 08544	Daniel Steinberg	(609) 258-3000	dsteinbe@Princeton.edu
Project Lead the Way	Nonprofit Organization	Project Lead the Way	Curriculum	High School	PLTW partners with middle schools and high schools to provide a rigorous, relevant STEM education. Through an engaging, hands-on curriculum, PLTW encourages the development of problem-solving skills, critical thinking, creative and innovative reasoning and a love of learning.	https://www.pltw.org/	3939 Priority Way South Drive, Suite 400, Indiapolis, IN 46240	Carolyn Malstrom	518-320-6909	Cmalstrom@pltw.org
Ramapo College of New Jersey	Public University	Pre-College Experience	Summer Academy	High School	The Pre-college Experience at Ramapo College invites applications from students in good academic standing who wish to experience college life early to learn the academic and social skills necessary for success in college. Students may earn transferable college credit or choose a non-credit experiential program.	http://www.ramapo.edu/cipl/youth/	505 Ramapo Valley Road, Mahwah, NJ 07430	Rosa Mulryan	201-684-7636	rmulryan@ramapo.edu
Research & Development Council of New Jersey	Nonprofit Organization	Governor's STEM Scholars	Mentoring	High School / College	A public-private partnership among the Research & Development Council of New Jersey, Governor's Office, New Jersey Department of Education, and Secretary of Higher Education, this program brings together a diverse and representative group of 50 high school and post-secondary student leaders who are interested in pursuing a STEM-related major and career in New Jersey's vast STEM economy.	http://www.govstemscholars.com/about/				DHodges@CN-COM.COM

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Robotics Learning Center	Nonprofit Organization	Storming Robots	Competition	High School	Provides year-round robotics engineering and technology education for talented youth. We offer engineering challenges that are not commonly present at grade-school levels. Our high school programs often deliver college level challenges. Through the engineering process, students learn the basic mechanical skills to build robots from scratch. They then program their robots with true programming language. During summer, we offer weekly themed-based robotics and engineering workshops.	http://summer.stormingrobots.com	3322 Route 22 West Branchburg, NJ 08876 (908) 595-1010	Elizabeth Mabrey	908-595-1010	office@stormingrobots.com
Rowan University - RISE: Rowan's Intro for Students to Engineering	Public University	Rowan's Intro for Students to Engineering	Summer Academy	High School	Rowan's Introduction for Students to Engineering is being held July 12-14 with hands-on workshops and laboratory clinics as well as campus and industry tours. The program is $250 which includes lunch. Applications are available online.	http://www.rowan.edu/colleges/engineering/k-12/rise/index.html	Rowan University 201 Mullica Hill Road Glassboro, NJ 08028 (856) 256-5307	Kathy Urbano	856-256-5309	urbano@rowan.edu
Rutgers New Jersey Medical School	Public	SMART Initiative	Summer Academy / Winter Academy	High School (Underrepresented)	The SMART Initiative (Science, Medicine And Related Topics Pipeline) is a set of pre-college health related educational enrichment programs for students entering grades 8-12. Its mission is designed to assist participants in acquiring a strong background in the sciences and to cultivate interest in health careers. Programs are offered during the winter and summer.	http://njms.rutgers.edu/smart/	Office for Diversity and Community Engagement, 185 South Orange Avenue, Medical Science Building Room-B624, Newark, New Jersey 07103	Mercedes Padilla-Register	973-972-3762	Mercedes.p.register@njms.rutgers.edu
Rutgers School of Engineering	Public University	TARGET: The Academy at Rutgers for Girls in Engineering and Technology	Summer Academy	High School	The Academy at Rutgers for Girls in Engineering and Technology is a summer program designed for middle school and high school girls to increase awareness and familiarize them with career opportunities within engineering.	http://soe.rutgers.edu/target	98 Brett Road, Room B-110 Piscataway, NJ 08854 (732) 445-2212	Candiece White	848-445-4751	cawhite@rci.rutgers.edu

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Rutgers University	Public University	Young Scholars Program in Discrete Mathematics	Summer Academy	High School	The Rutgers Young Scholars Program in Discrete Mathematics is a summer program for mathematically talented high school students. It provides a mathematically rich environment to high school students interested in mathematics, and is designed to encourage them to consider careers in the mathematical sciences.	http://dimacs.rutgers.edu/ysp/	96 Frelinghuysen Rd. Piscataway, NJ 08854	Jean Mara	848-445-4065	jemara@dimacs.rutgers.edu
Rutgers University	Public University	Math and Science Learning Center	Tutoring / Demonstrations	College / High School	The MSLC provides support services for University students and outreach programs for K-12 students. Special to the MSLC are the hands-on interdisciplinary science demonstrations and activities.	https://rlc.rutgers.edu/mslc	85 Somerset St, New Brunswick, NJ 08901			eickhors@rci.rutgers.edu
Rutgers University	Public University	Pre-Engineering Summer Academy	Summer Academy	High School	The Pre-Engineering Summer Academy at Rutgers University is an intensive one-week certificate program (July 31 - August 6, 2016) that will introduce participants to aerospace, biomedical, civil, computer, electrical, forensic, and mechanical engineering through an integrated program of lectures, demonstrations, hands-on projects, tours, and field trips.	http://summersession.rutgers.edu/preengineering	Rutgers Division of Continuing Studies, 85 Somerset Street, New Brunswick, NJ 08901			summer@docs.rutgers.edu
Rutgers University	Public University	Douglass Project for Women in Math, Science & Engineering	Educational Support	College (Women)	The Douglass Science Institute (DSI) is a four-year summer residential program for young women entering 9th grade who want to explore a variety of areas including biology, chemistry, computer science, environmental and marine sciences, engineering, physics, and mathematics.	https://douglass.rutgers.edu/douglass-project-rutgers-women-math-science-and-engineering	Douglass Residential College, 125 George Street, New Brunswick, NJ 08901	Nicole Wodzinski	848-932-9197	nicole.wodzinski@rutgers.edu
Rutgers University-Newark	State Government	Aim High Academy	Summer Academy	High School (Low SES)	These precollege programs, titled Aim High Academy (AHA), have provided an array of education enrichment activities for high-achieving, low-income and/or first generation students with the primary goal to better prepare students and motivate them to attend college. The AHA programs were campus-based, residential, and offered for at least three consecutive weeks during the summer.	http://www.nj.gov/highereducation/grants/AHA.shtml	Rutgers University-Newark Bradley Hall, Room 122 110 Warren Street Newark, New Jersey 07102	Geneva Paul	973-353-3428	

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Rutgers University - New Jersey Medical School	Public University	Pre-Medical Honors Program	College Coursework	High School	The Pre-Medical honors program is designed to attract promising high school students to medicine and the health sciences and is offered during the fall. Mini- Med School is a similar program offered to adults. Both nine-week courses take place Wednesdays 5:45p.m.-9:15 p.m. Each program includes 195 minutes of lectures and seminars. The programs address recent findings in medical research and healthcare, raise consciousness about the routes to medical care, and enhance one of the principle missions of New Jersey Medical School — to train socially conscious and humane physicians.	http://njms.rutgers.edu/education/pre-medical/	Medical Science Building, New Jersey Medical School, 185 South Orange Avenue, Newark, NJ 07103	Michael Grabow	973-972-1269	grabowmi@njms.rutgers.edu
Rutgers University Camden	Public University	REU site: Computational Biology Summer Program at Rutgers-Camden	Summer Academy	College	The Center for Computational and Integrative Biology (CCIB) at Rutgers University - Camden, will provide research training for 10 students, for 10 weeks during the summers of 2013- 2015 under a Research Experience for Undergraduates (REU) Site award. Participating students are expected to do full-time lab research as well as participate in seminars and workshops, such as publishing, insights on global issues and societal needs, regulatory issues, licensing, and entrepreneurship. The students targeted are expected to be at a critical stage where they are deciding whether to change academic focus, follow a new career path, and/or re-engage in academic study.	http://ccib.camden.rutgers.edu/reu.html	Camden	Benedetto Piccoli	8562252949	piccoli@camden.rutgers.edu

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Rutgers University Camden	Public University	Building a Sustainable Pipeline of STEM Scholars at Rutgers-Camden	Scholarships / Learning Community	College	The goal of the Rutgers University Camden S-STEM project is to build a sustainable pipeline of STEM students who enter, stay, and graduate from the university. This project is achieving this goal by: 1) increasing the number of STEM majors through a proactive recruitment campaign, utilizing STEM scholarships as a recruiting tool for academic talented STEM students with financial need, 2) creating a learning community that participates in a comprehensive program designed to improve student retention, promote academic success and build career preparedness, 3) partnering with area high schools and middle schools to enrich math and science education at these schools, 4) leveraging existing strong relationships with alumni to mentor and counsel STEM students about workplace expectations and career opportunities and to cultivate opportunities for internships and student employment.	http://www.nsf.gov/awardsearch/showAward?AWD_ID=0965947	Camden	Michael Palis	8562252949	palis@camden.rutgers.edu
Rutgers University New Brunswick	Public University	STEM for Education (STEM-E) Scholarship Program	Teacher Training	High School (College)	The goal of the STEM for Education (STEM-E) Scholarship Program at Rutgers University is to recruit, retain, and maintain a community of engineers and physicists who are dedicated to teaching in high-needs school districts. Additionally, the program offers long-term continuing professional development to ensure the success of new teachers. Broader Impacts are achieved in that STEM-E scholars will be the nation's leading educational change agents serving in high-need school districts as highly qualified math and science teachers who integrate engineering into their math and physics courses.	http://soe.rutgers.edu/stem-education-scholarship-program	School of Engineering, 98 Brett Road, Piscataway, NJ 08854	Evelyn Laffey	8489320150	elaffey@princeton.edu
Rutgers University New Brunswick	Public University	Preparation in STEM Leadership Program\	Mentoring / Scholarships / Research	College	The Preparation in STEM Leadership (PSL) Program provides an opportunity for academic peer leaders (tutors, study group leaders, etc.) to participate in advanced training. Through this training, peer leaders improve their communication, leadership, and group management skills. They also have the opportunity to earn scholarships and partner with faculty conducting educational research.	https://rlc.rutgers.edu/peer-leader-training/psl-program	85 Somerset St, New Brunswick, NJ 08901	Mary Emenike	8489320150	mary.emenike@rutgers.edu

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Rutgers University School of Engineering	Public University	Governor's School of Engineering & Technology	Summer Academy	High School	The Governor's School of Engineering & Technology is a summer residential program hosted by Rutgers School of Engineering. The program provides its scholars with a comprehensive enrichment course of study with emphasis placed on engineering and technology skills and career exploration. Scholars attend required and elective classes, work on small- group research projects, visit local corporations to learn about career opportunities, hear from guest speakers from academia and industry, and participate in other enrichment activities. High school students who have completed their junior year and who possess outstanding STEM skills are nominated by their high schools to apply to the program.	http://soe.rutgers.edu/new-jersey-governors-school-engineering-technology	98 Brett Road, Room B110, Piscataway, NJ 08854	Ilene Rosen	(848) 445-4753	gsetrutgers@gmail.com
Salem Community College	Community College	Technical High School - Academy of Biological and Medical Sciences	College Coursework	High School	Academy Programs allow students to take college courses through their public high school; a variety of STEM-related programs that include the Biological and Medical Sciences	http://www.salemcc.edu/academics/noncredit-community-education/programs-high-school-students	Salem Community College |460 Hollywood Avenue |Carneys Point, NJ 08069 856-299-2100			
Salem County Vocational Technical School District	Public High School	Academy of Engineering and Technologies	College Coursework	High School	Academy Programs allow students to take Salem Community College courses through their public high school.	http://www.scvts.org/academy-of-engineering-and-technologies.html	880 Route 45, Woodstown, NJ 08098		856-769-0101	bbaker@scvts.org
Sanifo-Aventis	Corporation	BioGENEius Challenge	Competition	High School	The Sanofi-Aventis International BioGENEius Challenge is a competition for high school a student that conducts original research in biotechnology. Held each year at the Biotechnology Industry Organization (BIO) convention and organized by the Biotechnology Institute, it is considered the most prestigious high school science competition, with the winner each year receiving $7,500	http://www.biotechinstitute.org/go.cfm?do=Page.View&pid=20	Biotechnology Institute, 1201 Maryland Avenue, SW, Suite 900, Washington, DC 20024	Dr. Larry Mahan	202-312-9269	lmahan@biotechinstitute.org
Science Olympiad	Nonprofit Organization		Competition	High School	Annual science competition for both middle and high school students.	www.soinc.org	Science Olympiad, Inc., 2 Trans Am Plaza Drive, Suite 415, Oakbrook Terrace, Illinois 50181	Jennifer Wirt		jwirt@livingston.org

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Seton Hall University	Private University	Project Acceleration	College Coursework	High School	Over the course of their high school career, students can earn up to 22 credits from Seton Hall University for approved courses taken in their secondary schools. Subjects include mathematics, computer science, biology, chemistry, physics, economics, psychology, political science, and sociology. There are currently 70 high schools offering Project Acceleration courses.		Seton Hall University, 400 South Orange Avenue, South Orange, NJ 07079	Francesca M. Phillippy - Director	(973)761-9224	projectacceleration@shu.edu
Stevens Institute of Technology	Private University	ESE: IM Extension Services in Engineering: Improving Instruction and Mentoring to Retain Undergraduate Women	Curriculum	College (Women)	The Stevens Institute of Technology along with WEPAN and other partners will deliver an Extension Service project that will include training, materials, technical assistance, and mini-grants to improve instruction in engineering and faculty mentoring skills, using research-based strategies to enhance retention of undergraduate women of all races and ethnicities. The project will serve 30 engineering colleges over a five year period.		1 Castle Point Terrace, Hoboken, NJ 07030	Susan Metz	2012168762	smetz@stevens.edu
Stevens Institute of Technology	Private University	Exploring Career Options in Engineering & Science	Summer Academy	High School	Stevens Institute of Technology offers a two-week career exploration and research program. Students live on campus for two weeks in summer and participate in hands-on research competitions and site visits to major companies.	http://www.stevens.edu/admissions/summer	Stevens Institute of Technology, Hoboken, NJ 07030		201-216-8076	summer@stevens.edu
Students 2 Science	Nonprofit Organization	Students 2 Science	Curriculum / On site Education	High School	Students 2 Science offers programs, centered at a commercial-grade Technology Center. The focus is on changing students' attitudes toward pursuing careers in Science, Technology, Engineering and Math (STEM); and improving student aptitude with STEM subject matter.	www.students2science.org	66 DeForest Avenue, East Hanover, NJ 07936	Donald Truss	973-947-4880	DonaldTruss@Students2Science.org
Summer Institute for the Gifted	Nonprofit Organization	Summer Institute for the Gifted - Princeton University	Summer Academy	High School	College professors teach challenging courses in number theory, problem solving, critical thinking, algebra, PSAT math, geometry, precalculus / trigonometry, biology, chemistry, space technology, robotics, veterinary medicine, archaeology, anatomy and physiology, physics, humanities, ethics, and arts. Includes a complete recreational pro gram and many cultural opportunities.	www.giftedstudy.org	Princeton University		866-303-4744	sig.info@giftedstudy.org

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The Center for Innovation in Engineering and Science Education at Stevens Institute of Technology	Private University	Waterbotics	Curriculum	High School	WaterBotics is an innovative, underwater robotics curriculum that can be used in traditional classroom settings or in after-school and summer camp programs. Team of students work together to design, build, program, test and redesign underwater robots, made of LEGO® and other components.	https://waterbotics.org/	Center for Innovation in Engineering and Science Education, Castle Point on Hudson, Hoboken, NJ 07030		201-216-5374	
The College of New Jersey	Public University	TUES: Collaborating Across Boundaries to Engage Undergraduates in Computational Thinking	Curriculum	College	To adequately prepare a workforce for the changing economic and global landscape, the project is developing a model that enables students with diverse perspectives and disciplinary backgrounds to learn how to collaborate and integrate concepts from their respective fields to develop technology-based solutions for complex real-world problems. The model includes collaboration with a community partner, making it practical for the many campuses with community engaged learning curricula.		2000 Pennington Rd, Ewing Township, NJ 08628	Sarah Pulimood	6097713255	pulimood@tcnj.edu
The College of New Jersey	Public University	PERSIST 2.0 in Biology and Chemistry (Program to Enhance Retention of Students In Science Trajectories in Biology and Chemistry)	Scholarships / Support	College	Building on experiences and outcomes from a prior award, the PERSIST program includes a well-defined application process (with a required interview), peer and faculty mentoring, tutoring, mini-bridge component, and career development programming. Over the 5-year project, 34 unique individuals are receiving scholarship support including two cohorts of freshmen, one cohort each of five sophomores or five juniors, as well as 6 seniors (for just the first project year). In addition, PERSIST is designed to allow carefully chosen students, the time and academic support necessary to improve basic skills, leading to a reduction in an artificially acquired achievement gap.	http://nsf.gov/awardsearch/showAward?AWD_ID=1259762	2000 Pennington Rd, Ewing Township, NJ 08628	Benny Chan	6097713255	chan@tcnj.edu
The College of New Jersey	Public University	FIRSTS (Foundation for Increasing and Retaining STEM Students) Program: A bridge program to study the sociological development of science identities	Summer Academy	College (Low SES)	FIRSTS (Foundation for Increasing and Retaining STEM Students) is an extended summer bridge program for incoming students that continues through their first semester at college. The overall goals of this program are to help students from underserved populations transition to the rigors of the STEM curriculum and gather both qualitative and quantitative data on the reasons financially needy students elect to leave STEM disciplines.		2000 Pennington Rd, Ewing Township, NJ 08628	Sudhir Nayak	6097713255	nayak@tcnj.edu

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The Wetlands Institute	Nonprofit Organization	Changing Tides with STEM	Location Activities	High School	Educational programs offered to full classes of K-12 science students. Programs focus on water quality and water quality testing, recently reworked to fit with Next Generation science education standards.	http://wetlandsinstitute.org/about-us/visit-us	1075 Stone Harbor Blvd. Stone Harbor, NJ 08247-1424 (609) 368-1211	Brooke Knapick	609-368-1211	bknapick@wetlandsinstitute.org
Thomas Edison National Historic Park	Federal Government Agency	Thomas Edison National Historic Site	Location Activities	High School	West Orange was the site of Edison's ultimate research lab -- a place devoted to the "rapid and cheap development of inventions," serving his goal of inventing products that would be useful and affordable to everyone. This lab was staffed by as many as 60 workers and equipped with state of the art machinery and instruments, stocked with just about everything imaginable, " . . . from an elephant's hide to the eyeballs of a United States Senator."	www.fieldtrip.com/nj/17360550.htm	Edison National Historic Site Main Street & Lakeside Avenue West Orange, NJ 07052 (973) 736 0550		(973) 736-0550	
U.S. Army Educational Outreach Program	Federal Government Agency	Research and Engineering Apprentice Program (REAP)	Summer Academy / Research	High School (Underrepresented)	Science and Engineering Apprentice Program (SEAP) is a DOD sponsored summer Science and Engineering Apprentice Program that provides students with invaluable experience and exposure to the world of scientific research. The program offers apprenticeships to high school students interested in science and engineering. The students are assigned to a participating laboratory to pursue scientific experiences with a scientist or engineer who serves as mentor to the apprentice for eight continuous weeks.	http://www.usaeop.com/programs/apprenticeships/reap/	New Jersey Institute of Technology (NJIT)	Irene O'Mara	603-228-4520	renie@aas-world.org
Young Science Achievers Program (YSAP)	Nonprofit Organization	Young Science Achievers Program			The Young Science Achievers Program offers grants of up to $500 per project for projects with two or more students in the project. A project submitted by one student is limited to a total funding of $250.		Young Science Achievers Program P.O. Box 5183 North Branch, NJ 08876			info@ysap.org